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BEFORE THE ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION

In re Determination of Navigability of the Gila River in Maricopa County	No. 03-007-NAV MARICOPA COUNTY'S AND THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY'S POST-HEARING RESPONSE MEMORANDUM

Pursuant to Arizona Administrative Rule R12-17-108(B), Maricopa County and the Flood Control District of Maricopa County, by and through counsel undersigned, submit their Post-Hearing Response Memorandum on the Navigability of the Gila River in Maricopa County, Arizona. This Memorandum responds to the Opening Memoranda submitted in opposition to finding the Gila River navigable.

Furthermore, under R12-17-108(A), absent permission of the ANSAC, opening memoranda are limited to 25 pages. The memorandum that the Gila River Indian Community ("GRI memo") submitted, greatly exceeded that already generous page limit. FCD and Maricopa County move the Commission to strike the pages of the GRI memo that exceed the number permitted under the rule.

I. THE PROOF OF NAVIGABILITY PRESENTED TO THE COMMISSION MORE THAN MEETS THE STATUTORY STANDARD.

Arizona Revised Statues ("A.R.S.") section 37-1128(A) provides the standard of proof for navigability determinations. That section states:

> After the commission completes the public hearing with respect to a watercourse, the commission shall again review all available evidence and render its determination as to whether the particular watercourse was navigable as of February 14, 1912. If the preponderance of the evidence establishes that the watercourse was navigable, the commission shall issue its determination confirming that the watercourse was navigable. If the preponderance of the evidence fails to establish that the watercourse was navigable, the commission shall issue its determination confirming that the watercourse was nonnavigable.

A.R.S. § 37-1128(A) (Supp. 2005). Only evidence that relates to the Gila River's natural and ordinary condition is relevant to the Commission's determination. Any evidence that disregards this essential element is irrelevant. The only evidence that was presented at the hearing on November 16 & 17, 2005 that related to the river's natural and ordinary condition was Mr. Hjalmar W. Hjalmarson's report that evaluated the physical conditions of the river pre-development. The Commission should disregard other irrelevant evidence. Consequently, the proponents of navigability have met the standard of the preponderance of the evidence.

Moreover, other evidence of actual boating on the river supports a finding of navigability. Although much of the water that would have supported boating was diverted between 1850 and 1912, there is still ample evidence that boating on the river actually took place. As highlighted by Dr. Donald C. Jackson and listed in the Arizona State Land Department Gila River Study ("ASLD study"), many people used the river to navigate while diversions were actually happening. The fact that water-borne travel was happening irrespective of the ever-growing diversions highlights the fact that the Gila River was, and remains, susceptible to navigation on February 14, 1912.

In addition to the evidence presented by the parties, at the hearing non-parties testified to their modern navigation on the river. Jon Colby testified that he was presently employed as an outfitter and guide on the Upper Gila. He stated that he guided groups of people via kayaks, rubber rafts, and canoes through the Gila Box Riparian National Conservation Area managed by the Bureau of Land Management near Safford, AZ. Gila River Navigability Hearing Transcript ("TR") 11/17/2005 331:l-15--339:12.[1] In addition, Dave Weedman, a biologist with Arizona Fish & Game, testified at the hearing that he had floated the river gathering information on fish populations. TR 11/16/2005 211:8-13. Evidence of current boating is probative of the susceptibility of the Gila River's navigability at statehood. *Alaska v. Ahtna, Inc.*, 891 F.2d 1401 (9th Cir. 1989). The fact that boating on the Gila persists to this day even though the vast majority of the river has long been diverted for agriculture is strong evidence that before these diversions began the river was navigable in fact.

Regardless of the opponents' attempts to obscure the facts, there is ample evidence of both modern and historical boat travel on the upper Gila River and historical evidence of boat travel on the entire river. The following table summarizes evidence of actual travel on the river.

Year(s)	Party	Location	Citation
1824-27	James Ohio Pattie	Entire River	ASLD study IV-1
1846-47	Mormon Battalion	Lower Gila	ASLD study IV-2
1849	Edward Howard Party	Lower Gila	ASLD study IV-2
1850	Unknown 49'er letter from "Camp Salvation"	Lower Gila	ASLD study IV-3; Transcript ("TR") 11/16/2005 39:9-15; TR 11/17/2005 209:20-210:5
1881	Cotton and Bingham	Lower Gila	ASLD study IV-7; TR 11/16/2005 39:23-40:1; TR 11/17/2005 210:18-211:3

[1] References to the hearings are cited by "page number:line number(s)".

Year(s)	Party	Location	Citation
1881	William "Buckey" O'Neill party	Lower Gila	ASLD study IV-7; TR 11/16/2005 39:16-22, 172:23-173:2; TR 11/17/2005 211:4-19
1895	Evans and Amos	Entire River	ASLD study IV-8: TR 11/16/2005 40:1-5, TR 11/17/2005 212:2-215:9
1905	Jack Shibely	Lower Gila	ASLD study IV-13; TR 11/16/2005 40:13-14, 116:7-20, 215:12-18.
1909	Stanley Sykes	Entire River	TR 11/16/2005 40:15-16, 106:1-16,
1959	Three unknown men	Entire River	ASLD study IV-21
1995-present	Jon Colby-Cimarron Adventure & River Company	Upper Gila	TR 11/17/2005 331:15-332:12
Unknown	Dave Weedman, Fish & Game Biologist	Upper Gila	TR 11/16/2005 211:8-13

Notwithstanding the fact that there is ample evidence of actual travel on the Gila; the focus on historic evidence fails to recognize the importance of the susceptibility analysis, which in this case is more important because of the river conditions at statehood. Not one of the presenters at the hearings refuted or even intelligently challenged Mr. Hjalmarson's study proving that the Gila River, at least from the confluence of the Salt to the Colorado, was susceptible to navigation at statehood.

II. THE CHALLENGES RAISED TO EVIDENCE OF THE GILA RIVER'S SUSCEPTIBILITY TO NAVIGATION AT THE TIME OF STATEHOOD ARE INSUFFICIENT AND UNCONVINCING.

Opponents of navigability apparently misunderstood and therefore mischaracterize the report and presentation by Mr. Hjalmarson "Winn" Hjalmarson. Mr. Hjalmarson's testimony was scientifically accurate and testable because all of the underlying data necessary to repeat his

calculations were either included in his report, or available. Just as opponents' expert, Dr. Littlefield did, Mr. Hjalmarson did not include every single piece of data in his report. If he had, the report would have been unusable. That is why he provided citations to his sources. Nonetheless, Mr. Hjalmarson's assumption of a single, meandering channel was actually supported by Dr. Gary Huckleberry. TR 11/16/05 57:2-58:7. Drs. Schumm and Huckleberry acknowledged that the Gila River became a wide-braided river as a result of large flood events, TR 11/16/2005 59:13-21; Evidence Log ("EL") #6-Schumm report pages 8-9, but Dr. Schumm testified that a braided river could revert to a single meandering channel over time if the natural conditions prevailed. TR 11/17/2005 13:9-14, 34:13-16. Mr. Hjalmarson testified that based on the natural conditions (e.g. slope, sediment, etc.) the Gila River would return to a single meandering channel. *Id.* at 279:12-17. Moreover, the primary reason that the Gila River did not return to a single meandering channel at the time of statehood was because the natural flow had been diverted and the process of re-establishing a single channel interrupted. TR 11/17/2005 254:22-255:7. Opponents of navigability incorrectly argue that the river cannot be navigable because it did not return to a single, meandering channel by statehood. This spurious argument fails to acknowledge that a river is navigable, or not, based on its natural and ordinary conditions. *Defenders of Wildlife*, 199 Ariz. at 423 ¶ 38, 18 P.3d at 744. In this case, the conditions present before diversions began.

Opponents also mischaracterize flow data. SRP cites the ASLD study finding of 1,277 cfs as the pre-statehood average monthly flow. SRP Opening Memo page 10. However, this figure does not adjust for diversion of water. In contrast, using data from the U.S. Geological Survey, Mr. Hjalmarson calculated the pre-development mean (2,330 cfs), median (1,750 cfs), and base flow (290 cfs) of the river. EL #23-Hjalmar W. Hjalmarson, *Navigability Along the*

Natural Channel of the Gila River 13-14 (October 25, 2002) ("Hjalmarson report").[2] SRP failed to note that the ASLD estimate was a post-diversion estimate of the river flow, not, as Mr. Hjalmarson computed and the federal navigability test requires, *Economy Light & Power Co. v. United States*, 256 U.S. 113 (1921), a pre-diversion natural and ordinary flow rate. The Gila River Indian Community also cited data that appears to confuse local groundwater figures with base flow in the river. *See* GRI memo 30:11-31:6.[3]

Next, although no Opponents actually challenge his use of the three federal tests to determine whether the pre-development characteristics of the river were conducive to actual navigation, SRP attempts to cast doubt on Mr. Hjalmarson's conclusion by commenting that under the Langbein method the Gila River was not rated at the "maximum feasible for commercial navigation." SRP memo 22:16. However, this commentary ignores the fact that the Langbein method measures the river's capability to support both downstream and upstream navigation and that the river met the test for commercial navigation, Hjalmarson report page 29, and that in order to be navigable a river need only be navigable in one direction, not both. TR 11/17/05 253:7-9. Therefore, SRP's comment is irrelevant.

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[2] Mr. Hjalmarson testified that the Gila was perennial and that 90% of the year, the river flow equaled or exceeded the baseflow and 37% of the year, the river flow equaled or exceeded the average. TR 11/17/2005 240:17-23.

[3] Here and throughout its memorandum, the Gila River Indian Community used argumentation in place of facts and citations to the record. The Community, without any support whatsoever, alleges that Mr. Hjalmarson, a registered Arizona professional engineer and former hydrologist for the U.S. Geological Survey for thirty-one years and surface-water specialist for twelve years, *see* Exhibit One-Hjalmar W. Hjalmarson CV, "misinterpreted" the Freethey and Anderson data and that he used a "mishmash" of formula. GRI memo 24:6-9. The Community's counsel had an opportunity to cross-examine Mr. Hjalmarson at the hearing regarding this issue, but did not. The Community is merely attempting to assassinate Mr. Hjalmarson's character and credibility by improperly injecting unsupported 'pseudo-analysis' into its memorandum. This, along with all other portions of the GRI memo that are unsupported by record citations should be struck from the record.

Finally, in a vain attempt to avert the effect of his testimony, the Apache Tribe mischaracterizes a quotation from the transcript alleging that Mr. Hjalmarson actually said the river was not navigable in fact.[4] Apache Tribe memo 14-15. However, Mr. Hjalmarson actually stated that the river was indeed susceptible to navigation in its pre-diversion, natural and ordinary condition. TR 11/17/2005 256:5-9.

Opponents to navigability next try to discredit the testimony by Dr. Donald C. Jackson. Admittedly, Dr. Jackson is not a lawyer. However, SRP mischaracterized his credentials in a clumsy attempt to undermine his testimony. Dr. Jackson is a well-respected history professor and the author of a book on western water law. *See* Exhibit Two-Donald C. Jackson, Ph.D. CV. Dr. Jackson is an expert on western water law, not a "layman" as SRP would have the Commission believe. Dr. Jackson merely offered his opinion of how the seminal navigability cases were to be interpreted with respect to the facts present here. He did nothing more than provide ANSAC with his interpretation of cases and the applicable legal standard combined with evidence.

SRP also inaccurately characterized Dr. Jackson's testimony as supported by only "cursory" review of "anecdotal" evidence. Apparently, SRP misapprehended the stated purpose of Dr. Jackson's testimony. He testified that based on his review, the "totality of the evidence" supported his conclusion that the lower Gila River was susceptible to navigation. His review of various historical accounts strongly supports the conclusion that contemporaneous observers of the Gila treated it as a navigable river. The examples that he discussed in his testimony provided

[4] Once again, the opponents to a finding of navigability have confused *actual navigation on* the river with *susceptibility to navigation*. Mr. Hjalmarson agreed with the Apache Tribe's counsel that at the time of statehood the river was not actually capable of floating boats, TR 11/17/2005 327:11-19, but the whole point of his presentation and report was the river was susceptible to navigation in its pre-development, pre-diversion normal and natural condition. TR 11/17/2005 256:5-9.

admissible evidence that not only was the river susceptible to navigation, it was in fact actually navigated, even while diversion was occurring.

III. THE EVIDENCE PRESENTED BY OPPONENTS TO NAVIGABILITY IS CONCLUSORY AND IRRELVANT TO THE COMMISSION'S DETERMINATION.

Citing Dr. Littlefield's report as support, SRP argues that Federal Land surveyors did not think the Gila was navigable. SRP memo page 5. However, as Dr. Littlefield himself admitted, there are at least two problems with that argument: 1) although the survey manual had a lot of detail about how to demarcate navigable and non-navigable streams, the manuals do not provide any guidance about how to determine whether something was actually navigable or susceptible to navigation, EL #19-Littlefield Deposition 5/25/2001 122:23-123:6; and 2) nobody knows which survey manual, if any, the surveyors actually used. *Id.* at 117:20. Furthermore, the U.S. Supreme Court held that the surveyors' actions regarding meandering have little significance because surveyors were known to meander both navigable and non-navigable streams and because they were not "clothed with power to settle questions of navigability." *Oklahoma v. Texas*, 258 U.S. 574, 585 (1922).

As was addressed in FCD and Maricopa County's opening memorandum, the Government Land Office surveys do not undermine the susceptibility of the Gila River to navigation. In contrast with SRP and Dr. Littlefield's assertion, surveyors did place meander posts at various places along the river. *See* EL # 14-Government Land Office Survey Notes ("*Surveys*") Township ("T") 4 South ("S"), Range ("R") 4 West ("W"), Book 1161, pages 43, 47, and 60; *Surveys* T5SR4W Book 1165 p. 60; TR 11/16/05 130:20-131:1-132:5; *Surveys* T5SR5W Book 1164 pgs. 39, 56, 58. Regardless, it seems ludicrous to suggest that because some surveyor visited a location once for only long enough to place a post in the ground, that this provide conclusive evidence to defeat the ownership of the State. As all parties

acknowledge, the river is variable. Moreover, river usage was also likely variable and intermittent, but as evidenced by the various accounts of boating, it did happen and would likely have happened more frequently if the population of Arizona had been greater before all of the water was diverted.

Opponents also cite to the land patents not excluding the river as evidence of non-navigability. This reliance is unfounded. In *Choctaw Nation v. Oklahoma*, 397 U.S. 620, 648 (1970), the U.S. Supreme Court stated that "[c]onveyance of a river bed would not be implied and would not be found unless the grant 'in terms embraces the land under the water of the stream.' Such disposals by the United States 'during the territorial period are not lightly to be inferred, and should not be regarded as intended unless the intention was definitely declared or otherwise made very plain.'" (internal citations omitted). All land patents from the Federal Government are presumed to exclude the lands underneath navigable waters unless the patent explicitly includes the land. Although the Federal Government could dispose of lands pre-statehood, if the grant was not explicit the land was transferred to the state upon admission to the Union under the 'equal footing' doctrine. *Defenders of Wildlife*, 199 Ariz. at 415 ¶ 2, 18 P.3d at 726. The state could then dispose of the lands as it saw fit. *See Wear v. Kansas ex rel. Brewster*, 245 U.S. 154, 157-58 (1917); *Hardin v. Jordan*, 140 U.S. 371, 384 (1891). Although it may dispose of bed lands under certain circumstances, Arizona retains ownership of its bed lands in trust for the people of Arizona under both the Arizona Constitution's gift clause and the public trust doctrine. *See Defenders of Wildlife*, 199 Ariz. at 416 ¶¶ 2-3, 18 P.3d at 727. Consequently, because the Federal patents inherently excluded the bed lands without need to make the exclusion explicit it is irrelevant that the land patents do not exclude the river, which would have been an unnecessary act.

Next, although various parties protest otherwise, under the Federal navigability test, the river must be evaluated in its pre-diversion condition, natural and ordinary condition. In *Economy Light & Power Co. v. United States*, 256 U.S. 113 (1921), the U.S. Supreme Court directly addressed this issue. In *Economy Light & Power*, the Court held that irrespective of a river's falling into disuse as a corridor of commerce because other modes of travel were more efficient, "the fact. . . that artificial obstructions exist capable of being abated by due exercise of the public authority, does not prevent the stream from being regarded as navigable in law, if, supposing them abated, it be navigable in fact in its natural state." *Id.* at 118. In *State v. Bonelli Cattle*, 108 Ariz. 258, 259, 495 P.2d 1312, 1313 (1972), the Arizona Supreme Court acknowledged that artificial obstructions cannot alter a state's property ownership rights. ("Most certainly, the United States government could not claim additional rights in the bed of a navigable river by the construction of dams and artificial channels."). Clearly, under the Federal navigability test applicable to equal footing cases, the Commission is required to disregard artificial obstructions and evaluate the Gila River's susceptibility based on its natural condition.

Drs. Schumm and Huckleberry both viewed the river in post-diversion condition and neither attempted to determine the river's navigability pre-diversion. Dr. Schumm's report has no bearing on the Commission's determination of navigability because it is based solely on the conditions of the river in an un-natural condition, post diversions. TR 11/17/2005 28:15-28:20, 31:8-11, 50:23-51:4. His report highlights the fact that the river changed significantly due to irrigation diversions. As quoted by Dr. Schumm on page 8 of his report, in 1923 C.P. Ross reported in *The Lower Gila Region, Arizona* that by 1917, a large part of the river was already dry, although small reaches still had water. EL #6-Stanley A. Schumm, *Geomorphic Character of the Lower Gila River* 8 (2004) ("Schumm Report"). Moreover, Dr. Schumm's report states

that pre-statehood descriptions of the river compiled by Graf et al. (1994) agree that it was bordered by willows and cottonwoods. *Id.* The width ranged from 240' to 1300' with 450' the most common estimate, while the depth ranged from 0'- 4'. *Id.*[5] Dr. Schumm also notes an account detailed in Ross's 1923 report by John Montgomery, a rancher, who described the river in the summer of 1889 as a "well-defined channel with hard sloping banks lined with cottonwoods and bushes." Mr. Montgomery is also reported as saying that "[t]he water was clear, 5 or 6 feet deep and contained many fish." Dr. Schumm relates a quotation from a U.S. Geological Survey Bulletin entitled *Guidebook of the Western United States*, written by N.H. Darton in 1933 describing the Gila similarly as Mr. Montgomery. Darton is quoted as saying,

> The Gila River channel has changed materially in a century or less. When it was originally discovered, there was a well-defined channel with hard banks sustaining cottonwoods and other trees and plants. The current was swift and deep in places, so that the stream could be navigated by flat boats of moderate size, and it contained sufficient fish to be relied upon as food for many Indians... Now (1933) the Gila River is depositing sediment in its lower part and its braided course follows many narrow sand-clogged channels.

Clearly, the river has changed markedly since irrigation diversion began in earnest. Dr. Schumm's report reinforces this by showing that the river has been altered by diverting the water. Moreover, because Dr. Schumm did not perform any analysis to determine whether the river would have been navigable in its natural and ordinary condition and his report clearly states that the river was likely navigable before diversions, his report does not support a finding of non-navigability.

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[5] These estimates of the river's pre-development width are consistent with Mr. Hjalmarson's calculation that the width was "between about 200 and 300 ft about 60 percent of the days in a typical year," and that "[a]t least 90 percent of the time the channel width in the study reach is more than 170 ft." EL #23-Hjalmarson report page 20.

IV. DETERMINATION OF INDIANS' CLAIMS TO OWNERSHIP OF THE BED OF THE RIVER IS OUTSIDE THE SCOPE OF THE ANSAC'S LEGAL AUTHORITY.

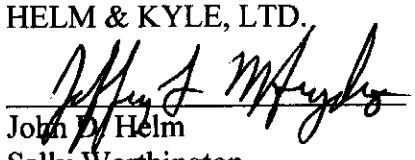
Irrespective of the truth or falsity of its argument and the underlying facts, the ANSAC should disregard the Gila River Indian Community's argument that the Federal Government granted the tribe ownership of the bed of the Gila River where the river passes through its reservation because it is irrelevant to the ANSAC's determination of navigability. In addition, determination of ownership of the bed of the river is beyond the scope of the ANSAC's powers under A.R.S. § 37-1121 *et seq.* The ANSAC's sole purpose is to compile evidence and make determinations regarding navigability of Arizona's rivers and streams, ownership determinations are beyond the scope of the Commission's statutory powers. The Commission should disregard the Gila River Indian Community's evidence and argument on this topic.

V. CONCLUSION

The Federal test for navigability in fact only requires that the Gila River be susceptible to navigation in its natural and ordinary condition, not that navigation actually have occurred. *See The Daniel Ball*, 77 U.S. (10 Wall.) 557, 563 (1870). The evidence presented opposing a finding of navigability merely shows that the river has changed dramatically since significant diversion began and that the contemporaneous observers viewed the river in that altered condition. The only evidence presented about the Gila River in pre-settlement, pre-diversion condition was by Mr. Hjalmarson. His testimony, along with historical evidence of actual navigation on the river, supports a finding that the river was navigable in its natural and ordinary condition. Consequently, this commission should determine that the Gila River, at least from the confluence with the Salt to the Colorado, is navigable.

RESPECTFULLY SUBMITTED this 27th day of February 2006.

HELM & KYLE, LTD.



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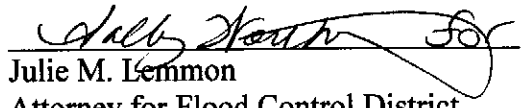

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-Surface-water hydrology, geomorphology, sediment yield, alluvial fan flooding and hydraulics of arid lands.
-Specialized services include analysis, design, consultation, review, advice, expert witness testimony, research, training workshops, site inspection and hydrologic data.
-Technical specialties include flood-hazard assessment, flood-frequency analysis, stage-discharge relations, hydraulics of distributary-flow areas, statistical analysis, flood routing, direct and indirect measurements of discharge, flood insurance studies, and water resources.

Qualifications

-Broad practical background with considerable field experience during the past 38 years in the southwestern United States.
-Wide experience with complex analytical methods and techniques.
-Extensive bibliography and personal library.

Professional Accomplishments

-Member of committee on alluvial fan flooding for National Research Council of the National Academy of Science.
-Served as an engineer and hydrologist for U.S. Geological Survey for 31 years. As the surface-water specialist for Arizona district for 12 years was responsible for quality assurance of hydrologic data collected, analyzed and compiled in accordance with standards.
-Directed hydrologic studies and wrote many technical reports on the surface water hydrology of arid lands that were published by the U.S. Geological Survey and technical societies. See attached bibliography.
-Testified as expert witness in Arizona, Yavapai County and U.S. District Courts on the nature of floodflow.
-Conducted many training courses and lectures for hydrologists, foreign hydrologists, and university students.

Education

Bachelor of Science, Engineering, Arizona State University. Graduate studies, numerous seminars and workshops by federal agencies including the U.S. Army Corps of Engineers, Federal Emergency Management Agency and the Federal Highway Administration.

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Bills, D.J., and Hjalmarson, H.W., 1990, Estimates of ground-water flow components for Lyman Lake, Apache County, Arizona, with a section on Geochemistry of surface water and ground water in the Lyman Lake area by F.N. Robertson: U.S. Geological Survey Water Resources Investigations Report 89-4151, 55 p.

Laney, R.L., 1977, Effects of phreatophyte removal on water quality in the Gila River Project area, Graham County, Arizona, with a section on Statistical analysis by H.W. Hjalmarson: U.S. Geological Survey Professional Paper 655-M, 23 p.

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Phillips, J. V. and Hjalmarson, H. W., 1996, Implication of translatory-wave phenomena for engineering design: Rivertech 96 Conference Proceedings, September, 1996.

Thomas, B.E., Hjalmarson, H.W., and Waltemeyer, S.D., 1997, Methods for estimating magnitude and frequency of floods in the southwestern United States: U.S. Geological Survey Water Supply Paper 2433, 195 p. Study directed by Hjalmarson.

Thomsen, B.W., and Hjalmarson, H.W., 1991, Estimated Manning's roughness coefficient for stream channels, and flood plains in Maricopa County, Arizona: Phoenix, Flood Control District of Maricopa County report, 126p.

Wirt, L. and Hjalmarson, H. W., 2000, Sources of springs supplying base flow to the Verde River headwaters, Yavapai County, Arizona: U. S. Geological Survey Open-File Report 99-378, 50 p.

EXHIBIT TWO

CURRICULUM VITAE - 2003

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EDUCATION:

Ph.D University of Pennsylvania, 1986
M.A. University of Pennsylvania, 1982
B.S. Swarthmore College, 1975
Registered Engineer-in-Training (EIT)
Commonwealth of Pennsylvania, 1975

FELLOWSHIPS:

Fellow: Visiting Scholar, Hagley Museum and Library, Spring 1998
Fellow: Dibner Institute for the History of Science and Technology, Massachusetts Institute of Technology, Fall 1997
Fellow: Fletcher Jones Research Fellow, The Huntington Library, San Marino, CA., Spring 1993
Fellow: Philadelphia Center for Early American Studies University of Pennsylvania, 1988-89
Fellow: Pre-doctoral fellow, National Museum of American History Smithsonian Institution, 1985-86

HONORS AND AWARDS:

Outstanding Academic Book for 1996, selected by *CHOICE*, the official publication of the Association of College and Research Libraries. [awarded for *Building the Ultimate Dam: John S. Eastwood and the Control of Water in the West*, referenced below]

1994 recipient of Ray A. Billington Award from the Western History Association for the best article on the history of the American West. [awarded for "Engineering in the Progressive Era: A New Look at Frederick Haynes Newell and the U.S. Reclamation Service," referenced below]

BOOKS:

Editor, ***DAMS***, Volume 4, Studies in the History of Civil Engineering (Aldershot, England: Ashgate/Variorum Press, 1998).

Building the Ultimate Dam: John S. Eastwood and the Control of Water in the West (Lawrence: University Press of Kansas, 1995).

Great American Bridges and Dams (New York: John Wiley, 1988).

RECENT PROFESSIONAL SERVICE:

Senior Historian, "History of Federal Dams" Project sponsored by the National Park Service, Bureau of Reclamation, and Corps of Engineers. [Professor David Billington, Princeton University, Principal Investigator]

Senior Research Fellow, Center for the History of Business, Technology and Society, Hagley Museum and Library, Wilmington, Delaware.

Member, Public Awareness Committee 2002-03, United States Society on Dams.

Advisor/consultant for PBS documentary on "Building Big: Dams" produced by WGBH-TV in association with the National Science Foundation; 1999-2000.

Advisor/consultant for video documentary on "The St. Francis Dam Disaster" being prepared by Wilkman Productions, Los Angeles, California. 2001-2003.

Historical Consultant for the Flood Control District of Maricopa County,[Arizona concerning the navigability of the Gila River and the Gillespie Dam. 2000-2003

Historical Consultant for United States Postal Service, Stamp Series, 2003

Chair, Melvin Kranzberg Dissertation Fellowship Prize Committee, Society for the History of Technology; Member of committee 1998, 1999; Chair of committee 2000.

Chair, Rachel Carson Dissertation Prize Committee, American Society for Environmental History; Member of committee 1998; Chair of committee 1999.

ARTICLES AND REVIEWS:

"Boulder Dam: Origins of Siting and Design," *Bureau of Reclamation Historical Symposium Proceedings* (CD-ROM, June 2002)

"Private Initiative - Public Works: Ed Fletcher, the Santa Fe Railway and the Cave Creek Flood Control Dam" in Char Miller, ed. *Fluid Arguments: Water Development in the American Southwest* (Tucson: University of Arizona Press, 2001): 251-275.

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"Hydroelectric Power," in Paul Boyer, ed., *The Oxford Companion to United States History* (New York: Oxford University Press, 2001)

"Dams" article in Rudi Volti, ed., *The Encyclopedia of Science, Technology and Society* (New York: 1999)

"Water Policy in the American West," article in *Microsoft Encarta 2002 Encyclopedia* (Redmond, WA.: 1998)

"Dams and Environment in the American West," article in *Microsoft Encarta Encyclopedia Yearbook* (Redmond, WA.: 1998)

Book review of *Industrial Cowboys: Miller and Lux and the Transformation of the Far West* (Berkeley: University of California Press, 2001) for *American Historical Review* (December 2002): 1565-1566.

Book review of Mark Fiege, *Irrigated Eden: The Making on an Agricultual Landscape in the American West* (Seattle: University of Washington Press, 1998) for *Business History Review* (Autumn 2002): 603-605

Book review of Robert Kelley Scheinder, *Unruly River: Two Centuries of Change Along the Missouri* (Lawrence: University Press of Kansas, 1999) in *Pacific Historical Review* (scheduled for publication Fall 2000)

Book review of Jay Brigham, *Empowering the West: Electrical Politics Before FDR* (Lawrence: University Press of Kansas, 1998) in *Environmental History Review* (Fall 1999)

Book review of Robert Richter, *Wind Energy in America: A History* (University of Oklahoma Press, 1997) in *American Historical Review* (1998)

Book Review of Harvey H. Jackson III, *Putting Loafing Streams to Work: The building of Lay, Mitchell, Martin, and Jordan Dams, 1910-1929* (University of Alabama Press, 1997) in *The Alabama Review* (1998)

Book review of Doyce B. Nunis, Jr., ed., *The St. Francis Dam Disaster Revisited* (Los Angeles: Ventura County Museum of Art and History, 1996), in *IA: The Journal of the Society for Industrial Archeology* (1998)

Book review of Donald J. Pisani, *Water, Land, and Law in the West: The Limits of Public Policy, 1850-1920* (Lawrence, KS: University Press of Kansas, 1996) in *Journal of the West* 1997

Book review of Donald E. Wolf, *Big Dams and Other Dreams: The Six Companies Story* (Norman, OK: University of Oklahoma Press, 1996), in *Pacific Historical Review* 66 (November 1997)

Book review of Carol Sheriff, *The Artificial River: The Erie Canal and the Paradox of Progress, 1817-1862* (New York: Hill and Wang, 1996), for *American Historical Review* (June 1997)

Book review of Gene Rogge, et al, *Raising Arizona's Dams: Daily Life, Danger, and Discrimination in the Dam Construction Camps of Central Arizona* (Tucson: 1995) in *Technology and Culture* 37 (April 1996)

Book review of *The Great Road: The Building of the Baltimore & Ohio, The Nation's First Railroad, 1828-1853* (Palo Alto: 1994), in *Journal of the Early Republic* 16 (Fall 1996)

"As We Saw It: Construction of the Colorado Aqueduct Tunnels, 1934," *Westways* (October 1996)

Book review of John A. Jakle and Keith A. Sculle, *The Gas Station in America* (Baltimore: 1994) in *Technology and Culture* 36 (October 1995)

Book review of Nicholas Schnitter, *A History of Dams: The Useful Pyramids* (Rotterdam: 1994) in *Technology and Culture* 36 (January 1995)

Book review of Simon W. Freese and Deborah Lightfoot Sizemore, *A Century in the Works: Freese and Nichols Consulting Engineers, 1894-1994* (College Station, TX: 1993); in *Journal of the West* (1996)

Book review of Wiebe E. Bjiker and John Law, eds.; *Shaping Technology: Studies in Technological Change* (Cambridge, MA: 1992), in *Journal Of Interdisciplinary History* 25 (Winter 1995)

"Roads Most Traveled: Turnpikes in Southeastern Pennsylvania in the Early Republic," in Judy McGaw, ed., *Early American Technology: Essays in the History of Making and Doing Things From the Colonial Era to 1850*, (Williamsburg, VA.: Institute of Early American History and Culture, 1994), pp. 197-239. [Published in association with the University of North Carolina Press]

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Book review of John Bowie, *Workshop of the World: A Selective Guide t the Industrial Archeology of Philadelphia* (Philadelphia: 1991) *in technology and Culture* (January 1993)

Book review of Albert P. Heiner, *Henry J. Kaiser, American Empire Builder: An Insider's View*, in *Technology and Culture* 22 (July 1991)

Book review of Mark S. Foster, *Henry J. Kaiser: Builder in the American West* in *Technology and Culture* 22 (July 1991)

Book review of Daniel Sperling, *Alternative Transportation Fuels: An Environmental and Energy Solution* in *Environmental History Review* 15 (Spring 1991)

Book review of Ross Holland, *Great American Lighthouses* in *The Public Historian* 12 (Summer 1990)

"Horseshoe Dam," Historic American Engineering Record Report, 1991, File# HAER AZ-24, Prints and Photographs Division, Library of Congress, Washington, D.C.

"Stewart Mountain Dam," Historic American Engineering Record Report, 1990, File# HAER AZ-12, Prints and Photographs Division, Library of Congress, Washington, D.C.

"Roosevelt Dam," Historic American Engineering Record Report, 1990, File# HAER AZ-6, Prints and Photographs Division, Library of Congress, Washington, D.C.

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Exhibit review of "The Fairmount Waterworks, 1812-1911" (Philadelphia Museum of Art), in *Technology and Culture* 30 (July 1989).

"19th Century American Bridge Failures: A Professional Perspective," in *Proceedings of the Ohio State University Historic Bridge Symposium* (Columbus: Ohio State University and the Ohio Historical Society, 1988): 113-125.

Book review of Graham West, *Innovation and the Rise of the Tunneling Industry* in *Science*, July 29, 1988.

Book review of Michael Welch, *A Mission in the Desert*, in *Technology and Culture* 28 (April 1987).

Book review of Margaret Latimer, Brook Hindle, Melvin Kranzberg, eds., *Bridge to the Future: A Centennial Celebration of the Brooklyn Bridge*, in *IA: The Journal of the Society for Industrial Archeology* 12 (1986).

Book review of Donald J. Pisani, *From the Family Farm to Agribusiness: The Irrigation Crusade in California and the West, 1850-1931*, in *Technology and Culture* 27 (October 1986)

Book review of William A. Myers, *Iron Men and Copper Wires: A Centennial History of the Southern California Edison Company*, in *Technology and Culture* 27 (October 1986)

Book review of John Shaw, *Water Power in Scotland, 1550-1870*, in *Annals of Science* (November 1985)

Exhibit review of "Centennial Celebrations: The 100th Anniversary of the Brooklyn Bridge" (National Museum of American History), in *Technology and Culture* 15 (April 1984)

Book review of Lawrence Lee, Reclaiming the American West, in *Technology and Culture* 24 (October 1983)

Book review of Stanley Davison, *The Leadership of the Reclamation Movement*, in *Technology and Culture* 24 (October 1983)

"Controversy in Hydraulic Design: The Littlerock Dam, 1918-1977," in *Proceedings of the American Society of Engineering Education* Vol. 2, (1982): 471-477.

Book review of Howard Newlon, *A Selection of Historic Papers American Papers on Concrete* in *Technology and Culture* 22 (July 1981)

Book review of Howard Miller and Quinta Scott, *The Eads Bridge* in *IA: The Journal of the Society for Industrial Archeology* 6 (1980)

"John S. Eastwood and the Mountain Dell Dam" *IA: The Journal of the Society for Industrial Archeology* 5 (1979): 33-48.

Book review of Norman Smith, *Man and Water: A History of Hydrotechnology* in *ISIS* 70 (1979).

Book review of Hunter Rouse, Hydraulics in the United States, 1776-1976 in *Technology and Culture* 18 (October 1977).

CONFERENCE AND LECTURE PRESENTATIONS:

Paper: "Boulder Dam: Origins of Siting and Design," Bureau of Reclamation Historical Symposium, University of Nevada , Las Vegas, June 2002.

Paper: "Bulk Does Not Mean Strength: John S. Eastwood and the Multiple Arch Dam," United States Society on Dams Annual Conference, San Diego, California, June 2002.

Paper: "Privilege and Responsibility: The St. Francis Dam Disaster," Society for the History of Technology Conference, San Jose, October 2001.

Paper: "The Pastoral, The Monumental, and What Lies In-Between: Images of Dams and the Riparian Landscape 1900-1960," International Water History Association Conference, Bergen, Norway, August 2001.

Paper: "Knowing Nature, Knowing Culture: John R. Freeman and the Engineering of Hetch Hetchy Reservoir in Yosemite National Park, 1910-1913," Water in History

Conference, University of Wales - Aberstwywyth, July 1999.

Paper, "Beyond Beauty and Wilderness: Preservationist Arguments to Save Hetch Hetchy (1912-1913)" at Annual Conference of the American Society for Environmental History, Tucson, AZ., April 1999.

Paper, "'Large Reservoirs a Necessity: John R. Freeman and Western Dam Building, 1906-1932" at Annual Meeting of the Western History Association, Sacramento, Ca., October 1998.

Paper: "Public Works - Private Initiative: Ed Fletcher, the Santa Fe Railway and the Cave Creek Flood Control Dam," at *Water in the Southwest Conference* sponsored by American Society for Environmental History, Trinity University, San Antonio, TX, May 1998

Paper, "Dams and the Environment," at *Environmental Research Workshop*, Georgetown University Law Center, Washington D.C., February 1998

Paper: "The Business of Power: Henry Huntington and the Pacific Light and Power Corporation," Annual meeting of the Society for the History of Technology, Pasadena, CA., October 1997.

Paper: "Hydraulic Empire: John R. Freeman and America's Massive Dam Tradition," Dibner Institute for the History of Science and Technology Colloquium, Cambridge, MA., September 1997.

Paper: "It Is Your Dam Business: Water and Power in the American West," Thomas and Lurie Jones Lecture, Lafayette College, Easton PA., November 1996.

Commentator for session: "'Not Quite Modern' Technologies," Annual meeting of the Society for the History of Technology, London, England, August 1996.

Participant in National Council on Public History Roundtable on Public and Private Discourse in Water Resource History. Presentation: "Public Works - Private Interests: Alternative Views of Western Water Resources Development," Annual meeting of the Organization of American Historians, Washington D.C., April 1995.

Paper: "Surveying the Land: Topography and the Development of Water Resources in the American West," Annual meeting of the Society for the History of Technology, Lowell, Mass., October 1994.

Paper: "The New Western History and Water Resources," Museum of American History Colloquium Series, Smithsonian Institution, Washington, D.C.; January 1995.

Participant in National Archives symposium on water resources records, National Archives II, College Park, Maryland, April 1994.

Paper: "Henry Huntington and the Business of Hydroelectric Power: The Big Creek Project (1902-1913)," Seminar meeting of the Center for the History of Business, Technology and Society, Hagley Library, Wilmington, DE, December, 1993.

Paper: "'I Have My Hand in On Those High Boys': Personal and Professional Interrelationships Among the Western Dam-Designing Elite, 1900-1930," Western History Association Conference, Tulsa, OK, October, 1993.

Paper: "Roads Most Traveled: Early Turnpikes in Pennsylvania," Annual meeting of the Society for the History of Technology, Cleveland, OH, October 1990.

Paper: "A New Look at Progressive Era Engineering in the West: Frederick H. Newell and the U. S. Reclamation Service," Annual meeting of the Society for the History of Technology, Sacramento, CA, October 1989.

Paper: "Controversy at Big Meadows: John S. Eastwood, John R. Freeman and the "Psychology" of the Multiple Arch Dam," Annual meeting of the Society for the History of Technology Conference, Raleigh, NC, October 1987.

Paper: "Variety, Choice and Technological History: The Structural and Massive Traditions in Dam Design," Annual meeting of the Society for Industrial Archeology, Troy, NY, May 1987.

Paper: "An Economic History of Water Use and Water Storage in Western America," West Virginia University/Smithsonian Institution Symposium, Washington, D.C., April 1986.

Paper: "A History of Masonry and Concrete Bridges in America," Annual meeting of the American Society of Civil Engineers, San Francisco, CA., October 1984.

Paper: "Theory and Practice in the Development of a Technological Style: California's Early Three-Phase AC Power Systems," Annual meeting of the Society for the History of Technology, Philadelphia, PA., October 1982.

Paper: "Myth and Reality of Late 19th Century Truss Bridge Failures," Annual meeting of the Society for Industrial Archeology, Detroit, MI., June 1980.

PROFESSIONAL SERVICE AND ACTIVITIES:

Book Review Editor, *IA: Journal of the Society for Industrial Archeology* (1989-1994)

Scholarly referee for:
- The University of Arizona Press
- The University of Nevada Press
- The University of Oklahoma Press
- Texas Tech Univesity Press
- The MIT Press
- Lehigh University Press
- *Technology and Culture*
- *Western Historical Quarterly*
- *Pacific Historical Review*
- *IA: The Journal of the Society for Industrial Archeology*
- *The Public Historian*

TEACHING AND PROFESSIONAL EXPERIENCE:

Fall 1998- Present: Associate Professor of History, Lafayette College

Fall 1997- Spring 1998: Sabbatical Leave from Lafayette College
- Fellow, Dibner Institute for the History of Science and Technology Massachusetts Institute of Technology, Fall 1997
- Fellow, Center for the History of Business, Technology and Society at the Hagley Museum and Library, Wilmington, Delaware

1989-1999: Assistant & Associate Professor of History,
Lafayette College, Easton, PA.
Taught courses in:
- Out of the Past: Themes in American History (1607-1980)
- American History Since Reconstruction (1870-1980)
- Transformation of the American Environment
- Progressivism in America (1870-1920)
- Recent America (1930-1980)
- History of Technology
- Seminar on the History of American Technology
- Seminar on the History of the American West (1800-1930)
- Senior Colloquium on "Water and Society"
- Value, Science and Technology Seminar on "Water and Society"

Spring 1993: Junior Faculty Leave, Lafayette College
Fletcher Jones Research Fellow, The Huntington Library, (Spring 1993)

1988-1989: Research Fellow,
Philadelphia Center for Early American Studies, University of Pennsylvania

1988: Visiting Lecturer, History Department, Drexel University.
Survey course on the history of science
1987: Visiting Lecturer, History and Sociology of Science Department.
University of Pennsylvania.
Taught courses in:
American Technology Since 1880 (HSS 222)
Technology and Society (HSS 003)

1985-1986
Pre-doctoral fellow, National Museum of American History, Smithsonian Institution
1981-1983
Graduate student, University of Pennsylvania

1975-1981; 1983-1985
Staff Engineer
Historic American Engineering Record
National Park Service