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BEFORE THE ARIZONA NAVIGABLE STREAM

ADJUDICATION COMMISSION

IN THE MATTER OF THE NAVIGABILITY OF THE SALT RIVER FROM THE CONFLUENCE OF THE WHITE AND BLACK RIVERS TO THE GILA RIVER CONFLUENCE, MARICOPA COUNTY, ARIZONA	Nos. 03-005-NAV and 04-008-NAV (Consolidated) (Salt) ARIZONA STATE LAND DEPARTMENT'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW REGARDING THE SALT RIVER

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FINDINGS OF FACTS ("FOF") [1]

The Arizona State Land Department's ("ASLD's" or the "State's") Findings of Fact and Conclusions of Law may not contain all of the facts and law relied upon by the State in its briefs. Nevertheless, all facts cited within the State's briefs are supported by the Commission's official record.

1. In 1972, the Salt River Pima-Maricopa Indian Community sued Arizona Sand & Rock Co., the Arizona Department of Transportation, and others, in the United States District Court, District of Arizona, concerning, among other things, the location of its reservation's south boundary on the River. The reservation is in Township 1 North, Range 5 East. For purposes of the lawsuit, all parties agreed that the River was not navigable, and in 1977 the Court entered its judgment based on the parties' stipulation. CIV 72-376 PHX WDM. The Court's judgment involved only those miles within the reservation, and the non-navigability finding included in the judgment was not based on the applicable federal test for determining navigability pursuant to the equal footing doctrine. *Salt River Pima-Maricopa Indian Cmty. v. Arizona Sand & Rock Co.,* D. Ariz. (CIV 72-376-PHX) (Apr. 13, 1977).

2. In 1985, Arizona officials first asserted a sovereign interest in Arizona's streambeds. *Land Dep't v. O'Toole*, 154 Ariz. 43, 739 P.2d 1360 (1987).

3. The Legislature enacted a law in 1987 substantially relinquishing the State's interest in any such lands. Laws 1987, Ch. 127, § 4, effective April 21, 1987.

4. The Arizona Center for Law in the Public Interest filed a lawsuit challenging the legislation, and the court of appeals ultimately found that the legislation violated the public trust doctrine and the Arizona Constitution's gift clause, and that navigability – and thus bed ownership – must be determined pursuant to federal law. *Center for Law in the Public*

[1]Documents with the initial letter "L" are from the Lower Salt record; those with the initial letter "U" are from the Upper Salt record; those with the initial letter "C" are from the Consolidated Salt record.

Interest v. Hassell, 172 Ariz. 356, 837 P.2d 158 (App. 1991).

5. The Legislature thereupon enacted statutes establishing the Arizona Navigable Streams Adjudication Commission (ANSAC) and providing for ANSAC to conduct public hearings for all of the watercourses. 1992 Arizona Session Laws, ch. 297.

6. In 1994, as ANSAC began to take evidence on certain watercourses, the Legislature amended the underlying legislation. 1994 Arizona Session Laws, ch. 178.

7. In 2001, the court of appeals struck down the 1994 statutes as inconsistent with the federal test for navigability. *Defenders of Wildlife v. Hull*, 199 Ariz. 422, 18 P.3d 711 (App. 2001).

8. The Legislature once again amended the statutes, to comply with the court of appeals' mandate. 2001 Arizona Session Laws, ch. 166, § 1.

9. Pursuant to Title 37, Chapter 7, Arizona Revised Statutes, ANSAC conducted a public hearing on the Lower Salt River, from Granite Reef Dam to the Gila-Salt confluence, on April 7, 2003, and, after post-hearing briefing, found the River to be non-navigable as of February 14, 1912, by unanimous vote.

10. ANSAC issued its Report Findings and Determination Regarding the Navigability of the Lower Salt River in September 2005.

11. Pursuant to Title 37, Chapter 7, Arizona Revised Statutes, ANSAC conducted a public hearing on the Upper Salt River on October 20, 2005 in Phoenix, and, after post-hearing briefing, found the River non-navigable as of February 14, 1912 again by unanimous vote.

12. ANSAC issued its Report, Findings and Determination Regarding the Navigability of the Upper Salt River, from the Confluence of the White and Black Rivers to Granite Reef Dam, on December 13, 2007.

13. On April 27, 2010, the Arizona Court of Appeals issued its opinion in the matter

of *State of Arizona v. ANSAC*, 1 CA-CV 07-0704 (Lower Salt River) ("*Winkleman*"), finding that ANSAC had misapplied the *Daniel Ball* test. The court vacated the judgment of the superior court and remanded the matter to ANSAC for further proceedings.

14. On February 22, 2012, the United States Supreme Court issued its opinion in *PPL Montana, LLC, v. Montana*, 132 S. Ct. 2115 (2012).

15. Pursuant to *Winkleman* and *PPL,* ANSAC conducted hearings on the navigability of the Salt River (combining the Lower Salt and the Upper Salt) from October 20-23, 2015; November 11-20, 2015; January 26-29, 2016; February 23-26, 2016; March 10-11 and 30-31, 2016; and May 17-19, 2016.

I. Segmentation

16. ASLD has segmented the River in accordance with the dictates of *PPL*[2] by identifying characteristics of reaches that are similar enough in depth, width, degrees of pattern and character of rapids, and flow rates, to be cohesive over some distance. Over the River's course, there are differences that affect the River's susceptibility to navigation such as bedrock canyons and alluvial valleys. Tr. 10/20/2015, at 52-53 (Fuller)[3]; *see* C028-349 (aerial photographs); C030-364, at 52, 58, 65, 74, 87, 97 (Fuller PPT). The exact segment boundaries can be found in exhibit C028-349. Based on the River's diverse physical characteristics it is appropriate to segment the River as follows:[4]

17. Segment 1 (from the White/Black River confluence to Apache Falls - just upstream of the U.S. 60 bridge [33.4 River Miles (RM)]) has a pool and riffle pattern with many rapids in an incised canyon; its geology is different from that of the other segments. This segment is not navigable. Tr. 10/20/2015, at 54-61 (Fuller); C030-364, at 52-53 (Fuller

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[2] *PPL Montana, LLC v. Montana*, 132 S. Ct. 1215 (2012).

[3] Transcript of hearings held before The Arizona Navigable Streams Commission ("ANSAC"); the name of the witness appears in parentheses.

[4] For a full description of each segment, see Section VIII.

PPT).

18. Segment 2 (from Apache Falls to Sleeper Rapid, just below Quartzsite Falls [32.8 RM]) has a channel that is relatively straight/somewhat sinuous and is within bedrock canyons except for Gleason Flat. This is a popular whitewater boating reach with some pools and riffles and some rapids. Tr. 10/20/2015, at 61-87 (Fuller); C030-364, at 58-59 (Fuller PPT).

19. Segment 3 (from Sleeper Rapid to near Roosevelt Dam [37.9 RM]) has bedrock canyons in its upper part with a pool and riffle character, a straight/sinuous channel and some rapids and then flats. Tr. 10/20/2015, at 98-100 (Fuller); C030-364, at 65-66 (Fuller PPT).

20. Segment 4 (from Roosevelt Dam to Stewart Mountain Dam [35.5 RM]) is within a bedrock canyon and was perennial with pool and riffle characteristics in its natural state; it is now underneath Roosevelt Dam and Apache, Canyon, and Saguaro reservoirs. Tr. 10/20/2015, at 108-109 (Fuller); C030-364, at 74, 75 (Fuller PPT).

21. Segment 5 (from Stewart Mountain Dam to Verde River confluence [9.2 RM]) was perennial, with pool and riffle characteristics and a relatively straight/sinuous channel; this reach is mostly alluvial. Tr. 10/20/2015, at 131-32 (Fuller); C030-364, at 87, 88 (Fuller PPT).

22. Segment 6 (from Verde River confluence to the Gila River [41.3 RM]) was perennial, with no known rapids; it has pool and riffle characteristics with a sinuous to straight channel within a miles-wide alluvial valley. Tr. 10/20/2015, at 147-48 (Fuller); C030-364, at 97-98 (Fuller PPT).

II. Hydrology and Geomorphology

A. Pre-Diversion Flow[5]

23. The Salt River (the "River") watershed drains about 15,000 square miles of

[5] For flow information on each Segment, see Section VIII.

central and eastern Arizona and ranges in elevation from 12,643 feet at Humphrey's Peak north of Flagstaff and 11,590 feet at Mount Baldy near Greer to 930 feet at the Salt-Gila confluence.[6] L030, at 5-1 (ASLD Report).

24. Although the River is nominally a tributary of the Gila River, it is larger in catchment area and discharge and might properly be considered the main stream; it receives the drainage from central Arizona, as its principal tributary, the Verde, flows southeasterly and south from the mountains and tablelands south of the Colorado River. Although it drains a smaller area, its basin is much higher and cooler and receives an average precipitation far beyond that of the Gila Basin. C028-350, at 61 (Eleventh Annual Report, USGS, 1889-90); C002-24, at 22 (Davis, United States Geological Survey ("USGS"): "Water Storage on Salt River, Arizona, 1903).

25. The watershed is bounded by the Mogollon Rim to the north, the Mazatzal Mountains to the west, the Superstition Mountains and the Gila River watershed to the south, and the White Mountains to the east. U027, at 4-4 (ASLD Report).

26. Major perennial tributaries to the upper watershed include the White, Black, and Verde Rivers, and Tonto Creek. L030, at 5-1 (ASLD Report).

27. The mountainous areas of the watershed typically receive 20 to 30 inches of rain annually. L022-1, Doc. 2 (Hjalmarson: "Hydrology Along the Natural Channel of the Salt River," 2/25/03).

28. Precipitation occurs during two major seasons: in late summer as intense, localized orographic thunderstorms and in winter as large-scale cyclonic storms originating over the Pacific Ocean. Winter storms tend to produce the largest flows on the River, and

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[6] *Arizona Stream Navigability Study for the Salt River: Granite Reef Dam to the Gila River Confluence*, Draft Final Report, prepared for the Arizona State Land Department, December 1992 by CH2Mhill SWCA Environmental Consultants, and Revised: September 1996 by JE Fuller/Hydrology & Geomorphology, Inc., and in April 2003 by JE Fuller. Jon Fuller has studied rivers for more than 30 years and has worked on more than 500 rivers. Tr. 10/22/15, at 655 (Fuller).

over 90 percent of the largest storms occur in winter. L030, at 5-4, 7-3 (ASLD Report); U027, at 4-4 (ASLD Report).

29. The study reach experiences a hot, dry climate typical of the upper Sonoran Desert. Mean precipitation and temperature do not vary significantly, although the climate varies significantly with elevation within the watershed. U027, at 4-4 (ASLD Report).

30. Vegetation is dominated by Sonoran Desert Scrub-Lower Colorado River Subdivision communities which include grasses, low scrubs, and saguaro cacti. Before the 1940s, some reaches were lined with cottonwood, seepwillow, and mesquite trees, particularly in Segments 5 and 6 and within the flats in Segments 1 through 4. The upper watershed extends through several climatic-vegetation zones. U027, at 4-5 (ASLD Report).

31. Prior to and during early occupation by Euro-American settlers, the River was perennial, with reliable flow throughout the year. L030, at 5-5 (ASLD Report); Tr. 4/7/03, at 201 (Schumm); C018-161, at 9 (Thomsen and Porcello, 1991). A perennial stream is a stream which flows year round, non-zero base flow. L030, Glossary-11 (ASLD Report). The River [in Segments 1, 2, and 3] is still perennial. U027, at 4-5, 4-10 (ASLD Report).

32. Sources of runoff included discharge from springs and snowmelt in the upper watershed, storm water runoff, and groundwater discharge. Reservoir impoundments, canal diversions, and groundwater withdrawals over the past 80 years have effectively eliminated low-flow runoff within the study reach. Today, the lower River flows only in response to local storm water inflows, runoff which passes the irrigation diversions at Granite Reef Dam during periods of high-flow, and effluent discharge from the 91st Avenue sewage treatment plant downstream of Phoenix. L030, at 5-4 (ASLD Report).

33. Available information indicates that prehistoric stream flow rates were similar to those found by early Euro-American explorers and settlers. L030, at 2-17 (ASLD Report).

34. Before Euro-American development, monthly fluctuations occurred in response

to seasonal precipitation and snowmelt runoff, but stream flow rates were sufficient to support rich riparian vegetation, fish and beaver populations, and extensive prehistoric irrigation systems. By the late 1890s irrigation diversions had significantly reduced flow rates. L030, at 7-12 (ASLD Report).

35. The upper watershed provides the majority of the runoff (the base flow), but some runoff is below the gages at Roosevelt Dam [in Segment 3] and on Tonto Creek, both of which are upstream of the reservoir. This means that 15% of the total drainage area is below those gages and above Stewart Mountain Dam [at the end of Segment 4]. Tr. 5/17/16, at 4726 (Fuller).

36. Base flow is not just the amount of water coming from one point on the River but includes upstream contributions, *i.e.* the amount of water that is normally in the River. Tr. 5/17/16, at 4727-28 (Fuller).

37. The River's flows fluctuate seasonally, with higher flows from December through May (L030, at 7-17, Table 7-14 [ASLD Report]) and winter storms producing the largest peak flows (L030, at 5-4, (ASLD Report)). *See also* Tr. 10/20/2015, at 44 (Fuller), C030-364, at 39 (Fuller PPT) (February, March and April, and to some extent January and May, are the months with the highest flow, with a small bump in the monsoon season); Tr. 10/21/15, at 503-04 (Fuller); C030-364, at 39, 229 (Fuller PPT) (Salt River Seasonal Flow Variation); U027, 5-34 (ASLD Report). The time of River's low flow is in May, June and July. U027, 5-34 (ASLD Report). Seasonal high flows are not floods. Tr. 5/17/16, at 4730 (Fuller).

38. The River is not erratic and unpredictable for boaters; measurements allow prediction of the flow within a range. Tr. 5/17/16, at 4726-27; 5/18/16, at 4814 (Fuller); C053-385, at 111 (Fuller Rebuttal PPT).

39. Discharges from springs in bedrock aquifers provide a constant base flow with

an average discharge of more than 350 cubic feet per second (cfs) during the driest months. U027, at 4-10 (ASLD Report).

40. Base flow alone (as used by Mr. Gookin) without adding input from precipitation or snowmelt equates to drought conditions - not the River's ordinary and natural condition. The ten per cent number on Fuller PPT 85 is outside the normal range; 90% of the time the flow is more. Tr. 5/18/16, at 4765-66 (Fuller); C053-385, at 85 (Fuller Rebuttal PPT).

41. Many springs and tributaries add flow to the River, so the flow rate increases in the downstream direction through Segments 1 through 5. Tr. 10/21/15, at 490 (Fuller); C030-364, at 213 (Fuller PPT).

42. The USGS established several gage stations on and near the River: At Roosevelt (1888); Near Roosevelt (1913); below Stewart Mountain Dam (1931); Verde River below Tangle Creek (1945); Verde River below Bartlett Dam (1888); and Tonto Creek above Gun Creek (1942). C028-357 (USGS Water Supply Papers); C018-161, at 5, Fig 2, at 11, Table 1 (Thomsen and Porcello, 1991). An additional gage at Chrysotile was established in 1924. *See* C053-385, at 81 (Fuller Rebuttal PPT).

43. Direct measurement from gages show that in 1889 the River's average annual minimum flow at Arizona Dam [in Segment 6] was 2,656 cfs. L030, at 7-7 (ASLD Report).

44. Long-term and/or historical stream flow records exist for the entire study area upstream of Granite Reef Dam. Estimates of long-term flow rates have been developed based on indirect data such as climatic reconstruction using tree-ring records, short-term stream gage records made before statehood, long-term USGS stream gage records, miscellaneous engineering reports, FEMA records, reconstruction of pre-development flows derived from modern stream gauge records, early explorers' accounts, and extrapolations based on irrigation capacity. U027, at 4-5, 5-5 (ASLD Report); C018-161, at 11-12 (Thomsen and

Porcello, 1991).

45. Based on USGS gage data through 2015, USGS studies from Thomson & Porcello and Pope et. al, and taking into account the depletion numbers proposed by Mr. Burtell, and the entire data range proposed by Dr. Mussetter, Mr. Fuller produced consensus flow data: "Recommended Ordinary & Natural Flow Data for Use by ANSAC in Making Navigability Determinations." *See* C053-396, at 8 (Salt River Rebuttal: Hydrology); Tr. 5/18/16, at 4747-66 (Fuller). The complete chart of recommended flow data is also attached hereto as "Attachment 1." An explanation of the work that produced the recommended flow data can be found in C053-396 (Salt River Rebuttal: Hydrology) and the accompanying transcript, Tr. 5/18/16, at 4747-66 (Fuller). The details on the various flow rates for each Segment can be found in the relevant hydrology/geomorphology section for each segment.

B. Depths

46. When the River's flow is measured at a gage station, the depth is measured at the pool area and the rating curve is typically measured above the riffle at a control section; relating the two things arrives at a discharge. Tr. 10/23/15, at 808-09 (Fuller); C030-364, at 240 (Chrysotile gage) (Fuller PPT).

47. ASLD calculated flow depths along the River for each Segment based on USGS rating curves and field sections; actual measurements; historical and contemporary observations; 1907 topographic mapping with a five-foot contour interval; and interpolating low flow geometry. Tr. 10/21/15, at 506-09 (Fuller); C030-364, at 232, 233 (Fuller PPT); Tr. 10/21/15, at 509-511; C030-364, at 228, 234, 235 (Fuller PPT).

48. Subsequently, ASLD has taken into account criticisms from other parties' expert witnesses (Dr. Mussetter, Mr. Burtell, and Mr. Gookin) to derive consensus depth numbers for each Segment. Tr. 5/18/16, at 4774-4800 (Fuller); C055-398, at 102 (corrected page of C053-385). Mr. Fuller produced "Recommended Flow Depth Estimates by River

Segment for the Ordinary & Natural Condition." C055-400, at 18 (corrected page of C053-397 [Salt River Rebuttal: Rating Curves]). The complete report on those depths and the details on how they were calculate can be found at C053-397 (Salt River Rebuttal: Rating Curves) and C055-400 (corrected page of C053-397 [Salt River Rebuttal: Rating Curves]), and the accompanying transcript, Tr. 5/18/16, at 4770-4803 (Fuller). These numbers represent the River's depths in various ways and at different flow rates, based on the River's seasonal fluctuations. The details of the depths for each segment can be found in the relevant hydrology/geomorphology section for each segment. A chart with those depths is also attached hereto as "Attachment 2." The "median daily (entire year)" column represents the closest and most helpful number for understanding the depth related to small boat navigation on the River. Tr. 5/18/16, at 4801-02 (Fuller). Those numbers show: 1.6' for Segment 2; 2.5' for Segment 3; 2.6' for Segment 4; 1.6' for Segment 5; and a range of 1.6 - 3.4' for Segment 6. C055-398, at 102 (corrected page of C053-385); *see also*, Attachment 2 and C055-400, at 18 (corrected page of C053-397 [Salt River Rebuttal: Rating Curves]).

49. These depths are consistent with observations made in historical descriptions, such as the use of triangulation in 1868 by GLO surveyor Ingalls in Segment 6 and demonstrate that the depths were sufficient for historical boats to have navigated on the River. Tr. 10/22/15, 573-74 (Fuller); C030-364, at 239 (Fuller PPT). Surveying by triangulation means that the River was too deep to cross on foot. Tr. 10/20/2015, at 43 (Fuller); C030-364, at 36 (Fuller PPT); Tr. 3/10/16, at 3795-97 (Littlefield) (triangulation was method of measuring distance when you could not measure a river that was too deep and wide to cross). [*See* Section IV(E)(1) for information on government surveying.]

50. These depths demonstrate that canoes of the type available before and at statehood could have been used year-round in Segments 2 through 6, as well as low-draft maneuverable flat boats. At times of higher flow, larger boats, such as Mr. Logan's [*see*

"Historical Boating" sections], could navigate the entire River. Tr. 5/18/16, at 4805 (Fuller), C053-385, at 104 (Fuller Rebuttal PPT). (Mr. Logan built his own boat, along with three other men, and took it down the River during spring runoff sometime before 1873. C053-392, at 42 [Carl Hayden, *Charles Trumble Hayden*].) Segment 6 could support even larger loaded flat boats with moderate drafts. C053-385, at 104 (Fuller Rebuttal PPT).

51. Ingalls called out some fords in 1868. A ford is a shallow place with good footing for crossing, implying that other parts of a river are not fordable, *i.e.* they are deeper. Tr. 10/20/15, at 50-51 (Fuller); C030-364, at 47 (Fuller PPT).

C. Channel Configuration

52. Generally, the River [in Segments 1 through 4] is located almost entirely within steep bedrock canyons, except for the flats that are now inundated by reservoirs. U027, 4-10. The channel itself in those Segments is relatively steep and bouldery with a pool and riffle channel pattern, and the average channel slope is about 20 feet per mile and includes several small waterfalls. U027, 5-6. Near [Segment 3's] downstream limit, the active channel area becomes broader with a more extensive floodplain and is bounded by stable alluvial surfaces and bedrock. U027, 5-6 (ASLD Report). Due to the bedrock canyons, there has been no significant change in the channel morphology over time. Tr. 10/21/15, 485-86 (Fuller); C030-364; at 209-211 (Fuller PPT).

53. Channel geomorphology at statehood [in Segments 1 through 4] was essentially unchanged from its condition before statehood except where the River has been inundated by reservoir impoundments. U027, 4-15 (ASLD Report); Tr. 10/21/15, at 486 (Fuller); C030-364, at 233 (typical channel sections) (Fuller PPT).

54. In the alluvial valleys (Segments 5 and 6), where there is hardly any bedrock, there is the potential for the low-flow channel to move more significantly in floods; according to a 1912 USGS map, Segment 6 had a single channel for 85% of its length. Tr. 10/21/15,

486-87 (Fuller); C030-364, at 209-211 (Fuller PPT). Available information indicates that natural channel conditions probably included a perennial low-flow channel located within a broader low floodplain; the banks of the low-flow channel were lined by riparian vegetation such as cottonwood, seepwillow, and mesquite trees, while less dense vegetation or swampy areas were found in the low floodplain. L030, 5-9 (ASLD Report).

55. According to Dr. Pewe, "[t]he River is a braided stream; it has a series of anastomosing channels, although only one or two are occupied except in times of flood." Thus the River is braided at flood conditions but in non-flood conditions, only one or two channels are occupied; the River has a compound channel. Tr. 11/18/15, at 1409-10 (Fuller); C026-E, at 2 (Pewe, "Morphology of the Salt River," October 1966).

56. The River lacks the numerous sub-channels of nearly equal magnitude found in some braided streams, and within the limits of its poorly defined high-flow channel is a well-defined low-flow, invert, or main-flow channel. C042-366, at 127 (Graf, *Flood-Related Channel Change*).

57. A review of 112 years [from 1869 to 1981] of change in the River's channel shows that "this arid-region river has a main-flow channel that has migrated laterally up to [one mile] in response to [flood] events." C042-366, first page (Graf, *Flood-Related Channel Change*). "Although the channel has changed somewhat over the past century, it has not behaved like a nearby Gila River as described by Birkham (1972, 1976)." C042-366, at 127 (Graf, *Flood-Related Channel Change*); Tr. 5/19/16, at 4893 (Fuller).

58. A "compound channel" in dry regions is characterized by a single, low-flow meandering channel inset into a wider braided channel network. C028-319, at 8 ("Field Guide . . . Arid West Region").

59. Perennial streams in the arid West consist of a single-thread channel with lateral adjacent floodplains that are either continuous or intermittent along the course of the channel.

C028-319, at 10 ("Field Guide . . . Arid West Region").

60. After a flood event, a low-flow channel re-establishes itself. Tr. 1/29/16, 2676 (Mussetter).

61. A "braid" is a multithread channel formed, for example, by the meltwater flow from a glacier in a sandur. C018-182, at 41 (*Dictionary of Geology*).

62. A "braided river or stream" is one that divides and rejoins around bars of a width similar to the channel width and with a sinuosity of 1-1.3. C018-182, at 41 (*Dictionary of Geology*).

63. A river is said to have a braided pattern when the deeper channels form a lacy or reticulate network of divergent and convergent members. Most braided streams occur where there are almost no lateral confining banks. C018-183, at 90 (*Encyclopedia of Geomorphology*).

64. Braiding, that is a split channel, is not an obstacle to navigability; a 1904 map shows a dominant channel - a low-flow channel that is the boating channel (in Segment 6). Tr. 10/20/15, at 31-34; C030-364; at 17, 24, 25 (Fuller PPT).

65. A compound river has a single defined sinuous or meandering channel set within a braided flood channel. Tr. 10/22/15, at 660-62 (Fuller).

66. Federal surveyor Ingalls showed a permanent low-flow channel and other channels that may have been occupied at higher flows. Tr. 10/20/2015, 41, 43-44 (Fuller); C030-364, at 36 (Fuller PPT).

67. Surveyor Ingalls referred on his plat map to the southernmost channel of the River [in Segment 6] as a slough and the northern channel as the Salt River. *See* C030-364, at 35, 36, (Fuller PPT).

68. From historical descriptions, the geometry characteristics of Segment 5 do not appear to be significantly different from the channel planform of Segment 6's natural

condition; Segment 6 had more of a tendency to have a compound channel but not a braided channel such as is depicted in C030-364, at 13 (Fuller PPT). Tr. 10/22/15, at 657-60 (Fuller).

69. Although the channel conditions described between 1850 to 1910 most likely represent the natural geomorphic condition of the Lower Salt River [Segment 6], by 1912, the geomorphology of the River had been impacted by Euro-American settlement and a period of severe flooding that occurred between 1890 and 1916. L030, at 5-9 (ASLD Report).

70. Channel stability was further confirmed by Swilling arriving in the Salt River Valley in 1867 and utilizing the ancient Hohokam canals for irrigation. Tr. 5/18/16, at 4855-56 (Fuller); Tr. 1/26/16, at 2030-31 (August).

71. Before the 1891 flood, the River's channel [in Segment 6] was stable, as evidenced by vegetation, particularly trees, which showed the location of the low-flow channel. Woody vegetation may play an important role in maintaining channel stability during moderate flood events by restricting and directing flood flow. C018-228 (*Historic Channel Changes*).

72. In 1912 the River had an easily identified low-flow channel, or thalweg, defined by frequent (if not perennial) flow and trees growing along the banks. The low-flow channel tended to shift within the flood plain in response to flood magnitude. The stream pattern was straight with some minor braiding of the low-flow channel. The low-flow channel had an average width of 360 feet, significantly narrowed from pre-settlement conditions. Narrowing probably occurred in response to the reduction in low-flow discharges caused by irrigation diversions. L030, at 5-9 (ASLD Report); *see also* Tr. 10/20/2015, at 31-34 (Fuller); C030-364, at 24, 25 (photographs of the River at Tempe in 1926, showing a dominant channel) (Fuller PPT).

73. In its current condition, the River is an ephemeral stream [below the Dams] whose natural geomorphology is nearly obscured by urbanization. L030, at 5-10. The River

is still perennial above the Dam. *See* U027, at 4-10. (ASLD Report).

D. Floods and Droughts

74. A flood is an inundation of area that is normally dry; it is an unusual condition - not seasonal variation. Tr. 10/21/15, at 496 (Fuller).

75. A floodplain is an area that includes a low flow or main channel that is ordinarily inundated up to the ordinary high water mark and elevated areas that are less frequently inundated. Tr. 11/18/16, at 1299-30 (Fuller).

76. All rivers experience floods; floods are unpredictable and relatively rare, occurring about 1% of the time. Floods are not seasonal variations such as are shown on C030-364, at 229 (Fuller PPT); Tr. 10/21/15, at 496-98 (Fuller).

77. Flash floods can occur, but extremely rarely, in Segments 1 through 4, perhaps from side canyons. Tr. 5/18/16, at 4812 (Fuller); C053-385, at 111 (Fuller Rebuttal PPT).

78. John Wesley Powell reported in 1893 that floods of 10,000 to 20,000 cfs occurred annually. U027, at 5-24. Flows exceeding about 13,000 cfs continue to occur periodically upstream of Roosevelt Dam. U027, at 5-27 (ASLD Report).

79. Records from more than 108 years which included some very large floods, seven or eight that exceeded 20,000 cfs, show the River's low-flow condition is substantively the same. Tr. 10/20/15, at 40 (Fuller); C030-34 at 31 (Fuller PPT).

80. Large floods do a lot of geomorphic work, shaping the flood plain, but it is ordinary floods that shape the low-flow channel which returns after the flood recedes. Tr. 10/20/15, at 36-37 (Fuller); C030-364, at 24, 25, 29, 30 (Fuller PPT).

81. An aerial photograph taken in 2013 [in Segment 5] and a 1905 topographical map of the same area show the low-flow channel in substantially the same condition even after some large floods that exceeded 20,000 cfs. Tr. 10/20/2015, at 39-40 (Fuller); C030-364, at 31 (Fuller PPT).

82. Major floods (sufficient to affect irrigation) occurred on the upper River in February 1874, December 1879, August 1881, February 1884, September 1887, December 1889, February 1890, February 1891, April 1895, August 1904, February 1905, April 1905, November 1905, November 1906, December 1907, February 1908, December 1909 to January 1910, and July 1910. U027, at 3-29, 5-25 (ASLD Report).

83. Severe floods on the Lower River occurred in 1833, 1862, 1869, 1874, 1880, 1891, 1893 and 1905. L030, at 5-9, 7-22, Table 7-16 (ASLD Report).

84. The greatest flood on the River was in 1891, with 276,000 cfs, with a second swell increasing to a maximum of 300,000 cfs a few days later. C002-24, at 20, 42 (Davis, "Water Storage on the Salt"; USGS, 1903). After this flood, the water would have sought out and reformed a low-flow channel. 10/23/15, at 912-13 (Fuller).

85. The 1891 flood cut off a meander bend at Tempe and was large enough to destabilize bank vegetation and result in channel change. *See* photographs of River at Tempe in 1890 and 1900, C018-228 (*Historic Channel Changes*).

86. Channel change has also occurred on the Colorado River, where the ASLD has land in modern day California because of the avulsion of that River. Tr. 5/18/16, at 4829-30 (Fuller).

87. A major flood occurred on the River in 1905. L030, at 3-15. Boats were used to rescue people from the flooded River, as the *Arizona Republic* reported in February 1905. L030, at 3-19, 3-23 (ASLD Report).

88. Major droughts occurred on the upper River [Segments 1 through 5] from September to November 1898, July to November 1901, and in May 1910. U027, at 3-29 (ASLD Report).

89. An extreme drought occurred in the Salt River Valley [Segment 6] from 1898 to 1904. L030, at 3-9 (Table 3-1).

90. A ten-year drought occurred in the 1890s, at a time when there were a lot of diversions from the River [in Segment 6]. Tr. 1/26/16, at 2006-07 (August).

III. Ordinary and Natural Condition and Subsequent Changes

A. Descriptions of the Pre-diversion River

91. Because of the area's remoteness, the rugged terrain, and the Apache threat [in Segments 1-3], descriptions of the upper River in its natural condition are not common. Those observers who described the River there saw a perennial stream, although its flow was highly variable, both seasonally and annually. U027, at 3-24 (ASLD Report).

92. Father Jacobo Sedelmayr, in 1748, stated: "A very pleasant country surrounds this fork of the rivers [the Gila and the Salt in Segment 6]. Here the eye is regaled with creeks, marshes, fields of reed grass and an abundant growth of elders and cottonwood." C028-301, at 24 (Jacobo Sedelmayer, Missionary).

93. In the 1820s, beaver abounded on the River, and trappers, such as James Ohio Pattie and Ewing Young, traveled along the River as they trapped. L030, at 3-6, 3-10. In 1826 Pattie described the River (referring to it as the "Black") at its confluence with the Gila as "afford[ing] as much water at this point as the [Gila] . . . We found it to abound with beavers. It is a most beautiful stream, bounded on each side with high and rich bottoms." C028-312, at 43/122 (*Pattie Narrative*).

94. In July 1852, John R. Bartlett of the U.S. Boundary Commission, while conducting a reconnaissance of the River from its confluence with the Gila to present-day Mesa, described the River at a point 12 miles upriver from its confluence with the Gila [in Segment 6] as follows:

> The bottom, which we crossed diagonally, is from three to four miles wide. The river we found to be from eighty to one hundred and twenty feet wide, from two to three feet deep, and both rapid and clear. . . . The water is perfectly sweet, and neither brackish nor salty, as would be inferred from the name. We saw from the banks many fish in its clear waters, and caught several of the same species as those taken in the Gila.

> The margin of the river on both sides, for a width of three hundred feet, consists of sand and gravel, brought down by freshets when the stream overflows its banks; and from the appearance of the drift-wood lodged in the trees and bushes, it must at times be much swollen, and run with great rapidity. The second terrace or bottom-land, varies from one to four miles in width, and is exceedingly rich. As it is but little elevated above the river, it could be irrigated with ease. At present it is covered with shrubs and mezquit trees, while along the immediate margin of the stream large cotton-wood trees grow."

C028-303, at 240-41 (Bartlett's *Personal Narrative*); C018-37 (*Arizona Wildlife*, at 70).

95. Bartlett described the River's condition in July 1852 as a couple of feet deep and about 120 feet wide, which is consistent with the earliest maps of the River in Segment 5, and it is clear that Bartlett's description is not of the River in a flood condition because it is clear, sweet, and previously had freshets. Tr. 10/20/15, at 179 (Fuller); C018-45 (undated drawing, pencil and wash, showing Bartlett "On the Salinas, North of the Gila, New Mexico").

96. Farther up the River, Bartlett recorded the following:

> We found the river clear and rapid, as at the first camp, with many trout, whose silvery sides glittered in the translucent stream. The quantity of water passing down the Salinas is more than double that of the Gila . . . [i]n crossing the bottom we passed many irrigating canals; and along the base of the plateau was one from twenty to twenty-five feet wide, and from four to five feet deep, formed by cutting down the bank.

C028-303, at 244 (Bartlett's *Personal Narrative*).

97. In the 1860s, the River was a deep and narrow stream with a permanent flow:

> Within a few decades it became erratic as only a desert stream can when the natural covering of the watershed is impaired. With the expansion of farming, cattle, lumber and mining industries, run-offs from the watershed increased to flood dimensions, often cutting new channels, and after they washed out the farmers' diversion dams and spent their dynamic force on other destruction, the flow usually became insufficient for irrigation of current crops . . . .

L016, at 189 (Littlefield Report, 1996, quoting Odd S. Halseth's speech, "1500 Years of Irrigation History," to a 1947 National Reclamation Assoc. meeting in Phoenix).

98. William Pierce, Deputy U.S. Surveyor, found in 1867 that the River in

Township 1 North, Ranges 1 East and 1 West (close to the Salt-Gila confluence) was 6.5 chains[7] wide; and he noted that "at the time of running this line while the water at the lower ford was so deep as to render fording impracticable the water at upper ford was not more than 3 ft deep." C028-335, Book 1357, at 4-5.

99. George P. Ingalls, a government surveyor, described the River in Township 2 North, Range 6 East [in Segment 6] in his field notes in February 1868 as follows:

> Salt River [is] a fine stream of pure water flowing in a westerly direction through the middle of the township. It is fordable during six or seven months of the year in Section 29 at the crossing of the Fort McDowell and Maricopa Wells Road. Timber, cottonwood and willows on both banks of Salt River.

C028-334, Book 1, at 605.

100. George Ingalls also noted that although nearby land was unfit for cultivation the uplands are "well adapted for grazing purposes." C028-334, Book 1, at 605.

101. In December 1868, W.F. Ingalls (George's brother), conducting a cadastral survey, described the River [in Segment 6] as follows:

> Salt River is at this season of the year at least a large stream . . . nor do I think it ever entirely dry. It has moreover a very heavy fall of I should think 12 to 15 feet to the mile which makes it especially valuable for irrigating. I consider this valley from 6 to 10 miles wide . . . as some of the best agricultural land I have yet seen in the Territory and should recommend that it be subdivided at an early day. (Ellipses in ASLD Report.)

Ingalls also noted that the River had timber cottonwoods along its banks, and he described the Salt River Valley around present-day Tempe [in Segment 6] as "low and inclined to be swampy." L030, at 3-15 (ASLD Report). Tr. 10/20/15, at 180-81 (Fuller); C030-364, at 130 (Fuller PPT). The Ingalls' maps did not indicate any marshes along the corridor of the low-flow channel itself. Tr. 5/18/16, at 4807 (Fuller).

102. In September 1870, General George Stoneman and John Huguenot Marion

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[7] A surveyor's chain is a unit of length equal to 66 feet. *See* Kissam, P. *Surveying Practice,* McGraw Hill Pub., New York, at 126. Three chains would therefore measure 198 feet.

crossed the River at Phoenix [in Segment 6], noting that the River was the next largest Arizona stream after the Colorado and that the "water was low when our party crossed it, yet it was with some difficulty that we made the trip." L016, at 171-172 (Littlefield Report, 1996).

103. Mike Burns, a Yavapai Indian who had been captured at the age of seven, wrote about the River as it had been in the 1860s and 1870s, noting that it was then difficult to cross in the winter because of the high water from White River and Tonto Creek [Segment 4]. U027, at 3-24 (ASLD Report).

104. Dr. William Corbusier crossed the River [in Segment 3] in February 1874 and commented that the "water was so high and turbulent that we could not cross, and it was some time before we found a fording place." Tr. 10/20/15, at 183 (Fuller); C030-364, at 134 (Fuller PPT).

105. Indian Commissioner L.E. Dudley drove some Indian men, women and children across the River near the Verde confluence in March 1875 [in Segment 5 or 6], noting that the water was waist-high to a tall man. Tr. 10/20/15, at 184 (Fuller); C030-364, at 135 (Fuller PPT).

106. Hiram Hodge, author of an 1877 guidebook to Arizona, said of the River: "At low water it is a clear, beautiful stream, having an average width of two hundred feet for a distance of one hundred miles above its junction with the Gila [Segments 6, 5, 4, and part of 3], and a depth of two feet or more." L030, at 3-15 (ASLD Report); Tr. 10/20/15, at 180; C030-364, at 129 (Fuller PPT).

107. In an undated account, a pioneer recollected his early days in Buckeye [near Segment 6]:

> [T]ime was when the river bottoms of the Salt and Gila were beautiful places—where there were rocks and ripples visible, many pretty pebble beaches, and cottonwood trees growing on the banks of a beautiful stream. We used to go fishing in the Salt and to have picnics on the river bank.

C028-308 at 203 (House by the Buckeye Road).

108. Pioneer archaeologist Adolph Bandelier, visiting the Tonto Basin [in Segment 3] in late May of 1883, described the River as: "a broad, blue, rushing stream, wider than the Gila, with clear and very alkaline waters" and called it "the finest large river in the Southwest," that flowed through a "beautiful green valley, planted with grain, emerald green, where the ranches of Mr. Danforth and of Mr. Robertson lie." U027, at 3-26 (ASLD Report).

109. On the same trip, near the mouth of Pinto Creek [in Segment 3], Bandelier noted that "Chico [presumably his horse] did not like to cross Salt River, which is very swift, and as broad as the Gila at San Carlos, but only 'belly deep'." U027, at 3-26 to 3-27 (inner quotation marks in original). Bandelier also noted that the River at that location was "alive with trout." U027, at 3-27 (ASLD Report).

110. Personnel from Wallace W. Elliot & Co. described the River [primarily in Segment 6] in Territorial times as being capable of irrigating vast stretches of land, and they continued with the following statement:

> The Salt River (the "River") rises in the eastern part of the Territory, in the White Mountains, its head-waters being the White and Black Rivers. It has numerous large branches, coming in mostly from the north, draining the country far to the north, including the Tonto Basin, the Sierra Ancha, White, San Francisco, and other mountains. Arivaypai is the principal southern tributary. On this stream is a deep canyon with wild scenery. Its course is west and southwest, and it unites the Gila below Phoenix some twenty miles. The river was named the Rio Salado by the early Spanish and Jesuit explorers, on account of its waters being highly impregnated with salt, which is easily noticed at low water. This is caused by a heavy salt formation, through which the river passes about one hundred miles above Phoenix. At low water it is a clear beautiful stream, having an average width of 200 feet for a distance of 100 miles above its junction with the Gila, and a depth of two feet or more. Its length is about two hundred miles and it flows through the largest body of agricultural land in the Territory after it leaves the canon.

C018-218, at 90 (History of Arizona Territory, 1884); L030, at 3-8, Table 3-1 (ASLD Report).

111. "This river, though considered as a tributary of the Gila, is in fact larger both in

catchment area and discharge, and might properly be considered the mainstream." C028-350, at 61 (11th Annual Report, USGS, 1889-1890).

112. Arthur Powell Davis of the USGS reported in 1903 that the Apache Indian Reservation was almost entirely covered with forest and grass, whereas the Tonto Creek Basin [in Segment 3] was closely pastured and delivered some silt into streams during floods. C002-24, at 41 ("Water Storage on Salt").

113. In 1903, the water table was still close to the surface; springs discharged along river banks and farmers drained their land with shallow ditches, providing some flow to the River. L030, at 7-12 (ASLD Report). However, the natural covering of the watershed had been impaired by the expansion of farming, cattle, lumber and mining industries, causing run-offs from the watershed to increase to flood dimensions, cutting new channels, and washing out farmers' diversion dams. L016, at 189 (Littlefield Report, 1996, quoting Halseth).

114. In spite of USGS[8] comments about marshy areas on the north-west boundary of the Gila River Indian Reservation, there is no evidence that marshes invaded the River's low-flow channel [in T1N, R1E]. Tr. 11/20/15, at 1792-93 (Gookin).

115. None of the river descriptions talks about a River that is either less than two feet or substantially depleted due to natural conditions. Tr. 10/20/15, at 186 (Fuller).

B. Changes to the River's Natural Condition/Dams and Diversions

116. The first significant diversion of the River was the Swilling Ditch in 1867 [in Segment 6]. Tr. 10/20/15, at 164 (Fuller); Tr. 1/26/16, at 1880 (August).

117. Irrigation diversion began to reduce low flows as early as the 1870's. L030, at 7-7 (ASLD Report).

118. In addition to Swilling's Ditch (the Salt River Valley Canal), many other irrigation diversion canals were constructed on the River [mostly in the upper part of Segment

[8] United States Geological Survey

6]: Maricopa (a branch of the Swilling Ditch) 1870; Tempe 1870; Broadway 1870; Utah 1877; Mesa 1878; Grand 1878; San Francisco 1880; Arizona 1883; Highland 1888; Cross-Cut 1889; and Consolidated 1891. L030, at 7-11, Table 7-8 (ASLD Report); Tr. 10/20/15, at 164-67 (Fuller); C030-364, at 117, 118 (Fuller PPT); C001, at 158-59 (Littlefield Report).

119. These canals sometimes took virtually all of the water from the River. L030, at 7-8, Table 7-4; Tr. 10/20/15, at 165-66 (Fuller); Tr. 3/11/16, at 3872-73 (Littlefield); C001, at 158-59 (Littlefield Report, 2014); U032, at 28, 46-47, 51 (Kibbey Decree, 3/31/1892).

120. Most canals had their own diversion dams on the River although some combined over the years. C001, at 158-59 (Littlefield Report, 2014).

121. In addition to the canals taking water from the River, numerous canals were operating on the River's main tributary, the Verde and its tributaries. C062-402 (Map: Upper Verde River Canals, *Irrigation and Agricultural Practice*); C062-408 at 7-22, 7-23, Table 7-16 (ASLD Verde Report) (showing irrigation diversions from 1868 to 1913 between Perkinsville and the Salt confluence).

122. The changes in the [Verde] river brought by the settlers resulted in the water level dropping and the Verde becoming narrower. The ditch companies tried to get as much of the water diverted into their ditches, which had a major impact on the water level, as did wells, climate change, and overgrazing. C062-418 (Verde Tr. 2/20/15, at 1808-09, 1832-33 [Randall]).

123. When the white settlers came, in about 1860, they began irrigating from the river and they haven't stopped. There has been less and less water in the Verde since Mr. Randall's elders were living; the water has gone away over time. C062-418 (Verde Tr. 2/20/15, at 1836-39 [Randall]).

124. The Apache were farmers, but they generally irrigated their crops from springs, not from the Verde River. C062-418 (Verde Tr. 2/20/15, at 1839 [Randall]).

125. Studies, including tree ring studies and estimates of pre-1870 streamflow for one hundred years before 1850 show that non-Indian settlers were diverting significant quantities of water from the Gila and its upstream tributaries, like the Salt, in the 1870s. C062-406, at 4, 5 (Thomsen & Eychaner, 1991).

126. The Eleventh Census reported that total irrigated acres in Maricopa County in 1889 were 35,212. Water was claimed, however, for 151,360 acres. The average water use on 60,000 acres irrigated in 1895 was 4.6 acre feet per acre. C018-161, at 7 (Thomsen and Porcello, 1991).

127. By 1890, about 80,000 or 100,000 acres were being irrigated, due to the Arizona Canal being completed in 1885. Tr. 1/26/16, at 2007-08 (August).

128. John Wesley Powell, Director of the USGS, noted in 1890 that the Arizona Canal Company had built a dam or weir on the River about 30 miles upstream of Phoenix and a mile below the junction with the Verde. He also reported that below the Canal were a dozen other canals, varying in length from three to 22 miles and covering 300,000 acres of land of which 35,000 were annually cultivated, that were taking water from the River so that all of the River's water was being "utilized and little more can be done in the way of land reclamation without the construction of storage reservoirs." C028-350, at 61-62 (Eleventh Annual Report, USGS, 1889-90).

129. For photographs of the Arizona Canal, *see* C022-1, at 23, 25 (Gookin Report, 7/27/15); C020 (Littlefield Declaration, App. B: 64, Fig. 82 [Arizona Canal under construction or repair, with skiff in background], Fig. 83 [closeup view of skiff]).

130. The Kibbey decision (*Wormser v. Salt River Valley Canal Co.*, Second Judicial District, Territory of Arizona, County of Maricopa [Mar. 31, 1892, No. 708]), decided rights among various canal companies and water users. L006 (Kibbey Decree); U032 (Kibbey Decree). It noted that during the winter months of December until the middle of May, there is

a large volume flowing in the river, more than adequate for the irrigation of all the lands in the valley. *Id.* at 1. The volume is diminished with the advance of the season, from thousands of cfs to, at a minimum, 300 cfs. *Id.* at 5. As both the increase of population and the different products to which the land was cultivated increased, the demand for water in the summer months when the supply is the least, aggravated by an unnecessary and very considerable waste of water, exceeded the supply. *Id.* at 5. The complainants alleged that as of January 1, 1887, the large quantity of diversions diminished the river such that it prevented complainants from receiving water in their downstream ditches. *Id.* at 10.

131. [T]he various canals and ditches taking water from Salt River have an aggregate capacity much larger than the low-water flow of the river, which is in the neighborhood of 300 cfs, and the irrigable land under these canals is proportionally in excess of the water supply in the dry season. L018-31, Ex. 205, at 55 (A.P. Davis, Water-Supply and Irrigation Papers of the USGS, Department of the Interior, No. 2, 1897, *Irrigation near Phoenix, Arizona*).

132. A map from 1897 shows many canals and the Arizona Dam. C001, at 129, Fig. 37 (Littlefield Declaration, 2014).

133. USGS gauge records at McDowell for 1899 show that near Phoenix "during ordinary seasons all of the water of Salt River is diverted and at the present time there is a shortage in the summer months." C028-358, at 386 (Twenty-First USGS Annual Report).

134. In 1899, the USGS reported that about 200 Maricopas had a small canal from the River, about six miles above the Gila junction. That report also noted that the Pimas and Maricopas who lived near the Salt River Reservation had helped the Mormons build a canal about twenty years before [*i.e.* about 1880]. C028-358, at 357 (Twenty-First USGS Annual Report).

135. Thomas Means, of the U.S. Department of Agriculture, reported that:

> [In 1900] [w]ater is found everywhere in the gravels beneath the valley, the depth and amount of matter in solution varying greatly. The level of standing water and its character have no doubt been much changed during the years in which irrigation has been practiced. Little is known of the condition existing before irrigation, except that the water was deeper than now.

C001, at 161 (Littlefield Report, 2014, quoting from Means, *Soil Survey in the Salt River Valley*, [1901]).

136. The Salt River Valley Water Users Association was established in 1903 to represent individual water users in their dealings with the federal government (regarding a water-storage dam under the Reclamation Act of 1902). L030, at 3-9 (ASLD Report).

137. By 1903, a number of large canals were diverting the River's water and serving the extensively irrigated lands near Phoenix and Mesa. During ordinary seasons, all of the River's water was diverted and shortages arose in the summer months. C028-359, at 23 (USGS Water Supply Paper, 1903).

138. In 1906-08, the U.S. Reclamation Service built the Granite Reef Diversion Dam three miles below the confluence with the Verde [in Segment 6] to replace the Arizona Diversion Dam and in conjunction with the construction of Roosevelt Dam. U027, at 3-21 - 3-22 (ASLD Report). Two canals led from Granite Reef dam: the Arizona Canal on the north side of the River, through laterals, irrigated all farm lands adjacent to Phoenix, Glendale, and Peoria; and the Consolidated Canal supplied all the south-side lands around Mesa, Gilbert, Chandler, and Tempe. C018-46, at 144-45 (*Doctor on Horseback*).

139. In 1910, the Kent Decree (*Hurley v. Abbott*, Third Judicial District, Territory of Arizona, County of Maricopa (Mar. 1, 1910), No. 4564) defined the irrigation status of every parcel of land in the Salt River Valley. The Decree confirmed appropriations that were sufficient to divert all of the River during low flow months: Settlers' acreage irrigated and miner's inches used increased from 5,543 a.f. and 1,663 m.i. in 1869 to 151,083 a.f. and 45,325 m.i. in 1909. C022-12 (Decree), at 77-78, Table No. 10.

140. Upstream diversions from the White and Black Rivers have also diminished the flow. Tr. 10/20/2015, at 66-67 (Fuller); Tr. 11/17/15, at 1171 (Fuller).

141. The primary purpose of the diversions and dams on the River was the watering of crops, which was a very substantial economic issue and one that grew over time. Crops were grown on the Verde in 1865 as well as in the Salt River Valley. Tr. 3/30/16, at 4089 (Littlefield).

142. Various reservoir sites were contemplated for the River. *See* 1889 Map of Maricopa County, "Showing Salt River Valley also the proposed reservoir sites for water storage, dam sites, modern canals, ancient canals and ruins, land to be reclaimed by a water storage system, etc." C018-142.

143. Several dams have been constructed on the River. Construction of the Arizona Dam in 1883 (at the approximate location of the later-built Granite Reef Dam [in Segment 6]) constituted the first major step towards creating a non-navigable situation by diverting the River's entire flow during low-flow periods. Tr. 4/07/03, at 144 (Gookin); *see* C019 (photo of River and Arizona Canal in 1905). The Arizona Dam was completed in 1885 (three-quarters of a mile below the River's confluence with the Verde). Tr. 10/20/15, at 197-98 (Fuller); C030-364, at 153 (Fuller PPT), (1885 photo showing construction of the Dam across entire channel and a flat boat used in construction.) The dam could initially divert about 1,000 cfs into the Arizona Canal, but a crosscut canal was subsequently built (because more rights were developed under the 1910 Kent Decree) to take the water down to where 48th Street is today. Tr. 11/19/15, at 1483-84, 1718 (Gookin). The water diverted by the Arizona Dam and Canal could be returned to the River two miles downstream, leaving two miles of dry riverbed. Tr. 11/19/15, at 1489, Tr. 11/20/15, at 1718 (Gookin). The dam was damaged/washed out in a flood in 1905. U-027, 3-21 (ASLD Report).

144. Jointhead Dam was completed in 1886 in Tempe to serve both the Swilling

Ditch and the North Extension canal. L23-2, at 112-16 (Graf: "The Salt and Gila Rivers in Central Arizona"). The dam was located on the River's low-flow channel. Tr. 10/23/15, at 934 (Fuller).

145. In the summer of 1889, the county sought a suitable site for a dam on the Salt and Verde Rivers. Lead by County Surveyor Breakenridge, a party of men trekked 370 miles along both rivers and chose the site of the future Roosevelt Dam - 400 yards below the Salt-Tonto confluence. This site had appropriate rock type and formations, and lumber was about 20 miles away in the Sierra Anchas. C018-19, at 121-22 ("Two Sides of the River," Zarbin).

146. The county noted that a dam below the Salt/Verde confluence would be necessary to supply "all of the canals of the valley." C018-19, at 123 ("Two Sides of the River," Zarbin).

147. The National Irrigation Congress met in Phoenix in 1896, which meeting resulted in the National Reclamation Act of 1902. C018-46, at 78 (*Doctor on Horseback*).

148. Arthur P. Davis reported to the Water Storage Commission in 1902 that the reservoir [at Roosevelt] would have features that required wood and that logs would be floated down the River from the mountain valleys above for that purpose. C018-143 (*Arizona Republican*, 4/27/1902).

149. The Salt River Valley Water Users' Association was organized in early 1903; later that year the Roosevelt Dam was authorized. C018-46, at 79 (*Doctor on Horseback*).

150. Roosevelt Dam was constructed [in Segment 4] as the first project approved under the 1902 Reclamation Act. U027, at 3-21 - 3-22; L030, at 3-9 (ASLD Report); C018-46, at 79 (*Doctor on Horseback*). Mapping of the Tonto Basin site [in Segments 3 and 4] had begun in 1902. U027, at 3-21 (ASLD Report); C018-55 (photograph of dam site circa 1890), and the Roosevelt road was constructed from 1903 to 1905. C001, at 159-60 (Littlefield

Report, 2014).[9]

151. By the time the Roosevelt Dam construction began, the River was virtually completely diverted by diversion dams downstream. Tr. 3/30/16, at 4043 (Littlefield).

152. Granite Reef Dam, a permanent diversion dam, was started in 1905 to replace the numerous brush dams at canal head-gates along the River and was completed in 1908. L030, at 3-9, Table 3-1 (ASLD Report); C001, at 160 (Littlefield Report, 2014); Tr. 3/10/16, at 3871-72 (Littlefield) (Diversion dams were hastily built and temporary.) The 1,100 foot-long concrete dam was designed to divert all of the River's flow. L036, PPT 18, 4/07/03 (Roberts [SRP]); C020, App. B: 38, Fig. 48 (photograph of Granite Reef Dan under construction in 1907); Figs. 49 and 50 (photographs of dam in 1908); Fig. 51 (photograph of dam in 1909) (Littlefield Decl.).

153. By 1910, the power-canal diversion dam, the power canal, the power plant, the Roosevelt Dam, and Granite Reef dam, were all completed; the improvements of the Arizona Canal system and the wells for underground pumping were still under construction. C028-359, at 22 (Water Supply Paper for 1912).

154. During the 1920s, the Salt River Project built three more dams, to increase power production:

> Mormon Flat Dam (Canyon Lake), 1925 [in Segment 4],
> Horse Mesa (Apache Lake), 1924-27 [in Segment 4], and
> Stewart Mountain (Saguaro Lake), 1928-29 [in Segment 4-5].

U027, at 3-22 to 3-23 (ASLD Report); C030-364, at 119 (Fuller PPT).

155. At the time of Roosevelt Dam's dedication in 1911, 500,000 acre feet (a.f.) of water was stored behind the Dam. L036, PPT 25, 4/07/03 at 239 (Roberts [SRP]).

156. Reservoir impoundments, canal diversions, and groundwater withdrawal since about 1913 have effectively eliminated low-flow runoff. L030, at 5-4 (ASLD Report).

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[9] For more information on the building of Roosevelt Dam, *see* Segment 4 below.

157. Robert Webb's *Ribbon of Green* contains some historical descriptions and Webb cites Professor Minckley, 1973 (at 121) for the contention that the reach [in Segment 5] has become more cobbley and less vegetated than before the dams which trap sediment in reservoirs and the stream. Tr. 10/20/15, at 185 (Fuller); C030-364, at 137 (Fuller PPT).

158. Now the River gets shut off through most of the year; it is open from about May until about the end of September. Tr. 10/23/15, at 973 (Fuller).

IV. General Information

A. Prehistory

159. The oldest archaeological remains documented in the Southwest date to about 13,500 years ago; the people were mobile gatherers and big-game hunters. Experts differ on when agriculture arrived in the Southwest; it could have been more than 4,000 years ago or about 2,000 years ago. Nevertheless, people constructed irrigation canals and established permanent settlements. C018-194 ("Archaeology Southwest - Exploring and Protecting the Places of our Past"); C018-48, at 8 (*Hohokam Millennium*).

160. The Hohokam relied on the River's constant and predictable flow to support one of the largest, most complex, irrigation-based societies in prehistoric North America. L030, at 2-18 (ASLD Report).

161. For more than 1,000 years water from the River has allowed civilizations to flourish in the Salt River Valley [Segment 6]. L030, at 2-1 (ASLD Report).

162. The River sustained a rich riparian environment, providing the Hohokam with food, fuel, and construction materials. L030, at 2-13, 2-17 (ASLD Report).

163. The Hohokam heartland was spread over an expanse of almost 30,000 square miles in the southern half of Arizona - generally bounded by the upper reaches of the Agua Fria and Verde Rivers to the north, and Mogollon Rim to the northeast, the Dragoon Mountains to the southeast, the Mexican border to the south, and the Growler Mountains to

the west. C018-48, at 5 (*Hohokam Millennium*); see C018-192 and -193 for maps of Hohokam and other groups' ancestral lands.

164. The Hohokam, who numbered between 80,000 and 200,000, occupied the area from at least about A.D. 250-1450, (or perhaps as early as 300 B.C.), constructed an irrigation system that extended over 315 miles, and included at least ten separate canal systems. L030, at 2-17 (ASLD Report). Most canals measured 10 to 20 feet wide and were 3 to 12 feet deep with a maximum diversion capacity of about 240 cfs per canal. L030, at 2-9 - 2-17 (ASLD Report). Experts differ on the number of acres of land irrigated: estimates of 70,000 acres to more than 250,000 acres of land have been stated, supporting a population of about 200,000 people, and 300 miles of main canals plus 1,000 miles of smaller canals. Tr. 10/20/15, at 153-54 (Fuller). C030-364, at 108, 109 (1929 map of Hohokam canals) (Fuller PPT); L030, at 2-1, 2-13, 2-17 (ASLD Report); C018-48, at 5 (*Hohokam Millennium*); C018-53 (1884 map showing modern cities and towns, ancient pueblos, settlements, and canals); C018-194 ("Archaeology Southwest - Exploring and Protecting the Places of our Past"); C018-161, at 6 (Thomsen and Porcello, 1991).

165. Hundreds of thousands of acres were once under cultivation. C028-296, at 361 ("Resources of Arizona").

166. Federal surveyors in 1868 found "evidence of land [in Township 1 North, Range 3 East] having been under cultivation at some former time;" they noticed acequias that were "still in a good state of preservation." C028-330, Book 2, at 213.

167. When Frank H. Cushing, a pioneer of Arizona archaeology, entered the Salt River Valley in 1892, he found "one of the most extensive ancient settlements we had yet seen. . . . Before us, toward the north, east, and south, a long series of . . . house mounds, lay stretched out in seemingly endless succession." [Ellipses in original] He could also see "the former courses of the most massive canals ever built in the pre-Columbian Americas north of

Peru." C018-48, at 1, Figs. 1.2, 1.3 (*Hohokam Millennium*); C028-276, at G-29 ("Cultural Resources Overview").

168. The Hohokam traded goods - agricultural products, pottery, abalone shells, and blue shells - with people on the coast; travel was a constant in their lives - an essential element. Tr. 1/26/16, at 2027-28 (August).

169. From about 100 A.D. to about 1450 A.D., when the area of the Upper River [Segments 1 through 4] was abandoned, the subsistence base was agriculture, particularly in the lower Tonto Basin. Although some ancient canals have been identified, early occupants depended more on floodwater farming than irrigation in the Tonto Basin. U-027, at 2-1, 2-22 (ASLD Report); Tr. 10/20/15, at 153 (Fuller).

170. During the period A.D. 700 - 1075 in the Phoenix basin [in Segment 6], settlements grew and irrigation became more complex; irrigation technology allowed agricultural lands on the lowlands as well as on terraces away from river floodplains. C028-276, G-6 - G-7 ("Cultural Resources Overview").

171. Between A.D. 1519 - 1692, the ancestral Pima occupied the Salt, Gila, and lower Santa Cruz Valleys, and the Maricopa, who later moved into and shared territory with the Pima, farmed, hunted, gathered wild seeds, and fished the rivers from boats, using nets and traps. C028-276 at G-10 - G-11, G-15 ("Cultural Resources Overview").

172. In about 1540, the Yavapai then the Apache began using the Upper River area [Segments 1, 2, 3, 4] and practicing floodwater farming. U027, at 2-1 (ASLD Report). Before the 1860s, the area was occupied exclusively by the Yavapai and Western Apache. U027, at 3-1, 3-2 (ASLD Report).

173. A map by Francisco Kino of native populations of Southern Arizona that includes the Salt River does not show any Native Americans living on the lower Salt River. C046-376 (Pioneer Padre).

174. Between 1700 and 1775, there was a major shift [eastward] in the population in the location of the Pima villages, and the Maricopa were also moving. In 1767, Cocomaricopas first appeared at the Gila-Salt confluence, and by 1800 the Maricopa were living on the Gila above its junction with the Salt; in "mesquite gathering and fishing expeditions, they were accustomed to camp . . . on the Salt as far upstream as Phoenix, but they had no settlements there. No one lived permanently on the Salt River below the point where it emerged from the mountains" because that area was too exposed to Yavapai and Apache attacks. C046-376 (Pioneer Padre); C046-378, at III-54 (Hackenberg, Pima-Maricopa Indians); C058-11, at 18 (Spier: *Yuman Tribes of the Gila River*).

175. For a long time, the Maricopas lived at Gila Bend and came at harvest time to trade with the Pimas [on the Gila River]. Soon after 1833, they settled beside the Pimas. C053-391, at 93 (Russell, *The Pima Indians*).

176. The western Apache raided their traditional enemies - the Pimas, Papagos, and Maricopa. The Apache range in what is now Arizona and into Mexico was widespread. The White Mountain Apache mostly raided into Sonora, Mexico; Cibicue and San Carlos Apaches divided their attention between Mexican settlements and the Pima, Maricopa and Papago. *See* Map VI for traditional migrations of Western Apache clans. C062-422, at 87-88, 93 (Goodwin: *Social Organization of the Western Apache*).

177. "Maricopa" is an inclusive name for Yuman-speaking peoples of the Gila and Salt valleys; the name first appeared in the 1846 records of the Kearney expedition. C058-9, at 9 (Ezell: *The Maricopas*).

178. Hostilities between the Pima and Maricopa on one side and the Yavapai on the other were the rule for several generations. Stretches of uninhabited land separated the Yavapai's hostile Pima and Maricopa neighbors in the south. C028-298, at 248-49 (Gifford: *Northeastern and Western Yavapai*).

179. By 1846, marauding Indians [Apaches] had confined the Pima and Maricopas to a small area on the Gila; the Gila Pimas gathered clay in the Superstitions, but this region was uninhabited country visited only during a raid or to gather desert products. C053-390, at III-30, 38-39 (Hackenberg: *Pima-Maricopa Indians*).

180. Both major transcontinental routes from the east to California passed through the Pima Villages; only a few followed the Gila downstream from the Pima Villages to its confluence with the Salt. C028-299, at 21 (*Once a River*).

181. In July 1852, John Bartlett, of the U.S. and Mexican Boundary Commission, encountered Pima and Maricopa fishing parties twelve miles upstream on the Salt from the Gila-Salt confluence. C053-389, at VI-5 (Hackenberg: *Pima-Maricopa Indians*). Bartlett noticed some wigwams, and a Pima man told him that his people used the wigwams when they came up the River to fish and that they had also come to that place to escape an outbreak of cholera. C053-393, at 241 (Bartlett, *Personal Narrative*).

182. By 1852, the Maricopa, who had lived on both sides of the Gila since at least 1800, had been joined by tribes from the Colorado River. C058-11, at 4, Fig. 1 (map) (Spier: *Yuman Tribes of the Gila River*).

183. The Maricopas fished [in the Gila] with a scoop or bow and arrow. C058-11, at 76 (Spier: *Yuman Tribes of the Gila River*).

184. The Pimas alone numbered 4,117 in 1858. Tr. 11/19/15, at 1526 (Gookin).

185. Indian corn and wheat fields were still in production near the confluence of Sycamore Creek and the Salt [in Segment 5] in 1864. U027, at 3-11 (ASLD Report).

186. For several years the Pimas had had little water to irrigate their fields [on the Gila]; Mormon settlers on the River invited them to come to that valley, and some accepted. The settlers' motive included the desire for the Pimas to act as a buffer against Apache assaults. C053-391, at 54 (Russell, *Pima Indians*).

B. Spanish Exploration

187. The Salt River Valley was largely bypassed by exploration and development throughout the Spanish, Mexican, and U.S. Territorial periods, until the 1860s. L030, at 3-1 (ASLD Report).

188. The Gila seemed to be an important barrier for the Spaniards and they did not establish any colony or mission north of the Gila in the Salt River area. When they traveled north to the Hopis it was usually from their base in Santa Fe, not from Sonora. C062-416 (Verde Tr. 2/25/15, at 2441 [August]).

189. Non-Indian intrusions into the [Central Arizona Water Control Study] area before 1863 were sporadic and temporary. C028-289 ("Evaluation of Historic Cultural Resources").

190. The main transportation route used by the Spanish to connect southern Arizona and California was along the Gila River, but even this route bypassed the junction of the Salt and Gila by running straight between Maricopa Wells and Gila Bend. L030, at 3-10 (ASLD Report).

191. Alvar Nunez Cabeza de Vaca, in 1527, was the first European to traverse what is now Arizona. Tr. 1/27/16, at 2170-71 (August); C040-A, at 9 (August Report).

192. Marcos de Niza's expedition of 1538-39 (an advance for the Coronado Expedition of 1540-42) crossed the Upper Salt into the White Mountains. Tr. 1/27/16, at 2171 (August); Tr. 1/26/16, at 2041-42 (August); C040-A, at 10 (August Report).

193. Other members of the Coronado Expedition crossed the River in 1540 and entered the White Mountains. C040-A, at 10 (August Report). The Expedition built rafts to cross the river. One of the Expedition's chroniclers referred to the River as the Rio de las Balsas ("river of rafts"). C028-288, at 323 (Bartlett, *Rolling Rivers*).

194. Spanish missionaries apparently did not venture above the Salt-Verde

confluence. U027, at 3-5 (ASLD Report).

195. In 1697 and 1699, Father Kino and Juan Mateo Manje located Pima villages on the Gila. C046-378, at III-47 (Hackenberg, Pima-Maricopa Indians).

196. Juan Bautista de Anza the Elder visited the Salt River Valley in 1697. Tr. 1/26/16, at 1910 (August).

197. Father Kino visited the Lower Salt River and made a couple of maps, in 1698 and in 1701-02; he called the River the "Rio Azul" (Blue River). The River was later called the Rio Salinas or Salt River. Juan Mateo Manje, an official record keeper or diarist, traveled with Kino. Tr. 1/26/16, at 1911-12 (August).

198. Kino and Manje traversed the area of the Salt River Valley (and then moved further down the Gila). They climbed a pass to the top of the Estrella Mountains from where they observed the River, and they also saw the River from the bank. Tr. 1/26/16, at 2057 (August); C040-A, at 14 (August Report, 1/20/16).

199. Father Kino and Manje did not comment on the navigability of the Salt. Tr. 1/26/16, at 2058 (August).

200. A map of Father Kino's travels in Pimeria Alta shows no Indian presence on either the Rio Salado or Rio Azul. C046-376 (Pioneer Padre). When Father Kino came through the region and recorded where the tribes were he did not notice any Pima on the Salt; the Pima were farming only near the Salt/Gila confluence. Tr. 2/26/16, at 3477 (Gookin).

201. The Spanish also named the River "Rio Salado," because its waters were highly impregnated with salt which was easily noticed at high water; there was a heavy salt formation one hundred miles above what is now Phoenix. C028-297, at 90 (History of Arizona Territory).

202. In 1716, Padre Luis Velarde stated that the major rivers of the region were the Gila and the Colorado, but he also mentioned "two others, called the Salado and the Verde,

the first because it is salty, and the latter perhaps because it runs among greenish shapes or rocks." L030, at 3-10, 3-14 (ASLD Report).

203. Father Ignacio Keller reached the Salt River in 1737, but his party was attacked by Apaches six years later when traveling north of the Gila to visit the Hopis. Tr. 1/26/16, at 2058-59 (August); C040-A, at 15 (August Report, 1/20/16).

204. Both Father Keller, in 1743, and Father Sedelmayr, in 1744, failed in attempts to reach the Hopis due to Apache hostility. C053-391, at 28 (Russell, *The Pima Indians*).

205. Father Jacobo Sedelmayr, in 1748, found that a "very pleasant country surrounds this fork of the rivers [the Gila and the Salt - Segment 6]. Here the eye is regaled with creeks, marshes, fields of reed grass and an abundant growth of elders and cottonwood." C028-301, at 24 (Dunne, *Jacobo Sedelmayr, Missionary*).

206. Father Sedelmayr and his expedition traveled with horses and would not have left their horses and built a boat when they encountered the Salt. He did not use a boat when he encountered the Colorado. Tr. 1/26/16, at 2059-61 (August).

207. In 1775, in describing the rivers of southern Arizona, Father Francisco Garces found the Rio de la Asumpcion, which comprised the Verde and Salt rivers [*i.e.* below its confluence with the Verde], as "much larger than the Gila." U027, at 3-6 (ASLD Report).

208. The Spanish travelled on foot, on horseback, or in wagons. Tr. 10/20/15, at 168 (Fuller); C030-364, at 120 (Fuller PPT). They brought supplies with them and introduced cattle, sheep, and new crops to the area; they also brought chocolate which drew the Indians to the missions. Tr. 1/26/16, at 2045, 2051 (August).

209. The Spanish explorers oftentimes had cattle and sheep with them. Tr. 1/26/16, at 2045 (August).

210. The Spanish did not use boats to navigate up the Colorado. Tr. 1/26/16, at 1906 (August).

211. When the Spanish used boats (in other parts of the U.S.), such as on the Mississippi, they used canoes. Tr. 1/26/16, at 2060 (August).

212. Canoe use was how the Spanish determined that the Mississippi was navigable for their purposes. Tr. 1/26/16, at 2063 (August).

213. The Jesuits were attempting to push their sphere of influence north to evangelize the Hopis. Tr. 1/26/16, at 2061 (August).

214. Spanish influence in Arizona waned after 1821, but Mexicans continued to travel through Arizona between Santa Fe and Mexico; this route began in the 1500s and continues today. Tr. 1/26/16, at 1924-25 (August).

215. The Spanish explorers used horses and would not have abandoned their horses for a boat had they come across a river that could be boated. C062-416 (Verde Tr. 2/25/15, at 2453 [August]).

216. The Spanish explorers' reference for navigability is unclear. The Spaniards never used the word "boat" or "navigable" in noting a river. Tr. 1/26/16, at 2049 (August). They would note, however, if a river was "big enough to float a giant boat or sailboat." Tr. 1/27/16, at 2163 (August).

C. Trappers

217. St. Louis, Missouri, was the principal mart and outfitting point for the fur trade; transportation for the interior expeditions was by pack trains or wagons, and the Santa Fe trade was carried on principally by wagon. C018-222, at 32 (*American Fur Trade*).

218. Various types of boats were used in the Missouri valley including mackinaws, bull-boats or canoes used in the downstream direction for navigation. C018-222, at 32 (*American Fur Trade*).

219. The dugout canoe was extensively used for local traffic in the neighborhood of the posts in the Missouri Valley: "Many a journey was made in these crude boats from the

heart of the wilderness two thousand miles away to St. Louis." C018-222, at 34 (*American Fur Trade*).

220. The fur trade of the West developed slowly during the first twenty years of the nineteenth century. C018-186, at 4 (Blomstrom, *Fur Trading*)

221. Under 200 years of Spanish rule in Mexico no trade with foreigners was allowed, but after the 1821 Revolution, the attitude of the Mexican government toward Americans changed from one of suspicion and distrust to one of encouragement, and Americans were invited to sell their wares in New Mexico. C018-207, at 28 (Trimble, "Arizona Adventure"); C018-186, at 8 (Blomstrom, *Fur Trading*).

222. However, once the bureaucratic confusion following the Mexican Revolution subsided, the old Spanish policy of strict rules concerning commerce with outsiders was reinstituted. C018-207, at 34 (Trimble, "Arizona Adventure").

223. American trappers began exploring the Southwest while it was still part of Mexico; they generally rode horseback through the Southwest and did not normally use boats. U027, at 3-6 (ASLD Report).

224. Santa Fe was the trading place for furs in the South. C018-186, at 5 (Blomstrom, *Fur Trading*)

225. Taos was the launching pad for expeditions into Arizona while it was still part of Mexico and Mexicans weren't eager to welcome them. C053-394, at 33, 34 (Trimble, "In Old Arizona").

226. Although generally only Mexicans could trap in Mexico, traders were allowed to trap in the area surrounding Santa Fe, with a Mexican governmental license. C018-186, at 8, 10 (Blomstrom, *Fur Trading*).

227. In the early 1820s, American trappers began to trap, legally and illegally, in New Mexico (Arizona). Santa Fe and Taos were the headquarters of trading and trapping

covering the whole west, south of what is now Wyoming. C018-159, 10 (Davis, "Man and Wildlife" thesis).

228. Beaver trappers operating in Arizona generally came from Taos or Santa Fe and there is no river that runs between the two areas. Trappers oftentimes did not take river routes in order to disguise where they were going. C062-416 (Verde Tr. 2/25/15, at 2470 [August]).

229. American fur traders (mountain men) along with some French and Hispanic fur trappers, came into Arizona in the early 1820s to harvest beaver pelts. Some came illegally. They trapped beaver on the banks of rivers. Tr. 1/26/16, at 1925-27 (August); C018-30 (Historical Atlas of Arizona, showing [trapper] Penetration); C018-159, 8-9 (Davis, "Man and Wildlife" thesis).

230. Horses were essential to the early explorers and trappers, and extra horses were brought to carry additional furs. The loss of horses meant the loss of the means of transportation of furs to the market. C018-186, at 5, 9 (Blomstrom, *Fur Trading*). Trappers would be in "big trouble" without their horses. C062-416 (Verde Tr. 2/25/15, at 2453 [August]).

231. James Ohio Pattie was trapping on the Colorado River when his horses were stolen by Indians and it was then impossible to transport the furs. C018-186, at 14 (Blomstrom, *Fur Trading*).

232. Early trappers were frequently evading or sustaining attacks by Indians by Indians and horses were their means of escape. C018-186, at 4-6, 10-13 (Blomstrom, *Fur Trading*).

233. Small boats would not be useful for hauling a horse. C062-416 (Verde Tr. 2/25/15, at 2438 [August]).

234. When beavers caused water to overflow a stream's banks and thus create swampy areas, trappers were "compelled to construct canoes of bull and buffalo skins in order

to visit their traps." C018-227, at 2 ("Trapping Techniques of the Mountain Man").

235. Beaver were the universal quarry of the fur trappers; skins ("hairy banknotes") of average grade were used in the manufacture of the high-crowned men's hats which were the fashion in Europe, and the finer skins were sold to furriers throughout the world for making or trimming men's and women's garments. C018-186, at 5 (Blomstrom, *Fur Trading*); C018-207, at 31 (Trimble, "Arizona Adventure").

236. Beaver in Arizona could be trapped year-round except for during the hot summer months when the pelts were too thin. C018-207, at 31 (Trimble, "Arizona Adventure").

237. Mountain men/trappers who disposed of their furs in the south usually sold or traded them to American traders in Santa Fe. C018-186, at 5 (Blomstrom, *Fur Trading*).

238. The first American trappers in the area and who trapped the River were Sylvester and James Ohio Pattie and Ewing Young and their parties in 1825 and 1826. C028-290 ("Historical Atlas of Arizona).

239. The year 1826 saw increased trapping activity on Arizona rivers. More Americans were trying their luck on the Gila and the Salt. Kit Carson joined the experienced trapper Ewing Young in 1826. C018-186, at 12, 26 (Blomstrom, *Fur Trading*); C018-206, at 17-18 (Dodge, *The Road West*).

240. In 1826, the James Ohio Pattie party trapped their way up the Salt and Verde. C028-312, at 43/122 (*Pattie Narrative*). They came from Santa Fe by horse and went back to Santa Fe or California, where the market was. *See generally* C028-312 (*Pattie Narrative*); Tr. 10/20/15, at 170 (Fuller); C030-364, at 122 (Fuller PPT).

241. Pattie and other mountain men regarded the River as the most consistently productive beaver stream in Arizona. C018-159, 33; Fig. 1, at 222 (trapping routes along main beaver streams) (Davis, "Man and Wildlife" thesis).

242. Trappers likely harvested beaver using site-built boats in addition to other methods of trap-setting and pulling. C018-150 (Weedman affidavit, at 2, ¶ 4(f)).

243. Mountain men sometimes found boats useful; as James O. Pattie observed: "A canoe is a great advantage, where the beavers are wild; as the trapper can then set his traps along the shore without leaving his scent upon the ground about it." C028-312, at 65/122 (*Pattie* Narrative); C018-158, 12-13 (Davis, "Man and Wildlife" thesis).[10]

244. In November 1827, Pattie and his party built a canoe so they could trap both sides of the [Gila] river. C028-312, at 65/136 (*Pattie Narrative*).

245. The Pattie party also built eight dugout canoes and trapped and canoed down the Colorado River in December 1827. C028-312, at 68/122 (*Pattie Narrative*).

246. In 1829, Young with four men including Kit Carson and James O. Pattie trapped up the Salt, finding it to abound with beavers. The party split at the Verde-Salt confluence, some ascending the Verde, and Pattie and others going up the Salt. When they descended, they met at the confluence and returned to the Gila River. C028-312, at 43/122 (*Pattie Narrative*). After gathering furs on the Salt and Verde, some men from the party were dispatched to return to Taos, NM, with the furs. C018-186, at 18 (Blomstrom, *Fur Trading*)

247. During the summer of 1828, Ewing Young outfitted a party to trap on the Colorado River, although he remained in Taos. When the trappers reached the Salt they were attacked by Indians. C018-186, at 17 (Blomstrom, *Fur Trading*).

248. The period 1820 to 1830 saw the establishment of the southern routes from Missouri to California just as the northern routes were pioneered in the same period, and by 1832 the attention of both Mexicans and Americans had generally turned from trapping to trading. C018-186, at 26 (Blomstrom, *Fur Trading*).

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[10] The anthropologist Alfred Kroeber and historian Robert Cleland both found Pattie's *Personal Narrative* believable, and Blomstrom quotes from the Narrative extensively. C018-159, 22-23 (Davis, "Man and Wildlife" thesis); C018-186 (Blomstrom, *Fur Trading*).

249. By 1832, hundreds of trappers had dispersed to reach every stream in Arizona that contained beaver. C018-159, 10 (Davis, "Man and Wildlife" thesis).

250. Up until about 1832, fur trapping in the southwest continued to be highly profitable, but fashions changed and silk from China was being offered for hats instead of beaver; this trend plus hostile Indians caused the beaver trade to diminish, although some trapping continued. C018-159, 44-46 (Davis, "Man and Wildlife" thesis).

251. The wealth of information which the mountainmen/trappers gathered before 1845 made them invaluable when the general population started to move west. The trappers counseled and guided settlers, acted as scouts and advisors for the Army, supplied geographical information to the railroads, and acted as Indian agents for the government. C018-186, at 3 (Blomstrom, *Fur Trading*).

252. Mountain men such as Kit Carson skillfully guided U.S. soldiers in New Mexico and California in the 1840s and 1850s and when the army was exploring portions of the west and subduing Indians in the 1850s and 1860s, the mountain men and their knowledge of the country proved invaluable. Trapper Antoine Leroux was with Bartlett in 1852. C028-302, at 325-26 (El Palacio); C028-303, at 240, 244 (Bartlett's *Personal Narrative*) C018-207, at 27 (Trimble).

253. Beaver trapping in Arizona was still profitable in the late 19th century, with skins bringing from $8.00 to $20.00 depending on size and condition. Two brothers found beaver were plentiful in the Salt and Gila rivers and "commanded a ready market." It was reported that in the Salt River Valley "the business of trapping fur bearing animals is carried to a considerable extent and with good profit." Beavers from Arizona were "much more valuable" than those from Alaska. The brothers were building a canoe to trap beavers on the Salt and Gila rivers. C053-383 (*Arizona Republican*, 2/11/1894).

254. In 1891, trappers J.K. Day and his brother George left Camp Verde in a small

boat on a trapping expedition and arrived in Yuma nearly six months later with a large quantity of beaver and otter furs for market. This was their fifth such trip and they planned to do another. The Day brothers began their trip in the Verde Valley, boated down the Verde, Salt and Gila rivers, took their furs down to Yuma, then caught the train home. They reported that they made a "very remunerative profit out of the business" and that the furs "always command good prices, the demand for such pelts being always greater than the supply." By this time, trappers were no longer taking their furs to market in Taos or California but were staying in Arizona. C002-8 (*Arizona Sentinel*, 4/02/1892); Tr. 10/20/15, at 233-34 (Fuller).

255. A beaver trapper with pelts in his boat would be engaged in commercial activity in the early historic period. Tr. 3/31/16, at 4308 (Newell).

256. Canoes used reliably and consistently for trapping are using the river as a highway for commerce. C062-420 (Verde Tr. 4/01/15, at 3159-61 [Burtell]).

D. United States Acquisition

257. During the Mexican War, the U.S. military leaders realized in 1846 that a fixed route across Arizona was crucial for maintaining any future supply line to California and for protecting the southwest border from Indian and Mexican attacks. Thus, Colonel Stephen Watts Kearny organized an "Army of the West" under which he sent Captain Philip Cooke to open a wagon road from New Mexico to California while he, with 300 dragoons, would push west to occupy California. William Emory, a topographical engineer, had the task of creating an accurate map of the region between the Rio Grande and the Pacific Ocean. C018-159, at 48-49, 55 (Davis, "Man and Wildlife" thesis).

258. Cooke's force - not a combat unit - consisted of 500 volunteers of the Mormon Battalion and was assisted by Antoine Leroux and other former trappers; they reached San Diego in January 1847. C018-159, at 55-56, 62, Fig. 5, at 226 (Davis, "Man and Wildlife" thesis).

259. In 1848, the United States annexed all of the previously Mexican territory north of the Gila River. Treaty of Guadalupe Hidalgo, Feb. 2, 1848, 9 Stat. 922 (the "Treaty").

260. The Treaty required a boundary survey between the two nations; the U.S. Boundary Commission of 1849 was led by Lt. Amiel Whipple, a topographical engineer, and included William Emory. The running and marking of the boundary across to southern California was completed that year. C018-159, at 63-66 (Davis, "Man and Wildlife" thesis).

261. An undated map (with the notation: "November 8 through November 22)" shows Lt. Emory's passage from east to west through Arizona. The map shows "Coco Marikopos" and the "Pimo" Village north of the Gila River and east of the confluence of the Salt ("rio Salinas") and the Gila ("rio Gila"); the Emory party did not go north of the Gila. C062-421 (Calvin: *Lt. Emory Reports: Notes of a Military Reconnaissance"*).

262. At the same time, Forty-Niners would use Cooke's wagon road (the "Gila Trail"), among other trails, on their way to California. About 60,000 emigrants crossed southern Arizona from 1849 to 1851. C018-159, at 142-43, Fig. 5, at 226 (Davis, "Man and Wildlife" thesis).

263. John Bartlett was put in charge of the Boundary Commission in 1850; he and his Mexican counterpart began settling the U.S./Mexico boundary in early 1851. Bartlett was later charged with general negligence in the performance of his duties, mainly because he had agreed to a line farther north than the Treaty called for. C018-159, at 66-67, 81 (Davis, "Man and Wildlife" thesis).

264. In the meantime, in August 1851, Capt. Lorenzo Sitgreaves led a party to search for a wagon route from Santa Fe westward across northern Arizona. C018-159, at 97 (Davis, "Man and Wildlife" thesis).

265. In July of 1852, Bartlett conducted a reconnaissance of the River from its confluence with the Gila as far upstream as present-day Mesa. L030, at 3-10, 3-14 to 3-15

(ASLD Report).

266. The Boundary Commission was disbanded in 1852, and Bartlett and Emory returned to Washington. C018-159, at 81 (Davis, "Man and Wildlife" thesis).

267. In July 1853, Lt. Whipple began exploring the 35th parallel, generally following Sitgreaves' path, to determine the practicability of a railroad route from New Mexico to the Colorado River. C018-159, at 101-02, 109, 117, Fig. 3, at 224 (Davis, "Man and Wildlife" thesis). Arriving at the Colorado River near Fort Mohave, he crossed it in an inflatable raft. C018-160, at 3 (History of Rubber Boats).

268. Bartlett's error, which had given up 6,000 square miles needed for a proposed railroad, led to the Gadsden Purchase of 1853, under which the United States acquired land south of the Gila River to the current U.S.-Mexican border. Gadsden Purchase, Dec. 30, 1853, 10 Stat. 1031; C018-159, at 81 (Davis, "Man and Wildlife" thesis).

269. In January 1854, Lt. John Parke and George Stoneman were ordered to run the 32nd parallel across southern Arizona preliminary to a survey for the best route for the railroad across southern Arizona; later that year, Major Emory was appointed Commissioner and Chief Astronomer of the new Commission set up to survey the Gadsden Purchase boundary, and that survey concluded in October 1855. C018-159, at 82-85, Fig. 4, at 225 (Davis, "Man and Wildlife" thesis).

270. Also in 1854 Texas Western Railroad Company commissioned a survey - the first private survey - for a railroad along the 32nd parallel at a time when Lt. John Parke was surveying the same course for the government. These surveys led to the first accurate maps of southern Arizona. C018-159, at 167 (Davis, "Man and Wildlife" thesis).

271. Lt. Edward Beale surveyed a wagon route from Ft. Defiance to the Colorado River in the summer of 1857 with 77 Bactrian camels traveling generally along the 35th parallel. C018-159, at 117-18 (Davis, "Man and Wildlife" thesis). Two years later, Beale led

a government road-building crew, constructing a wagon road along the same route. C018-159, at 123 (Davis, "Man and Wildlife" thesis).

272. Arizona became a Territory in 1863 and was separated from the Territory of New Mexico. Act, Feb. 24, 1863, Ch. 56, 12 Stat. 664.

273. Congress passed the Enabling Act in 1910 for Arizona and New Mexico to enter the Union. Act of June 20, 1910, 36 Stat. 557, 568-579 (1910).

274. The Enabling Act's Section 20 provides, at paragraph Second, that Arizona disclaims all right and title to the unappropriated and ungranted public lands within its borders. Section 20 also provides, at paragraph Seventh, that the federal government reserves all rights and powers with respect to carrying out the Reclamation Act's provisions.

275. Nothing in the Enabling Act's Section 20 (or any other section) indicates Congressional intent to deny Arizona title to the beds of its navigable streams.

276. The Enabling Act's Section 28 contains the following language:

> There is hereby reserved to the United States and excepted from the operation of any and all grants made or confirmed by this act to said proposed State all land actually or prospectively valuable for the development of water power or power for hydro-electric use or transmission and which shall be ascertained and designated by the Secretary of the Interior or within five years after the proclamation of the President declaring the admission of the State.

277. Arizona became a State on February 14, 1912.

278. Nothing in the record shows that the Secretary of the Interior ascertained and designated any land pursuant to Section 28 of the Enabling Act by 1917.

E. Surveys and Withdrawals

1. General information regarding government surveys

279. From as early as 1804, federal surveyors were directed to meander navigable rivers so that settlers would not have to pay for riverbed land. Monuments were set only where waterway banks intersected with section lines. C018-174, at 15, ¶ 1-51 (*River and*

Lake Boundaries).

280. Pursuant to the 1831 meandering instructions "The courses and distances of the meanders of navigable streams are to be truly delineated . . . ." C018-174, at 16, ¶ 1-52 (*River and Lake Boundaries).*

281. Early instructions provided no specific directions on how to pick the point to place meander corners or angle points on the bank. Early manuals required non-navigable rivers to be meandered on only one bank. C018-174, at 16, ¶ 1-52 (*River and Lake Boundaries).*

282. The General Land Office issued several manuals for government surveyors, beginning in 1851; the 1851 and 1855 manuals instructed surveyors to meander, on both banks, only navigable bodies of water. C018-165, at 24 [441], ¶ 2; C018-166, at 13 [464], ¶ 2 (*Instructions to the Surveyors General* 1851).

283. The 1864 manual instructed surveyors to meander on one bank non-navigable bodies of water and rivers that are "well-defined natural arteries of internal communication, and have a uniform width." C018-167, at 9 [504] (*Instructions to the Surveyors General,* 1864*).*

284. The 1864 manual also carried forward the 1851 instruction for "Insuperable Objects on Line" which provided that if the surveyor encountered an impassable obstacle such as a river, he would "prolong the line across such obstacle[], by taking the necessary right angle offsets; or . . . by a traverse or trigonometrical operation" to regain the line on the opposite side. (The surveyor would triangulate by calculating the hypotenuse of the right-angled triangle.) The surveyor should also set a witness post at intersecting margins. C028-165, at 10, [438], ¶ 8 (*Instructions to Surveyors General,* 1851); Tr. 3/10/16, at 3796-98 (Littlefield).

285. Any confusion resulting from the various manuals was cleared up in the 1890

manual which required surveyors to meander both banks of non-navigable streams of more than three chains in average width in addition to navigable rivers.[11] C018-173, at 16, ¶ 1-52 (*River and Lake Boundaries*); C018-169, at 568, *Meandering*, Sec. 2 (*Instructions to Surveyors General* 1890).

286. When a section line intersected a major stream or lake, a corner monument was to be established on the section line at the bank of the water body. Once all section lines were completed, meandering began at the meander corner ("MC"), by selecting points, visually, along the bank until the next MC (at the section line) was reached. No monuments were set at these points. C018-173, at 14, ¶¶ 1-47 -48 (*River and Lake Boundaries).*

287. There were wide variations between different surveyors' actual treatment of meanders in the 1800s. C018-174, at 18, ¶ 1-54 (*River and Lake Boundaries).*

288. Instructions to surveyors regarding the meandering process were "pretty sketchy," perhaps to be assumed as part of surveyors' skills. C018-174, at 15, ¶ 1-52 (*River and Lake Boundaries).*

289. Where a river bank was not suitable for setting a permanent monument, a witness corner to the meander corner ("WCMC") was set. C018-173, at 14 (*River and Lake Boundaries).*

290. Meander corners were often not on the river's bank but at the top of a slope leading down the water's edge, sometimes hundreds of feet above the river. C018-174, at 18, ¶ 1-54 (*River and Lake Boundaries).*

291. In the 1800s, surveyors often bid on a township to survey without having seen the land; a surveyor might not even know there was a river there. As soon as he broke through the brush on the river bank, he had to decide navigability because he had to set a

[11] A surveyor's chain is a unit of length equal to 66 feet. *See* Kissam, P., *Surveying Practice*, McGraw Hill Pub., New York, at 126. Three chains would therefore measure 198 feet.

meander corner on the bank and meander the bank if the river was navigable. "We will probably never know what conditions influenced the surveyor's decision to meander or not meander where the instructions were silent." C018-175, at 48-49, ¶ 2-29 (*River and Lake Boundaries).*

292. Because surveyors were required to segregate navigable rivers from public lands, the presence of meander lines on the land plats has been wrongfully taken to be conclusive of navigability. C018-175, at 48, ¶ 2-28 (*River and Lake Boundaries).*

293. Although surveyors' manuals contained meandering instructions to government surveyors relevant to navigable bodies of water, neither the instructions nor the applicable federal statute (43 U.S.C. § 931) defined "navigable."

294. Surveyors determined navigability based on their judgment and experience; they were not given instructions on how to determine navigability: "whether a river was navigable or not was left to the judgment of the surveyor." Tr. 3/11/16, at 3831-32 (Littlefield).

295. Surveyors are not "clothed with the power to settle the questions of navigability," citing one of the "Red River" cases. The *Manual of Surveying Instructions* of 1973 quotes this citation. C018-175, at 49, ¶ 2-31 (*River and Lake Boundaries).*

296. The federal government relied on surveyors' notes and plats, as approved by the Surveyor General, for its determination of navigability. Tr. 3/11/16, at 3835-36 (Littlefield).

F. Surveys Conducted on the River

297. The federal government undertook formal surveys of its recently-acquired lands to prepare the region for orderly occupation by American settlers. C001, at 16 (Littlefield Report, 2014).

298. In 1851, a surveying party began its survey of Arizona, arriving at the confluence of the Gila and Salt Rivers in September or October; either John Bartlett or Lt. Whipple erected a monument marked "United States and Mexico Boundary Commission,

1851" on a hill just south of the confluence. Both the U.S. and Mexican survey teams adhered to the Land Ordinance of 1785. C018-26, at 245-48 ("Journal of Arizona History," Autumn 1988); C018-36 (Historical Atlas of Arizona, showing Routes of American Explorers and Surveyors).

299. In early 1867, William Pierce began the first rectangular survey of public lands in Arizona; he and his party arrived from Tucson at Maricopa Wells where they met their military escort, probably soldiers from Camp McDowell, and from there they began the survey at the 1851 monument at the Gila-Salt confluence. Pierce commented that:

> Salt River, at this season of the year, is a large stream . . . which renders it especially valuable for irrigation. I consider this valley . . . as containing some of the best agricultural land I have yet seen in the Territory, and would recommend that it be subdivided at an early day. [Ellipses in original]

C018-26, at 249-51 ("Journal of Arizona History," Autumn 1988).

300. Pierce's surveying party worked eastward, but as they turned northward, fear of an Indian uprising caused the military escort to withdraw to Camp McDowell, and the initial survey ended in February 1867. Surveys resumed the following year. C018-26, at 253 (Journal of Arizona History, Autumn 1988).

301. G. P. Ingalls and his brother W.F. Ingalls conducted surveys in 1868 from the Salt/Gila confluence to about where Granite Reef is now [in Segment 6] (about 42 miles). Tr. 10/20/15, at 41-43, 180 (Fuller); C030-364, at 35, 36, 130 (Fuller PPT); Tr. 3/11/16, at 3942, 3990 (Littlefield); C028-328 through -346 (Ingalls field notes).

302. The Ingalls brothers employed triangulation the majority of the time during their 1868 surveys for T1-2N, R1-6E where they crossed the River. *See* C028-346 (ASLD Excel Spread Sheet); Ingalls' field notes and plat maps from T1N, R1E (C028-328, -336); T1N, R2E (C028-329, -336, -345); T1N, R3E (C028-330, -336, -339); T1N, R4E (C028-331, -336, -340); T1N, R5E (C028-332, -336, -342); T2N, R5E (C028-333, -336, -342); T2N, R6E

(C028-334, -343). *See also* C001, at 29 (Littlefield Report, 2014: "[Wilfred Ingalls] employed triangulation to measure across the stream" in T1N, R1E).

303. The Ingalls brothers, at times, noted that when the River was shallow they could measure the width on line and did not use the triangulation method: "not too deep to prevent measuring across it on line." T1N, R2E (C028-329, -335, -346; T2N, R6E (C028-334, 343, 346).

304. The Ingalls brothers did not use the triangulation method to measure the sloughs for T1N, R1 - 4E. (C028-328, -329, -330, -331, -344, -345, -339, -340, -346.) There were no sloughs in T1-2N, R5-6E. (C028-332, -333, -334, -336, -337, -338, -341, -342, -343, -346.)

305. Ingalls' and Pierce's surveys incorrectly placed the River outside the flood plain in at least 12 places, including one area where the River was placed 30 feet up on bedrock in the Usery Mountains. C026-E, at 4 (Morphology of the Salt River).

306. Unquestionably, surveyors made mistakes. Tr. 3/30/16, at 4151 (Littlefield).

307. Federal surveyors conducted surveys in Segments 3 and 4 in 1881 and in Segment 5 in 1911 (above Granite Reef Dam to Tonto Creek Confluence and Roosevelt Lake), except for lands in national forests, on Indian reservations, on withdrawn land, or on land that was too rugged, which were never surveyed. C004, at 23-25, 28-29 (Littlefield Report, 2014).

308. In general resurveys were performed either because the original survey may not have been done properly or to add clarity. Resurveys of the River were conducted in 1888, 1899, and in 1910-11 [in Segment 6]. Tr. 2/25/16, at 3315 (Littlefield).

309. The resurvey by L.D. Chillson in 1888 was undertaken to establish the boundaries and interior lines of either the Salt River Indian Reservation or the Gila River Indian Reservation. Chillson meandered the right [north] bank of the River. He noted that most of the surrounding land was irrigated farmland. C001, at 48-51 (Littlefield Report,

2014); for Chillson's 1887 contract file *see* C047B and C052 (documents re Salt River Indian Reservation boundary).

310. Robert A. Farmer resurveyed the same area in 1910-11 to establish segments of the boundary of the Salt River Indian Reservation; he meandered the north bank and noted "3.80 [chains] Middle of channel of Salt River, course SW. (No water)." His notes also indicated the River was one foot deep and a few days later it was two to three feet deep. C001, at 51-52 (Littlefield Report, 2014).

311. The north border of the Gila River Indian Reservation (the middle of the River) was resurveyed in 1899. C001, at 52-53 (Littlefield Report).

G. Withdrawals

312. William Breckenridge, a professional surveyor, found the Tonto Creek dam site [for what became Roosevelt Dam] in 1889, and thereafter the federal government spent great effort collecting stream flow data at that point on the River. C002-46, at 436-47 (Peplow).

313. County surveyor Breckenridge's official report in August 1889 calculated that the reservoir [Roosevelt Lake] would hold a total of 103,058,040,800 cubic feet (counting water from Tonto Creek, Pinto Creek, Sallamay, and other streams and gulches) - the largest reservoir in the United States. The amount of water from the Salt and Pinto Creek would be 98,689,128,000 cubic feet. C002-21 (*Phoenix Herald*, 8/16/1889).

314. In 1902, Congress signed the Reclamation Act, 1902 ("the Act"). 43 U.S.C.A. §§ 837 to ___. Nothing in the Act expresses Congress's intent to withhold or withdraw the beds of navigable waters with respect to Congressionally-authorized projects.

315. In the early 1900s, the Bureau of Reclamation withdrew from public settlement lands anticipated to be covered by Roosevelt Lake, and it bought or condemned previously-patented lands in the Tonto Basin. U034 (Littlefield [2004]: "Reclamation Withdrawals"). Nothing in the record indicates that the federal government intended to withhold title to the

riverbed when it withdrew land from settlement.

316. As of 1908, irrigable water for Desert Land entries in Maricopa County was to come from "a government irrigation project now under construction." C018-214, at 37-38 (U.S. Government, *Free Lands and Dry Farming in the Southwest*, c. 1908).

317. After statehood, the Bureau of Reclamation withdrew lands around the three future lakes (Saguaro, Canyon, and Apache) [in Segment 4]. U034 (Littlefield: Reclamation Withdrawals).

H. Euro-American Settlement

318. The Salt River Valley was largely uninhabited during the first half of the nineteenth century. Instead, it served as a buffer zone between the Southeastern Yavapai and Tonto Apaches, who lived in the mountains to the north, and the Pima and Maricopa, who lived along the Gila River. The Pima Village at the junction of the Salt and Gila rivers was a landmark mentioned by numerous explorers, military men, and travelers. L030, at 3-9 (ASLD Report).

319. Irrigation had been an important concern even before settlement: John Bartlett, of the U.S. Boundary Commission, opined in 1852 that the River's second terrace "could be irrigated with ease." C053-393, at 241 (Bartlett, *Personal Narrative*).

320. As soon as there was Euro-American settlement, newspapers appeared, but "[l]ike the first towns, Arizona first newspapers were chancy affairs," and a few early newspapers lived and died in southern Arizona in the 1850s and 1860s. C062-403, at 4, 5 (Lyon: *Those Old Yellow Dog Days*).

321. The first newspaper in Phoenix was not established until the Salt River Herald was published in January of 1878. C043-368 (History & Archives File Cabinet Index).

322. The population for Arizona County, then part of the New Mexico Territory and mainly south of the Gila River, in 1860 was 6,482. C022-9, at 14-15 (*Population of States*

and Counties, 1790 - 1990).

323. On the eve of the Civil War, American settlement in Arizona was developing a more complex structure than a few self-reliant outposts of mining and farming. Army posts had been established, and the government was subsidizing mail service. This led to the establishment of a stagecoach line. C018-159, at 182 (Davis, "Man and Wildlife" thesis).

324. Congress enacted the Homestead Act in 1862. Ch. 75, 23 Stat. 392.

325. The purpose of the Homestead Act was to connect democracy to land ownership; to provide farms so that people would be loyal to the U.S., and Congress provided land grants to the States to support public services such as hospitals, public schools, universities, miners' hospitals, and institutions for the mentally disabled. Tr. 2/25/16, at 3328-29 (Littlefield).

326. Mining picked up in 1862 with the arrival of miners from California; in 1863, the military moved in to protect the miners, settlers moved in to provide the military, and communication lines were established. C018-159, at 188-91 (Davis, "Man and Wildlife" thesis).

327. When Arizona became a Territory in 1863, there were no schools, churches, or libraries, but by the end of September 1864 there was a territorial legislature. C018-159, at 199 (Davis, "Man and Wildlife" thesis).

328. The *Prescott Miner* newspaper predated the Territorial capital, but it moved from Chino Valley to Prescott in 1864. C062-403, at 6 (Lyon: *Those Old Yellow Dog Days*).

329. The establishment of the Territorial government at Prescott in 1864 ended the era of exploration and began the era of settlement. C018-159, at 2 (Davis, "Man and Wildlife" thesis).

330. The Territorial Legislature adopted the Howell Code, which continued Mexico's and New Mexico Territory's practice of appropriation as the means of acquiring

water rights. Howell's Ariz. Code, ch. 55, sec. 17.

331. The 1864 Arizona Bill of Rights provided that all waters within the State were public. Howell's Ariz. Code, at 19-21 (1865).

332. Fort McDowell was established on the Verde River in 1865. Tr. 10/20/15, at 158 (Fuller); C018-34 (Historical Atlas of Arizona, showing Military Posts, 1865-1920).

333. In the 1860s and 1870s non-Indian settlers arrived in Arizona in large numbers and began to divert water in significant quantities from the River near the area that became the Salt River Indian Reservation [in Segment 6]. C018-161, at 1-2 (Thomsen and Porcello, 1991).

334. In 1866, Pima Indians on the Gila told Charles Hayden about a good place to cross the Salt - where buttes stood on either side of the River [in Segment 6]; when Hayden reached the buttes, he climbed one, and, looking out over the forty-mile wide valley he envisioned an agricultural empire. He had learned the benefits of canals and irrigation during a sojourn in Santa Fe, New Mexico, in 1848. C040-C, at 109, 114 (August, *Vision in the Desert*).

335. This ford was originally used by the Hohokam, whose fields lay along the River. C018-12, at 2 ("Ash Avenue Bridge," National Park Service, 1991).

336. Jack Swilling organized the Swilling Irrigation and Canal Company in 1867 and began building an irrigation system [in Segment 6]. L030, at 3-6 - 3-7, Table 3-1 (ASLD Report). The Swilling Ditch was located near present-day 48th Street and was completed in 1868. L030, at 3-11, Fig. 3-5 (ASLD Report); C028-292, at 103 (*History of Arizona*). Thus began the modern-day agricultural development of the Salt River Valley. L030, at 3-16 (ASLD Report).

337. Swilling promoted the first modern irrigation system in the valley - built on the ruins of Hohokam canals. C040-C, at 120 (August, *Vision in the Desert*).

338. There were few if any [federal] patents issued along the River before Jack Swilling arrived, *i.e.* when the River was in its natural condition. Tr. 3/11/16, at 3843-44 (Littlefield).

339. John Y. T. Smith grew hay on the north side of the River close to Swilling's diversion [in Segment 6] to provide, along with other goods, to the Army at Fort McDowell, and he organized the building of a road to the Fort. Tr. 1/26/16, at 1949-52 (August). Jack Swilling also harvested hay early on. Tr. 1/26/16, at 2092 (August).

340. Soldiers from Fort McDowell built a wagon road through a pass in the Mazatzal mountains to Camp Reno on Tonto Creek (a Salt tributary) during the winter of 1867-68. The valley there "is very fertile and affords good grazing, but no settlers have yet ventured into it." Remains of acequias marked the area's former cultivation. C028-304, at 460 ("Report on Barracks and Hospitals").

341. Phoenix (known then as Pumpkinville) was established in 1868 near where Swilling was building canals. L030, at 3-7, Table 3-1 (ASLD Report).

342. When the Ingalls brothers surveyed in the Phoenix area in 1868 (T1N, R3E), Phoenix was already a settlement, and it was noted that the 50 inhabitants were irrigating via a ditch and were "display[ing] great energy in the construction of their lands . . . [and] will this year bring under cultivation a large extent of country." C028-330, Book 2, at 212-13; Tr. 3/10/16, at 3812 (Littlefield).

343. George Ingalls noted, in his 1868 survey of T2N, R5E that the River "affords many facilities for irrigating the surrounding country." C028-333, Book 1, at 494.

344. George Ingalls noted in May 1868 that land on the River's right bank about one mile downriver from the confluence with the Verde River (in T2N, R6E) was unfit for cultivation because it was at the foot of a rocky mountain. C028-338, Book 1257, at 90.

345. There were various military camps around the State in the 1860s and 1870s, but

none on the River itself. Tr. 10/20/15, at 172-73 (Fuller); C030-364, at 125 (Fuller PPT).

346. By 1870, about 235 settlers were engaged in the beginning of irrigated agriculture in this region after it had really not been used from 1450 to 1867. Tr. 1/26/16, at 1949 (August).

347. In early settlement days, freight could be hauled by ten-mule teams, each freight wagon with a trailer wagon attached; one pioneer recalled that when the Salt was in flood, he got Indians to ferry the goods across the River in canoes. C028-308, at 159 (*House by the Buckeye Road*).

348. Army escort wagons were the primary means of disbursing supplies from Yuma to military posts in Arizona Territory. C018-187 (Photo of Army Escort Wagon).

349. The non-Indian population of Arizona Territory in 1870 was 9,658. C018-12, at 2 ("Ash Avenue Bridge"). In Segment 6, the population was 200 in 1867, and 250 in 1870. Tr. 1/26/16, at 1962, 2035 (August).

350. Tucson's *Arizona Citizen* was established in 1870, and Yuma's *Free Press* in 1871 (it changed its name to the *Sentinel* in 1872). C062-403, at 7 (Lyon: *Those Old Yellow Dog Days*).

351. Charles Hayden claimed two sections of land (28 and 29) [in Segment 6] "for milling, farming and other purposes" on the south side of the River in 1870 and his company, Hayden Milling & Farming Ditch Co., claimed 10,000 m.i. of water for irrigation. Hayden subsequently abandoned the water claim when he partnered with Jack Swilling in constructing the Tempe Canal, which was finished in 1871. C018-12, at 2 ("Ash Avenue Bridge"); C018-13, at 4 (Berelov: "The Story of Charles Trumbull Hayden"); C028-292, at 103 (*History of Arizona*); C028-293, at 36 (*Charles Trumbull Hayden*); C040-C, at 120 (August, *Vision in the Desert*).

352. Hayden established the first ferry at Tempe, and his estate became "the beehive"

around which formed the community's economic activity and also its "cultural and social apiary." C028-294, at 39 ("The Rise of the Southeastern Salt River Valley").

353. In 1871, Jack Swilling offered 2,000 inches of water or 17 shares of stock in his Tempe Irrigating Canal Co. to anyone who would build a grist mill. Hayden accepted, and in 1872, opened a store and laid the foundation of the mill. C018-14, at 3 (Hayden Flour Mills and Silos); *see also* C018-16 "Kirkland-McKinney Ditch Historic Property Designation," Tempe Preservation Committee Staff Report, 4/7/2005 [re Swilling and Hayden]).

354. Hayden planned on using logs from the head of the Salt River for lumber:

> [T]he work of quarrying, hauling, cutting and laying of stone in the walls of "the pit" for the Waterwheel, was progressing finely, while the general stir indicated that by the time the pine logs could be cut up toward the head of Salt river and floated down its swollen stream, the Saw would be ready to make lumber, and a new epic chronicled in the industrial history of Central Arizona. No doubts are entertained as to the probability of being able to raft the logs to their destination by Hon. C. T. Hayden, who is a lumberman fresh from Maine."

C046-379 (*Arizona Sentinel*, 8/9/1873). The reporter for this story opined that the Salt River was "seven times as large" as the Gila before their confluence and pronounced "the Salt river the great living refreshing artery of Arizona, and the fruitful Nile of this Western Egypt." C046-379 (*Arizona Sentinel*, 8/9/1873).

355. The Tempe Canal was extended in 1873 and became known as the Hayden Ditch. C018-13, at 4 (Berelov: "The Story of Charles Trumbull Hayden").

356. Charles Hayden began operating the grist mill in 1874 that was powered by water from the River. C018-134, at 5 (Berelov: "The Story of Charles Trumbull Hayden").

357. Hayden's Ferry began operation in 1873 or 1874; at least two other ferries also operated in Segment 6. Tr. 1/26/2016, at 1946-47 (August).

358. The ferry, which Charles T. Hayden installed while his flour mill was being constructed, consisted of a cable across the River; the ferry boat was built of lumber

sufficiently sturdy to transport a wagon and team of horses. C018-13, at 5 (Berelov: "The Story of Charles Trumbull Hayden"); C018-58 (photo of flour mill with River in the background, 1915).

359. Wagon roads in Segments 5 and 6 in the 1870s tended to follow the River, then go overland, and reconnect to the Gila. Tr. 10/20/15, at 172 (Fuller); C030-364, at 124 (Fuller PPT).

360. Four roads radiated from Fort Apache, and the Tonto Creek road was probably built in the mid-1870s when the first white settlers arrived in the area [Segments 2 and 3]. U027, at 3-32 (ASLD Report).

361. The primary mode of transportation in the region [in Segments 1 - 4] was on foot, horseback, or wagon. U027, at 8-1, (ASLD Report).

362. The Apache Trail and its antecedents had long been the key means of transportation through the region. U027, at 3-32 (ASLD Report).

363. Settlers began moving into the Tonto Basin area [Segments 3 and 4], and environmental changes began there beginning in the 1870s when cattle were introduced, resulting in overgrazing of the land. U027, at 3-27 (ASLD Report).

364. Ranching and several other livestock operations had been well established in the Tonto Basin [Segments 3 and 4] by 1875. U027, at 3-15 to 3-21 (ASLD Report).

365. Settlers in the Tonto Basin removed large areas of the bottomland mesquite bosques and riparian gallery forests to open the land for pastures and to obtain wood for fuel and construction. U027, at 3-28 (ASLD Report).

366. Beginning in the 1870s, overgrazing, changes in the amount and timing of precipitation and the natural processes of streams resulted in arroyo cutting and vegetation removal [in Segments 2 through 4]. U027, at 3-27 - 3-28 (ASLD Report).

367. Farming was also important in the Tonto Basin. U027, at 3-18 (ASLD Report).

368. Wagon roads in Segments 3 and 4 in the 1870s went from Tonto Creek, across the River near Pinal Creek, near where the 288 bridge is today, and then on down to Globe. Tr. 10/20/15, at 172 (Fuller); C030-364, at 123 (Fuller PPT); C018-32 (*Historical Atlas of Arizona*, showing main stagecoach lines).

> 369. Hiram Hodge, in his travels in Arizona in the mid-1870s, noted that: along the upper portions of the River, including the valleys of its many tributaries, there are in all at least two hundred thousand acres of land, capable of raising most of the products before named, and in those valleys which extend well up into the mountains, Irish potatoes of an excellent quality [could] be successfully raised.

370. The products that Hodge named were: wheat, barley, corn, beans, melons, pumpkins, sweet potatoes and other roots and vegetables of most kinds; peaches, pears, nectarines, apricots, and all other smaller fruits; grapes and most of the semitropical fruits; sugar-cane, hemp, tobacco, and no doubt rice and cotton. C028-305, at 44-45 ("Arizona As It Is").

371. Brigham Young, in 1875, sent seven men from Utah to scout out Arizona land for settlement; Mr. Hayden gave them "true and useful information about the country and natives." C056, at 43-44 (Hayden: *Charles Trumbull Hayden*).

372. Until railroad transportation was available in southern Arizona, Hayden wagon trains continued to deliver merchandise such as barley, graham flour, cracked wheat, and flour; Hayden also ran wagon trains in northern Arizona. In addition, Hayden had a blacksmith shop and a wagon shop. C056, at 44-48 (Hayden: *Charles Trumbull Hayden*).

373. In 1874, 1875, and 1876, Hayden acquired more than 300 acres of land, 70 acres of which was in the riverbed or "covered by Tempe Butte," and his business and agricultural holdings extended throughout the territory. C056, at 48-50 (Hayden: *Charles Trumbull Hayden*); C040-C, at 124 (August, *Vision in the Desert*).

374. A waterfall of 24 feet ran Hayden's grist mill; Hayden grew grain and alfalfa,

and he had an orchard which produced peaches, oranges, and lemons. C056, at 50 (Hayden: *Charles Trumbull Hayden*).

375. Carl Hayden, Charles T. Hayden's son, was born in October 1877; his recollections of the River were therefore when the River was no longer in its ordinary and natural condition. Tr. 1/27/2016, at 2140-44 (August).

376. Globe acquired a newspaper in 1878 - the *Silver Belt*; Phoenix acquired the *Salt River Herald* (in 1878) and the *Gazette* (in 1880); Tombstone acquired it first paper in 1879 (the *Nugget*) and in 1880 the *Epitaph*. The number of newspapers continued to grow in the 1880s. C062-403, at 8 (Lyon: *Those Old Yellow Dog Days*).

377. The late 1870s were the heyday of territorial journalism; between 1877 and 1880 a flurry of newspapers (13) were established, sparked by mining and railroad development. C062-403, at 7 (Lyon: *Those Old Yellow Dog Days*).

378. Congress enacted the Desert Land Act in 1877 to promote the settlement of western lands by appropriating and applying to the land waters from non-navigable streams. Ch. 107, 19 Stat. 377, 43 U.S.C. §§ 321-339 (1877). The Act does not define "non-navigable."

379. Desert land entries were made by declaring that the claimant intends to reclaim desert land by legally conducting water onto the land; he also had to acquire water rights necessary to permanently irrigate the land, file a map showing how he proposed to conduct water on the land, and the manner in which he intended to irrigate it. C018-214, at 19-20, ¶¶ 8, 12, 13 (U.S. Government, *Free Lands and Dry Farming in the Southwest*, c. 1908).

380. The claimant had to show specifically the source and volume of the water supply, how it was acquired and maintained, the number, length, and carrying capacity of all ditches, and that he has witnessed the land being effectually irrigated. C018-214, at 24, ¶ 23 (U.S. Government, *Free Lands and Dry Farming in the Southwest*, c. 1908).

381. A newspaper article explained that the decision of the late Secretary of the Interior, Hon. H.M. Teller, still stood: A claimant can make a successful claim under the Desert Lands Act if enough water was brought to the land claimed sufficient to raise crops; water did not need to cover all of the land. C018-130 (*Daily Herald*, 6/3/1885).

382. In the 1870s the markets for products in the Salt River Valley were local; by the late 1800s, with the advent of the railroad, markets become regional; good were transshipped along the Southern Pacific Railroad. Tr. 1/26/2016, at 2069 (August).

383. After 1877, hauling goods by railroad was the cheapest method available. Tr. 1/26/16, at 2096 (August).

384. The first successful homestead claim in Arizona was completed in 1878 when a settler received his patent to 160 acres in SE 1/4 of Section 18, T1N, R5E [in the Mesa area]. C018-215, at 8, ¶ 2 (*Homesteading*).

385. In 1879 the name of the post office at Hayden's Ferry was changed to "Tempe" because the area it served was irrigated from the Tempe Canal. C028-293, at 36 (*Charles Trumbull Hayden*).

386. Mail to Fort McDowell was delivered overland, and by 1879 wagon roads had been developed. U027, at 3-31, 3-32 (ASLD Report).

387. The population of Arizona in 1880 was 40,440; 5,689 people lived in Maricopa County; Gila County had none. C022-9, at 14-15 (*Population of States and Counties, 1790 - 1990*).

388. "Some of the ranches in early Gila County were large enough to allow for the establishment of a school or a Post Office. If such a settlement was given a name it was considered to be a town." U027, p. 3-17 (ASLD Report), i.e. early "towns" were not large and the population was spread out because there was much ranching up there. (For ranching and farming, see U027, pp. 3-15 - 3-21.)

389. Charles Hayden farmed and raised stock "as a necessary adjunct to his milling operation." He raised hogs and originally farmed a full section of land and planted 400 citrus trees in 1880 and grew 500 acres of wheat and 100 acres of alfalfa. He was a miller, a freighter, a merchant, and a farmer. C044-3, at 196, 199 (*Smoke Signals*, Spring 1969).

390. By 1883, farmers were settling in the Valley in large numbers, growing crops and taking their grain to the Hayden mill. L018, Ex. 191, at 3 (Historic Am. Engineering Record).

391. The amount of land in the Territory estimated to be under cultivation was 72,000 acres, and with the Arizona canal in operation the Salt River Valley alone "will have that much in cultivation." C018-74 (*Phoenix Herald*, 3/20/1884).

392. The first railroad came to Arizona, from Yuma to Tucson, in 1880; the railroad reached Tempe and Phoenix in 1887, crossing the River on the first railroad bridge - a timber structure near Hayden's Ferry, and the second railroad to arrive in Tempe was in 1904. Charles T. Hayden had wanted a wagon bridge to be constructed at the same time, but "travelers had to continue to use Hayden's Ferry to cross the River for another quarter of a century." C018-12, at 3-5 ("Ash Avenue Bridge," National Park Service, 1991); C018-35 (Historical Atlas of Arizona, showing Railroad Development from 1888 - 1976).

393. With the coming of the railroads between 1880 and 1883, new communities sprang up and more newspapers appeared. C062-403, at 9 (Lyon: *Those Old Yellow Dog Days*).

394. By 1885, a California company had built a bridge across the Gila River using redwood [not local wood]. C040-B, at 21 (Arizona Dep't of Transportation Report); Tr. 5/17/16, at 4552, 4645 (Fuller).

395. The railroad crossing bridge at Tempe in July 1887 "brought to an end the need for the service rendered by Hayden's Ferry during the previous sixteen years." C028-293, at

37 (*Charles Trumbull Hayden*). However, it is unclear when Hayden's Ferry actually ceased: it was reported that the ferry continued its operations until the Ash Avenue Bridge was completed in 1913. C018-12, at 2-5 (*Ash Avenue Bridge*).

396. The Southern Pacific was one of the main contenders for the transportation development of the West, which facilitated regional and national trading. L018, Ex.191, at 3-5 (Historic Am. Engineering Record).

397. The building of the railroads was heavily subsidized by the federal government. Tr. 1/26/16, at 2096 (August).

398. In 1888, Congress passed the Irrigation Reservation Act, under which water storage reservoir sites were to be located in the West. C018-19, at 119 ("Two Sides of the River," Zarbin).

399. By 1888, more than 400,000 acres had been cultivated in the Salt River Valley. L030, at 3-7, Table 3-1 (ASLD Report).

400. The Territorial capital was moved from Prescott to Phoenix in 1889. C018-12, at 4 ("Ash Avenue Bridge," National Park Service, 1991).

401. Population numbers for 1890 show: Phoenix, 3,152; Maricopa County, 10,986; Gila County (not close to the River), 2,021. Tr. 10/20/15, at 160 (Fuller); C030-364, at 114 (Fuller PPT). The population of Arizona in 1890 was 88,243. C022-9, at 14-15 (*Population of States and Counties, 1790 - 1990*).

402. Ore from the mines was moved by mule-drawn wagons. *See* C018-181 (photo of wagon train).

403. For a photograph of the River near Phoenix "pre-1896," *see* C018-58, No. 23.

404. Segments 1 through 4 had a slightly different economy [from that of Segment 6]; there was some mining near the River and small ranches in the Tonto Basin. The Apache wars (which ended in 1886) were felt more there than in Segments 5 and 6. Tr. 10/20/15, at

159-60 (Fuller); C030-364, at 113 (Fuller PPT).

405. Ranchers and farmers forded the Salt at the mouth of Tonto Creek [in Segment 4] at a place they called "The Crossing." U027, at 3-32 (ASLD Report).

406. By 1896, 1,670 acres of fields were being irrigated in the Tonto Basin. U027, at 3-20 (ASLD Report).

407. The most prominent uses of the River [in Segments 1 - 4] have been ranching, farming, mining, and hydroelectric power, with minor use for recreation. U027, at 3-30 (ASLD Report).

408. There were no major trails crossing the River above Tempe; but there was a railroad to Globe as of 1898 and one earlier (1887) in Phoenix. Tr. 10/20/15, at 171-72 (Fuller); C030-364, at 122, 123 (Fuller PPT).

409. According to the U.S. Bureau of Census, in 1900, Arizona's population was 122,931; the population of Gila County was 4,973; and the population of Maricopa County was 20,457. C018-179; C022-9, at 14-15 (*Population of States and Counties, 1790 - 1990*).

410. The United States government bought out most of the ranchers along the upper River from 1903 to 1905 when construction of Roosevelt Dam began. U027, 3-18 (ASLD Report); U034 (Littlefield (2004): "Reclamation Withdrawals and Water Power Designations"). However, ranching and farming continued during dam construction, peaking in the 1920s. U027, 3-18 (ASLD Report).

411. Population numbers for 1900 show: Phoenix, 5,544; Maricopa County, 20,457; Tempe, 885; Mesa, 722; Gila County (not near the River), 4,973. Tr. 10/20/15, at 160 (Fuller); C030-364, at 114 (Fuller PPT).

412. Construction of Roosevelt Dam (at the confluence of the Salt River and Tonto Creek) began in 1903. L030, at 3-9 (ASLD Report).

413. By 1904, a stage coach traveled daily between Globe and Roosevelt. U027, at

3-32 (ASLD Report).

414. The Apache Trail automobile road was built in connection with the construction of Roosevelt Dam in 1905 when the Reclamation Service cleared a road from Mesa to connect with the settlement of Roosevelt. U027, at 3-32 (ASLD Report).

415. Old SR 188, from Roosevelt north to Punkin Center was built from 1905 to 1910 to replace dirt roads, including the old Tonto Creek Road. U027, at 3-33 (ASLD Report).

416. Congress passed the Forest Homestead Act (for inholdings) on June 22, 1906 (16 U.S.C. § 507) and the Enlarged Homestead Act (Dry Farming Homestead Act) in 1909 (43 U.S.C. § 224). Congress also passed the Stock Raising Homestead Act (43 U.S.C. § 292) in 1916 to further promote the occupation of remnant lands not settled by the other Acts. C018-215, at 3 (*Homesteading*).

417. In 1907, automobiles were "becoming more useful even on our undeveloped roads." C018-46, at 149 (*Doctor on Horseback*).

418. By 1908, the Salt River Valley was being touted as providing "Rare Opportunities to the Investor and Homeseeker" mainly due to the construction of Roosevelt dam and reservoir that would provide a continuous supply of irrigation water for about 200,000 acres of land which would be distributed to the Valley's lands by means of canals, ditches, and laterals, leading from a diversion dam at Granite Reef. C018-29, frontispiece; at 1st, 3rd, 5th and 6th ("Salt River Valley").

419. Principal crops claimed to be raised in the Salt River Valley in 1908 included: wheat, barley, oats, sorghum, alfalfa, oranges, melons, dates, olives, peaches, apricots, pears, figs, almonds, grapes, and strawberries. Furthermore, dairy farming, horse and cattle raising, were successful, and fowls "of every kind," including ostriches, thrived. C018-29, at 7th, 13th ("Salt River Valley").

420. According to the U.S. Bureau of Census, Arizona's population in 1910 was 204,354; the population of Maricopa County was 34,488. Further population figures show that the population of Phoenix was 11,134; Salt River Valley, 21,589; Tempe, 1,473; Mesa, 1,602; Gila County (not near the River), 16,348; Globe Miami (not near the River), 9,361, and the Roosevelt area (in connection with the building of the Dam), 707. Tr. 10/20/15, at 160-61 (Fuller); C030-364, at 114 (Fuller PPT); C018-179.

421. For photographs of early-1900s bridges over the River, *see* C018-58, Nos. 3, 4, 9, 12, 16, 18, 21, 24.

422. For a photograph of a map of Arizona's railroads as of 1912, *see* C018-212.

423. The Ash Avenue Bridge, sited at the ancient crossing of the River [in Segment 6] and at Hayden's ferry was completed in 1913. C018-12, at 2, 4-9 ("Ash Avenue Bridge").

424. Homesteading occurred in every county and nearly every township in the State. C018-215, at 9 (*Homesteading*).

425. By the time the State began issuing land patents, the River had been completely diverted. Tr. 3/11/16, at 3891-92 (Littlefield).

I. Fishing in the River

426. In 1879 fish were being harvested [in Segment 6] with "giant powder," and a newspaper article called for legislation prohibiting its use, noting that the practice not only takes fish that are fit for the market but destroys the fry and other small fish; the River had been stocked with fish meant for food. C028-306 (*Phoenix Herald*, 5/7/1879). Giant powder is an explosive. L030, Glossary-8 (ASLD Report).

427. The River was fished commercially: Articles in the *Phoenix Herald* (May 1879) and in the *Arizona Gazette* (December 1881) mention that fish from the River [in Segment 6] were supplied for market. L030, at 3-17 (ASLD Report); C028-306 (*Phoenix Herald*, 5/7/1879).

428. A man had his hand amputated when it was mutilated by his misuse of giant powder. C028-295 (*Phoenix Herald*, 7/23/1880).

429. The *Phoenix Herald* on June 24, 1880, reported that "The restaurants occasionally furnish their boarders with excellent fish caught in Salt River." L030, at 3-17 (ASLD Report).

430. There was good fishing in the River in November 1880. C018-114 (*Phoenix Herald*, 11/26/1880).

431. A bill prohibiting the powder's use to kill fish was enacted in 1881. L030, at 3-17 (ASLD Report); C018-87 (*Weekly Arizona Miner*, 1/14/1881).

432. Fish were still abundant in the River in 1881: Newspapers reported that two boys caught over a hundred pounds of fish in a few hours and in 1882 that "a lucky disciple of Izaak Walton" caught a five-pound Colorado River salmon from the River. L030, at 3-16 - 3-17 (ASLD Report).

433. In the early 1880s fishing in the River was "quite good where an abundance of fish could be caught including 'that prince of Arizona waters the Colorado salmon' . . . which could be five feet long and weigh as much as forty pounds." C028-294, at 351 ("The Rise of the Southeastern Salt River Valley").

434. Occasionally, someone would use "great powder" to kill fish in the river, causing "great outrage by local sportsmen against such an opprobrious practice." C028-294, at 351 ("The rise of the Southeastern Salt River Valley").

435. The use of explosives apparently continued; a newspaper article reported that someone had been killing fish with giant powder. C018-93 (*Phoenix Herald*, 7/21/1882).

436. Judge Greenlaw, P.C. Bicknell and eight others had a successful hunting and fishing expedition down the river, catching 100 lbs of river trout ("chubs"). C018-85 (*Weekly Citizen*, 10/20/1883.

437. A girl was bitten by a wildcat while fishing on the River. C018-113 (*Arizona Silver Belt*, 12/5/1885).

438. Fish (salmon and suckers) were plentiful in the River although great numbers had been killed by "giant powder." C018-86 (*Weekly Citizen*, 6/20/1888).

439. Four men set brought back 145 pounds of fish from a fishing expedition. C018-119 (*Arizona Silver Belt*, 8/16/1900).

440. Fish were abundant in the River: "a fishing expedition was being organized, seine in hand, they were setting about to gather in a store of fishes." C018-90 (*Arizona Republican*, 2/9/1902).

441. Two men "enjoyed a few hours' fishing on Salt river last evening." C018-116 (*Arizona Republican*, 6/23/1903).

442. Thousands of fish - carp, suckers, and "Salt river salmon," but not catfish - died in the River in "the lower box canyon" C9018-98 (*Arizona Republican*, 9/30/1903).

443. Sediment from a flood killed many fish and carried others into irrigating ditches and far into alfalfa fields, but one man caught a salmon measuring three feet nine inches long. C018-120 (*Arizona Silver Belt*, 8/25/1904).

444. Pinney and Robinson, outfitters, advertised that they had the head of an eight-pound Colorado River salmon, which had been taken about eight miles west of Phoenix, on display at their store. C018-94 (*Arizona Republican*, 6/23/1905).

445. Hundreds of people were reported to be fishing in the River and the canals in June 1905, some catching fish weighing 13 to 30 lbs. C018-97 (*Arizona Republican*, 6/29/1905).

446. Four people left Phoenix to fish at the Tempe dam for a few days. C018-88 (*Arizona Republican*, 7/1/1905).

447. Four boys caught 57 fish measuring from one to two feet by grabbing them by

the tail. C018-101 (*Arizona Republican*, 8/8/1905).

448. Competition among fishermen was fierce: Robert Hudson claimed to have caught the biggest salmon "with a body like a family butcher bill and a head like a congressman." However, he was later accused of have bought this fish from "a Mexican," who had caught an even bigger fish. C018-103 (*Arizona* Republican, 6/27/1905).

449. Fishing for Colorado salmon was reportedly good in April and May 1905, and the catfish were "biting freely" with one catch of 35 fish reported. C018-42, 44 (Pinney & Robinson advertisements in *Arizona Republican*, 4/28/1905; 4/6/1905).

450. The man who introduced the catfish to the River (Dr. Roberts), reported that those fish were scarce now; he believes that they have migrated to the Salton sink because they like deep water. C018-99 (*Arizona Republican*, 5/6/1906).

451. There were many fish - salmon, cat, and carp - to be caught in the River and in the canal at the division gates on the Chandler ranch. C018-96 (*Arizona Republican*, 7/3/1907).

452. Three men took a hunting and fishing trip along the River as far up as the Verde. C018-111 (*Arizona Republican*, 9/24/07).

453. Fish (Colorado River trout, catfish, carp, suckers, and Verde trout) were still plentiful in the River in 1908. C018-39 - 41 (Pinney & Robinson's tackle advertisements in *Arizona Republican*, 4/10/1908, 4/12/1908, 4/11/1908).

454. In 1908, fishing "was receiving considerable attention;" a party of four were reportedly going to fish at the Arizona dam. C018-43 (*Arizona Republican*, 5/2/1908).

455. "Some years ago . . . Honest John" caught the largest fish in the River. C018-100 (*Arizona Republican*, 6/3/1908).

456. A man caught several fish in the River, including two that resembled black bass - "a new specie here." C018-112 (*Arizona* Republican, 6/14/1908).

457. A party of eight men caught (only) five fish in the River. C018-106 (*Arizona Silver Belt*, 6/29/1909). The same month, another party left for a fishing trip up the River. C018-108 (*Daily Silver Belt*, 6/20/1909).

458. Several friends "left this morning for a day's fishing at Salt River. A good catch of suckers was promised before the party set out." C018-117 (*Arizona Silver Belt*, 5/22/1910).

459. Carp, suckers, and Verde trout were being caught "in abundance" as well as some salmon. (and 5,000 black spotted Colorado brook trout were placed in the River). C018-118 (*Arizona Republican*, 1/20/1912).

460. Three men got badly sunburned while fishing in the River, but they caught 100 pounds of fish. C018-109 (*Arizona Republican*, 5/23/1912).

461. Mr. and Mrs. Blanchard drove to Granite Reef for a night's fishing in the River. C018-95 (*Arizona Republican*, 5/2/1912). The next month a party of men drove ten miles up the River to fish and caught 100 lbs of fish. C018-107 (*Arizona Republican*, 6/18/1912).

462. One man caught a five-pound carp in the River, and another caught thirty pounds of carp and "cat variety." C018-89 (*Arizona Republican*, 9/11/1913)

463. There were many stories of catfish, weighing from six to 35 pounds, being caught in the River. C018-92 (*Arizona Republican*, 4/25/1915).

464. Three people "spent Monday afternoon fishing in Salt River." C018-115 (*Arizona* Republican, 7/9/1915)

465. A Mexican youth caught some large carp, some weighing two and three pounds, and a very large catfish; he had thrown back many smaller fish. C018-110 (*Arizona Republican*, 10/14/1915).

466. "Sportsmen around the valley" fish in the River from Granite Reef dam to the Indian sloughs and the junction; heavy catches were reported of catfish, salmon, trout, goggle-

eyed perch, and black bass. A nine-pound catfish was caught in the Arizona canal. C018-102 (*Arizona Republican*, 4/7/1916).

467. Boys were catching fish in their bare hands even in 1917. C030-364, at 198 (Rev. Fred McNeil Collection, ASU Hayden Library, Special Collections, CP MCL 97725.T3) (Fuller PPT).

468. Restaurants were furnishing their patrons with "excellent fish" caught in the River in 1920. C018-67 (*Arizona Republican*, 6/24/1920).

469. A 1920 newspaper advertisement touted a "Fishermen's Special" leaving from the Union Stage Office at 15 East Jefferson every Saturday for $25; boat hire was included in the price. C018-65 (*Arizona Republican*, 7/2/1920).

470. People were catching fish in the River, at Roosevelt Lake [in Segments 3-4], and from the canals in 1890, 1899, and in 1916. *See* C018-58 (photographs: 1890 photo of a small boy with fish hung up on a horizontal pole taken from "Fish Creek Hill on the Apache Trail overlooking Fish Creek Inn." Fish Creek is a tributary of the Salt [in Segment 4]; six men holding up strings of fish caught from an irrigation canal in Scottsdale in 1899; two men in a canoe fishing for black bass on Roosevelt Lake in 1916; a man in a canoe on the Arizona Canal in 1920, and an undated photo of three men and a boy posing in front of rows of strung-up fish).

V. BOATS AND BOATING

A. Native-American Boating

471. A Tohono O'odham creation story features a dugout canoe that Montezuma's friend, Coyote, warned Montezuma to build in order to save himself from a large flood. C018-21, at 19 (Tellman).

472. Traditionally, Native-Americans used various types of watercraft: the Sioux of the Mid-West used tub-boats or bull-boats; the Hupa of Northern California and Louisiana

Indians used dugout canoes; the Haida of Alaska used curved canoes; the Kodiak of Alaska used skin boats, and the Utes of Nevada used reed boats. C002-48 (*Nature and Science*).

473. The canoe, in addition to the dugout, was in wide use among Native-American Indians well prior to the arrival of Europeans. These were slightly framed craft with an exterior skin or hull of birch or pine sewn with sinews or root fiber. C044-5, at 8 (Newell Report).

474. Bark canoes were so strong and flexible that Indians used them not only in heavy rapids but also on the ocean. C018-210, at 12 (McPhee, *Survival of the Bark Canoe*).

475. The Hohokam traded with peoples from the lower Colorado and with peoples on the coast of the Sea of Cortez, all of whom made and used balsas and other watercraft. C028-313, at 112 ("Hohokam . . . Phoenix Sky Train Project").

476. The Hohokam may have used balsa rafts; Frank Cushing from the 1890s mentions that some people found a "canoe" or some type of boat; and recently boat ramps on the canals and boat-building materials have been tentatively identified. Tr. 10/20/15, at 154-55 (Fuller); Tr. 10/22/15, at 694-97 (Fuller); C030-364, at 110 (Fuller PPT); *see* C018-164, at 1, 2 (Photographic Highlights of Boating in Arizona); C028-313, at 111 ("Hohokam . . . Phoenix Sky Train Project").

477. Results from recent excavations of Hohokam canals suggest that baskets of corn or other produce were loaded onto rafts which were drawn along a tow path alongside a canal. The recent study cautiously speculated that a canal feature may have been a boat or raft slip. C028-313, at 111-12 ("Hohokam . . . Phoenix Sky Train Project").

478. Frederick W. Hodge, in 1893, found the remains of a "bundle of fagots or reeds" in an excavated Hohokam canal that may have been used for "a rude system of navigation" by balsas or cane rafts. C028-313, at 111 ("Hohokam . . . Phoenix Sky Train Project").

479. Hodge also thought that balsas or cane rafts could have been used for transporting "bowlders" and other material from the River to be manufactured into cutting and chipping tools. C028-313, at 111 ("Hohokam . . . Phoenix Sky Train Project").

480. It would be extremely unlikely that any decomposable evidence would be found many hundreds of years later by archaeologists because of the lack of anaerobic mud that could preserve organic materials in the largely sand and gravel Salt River, as well as the large floods on the River. Tr. 3/31/16, at 4330, 4391-93 (Newell); Tr. 5/18/16, at 4857-58 (Fuller).

481. The balsa has a nearly universal distribution. C028-313, at 112 ("Hohokam . . . Phoenix Sky Train Project").

482. Virtually all the groups living in the deserts west of the Phoenix basin used reed balsas for crossing the Colorado and the lower Gila. The Mohave used reed balsas "apparently made of cattail" that were large enough to carry four to six adults, and they made ceramic pots, one meter in diameter, to float children and goods across the rivers, as did the Cocopah and Maricopa who also used dugouts. C028-313, at 112 ("Hohokam . . . Phoenix Sky Train Project").

483. Entire families would take two- to three-day trips down the Colorado on large reed rafts braced with cottonwood poles. C058-12, at 127 (Forde: *Ethnography of the Yuma Indians*).

484. When the Halchidhoma lived on the Colorado they made rafts of bundles of tule that could hold ten men and their fishing nets, and they also used an unshaped log, as did the Maricopas. Catamarans were also made for use in high water, which were constructed of two logs side by side with sticks tied across them. C058-11, at 76-77 (Spier: *Yuman Tribes on the Gila River).*

485. The Maricopa fished along the slough of the Santa Cruz River, at the Gila-Salt confluence, and on the Salt as far upstream as Phoenix, but had no settlements there. C053-11,

at 108 (Spier: *Yuman Tribes on the Gila River*).

486. The Maricopa used unshaped logs for fishing boats, and they may have used catamarans that had two logs side by side with sticks tied across, as well as rafts that could hold ten men, such as were used on the Colorado. C059-E, at 76 (Spier: *Yuman Tribes of the Gila*).

487. The Maricopa used conveyances similar to those used by the Cocopah on the Colorado such as dugouts, rafts formed of logs, or brush tied together. C028-313, at 112 (Hohokam . . . Phoenix Sky Train Project); C059-E, at 76-77 (Spier: *Yuman Tribes of the Gila*).

488. Between A.D. 1519 and 1692, the ancestral Pima occupied the Salt, Gila, and lower Santa Cruz Valleys, and the Maricopa, who moved into and shared territory with the Pima, farmed, hunted, gathered wild seeds, and fished the rivers from boats, using nets and traps. C028-276, at G-15 ("Cultural Resources Overview").

489. John Bartlett, in 1852, visited the Pima villages and also traveled north to the Salt about 12 miles above the River's confluence with the Gila. He and his men made camp and soon saw "a body of twelve or fifteen Indians on the river making for our camp." The Indians were Pima who had been hunting and fishing. The Pima may have been fishing from boats. C053-393, at 241 (Bartlett, *Personal Narrative*); Tr. 5/18/16, at 4875-80 (Fuller).

490. The Pimas built a raft to cross the River in order to attack the Apache, they put their supplies on it, but the raft capsized; the Pimas then forded the River. This event is memorialized in a talking stick. Tr. 11/19/15, at 1463 (Gookin).

491. In early Euro-American settlement days, one pioneer recalled that when the Salt was in flood, he got Indians to ferry the goods across the River in canoes. C028-308, at 159 (*House by the Buckeye Road*).

B. One-Way Boating Trips

492. There are common examples of one-way trips on a frequent basis where boats are built to carry materials downriver and then are broken up for lumber at the bottom; when that occurs, it's commercial activity. Tr. 3/31/16, at 4388-89 (Newell).

493. A sweep-boatman would steer his boat downstream to his destination and then sell the boat for lumber. C043-367, at 31 (Excerpt Dimock, *Sunk Without a Sound*).

494. Boatmen on the Salmon River in the 1880s used wooden scows to deliver cargo about 39 miles downriver; after dropping off their cargo they would dismantle and sell and boat for lumber and return by road). C046-377 (Idaho Outfitters and Guides Assoc. webpage).

495. The Day brothers boated and trapped their way down to Yuma five times from Camp Verde on the Verde River, down the Verde, Salt, and Gila rivers, returning by train to Camp Verde. C002-8 (*Arizona Sentinel*, 4/02/1892).

496. Nathaniel Galloway built his own boats, often leaving one at the end of a run and building another. C018-2 (Staveley: "Than the Man"); C028-347 (*These Boats Will Speak*).

497. The Sykes brothers built boats for their trips down the Colorado in 1898 and in 1905. C018-185, at 218-219 (Giclas, "Stanley Sykes," *Journal of Arizona History*, Summer 1985).

498. Joaquin Mendez set out to guide Southern Pacific engineers and surveyors "to the present mouth of the Colorado by boat," the boat to be abandoned, sold, or brought back [overland]. C018-77 (*Arizona Sentinel*, 8/24/1911).

C. Types of Boats Available Before or Around Statehood

499. The first rubber boat made in the U.S. was in 1837; in the mid-1800s, naval and army personnel started to create inflatable flotation devices to cross rivers. C018-160, at 2

("History of Rubber Boats").

500. In 1842, John Charles Fremont used a rubber raft, 20' by 5', for the Platte River survey, and by 1851, Charles Goodyear had award-winning designs for inflatable boats. C018-160, at 2-3 ("History of Rubber Boats").

501. Lt. Edward Ives and his party, returning from a trip up the Colorado River and overland towards Fort Defiance [Arizona] in 1858, crossed the Little Colorado River in "Buchanan boats:" which were "tipsy structures of canvas stretched over wood." C018-159, 131 (Davis, "Man and Wildlife" thesis).

502. Sweepboats or "scows" appeared on the Salmon River in the 1870s; such boats were of shallow draft, 16' to 35' long, five to ten feet wide, with sidewalls of 3' to 4'. C002-9, at 30-31; C043-367; C043-377.

503. Steamboats were in general use on the Missouri River and other mid-western rivers in the 1800s; their use dwindled with the coming of the railroads. C018-3, at 164-65 ("Mountain Men and Grasshoppers").

504. Photograph of eight men in a wooden row-boat "rescuing people during a flood on the San Francisco River in Clifton" in 1884. C018-50.

505. Canoe clubs from all part of the United States and Canada met at Hay Island on the St. Lawrence River, with the western states being well represented in racing events. C028-277 (*Arizona Republican*, 8/5/1899).

506. Canvas canoes were in use in Arizona at the turn of the [20th] century. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2851); C018-270 (canvas folding boat advertised for auction, *Arizona Republican*, 5/18/1908).

507. Wooden/canvas canoes are durable; traditionally they "plied inland waterways loaded down with supplies going in and goods coming out of the woods. They traveled lakes, rivers, streams, and portages of all sizes . . . . They ran whitewater loaded down with hundreds

of pounds of supplies. . . . Light, small craft such as canoes are designed to support a load while the hull is supported by the water underneath it." C018-23, at 1-2 ("About Canoes").

508. Wooden boats of the kind built by James Logan (*see* Section VII, Historical Boating by Segment) and by Brad Dimock (*see* Dimock testimony at Tr. 10/22/15, at 527-29, 531, 534, 554) routinely bump off rocks; these boats are not fragile although they may need repairing if they T-bone a rock or a cliff. Tr. 5/17/16, at 4584 (Fuller).

509. The types of boats typically used in Arizona were flat-bottomed boats, skiffs, or canvas and wooden canoes. L030, at 8-3 (ASLD Report); Tr. 3/10/16, at 3780-81 (Littlefield).

510. Trappers used canoes in Arizona in the 1820s. C028-312, at 65/122, 68/122 (*Pattie Narrative*).

511. Photograph of a man sitting in a wooden boat beside the Hassayampa River circa 1900. C018-49.

512. By 1900 more durable rubber inflatable boats were being manufactured, but they were less than perfect. Better inflatables, called "pneumatic," were manufactured in 1913, and various kinds of inflatable boats were developed thereafter. C018-160, at 4-5 (History of Rubber Boats).

513. A friend of Stanley Sykes shipped a canvas boat by train as part of his luggage when he joined Sykes at Mellen [now Topock] on the Colorado in 1905, preparatory to floating down to Yuma. C018-185, at 219 (Giclas, "Stanley Sykes," *Journal of Arizona History*, Summer 1985).

514. Photograph of three men in a wooden rowboat on the River, probably in the Salt River Canyon [in Segment 2], circa 1910. C018-51.

515. A review of the historical records gives the general impression that there was no shortage of boats in Arizona. The types of boats typically used were flat-bottomed boats,

skiffs, or canvas and wooden canoes. Whenever a boat was needed to cross a flooded river, even during the period of early exploration, boats were borrowed from local residents, used and returned. L030, at 8-3 (ASLD Report); U027, at 6-3 (ASLD Report); *see generally*, C018-164 (Photographic Highlights of Boating in Arizona).

516. Small boats in Arizona were commonly homemade. C018-146 (Dimock Verde testimony, Tr. 3/31/2015, at 2837-38).

517. Small craft were increasingly being used and no doubt "will prove important factors in enlightening people as to the great value of inland waterways." C018-80 (*Arizona Republican*, 7/26/1908).

518. Boats that were used for trade and travel purposes around the time of statehood included paddle wheelers, and steamers on the Colorado; canoes; flatboats; mail-order boats from Sears; dugout canoes; and perhaps canvas canoes, some home-built boats, and rubber boats. C062-416 (Verde Tr. at 2437-38 [August]).

519. Boats available at statehood included collapsible kayaks (Kleppers); collapsible canoes; freight canoes; many home-made rowboats; and commercially-made steel boats. Kleppers are still made but with somewhat better skin (Hypalon). It was common for a person to build a boat for trapping; such boats were built to carry cargo. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2836-40).

520. Another assessment found that boats available at statehood included: steamboats, flat boats, skiffs, scows, rafts, canoes, rowboats, dories, riverboats, ferries, dugouts, kayaks, motor boats, and inflatables. C018-149, at 7 (Boating in Arizona).

521. Various types of low-draft boats were widely available by 1912, *see, e.g.*, the many types of boats featured in *Country Life in America*, 1908 (C002-45), and the following:

a. Rowboats: C002-43 (Country Life in America, 1910).

b. Steel boats: C018-220 (Catalog from Michigan Steel Boat Co., 1902, featuring boats of lengths from 11 1/2 feet to 14 feet and for various purposes

such as fishing, duck shooting, and family outings).

c. Canoes: C018-20 (Sailing canoes advertised in *Overland Monthly*, July 1892); C002-20 (Kennebec canoes produced in the early 1900s); C002-14 (advertisements in *Hunter-Trader-Trapper*, July 1912); C002-29 (canvas and wood canoes in a design based on Indian birchbark canoes, many of which are still in circulation although well over a hundred years old); C002-22 (*About Canoes*); C002-45 (*Country Life in America, 1908).*

d. Portable folding boats: C002-18 (*The Manufacturer & Builder*, 1874); C002-39 (King Folding Boat Co., 1880s); C002-13 ("Life Saving Folding Canvas Boat" in *Hunter-Trader-Trapper*, 1908); C002-41 ("Outing With a Portable Equipment," *American Homes and Gardens,* 1911); C002-35 ("A Back-Yard Wilderness" 1915).

e. Inflatable rubber boats: C002-38 (*The History of Rubber Boats and How They Saved Rivers).*

f. Build-it-yourself boats: C002-19 (*The Manufacturer and Builder*, August 1875); C002-25 ("Just a Boat," in *Country Life*, 1909; C002-15 (advertisement in *Hunter-Trader-Trapper*, 1912); C002-36 (directions for building a canoe based on traditional Algonquin design).

g. Mail-order boats: C002-16 (canvas boats, 1895 Montgomery Ward and Sears Roebuck catalogs); C002-13 (advertisement in *Hunter-Trader-Trapper*, 1908); C002-17 (Sears Roebuck catalog, 1912).

h. Ducking boats: C002-47 (pneumatic "boat" with leg cases were available for duck-huntings 1895); C002-37 (ducking boats were generally 14 to 16 feet long, wide and low with extremely shallow draft; lake and river boats have deeper draft and narrower beams, 1901).

522. By World War II, synthetic materials were developed which revolutionized inflatables; the Zodiac, developed in the early 1960s which was popular with the military, contributed to the rise of the civilian inflatable boat industry. C018-160, at 6-7 ("History of Rubber Boats").

523. Improvements to Neoprene and Hypalon fabrics in 1953 made inflatables more reliable, and in the mid-1960s outfitters began designing inflatable boats specifically for running rivers. C018-160, at 8 ("History of Rubber Boats").

524. Klepper boats were the same in 1970 as they were in 1910 except that the 1910 boats had rubberized canvas; now they are made of Hypalon, a type of rubber. But they have

the same shape and the same system. They take a lot of cargo and are the boat of choice for braided sandy rivers. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2860-61).

525. John Wesley Powell made a "voyage of discovery" down the Colorado in 1869 and he again boated down the river in 1871-72; his trips brought the Colorado River and the Grand Canyon to the American consciousness. C028-347 (*These Boats Will Speak*); C020, App. B; 67-77 (photographs of Powell and his boats on the Colorado).

526. Nathaniel Galloway developed a stern-first technique (known as "drifting") for running the Grand Canyon rapids in 1897, and he built his own boats. C018-2 (Staveley: "Than the Man"); C028-347 (*These Boats Will Speak*).

527. In 1909, Julius Stone hired Nathaniel Galloway to lead an expedition of four boats, which Galloway had designed and built back east, down the Colorado River, not for commercial purposes but for fun. Galloway was the paid guide for recreational purposes. Tr. 10/22/15, at 541-42 (Dimock).

528. Guided recreational river touring existed in Arizona in 1912 (citing the Stone expedition). C018-149, 119 (Fuller Boating in Arizona); C018-148 (Fuller Gila testimony, 6/16/14, at 91).

529. There were many boats on the Colorado River in 1909, 1910, and 1911. *See* photographs of Nathaniel Galloway, man sitting in small canvas boat; Ellsworth Kolb posing with his camera on a rock at the river's edge and a small boat tied up below; men with fish by a collapsible boat; Emery Kolb holding a 125-lb canvas boat; the Kolbs next to a boat with a hole in it; four men in a canvas rowboat near the mouth of Bright Angel Creek; and drawings and plans of Galloway boats Edith, Glen and Stone. C002-30, 31, 33; C018-204; C018-31 (*Historical Atlas of Arizona*, showing Colorado River Ports, 1852-1909); C018-38 ("*If Boats Could Talk*").

530. The design for the Edith came from northern Utah in the 1890s. The Kolb

brothers wanted to run the Grand Canyon in 1911. They obtained the plans and had two boats built back east. The Edith is now in the Grand Canyon museum. Tr. 10/22/15, at 531-32 (Dimock).

531. The Edith could carry a ton and had two cargo compartments. The Kolb brothers got the design from Galloway and Stone and built the Edith and the Defiance in 1910 and 1911. C018-146 (Dimock Verde testimony, Tr. 3/31/2015, at 2827-30); C028-347 (*These Boats Will Speak*). The Edith was 18' long and 4' wide with two cargo compartments; it could carry one ton of cargo such as trapping skins, mining equipment, staple goods. C018-146, at 2828-29 (Dimock Verde testimony).

532. The Kolb brothers carried heavy photographic equipment, ropes, blocks and tackles for lining the Edith around rapids. The Edith was designed to haul cargo because Galloway was a trapper. C018-146 (Dimock Verde testimony, Tr. 3/31/2015, at 2955).

533. When the Kolb brothers crashed the Edith while on the Colorado, they repaired the holes and continued their trip. C018-146 (Dimock Verde testimony, Tr. 3/31/2015, at 2830-32).

534. The Kolb brothers' scenic travel film was shown commercially for 60 years at the Grand Canyon's South Rim. C018-146 (Dimock Verde testimony), Tr. 3/31/15, at 2832.

D. Historical Boats vs. Modern Boats

535. The canoes that the Indians made were as good as or better than what could be done with modern tools and materials. C018-210, at 11 (McPhee, *Bark Canoe*).

536. Henri Vaillancourt made bark canoes that were strong, resinous, and waterproof; they could take a blow. The ribs and planking (split, not cut) were flexible. C018-210, at 10-11 (McPhee, *Bark Canoe*).

537. Bark canoes glance off rocks, leaving no trace, whereas aluminum boats get dented and leave heavy streaks of paint or aluminum on rocks. C018-210, at 11, 32, 99

(McPhee, *Bark Canoe*).

538. There are many types of canoes, with different shapes, including rocker (longitudinal curve), but all wood canoes are made in much the same way today as they have been for generations. C018-221 at 9-14 (*Complete Book of Canoeing*).

539. The design of modern boats is functionally the same as for historical boats, and the draws have not changed much. Tr. 10/22/15, at 624-25 (Fuller); C030-364, at 286 (Fuller PPT); Tr. 5/17/16, at 4709 (Fuller).

540. Fiberglass emerged as a canoe material after WWII; other materials such as ABS, polyethylene, and Kevlar, are used to make modern boats. C018-221, at 15-17 (*Complete Book of Canoeing).* Boating's general purpose of carrying people and load has not changed. There have been some performance improvements but no substantial change in historical boats vs. modern boats. Tr. 5/17/16, at 4685, 4690 (Fuller).

541. Historical boats were designed to deal with rapids, carry loads down fast-moving or slow-moving rocky and shallow rivers. There has been no meaningful or substantial change in appearance, weight, or draw (which is determined by the load carried and then there is only an inch or two difference and by the boat's design). Historical canoes look the same as modern canoes. Tr. 5/17/16, at 4685-89, 4709 (Fuller); C053-385, at 58 (photos of pre-statehood and modern rubber rafts and wood and canvas canoes) (Fuller Rebuttal PPT).

542. Historical and modern boats are similar in weight. A 14' pre-1910 wooden canoe weighed about 55 lbs; a 15' historical wooden canoe weighed about 60 lbs; and a 17' historical wood and canvas rigid canoe weighed 75 lbs. A modern 16' plastic canoe weighs 69 lbs; a modern 17' aluminum canoe weighs 72 lbs; and a modern 16' wood and canvas canoe weighs 76 lbs. However modern Kevlar canoes are lighter, which are designed for flat water. Tr. 5/17/16, at 4695-98 (Fuller); C053-385, at 60 (Fuller Rebuttal PPT).

543. A wood and canvas rigid canoe, which is designed for more maneuverability, and a folding canvas rowboat with metal frame - which is designed to be folded, packed up, and carried on a trail - have different functions and expectations and are propelled differently; these therefore do not provide a valid comparison of historical boats vs. modern boats. Tr. 5/17/16, at 4691 (Fuller); C053-385, at 59 (Fuller Rebuttal PPT).

544. Birchbark canoes today weigh about the same as historically, function the same, and are used about the same as historically. Tr. 5/17/16, at 4694 (Fuller).

545. Canoe shapes vary, but overall modern canoes are very similar to historical canoes. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2844).

546. A canvas over wooden frame canoe is probably similar in weight to a modern plastic canoe, with a draw varying from a few inches to four to six inches, maybe more depending on the load; if fully loaded the canoe could draw from four to eight inches. A fully loaded 18-foot canoe might have a little less draw: generally, the larger boat would have a lighter draft. Tr. 3/31/16, at 4312-15 (Newell).

547. There have been some changes in durability and performance: plastic is more durable, but Kevlar, for example, is very vulnerable to damage and is not appropriate for rocky shallow rivers. Tr. 5/17/16, at 4687 (Fuller).

548. Durability in boats has been improved over time, but boats made of canvas and stripped cedar, and other natural materials such as birch bark, was used on rocky rivers at the time of Arizona's statehood. Tr. 11/18/15, at 1363 (Fuller).

549. Durability can be a factor on some rivers, such as on the River in Segment 1, because of the size of the rapids, drops, rocks, tortuosity and narrowness of the channels; historic boats would have had difficulty there. Tr. 11/18/15, at 1363-64 (Fuller).

550. Durability, with respect to boats at statehood being meaningfully similar to today's boats, is not an issue in Segment 2 and even less so in Segments 3 through 6 because

of lower velocities [than in Segment 1]. Tr. 11/18/15, at 1364, 1366 (Fuller).

551. Durability is less important than the boat's draw. Tr. 10/22/15, at 627 (Fuller).

552. Although modern plastic canoes slide easier over rocks compared to wood and canvas boats, some [historical] canvas boats, being less rigid, could get into shallow areas because canvas flexes and moves more easily over obstacles. Tr. 5/19/16, at 5052 (Fuller).

553. Royalex is more durable than wood or canvas and wood canoes. However, neither Kevlar, Fiberglass - which is not used much today and tends to crack and is difficult to repair, nor aluminum boats - which dent and lose performance, is more durable than historical boats. Tr. 5/17/16, at 4698-4701 (Fuller).

554. Durability is not an issue in Segments 5 and 6, because they are easy to boat. Tr. 5/17/16, at 4701 (Fuller).

555. Historically, repairing boats was a regular part of the experience of boating; even today a boat will get rips and tears that need patching on the trip. Alex Mickel always carries a patch kit on trips. Tr. 10/21/15, at 399, 434 (Mickel).

556. Plastic is more durable and flexible than wood (not more flexible than canvas), but it is harder to repair than wood or canvas; people using historic boats were able to fix their boats. Tr. 11/18/15, at 1365 (Fuller).

557. Any modern boater should take along a repair kit, just as historical boaters like the Kolb brothers, did. Steamship captains also had to make repairs after hitting rocks on the Colorado, according to Mr. Lingenfelter's book *Steamboats on the Colorado* [C021-4]. Tr. 10/22/15, at 625-26 (Fuller).

558. Historically, boaters on rocky rivers expected to have to repair their boats periodically; boats would show typical wear and tear. Tr. 3/31/16, at 4412-13 (Newell).

559. Brad Dimock, a professional river runner, boat builder, and river historian, lives in Flagstaff. He has written three biographies of early river runners in the Grand Canyon and

many articles about boats, boat building, and boat river history. Tr. 10/22/15, at 525-28 (Dimock).

560. Brad Dimock works for a rafting company out of Flagstaff that runs rafts on the Colorado. He runs commercial dories through the Grand Canyon. He also runs commercially on the San Juan, Green, Yampa, and the upper Colorado. A commercial dory fully loaded with four passengers, a ton of gear, and himself, draws about 10-11 inches. C018-146 (Dimock Verde testimony, Tr. 3/31/2015, at 2825-26, 2879).

561. Mr. Dimock has boated the upper Colorado, Green, and San Juan Rivers in Utah; no boat used on those Rivers needs three feet of water. C018-146 (Dimock Verde testimony, Tr. 3/31/2015, at 2825).

562. Mr. Dimock built a replica of the Edith (16' 8" x 4'), one of the Kolb brothers' boats, and boated down the Canyon on the centennial of the Kolb brothers' trip and on other rivers. C018-146 (Dimock Verde testimony, Tr. 3/31/2015 at 2827-28; 2832-33).

To build his replica, Mr. Dimock used northern white cedar from New Hampshire and other woods also from back East. Many Colorado River boats were from the East and were made of cedar, oak, white oak, rock elm, and various other hardwoods; planking was usually a lighter soft wood except for the Powell boats. Tr. 10/22/15, at 558-61 (Dimock)

563. Mr. Dimock has boated the Upper Salt in modern kayaks and rafts about ten times, at high water during spring runoff. Tr. 10/22/15, at 543-44; 547-48 (Dimock).

564. Most of Mr. Dimock's experience has been on the Colorado, in kayaks, canoes, and small rafts. He uses newspapers for his historical research but not all boating accounts make the newspapers. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2817; 2923-24; 2929).

565. Mr. Dimock began his boat-building career by repairing his own wooden boats that he was running commercially. He has studied wooden boat building, has assisted

teaching wooden boat building, and has published three books and a lot of articles about boats and boating. He has built about two dozen wooden boats, about six of which were historical replicas. Tr. 10/22/15, at 527-29 (Dimock).

566. The first wooden boat that Mr. Dimock built was an almost exact replica of a 1911 boat (the Edith) that was taken through Grand Canyon by the Kolb brothers. The Edith has a pointy bow so the width varies from 3 to 4 feet; it is about 16 feet long, and has some rocker from end to end so the bottom goes up about 6 inches. The draft varies with the amount of load; a 500-lb load causes the draft to go down three or four inches; the total draft would then be six or seven inches, but it varies because of the rounded bottom. Tr. 10/22/15, at 529, 531, 534, 554 (Dimock); C028-352 - 354 (photographs of the Edith in Segment 5).

567. Mr. Dimock makes some dories out of wood, but modern wood which has many knots is not as tough as wood from old-growth trees. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2864-65).

568. Wood and canvas kayaks were tougher than fiberglass kayaks, but fiberglass is lighter. However, fiberglass can shatter, whereas big plank boats will take tremendous hits. C018-146 (Dimock Verde testimony, 3/31/15, at 2888; 2960-61).

569. Modern finishing methods do not make wooden boats more durable than they were 100 years ago. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2835).

570. Canoes were used on the River in historical times. Tr. 11/18/15, at 1367 (Fuller).

571. Modern rafts are more durable, but historically people didn't expect their wood boats to last more than one or two trips; cargo capacity was similar. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2841-43).

572. If you got a hole in a Klepper canoe in 1912, you would patch it. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2862).

573. A boater would expect to have to repair wood boats occasionally; not so with most modern boats. However expectations are different: historical boaters had to be ready for any eventuality whereas modern boaters assume safety. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2910-12).

574. The Klepper is the first folding kayak that was designed and built for commercial sales in 1910. It's the same design today. These kayaks have been used all over the world on big expeditions; they can hold enough cargo for a month's trip or longer. They are about 13 feet long and about a little under two feet wide. Tr. 10/22/15, at 540-41 (Dimock).

575. A historical wooden boat in 1912 could have been built to go down Segment 2, but it would probably have to have been portaged or lined in places. Ninety-nine percent of the river would be fine; that's how the [voyageurs] moved skins through Canada, with some portaging. Bad spots are not complete obstacles to navigating the entire river. Tr. 10/22/15, at 564 (Dimock).

576. Someone in historical times could have moved goods from just below Stewart Mountain Dam in Segment 5 to Granite Reef in Segment 6 as Mr. Dimock did in the Edith on 8/31/2015. Tr. 10/22/15, at 539 (Dimock).

577. Modern kayaks, canoes, drift boats, catarafts, rafts, have draws/drafts that are similar to those of historic boats, which were as boatable as modern craft, depending on the length of the boat, type of materials used, and how heavily it is loaded. Tr. 10/22/15, at 619-20 (Fuller); C030-364, at 282 (chart showing different boats on the left, and drafts for different kinds of boats as discussed in the 1930 *Utah* Special Master's Report on the right) (Fuller PPT). Of the boats featured on the chart, the canoes, scows, and shorter rowboats would be appropriate for use in Segments 2-6 of the River, and the longer rowboats and all of the other boats listed, including a Klepper kayak, would do fine in Segment 6 of the River.

Tr. 10/22/15, at 620-21 (Fuller).

578. Canvas and wooden boats are appropriate for use on rocky rivers. Tr. 10/22/15, at 621-24 (Fuller); C030-364, at 283 (photos of a wooden canoe and a canvas canoe, each is being poled upriver through rocky rapids, one in 1904 and the other in 1910); at 284 (a man "snubs" his birch bark canoe down a very rocky rapid)[12]; at 285 (a man poles his canvas canoe up a small stream in Maine, a stream that is much smaller than the Salt from Segment 2 down) (Fuller PPT).

579. Technology in boat building that has evolved since 1912 makes it easier to boat the River, but it is not necessary. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2956).

580. Modern kayaks and canoes are meaningfully similar to kayaks and canoes in use in 1912 with respect to their draw, handling, weight, durability, and cargo capacity. Such boats were available for sale in the U.S. and were used to carry cargo. Hard boats, such as modern duck boats, dories, rowboats, and flatboats are similar to those in use in 1912, but inflatable boats are different. C018-146 (Dimock Verde testimony, Tr. 3/31/15, at 2850-51); C028-309 (photographs of canoes).

581. Modern canoes - hard shell and inflatables - are meaningfully similar to boats in existence at statehood; they have the same purpose, function, design, and draft, although the materials are different. Tr. 10/20/15, at 104 (Fuller).

582. Mr. Williams, author of *Paddling Arizona*, a comprehensive paddling guide to Arizona's lakes, rivers, and creeks, stated that while there are rivers in Arizona that are navigable because of modern technology, like the East Verde (different from the Verde) and West Clear Creek, the Salt River is not one of those. Tr. 10/21/16, at 274-75, 294-95.

583. The transportation of commercial goods or passengers in a canoe or flatboat is a

[12] "Snubbing" is an effective technique for navigating a stream such as the River in Segment 2 in low water: "you can stop yourself with your snubbing pole, rotate the bow around where there are obstacles in front of you and you work your way through." Tr. 11/18/16, 1314 (Fuller).

commercial use of the river. C062-417 (Littlefield Verde testimony, Tr. 2/19/15, at 1569).

584. A canoe can haul cargo and can be used for a commercial purpose. C062-419 (Mussetter Verde testimony, Tr. 2/23/15, at 2028).

585. Modern boats do not allow boating in Segments that could not have been boated historically. Historical boats were small, of low-draft, primarily wooden, and homemade; boating was year-round. Modern materials make things a little easier, so a boater needs less skill, but the same reaches of the River were boated then as now and in similar types of boats. Tr. 5/17/16, at 4716 (Fuller).

E. Modern Boating with the 1911 Replica Edith

586. Mr. Dimock took his replica Edith down the River on August 31, 2015, having trailered it from Flagstaff. He put in just below Stewart Mountain Dam [in Segment 5] and boated about twelve miles downstream to Granite Reef [in Segment 6]. He loaded about 850 lbs of sandbags and jugs of water on board to give it a good heavy load. The River's flow was about 650 cfs. He ran aground once after taking the wrong line, and got out of the boat to pull it off the rocks. He then observed that the boat had leaked, allowing an additional 500 lbs of water to enter the big hatch and tilt the boat, because he had not soaked the boat the day before, which compounded the problem of taking the wrong line. The shallow spots in the River were about 50 to 100 feet out of the twelve miles. Mr. Dimock characterized the trip with the cargo as a success and stated that someone could do that exact trip in historical times. Tr. 10/22/15, at 532-39 (Dimock); Tr. 10/22/15, at 631 (Fuller); Tr. 5/17/16, at 4703-04 (Fuller); C030-364, at 288-293 (description and photos of Edith and Klepper on River) (Fuller PPT); C053-385, at 64 (photos of Edith in Grand Canyon and in Segment 5, and a Klepper) (Fuller Rebuttal PPT).

587. Mr. Dimock also made use of his Klepper kayak with him on August 31, 2015 [in Segment 5 and some of Segment 6]; he saw other boats on the River that day and none had

any problems except that one man fell out of his kayak. Tr. 10/22/15, at 540-41 (Dimock).

588. Jon Fuller and some other boaters accompanied Mr. Dimock on his trip with the Edith; Mr. Fuller was in a Klepper kayak. The trip was a success and demonstrated that wooden boats can run on the River. Tr. 10/22/15, at 628-37 (Fuller); C030-364, at 287-293 (includes a slide show at PPT 292) (Fuller PPT).

589. Mr. Fuller boated a replica of a circa 1900 wood-framed canvas Klepper from Stewart Mountain Ranch to Granite Reef dam, in Segment 5. Tr. 5/19/16, at 5141 (Fuller).

590. Mr. Dimock has run his replica Edith through the Grand Canyon and Cataract Canyon on the Colorado River, and Ladore Canyon on the Green River. C018-146, at 2832-33 (Dimock Verde testimony).

591. The longer the boat the more of a plunging factor there is, but this was not a problem on the River in general nor for the Edith or the Klepper in August 2015. Tr. 5/17/16, at 4713-15 (Fuller).

592. Mr. Dimock's schedule allowed no time to try the Edith on the Upper River in August 2015. Tr. 10/22/15, at 566 (Dimock).

F. Modern Boating[13]

593. The physical conditions described in Section II above - flow, depths, channel configuration - meet or exceed the minimum stream conditions for recreational boating. *See* L030, at 8-1 - 8-2 (Tables 8-1, 8-2) (ASLD Report).

594. The Boy Scouts of America and the Sierra Club initiated modern recreational rafting on the upper Salt River in the late 1950s. U027, at 3-1.

595. There are many boating guides and much website information for the River. Tr. 10/22/15, at 611-12 (Fuller); C030-364, at 274 - 277 (Fuller PPT); C018-28; C018-153 (Southwest Paddlers guides for rivers in Arizona, mostly for the Salt); C018-57 ("A

[13] For modern boating by Segment, see Section VII.

Riverrunner's Guide to the Salt River"); C018-59 ("A Guide to Salt River Canyon"); C018-154 ("Mild to Wild: Salt River Rafting"); C018-155 ("Salt River Rafting"); C018-156 ("Arizona: By Wilderness Aware"); C018-157 ("Mesa Fishing, Lakes and Rivers"); C018-199 ("Guide to the Upper Salt River, Arizona"); C018-200 ("Paddling Arizona: A Guide to Lakes, Rivers, and Creeks"); C028-282 (Saguaro Lake Guest Ranch); C028-283 (Salt River Canoe Kayak and Raft Rentals); C028-284 (Kayaking Salt River a cool alternative to tubing); C028-285 (Sonora Kayak Rentals); C028-286 (Canoeing and Kayaking the Lower Salt River). There are also rafting regulations. C018-158 (White Mountain Apache website information).

596. When Mr. Fuller has boated on the River (before the White Mountain Apache Tribe web page permitting system was implemented) he would go just downstream of the Highway 60 bridge [in Segment 2] and place money into a steel tube. Tr. 11/18/15, at 1368-70 (Fuller).

597. The White Mountain Apache Tribe denied Mr. Fuller's request for a permit to visit the River in Segment 1 because he was working on the navigability study. Tr. 11/18/15, at 1371-72 (Fuller).

598. The U.S. Forest Service grants commercial permits for boating through the Tonto National Forest from Cibecue Creek in the Salt River Canyon to the bridge at Roosevelt Lake [Segments 2 and 3]. C002-26 (*Phoenix Gazette*, 3/24/86).

599. The Forest Service limits the number of boaters on the River [in Segments 2 and 3] through its permitting process; there are many more applications for permits than there are permits so many boaters are turned down. Tr. 11/18/15, at 1377 (Fuller).

600. The Forest Service, whose permit season is from March 1 to May 15, employs a couple of people to manage their [part of the] River; they go down the River in rafts when the water is as low as 350 cfs and, in small boats, lower than that. In 2010, a wet year, the F.S.

recorded 7,000 user days in the daily reach of Segment 2, and about 570 in the wilderness section; in a dry year they recorded 850 user days for the daily reach and 190 for the wilderness part. Four companies have Forest Service permits to run trips in this area. Tr. 10/22/15, at 605-06 (Fuller); C030-364 at 272 (Fuller PPT).

601. The Forest Service also keeps track of private trips in Segments 2 and 3 from March 1 through May 15, allowing four launches a day. About nine people go on a single permit. Forest Service records show that in 2010 (a wet year) they issued 292 permits (2,600 people) and in 2015, a dry year, they issued 15 permits. Tr. 10/22/15, at 610 (Fuller); C030-364 at 273 (Fuller PPT).

602. Both the tribes and the Forest Service check to make sure people have permits, and the Forest Service also checks for gear, etc., and provides assistance. Tr. 11/18/15, at 1377-78 (Fuller).

603. No limitations on the number of trips are imposed in Segments 2 and 3 outside of the March through May season, but a permit is required from the White Mountain Apache Tribe and can be purchased online. The website to obtain the permit states: "the Salt River is open year round to river rafting." 11/18/15, at 1368; C018-158.

604. White-water (non-tranquil) boating usually takes place on streams with a gradient higher than 10 feet per mile and a flow of more than 500 cfs; these conditions provide Class I white water boating. C022-4, at 15-16 ("Recreational and Instream Flow").

605. Guided white-water rafting trips in the Salt River Canyon through the White Mountain Apache Reservation [Segments 2 and 3] take place in the spring and summer; the Tribe and the National Forest Service have granted permits to Salt River Canyon Raft Trips. C002-26 (*Phoenix Gazette*, 3/24/86).

606. Private recreational boating occurs primarily in Segments 2 and 3, and it goes on all year but mostly in the spring. Tr. 10/22/15, at 601 (Fuller); C030-364, at 268, 269

(Fuller PPT).

607. The Central Paddlers Club claims that its members have boated all of the Segments, but mostly Segment 2, and in Segment 5 (on dam releases). Tr. 10/22/15, at 603-04 (Fuller); C030-364, at 270 (Fuller PPT).

608. Jim Slingluff, a canoeist, has done Segments 2, 3, and 5. Tr. 10/22/15, at 604 (Fuller); C030-364, at 271 (Fuller PPT).

609. Jim Slingluff testified that outfitters will run Segment 2 and 3 below 300 cfs and as low as 200 cfs. L011-3, at 63.

610. Seasonal commercial recreation occurs mostly in Segments 2 and 3 but also in Segment 5. Inflatable kayaks are available for rent from rafting companies. A lot of tubing occurs in Segment 5. Several services offer shuttles in Segments 2, 3, and 5. Tr. 10/22/15, at 601-03, 607 (Fuller); C030-364, at 269 (Fuller PPT).

611. Jerry Van Gasse was running 20 trips a year in his commercial rafting operation, and George Marsik with Worldwide Rafting has done year-round trips, perhaps a 100 a year; Dorothy Riddle also. Tr. 10/22/15, at 604 (Fuller); C030-364, at 271 (Fuller PPT); U002-4; U006; U002.

612. Alex Mickel has been a river outfitter with a commercial operation ("Mild to Wild") on the Upper Salt River [in Segment 2 and 3] since 1998. He operates from the end of February-early March to early or late May and employs 20 to 25 people, with 14 of them full-time. Tr. 10/21/15, at 384-87 (Mickel).

613. Mr. Mickel's company uses rafts that may hold eight people and gear. Canoes are also regularly seen on the river. Tr. 10/21/15, at 387-88, 398 (Mickel).

614. Commercial inner-tubing takes place between Stewart Mountain Dam and Granite Reef Dam [in Segments 5 and 6]. C002-23 (*Arizona Rivers and Streams Guide*).

615. Mr. Fuller has seen all variety of canoes - tandem, solo, different lengths and

skill abilities - hard shell kayaks, inflatable kayaks, rubber rafts, rowboats, an aluminum motor boat, the sheriff's air (or jet) boat, all kinds of tubes, catarafts, and the Edith, on the lower River. Tr. 11/18/15, at 1379-80 (Fuller).

616. Arizona Game and Fish employees conduct fish counts on a semiannual basis and at the lowest flow time of the year, primarily in Segments 2 and 3, using rafts or canoes; they carry various types of equipment. Records from three years (2001 - 2004) show that AG&F personnel have conducted such canoe trips at 132 cfs and rafts down to 135 cfs. Tr. 10/22/15, at 612-13, 615-16 (Fuller); C030-364, at 275, 279, 280 (showing AG&F personnel on a raft with their equipment with the River at 150 cfs) (Fuller PPT).

617. The County Sheriff has two air boats, which they launch at 500 cfs and a jet boat that they launch at 600 cfs; they go from upstream of Granite Reef [in Segment 6] to just below Stewart Mountain Dam [in Segment 5]. Tr. 10/22/15, at 608, 613 (Fuller); C030-364, at 275, 278 (Fuller PPT).

618. In modern times, there are many kinds of boats on the River: inflatable rafts, catarafts; inflatable canoes or kayaks; hard-shell kayaks and canoes; jet boats, air boats, rowboats, motorboats; which type of boat to use depends on the flow rate. The seasonality in Segment 5 is affected by dam releases. Tr. 10/22/15, at 616-17 (Fuller); C030-364, at 281 (Fuller PPT).

619. The most weight that Jon Fuller has carried on the River is 1,000 lbs on his neoprene/rubber raft and about 70 lbs (excluding himself and others) in his canoe. Tr. 10/23/15, at 845-47 (Fuller).

620. Canoes and kayaks can pass over obstacles with as little as 3" of water, but a minimum depth of 6" and a minimum stream width of 25' will allow passage. The minimum water velocity to yield Class I and perhaps some Class 2 white water is about five feet per second (fps); rafts and drift boats need a minimum width of 50', depth of one foot, and

velocity of 5 fps for Classes I and II water. C022-4, at 21-22 (Cortell, *Recreation and Instream Flow*).

621. Hyra suggests the following criteria for canoeing and kayaking: minimum depth of 6", but one foot is safer and optimum is 2.5 feet; velocity of 10.0 feet per second (fps) is maximum (unsafe for open canoes), a safe velocity is 9.0 fps, and optimum is from .5 to 7.0 fps. C022-11, at A-12 (Hyra, *Methods of Assessing Instream Flows for Recreation*).

622. The Hyra depth recommendation of 6" applies to canoes in whitewater rivers, not to a "swimming pool" sort of draw. Don Farmer, Brad Dimock, Tyler Williams, and Jon Fuller, all recognize that 6 inches is a reasonable estimate of the draw of a typical loaded small boat. However, there are no parts of the River that are 6 inches deep, and Mr. Fuller is not using 6 inches for his assessment of the River's navigability. Tr. 5/17/16, at 4710-12 (Fuller); C053-385, at 70 (Fuller Rebuttal PPT).

623. Rafts, hard-shell and inflatable kayaks, and canoes can all boat in Segments 2, 3, and 5. Many boats are used on the reservoirs in Segment 4. Tr. 5/17/16, at 4677 (Fuller); C053-385, at 55 (Fuller Rebuttal PPT).

624. Segment 3 has year-round boating but most boating takes place during spring runoff; Segment 4, under the reservoirs, is not in its natural condition; Segment 5 sees lots of recreational boating, some commercial, primarily when the reservoirs release flow and subject to downstream demands; Segment 6 is not in its ordinary and natural condition: boating takes place only on effluent releases and, occasionally, during floods. Tr. 5/17/16, at 4674-75 (Fuller).

VI. Obstacles and Obstructions

625. Whether something is an obstacle or an obstruction depends on the type of boat used, the boater's expertise, and on the river's flow rate. C018-148 (Fuller Gila testimony, Tr. 6/16/14, at 66-67); C018-149 (Fuller Boating, PPT 78).

626. Rapids are in a section of a river where there is an increase in velocity or turbulence.[14] Classes I through V rapids are navigable. C018-148 (Fuller Gila testimony, Tr. 6/16/14, at 67-68); C018-149 (Fuller Boating, PPT 80-84).

627. Rapids are rated on an international scale from I to VI:

> Class I (pre-novice): fast moving water; riffles which are easily navigated with little training;
> Class II (novice): straightforward rapids; wide, clear channels, easy with training;
> Class III (intermediate): boat maneuvering required, moderate waves, tight channels, powerful currents;
> Class IV (advanced): powerful intense predictable rapids; moderate to high risk if capsized;
> Class V (expert): complex, violent, demanding; high risk, difficult rescue;
> Class VI (extreme): obstacles - unrunnable for most boaters.

C018-148 (Fuller Gila testimony, Tr. 6/16/14, at 68-69, 71); C018-149 (Fuller Boating, PPT 80-91); C018-219 (American Version: International Scale of River Difficulty).

628. Classes I and II rapids are no problem; Class IIIs might be a problem. C018-146 (Dimock Verde testimony, Tr. 3/31/15 at 2867).

629. Segment 1, which is not navigable, has many rapids, some as high as V and VI, and waterfalls as high as 20 to 30 feet. Tr. 10/20/15, at 54-55 (Fuller); Tr. 10/22/15, at 582-83 (Fuller); C030-364, at 212, 251 (Fuller PPT).

630. Rapids in Segments 2 through 6 are mostly Class IIs, but Segment 2 also has 19 Class IIIs and four Class IVs (per Forest Service listings/ratings). Tr. 10/20/15, at 66-68; 100; 107, 118; 132 (Fuller); C030-364, at 60, 67, 76, 86, 89, 212 (Fuller PPT). Classification of rapids in Segments 2 and 3 are derived from The Salt River Canyon Wilderness Boating Map. Tr. 5/18/16, at 4810 (Fuller).

631. Mescal Falls [in Segment 2] is a mild Class III rapid. Tr. 10/21/15, at 490 (Fuller); C030-364, at 46 (Fuller PPT). Quartzite Falls, also in Segment 2, was dynamited in

[14] For a full description of each Segment's rapids and as a percentage of the Segment, see Section VII.

1993 and is now a Class IV rapid at high water; before it was dynamited it was a Class III-V rapid; today it is normally boated without portage, but it is a constriction. Tr. 10/20/15, at 119-128 (Fuller); C030-364, at 213-222 (Fuller PPT).

632. There are no Class V or Class VI rapids on the River. C018-149 (Fuller Boating, PPT 95).

633. For downstream travel, rapids are not an issue, although some rapids in Segment 2 could require portaging, or lining. Tr. 5/18/16, at 4809-11 (Fuller), C053-385, at 106-08 (Fuller Rebuttal PPT).

634. Other potential obstructions that may cause some small difficulties include beaver dams, sand bars, strainers and sweepers, but these are not barriers to navigation. C018-148 (Fuller Gila testimony, Tr. 6/16/14, at 66-67); C018-149, 79 (Fuller Boating).

635. Beaver dams are not obstructions because they are easily crossed in a canoe or portaged around. C018-148 (Fuller Gila testimony, Tr. 6/16/14, at 75-76); C018-149 (Fuller Boating, PPT 96, 97).

636. Although beaver live in Segments 1, 2, 3, 5, and 6, they have no dams, except possibly in small channels in the effluent-dominated portion of Segment 6; otherwise beaver live in the banks (see Section VI(B)). Tr. 5/18/16, at 4815-19 (Fuller); C053-385, at 113, 114 (Fuller Rebuttal PPT).

637. No evidence exists that beaver built dams historically that would have impeded boating on the River. Beaver did not need to build dams because the River's depths supported bank-dwelling beaver. Tr. 5/18/16, at 4815, 20-22 (Fuller); C053-385, at 113-115 (Fuller Rebuttal PPT).

638. Sand bars are easily avoided: if you see one you just go around it. C018-148 (Fuller Gila testimony, Tr. 6/16/14, at 77-78); C018-149 (Fuller Boating, PPT 100, 101 [the navigable Colorado and Mississippi Rivers are both noted for the number and density of

sandbars]).

639. Moving sand-bars, logs or fallen trees floating in the river, or wind, would not make a river non-navigable. Tr. 3/31/16, at 4308 (Newell).

640. Sweepers and strainers are fallen trees in the channel or overhanging bank vegetation. They are not barriers to navigation because they are easily removed or avoided; like beaver dams these are only temporary difficulties to boating. C018-148 (Fuller Gila testimony, Tr. 6/16/14, at 79-80); C018-149 (Fuller Boating, PPT 103).

641. Marshes can be obstructions to small boats if there is no channel through them or if they are shallow. C018-149 (Fuller Boating, PPT 79).

642. Although federal surveyor Ingalls mentioned some marshes in Tempe in his survey of December 1868, his maps do not indicate any marshes along the corridor of the River's low-flow channel, and no map or photograph shows a marsh located on the River in the area of the low flow (boating) channel. L030, at 3-15; Tr. 5/18/16, at 4806-07 (Fuller), C030-385, PPT 110.

643. Unlike the rivers described in *PPL Montana*, the River (except in Segment 1) has no significant obstacles or obstructions that would require portaging and thus make the River non-navigable. C018-149 (Fuller Boating, PPT 79); *see PPL Montana*, 132 S.Ct. at 1224, 1231 (17-mile Great Falls reach of Missouri River has distinct drops including five waterfalls with continuous rapids in between; always requires portaging).

644. No qualified expert who testified and none of the historic boating accounts reported any problems with braiding, marshes, flash floods, beaver dams, or erratic flow. Tr. 5/18/16, at 4806-07 (Fuller); C053-385, at 106, 109 (Fuller Rebuttal PPT).

VII. Wildlife

645. Personnel on the 1854-55 survey Commission for the Gadsden Purchase boundary, headed by Major William Emory, noted the following wild animals near the

U.S./Mexican border in 1855: Gambel's quail, turkey, beaver (in the banks of the Gila and the Colorado), gray wolf, grizzly bear, jaguar, mountain lion, javelina, mule deer, white-tailed deer, pronghorn, bighorn C018-159, at 84-94 (Davis, "Man and Wildlife" thesis).

646. Prospectors, drawn to the new town of Prescott in 1863, saw Merriam's turkey, gray wolf, grizzly bear, mountain lion, mule deer, pronghorn, and bighorn. C018-159, at 193-96 (Davis, "Man and Wildlife" thesis).

647. Dr. Elliott Cous, surgeon, ornithologist and naturalist, who spent a year at Fort Whipple near Prescott in 1864-65, observed Merriam's turkey, Abert squirrel, beaver, grey wolf, grizzly bear, jaguar, mountain lion, mule deer, pronghorn, and bighorn. C018-159, at 136-140 (Davis, "Man and Wildlife" thesis).

A. Native Fish

648. Archaeological evidence indicates that the same species found in Arizona rivers in prehistoric times were also present around the time of statehood. Some of the species found in the River included very large fish such as squawfish (also known as Salt River Salmon, Colorado River Salmon), some of which grew to more than three feet long; razorback sucker; and flannelmouth sucker. The last-named fish tend to indicate "big river" conditions by Arizona standards. U027, at 6-5 (ASLD Report).

649. The Hohokam supplemented their diet with fish - including bonytail chub, roundtail chub, Colorado squawfish, razorback sucker, Gila coarse-scaled sucker, flannelmouth sucker, and Gila mountain sucker - from the River [in Segment 6]. L030, at 2-13, 2-17 (ASLD Report).

650. Historically, a wide range of native fish species was found in the River, including the "white salmon" or Colorado pike minnow, also known historically as Colorado River squawfish, Colorado salmon, and white salmon, which could weigh as much as 40-60 pounds and measure three to four feet long in larger river systems, but they could reach six

feet and weigh over 100 pounds. During the late winter and early summer, adult fish needed river depths of one to two feet and to survive the summer they needed pools with areas exceeding three to four feet deep. These fish were eaten by Native Americans and by European settlers and by 1904 were being harvested commercially from at least the lower River for sale in adjacent towns. C018-150, at 2-3, ¶ 5(a) (Weedman Affidavit); Tr. 10/20/05, at 141 (Weedman).

651. Razorback sucker (also known as the humpback sucker) were also historically present in the River, with an average length of one-and-a-half to two feet and weight of six to ten pounds. Their requirements for river conditions paralleled those of the pikeminnow. They were similarly used for food by both Native Americans and European settlers and were being harvested commercially by 1904. C018-150, at 3, ¶ 5(b) (Weedman Affidavit).

652. In June 1864, E.A. Cook, a member of the King S. Woolsey party, described fishing in the River at its confluence with Tonto Creek [Segment 4] as follows:

> We made a willow drag and caught about 200 fish. The largest ones looked verry much like Cod but had no teeth, and would weigh from 10 to 20 lbs. This kind of fishing was . . . verry fine sport for we had to go into the river and in some places it was up to our necks." Fishing was also good at Grapevine Springs where they caught "about fifty fish all suckers, but verry sweet." The only problem was that their lines were not strong enough to catch "the large fish which weigh from 10 lbs. to 40 lbs." (Spellings as in original.)

C002-34, at 156 (Davis, *Man and Wildlife in Arizona*).

653. Pioneer archaeologist Adolph Bandelier, visiting the Tonto Basin [in Segment 3] in late May of 1883, noted that Tonto Creek as well as the River at that location was "alive with trout." U027, at 3-27 (ASLD Report).

654. In May 1885, while William Burch and four other men boated down the River from four miles above the Tonto Creek confluence to Phoenix [in Segments 4 - 6], they caught large quantities of Salt River trout, some weighing eight and ten pounds; fish weighing

as much as 40 pounds had been previously reported in the River. L030, at 3-22 (ASLD Report); C018-134 (*Arizona Gazette*, 6/06/1885).

655. An article in 1894 comments on the change in character of the fish in the River: ten years before, the River had many hump-backed fish, but later the Colorado salmon became quite common and that gave place to the German carp that had escaped from fish ponds, into the canals, and then into the River. C018-91 (*Arizona Weekly Citizen*, 4/21/1894).

656. Aquatic biologist F.M. Chamberlain, observing the River in 1904 [in Segment 3], noted small pools of enough depth to protect fish, and "it is said salmon of marketable size can still be taken." C021-1, ¶ 40 (Burtell Declaration).

657. Newspapers reported in 1888, 1892, and 1908, that fish were dying because of diversions from the River. L030, at 3-17 (ASLD Report).

B. Beaver

658. At one time probably every permanent and intermittent stream in Arizona with an adequate food supply of willows and cottonwoods supported a beaver population. The River, considered by many trappers to be the best beaver stream in Arizona, was heavily trapped between the 1820s and 1840s; following the collapse of the fur market in the 1830s beaver made a vigorous comeback. C018-159, at 208 (Davis, "Man and Wildlife" thesis).

659. In the 1820s, beaver abounded on the River, and trappers, such as James Ohio Pattie and Ewing Young, traveled along the River as they trapped. L030, at 3-6, 3-10 (ASLD Report).

660. Writing in 1867, the physician and naturalist Elliot Coues described beaver as still being "very abundant" along the Salt and Verde rivers. L030, at 3-15 (ASLD Report); U027, at 3-24 (ASLD Report).

661. Beaver living along large rivers which flood frequently or in areas where there are few trees live in bank dens. C018-178, at 54 ("Where Waters Run Beavers").

662. Most records indicate that in Arizona beaver generally tunneled into the banks of rivers, rather than building lodges, with an entrance a considerable distance below waterline and the passage penetrated five to twenty feet back, ending in a chamber above the waterline. C018-159, at 14 (Davis, "Man and Wildlife" thesis).

663. Beaver eat numerous riparian trees. They build dams (lodges), out of a collection of logs, branches, sticks, etc., to pool the water but primarily for safety. C018-150, at 1, ¶ 4(a) - (c) (Weedman Affidavit).

664. A stream's suitability for lodges can be influenced by stream morphology, and if a beaver cannot find a suitable place for a lodge, it may build a den in the river bank with an underwater entry and upward-angled access to a dry cavity six to twenty feet from the entrance. C018-150, at 2, ¶ 4(a) (Weedman Affidavit).

665. Beaver dens are usually dug in the bluff banks of streams and have the entrance at a considerable depth below the surface of the water. C018-208, at 359 (Mearns, "Mammals of the Mexican Boundary").

666. Repeated seasonal high flows that destroy lodges and dams may encourage beavers to dwell in the bank. C018-150, at 2, ¶ 4(e) (Weedman Affidavit).

667. Beaver would not build dams across a river the size of the Salt because of the flood potential and width. Jon Fuller has seen beaver dams or lodges on sloughs or side channels. Beaver do not need to build dams where there are natural pools, as on the River. Some pools are 16 feet deep; others deeper. Tr. 10/20/15, at 176-77 (Fuller).

VIII. Segments

A. Segment 1

668. This 33.4-mile Segment runs from the Black/White River confluence to Apache Falls, a few meters upstream of the U.S. 60 Bridge. Tr. 10/20/2015, at 54 (Fuller); C030-364, at 52 (Fuller PPT).

1. Hydrology and Geomorphology

669. This Segment has many rapids, some with ratings as high as IV and V, with a pool-and-riffle to pool-and-drop pattern; it has unique geological features and is incised into a bedrock canyon; in addition to the Black and White Rivers, its major tributaries are Carrizo Creek and Sawmill Canyon. Tr. 10/20/15, at 54-59 (Fuller); C030-364, at 52 - 56; 212 (Fuller PPT).

670. This Segment has perennial flow but its many Class IV rapids and waterfalls 20 to 30 feet high render it not generally boatable. Tr. 10/22/15, at 582-83 (Fuller); C030-364, at 251 (Fuller PPT).

671. There are 25 Class II rapids for 9,990 feet (2 miles) and 44 Class III - V rapids for 19,690 feet (3.7 miles), totaling 29,680 feet (5.7 miles). Thus, 6% of the segment has Class II rapids and 11% has Class III - V rapids, for a total of 17%. Tr. 11/18/15, at 1224-27 (Fuller); C030-364, at 52 (Fuller PPT).

672. There have been no geomorphological changes in the River's natural condition since 1912. Tr. 10/22/15, at 585 (Fuller); C030-364, at 252 (Fuller PPT).

673. Photographs from Webb's *Ribbon of Green*, show the River at the Chrysotile gage from 1935, 1964, and 2000, in a condition which is essentially unchanged in Segments 1, 2, and 3. Tr. 10/20/15, at 187 (Fuller); C030-364, at 139 (Fuller PPT).

674. Based on full USGS stream data for the medians of each calendar day derived from the gages on the Black and White Rivers, and taking into account the data proposed by Mr. Burtell and Dr. Mussetter, this Segment's mean annual flow is 556 cfs, median annual flow is 410 cfs; 10% duration is 67 cfs; median daily (50%) flow rate is 167 cfs; 90% duration is 1,492 cfs, and its two-year flood is greater than 7,500 cfs. Tr. 5/17/16, at 4749-51 (Fuller); C053-385, at 81-83, 85, 86 (Fuller Rebuttal PPT). *See also,* "Attachment 1", Recommended Ordinary & Natural Flow Data.

675. This segment was not navigable in its ordinary and natural condition at statehood. Tr. 10/20/15, at 61 (Fuller); C030-364, at 57 (Fuller PPT).

2. Modern Boating

676. Alex Mickel legally boated from the confluence of the Black and White Rivers to Apache Falls, accompanied by White Mountain Apache Tribal members who were exploring the idea of opening commercial operations on the River. Tr. 10/21/15, at 391 (Mickel).

B. Segment 2

677. This 33-mile Segment runs from Apache Falls to Sleeper Rapid (just below Quartzite Falls); the San Carlos and White Mountain Apache tribes control the land, but a significant portion is within the Tonto National Forest and all of these entities do some boating permitting. Tr. 10/20/15, at 61-62, 66 (Fuller); C030-364, at 58, 59 (Fuller PPT).

1. Hydrology and geomorphology

678. This is a gaining reach. Tr. 10/21/15, at 491 (Fuller); C030-364, at 223 (Fuller PPT).

679. Its main tributaries are Cibecue Canyon and Canyon Creek. Tr. 10/20/15, at 67 (Fuller); C030-364, at 60 (Fuller PPT).

680. The channel is relatively straight in areas and somewhat sinuous, and the segment is within bedrock canyons except for Gleason Flat. Tr. 10/20/2015, at 63 (Fuller); C030-364, at 62 (Fuller PPT).

681. Rapids are mostly Class IIs, with 19 Class IIIs, and four Class IVs (per Forest Service listings/ratings), totaling 45 and comprising 11% of this reach's length. Tr. 10/20/2015, at 66-68 (Fuller); C030-364, at 60, 212 (Fuller PPT). Quartzite Falls is a Class IV rapid that can be portaged or lined, although it's normally boated without portage. Tr. 10/20/15, at 120-21 (Fuller); C030-364, at 214 (Fuller PPT). Mescal Falls is a mild Class III

rapid, and at low flow it is less than a III. Tr. 10/21/15, at 490 (Fuller); C030-364, at 213 (Fuller PPT).

682. The Salt River Canyon Wilderness Boating Map shows 12 Class II Rapids, 16 Class III rapids, and four Class IV rapids. C043-370.

683. Quartzite "Falls" is not a waterfall; it is a rapid. Tr. 10/20/2015, at 49 (Fuller). True falls, such as Great Falls on the Missouri River and Havasu Falls, are pictured on C030-364 at 46 (Fuller PPT).

684. Upstream diversions from the White and Black Rivers have diminished the flow. Tr. 10/20/2015, at 66 (Fuller); C030-364, at 59 (Fuller PPT).

685. Photographs from Webb's *Ribbon of Green*, show the River at the Chrysotile gage from 1935, 1964, and 2000, in a condition which is essentially unchanged in Segments 1, 2, and 3. Tr. 10/20/15, at 187 (Fuller); C030-364, at 139 (Fuller PPT).

686. Based on full USGS stream data for the medians of each calendar day derived from the Chrysotile gage, and taking into account the data proposed by Dr. Mussetter, and depletions proposed by Mr. Burtell, this Segment's mean annual flow is 632 cfs, median annual flow is 482 cfs, 10% duration is 158 cfs; median daily (50%) flow rate is 277 cfs; 90% duration is 1,501 cfs, and its two-year flood is 10,200 cfs. Tr. 5/18/16, at 4749-56 (Fuller); C053-385, at 81-83, 85, 87 (Fuller Rebuttal PPT). *See also,* "Attachment 1", Recommended Ordinary & Natural Flow Data.

687. Based on these USGS flow numbers, and taking into account criticisms posed by Dr. Mussetter, Mr. Burtell, and Mr. Gookin, the range of depths for this Segment is from 1.2 feet to 3.0 feet: the mean annual = 2.2'; median annual = 2.0'; 10% (entire year) = 1.2'; median daily (entire year) = 1.6'; 90% (entire year) = 3.0'; and the high-flow boating season (from February through May) ranges from 1.3' - 2.8'. The "median daily (entire year)" number most readily demonstrates the kinds of boating that could occur. Tr. 5/18/16, at 4774-

4802; 5/19/16, at 5122-24 (Fuller); C055-398, at 102 (corrected page of C053-385). *See also*, "Attachment 2", Recommended Flow Depth Estimates by River Segment for the Ordinary & Natural Condition.

688. Thus, boating could occur in canoes and low-draft maneuverable flat boats year-round, and on seasonal high flow, loaded small boats with low draft could also navigate the River in this Segment. All of these boats could be carrying a load, some more than others. Tr. 5/18/16, at 4803-04; 5/19/16, at 5139-41 (Fuller); C053-385, at 104 (Fuller Rebuttal PPT).

689. This Segment's physical conditions are similar to its ordinary and natural condition. Tr. 5/18/16, at 4949-50 (Fuller); C030-364, at 254-55 (Fuller PPT); Tr. 10/22/15, at 588 (Fuller).

2. Historical Information

690. McMillenville existed briefly - from 1876 to 1886; it was about ten miles from the River, with Apache Peaks between it and the River. It therefore would not have provided a market for goods carried on the River. There were no other population centers by the River in this Segment. Tr. 5/17/16, at 4520-28 (Fuller).

3. Historical Boating

691. Sometime before May 1873 Mr. Logan and three companions passed through this Segment in a "stout [wooden] boat." C053-392, at 42 (Carl Hayden, *Charles Trumbull Hayden, Pioneer*); Tr. 5/17/16, at 4640-42 (Fuller); C053-385, at 39 (Fuller Rebuttal PPT).

692. This Segment could have been boated historically by wooden flatboats loaded with goods. This opinion is based on Mr. Williams's wide knowledge of U.S. and Arizona rivers. Tr. 10/21/15, at 288, 329-30 (Williams).

693. A historic wooden canoe could have boated in this Segment at 100 cfs to 3,000 cfs, and a historic flatboat could have boated it at between 400 and 4,000 cfs. The ideal flow for historic flatboats would be 550 - 650 cfs. Mr. Mickel bases his opinions on his hundreds

of trips in this Segment and his vast experience on rivers. Tr. 10/21/15, at 396, 397-98; 475-76 (Mickel).

694. A historical loaded flatboat could navigate this Segment more than 50 percent of the year, and a historical loaded canoe at least 90 percent of the year. Tr. 10/21/15, at 288-90, 361 (Williams).

695. A historical wooden canoe or flatboat located with pelts or other goods could have lined Quartzite easily. Tr. 10/21/15, at 284-85 (Williams).

696. A boater hauling furs or other goods could negotiate the rapids, depending on his skill level and the flow rate, or the boater could line through them. He could move down this stretch at between 100 cfs and 10,000 cfs; the experience would vary at different flow rates. Tr. 10/20/2015, at 82-84 (Fuller).

4. Modern Boating

697. This Segment has boating year-round; the USFS limits boating to prevent overuse of the River. Tr. 5/17/16, at 4672-73 (Fuller).

698. There is modern commercial and recreational boating in this whitewater reach throughout the year. Commercial boating takes place in late winter into spring and occasionally into early summer. Tr. 10/20/2015, at 66 (Fuller); C030-364, at 63 (Fuller PPT).

699. Photographs of Segment 2 show pools, riffles, and rocks that are easy to get around. Tr. 10/20/2015, at 82-89 (Fuller); C030-364, at 62 (Fuller PPT); C018-255; C028-357.

700. Quartzite Falls was dynamited in 1993 because boaters became frustrated with waiting in line to portage. Before dynamiting, it was a Class III-V rapid; today it is normally boated without portage, but it is a constriction. A portage (on river-left) can take a single boater, with a load of 1000 pounds, an hour. The portage is a maximum of 200 feet. Tr. 10/20/2015, at 119-128 (Fuller); C030-364, at 213-222. (Fuller PPT).

701. In Quartzite's pre-vandalized condition, a canoe correctly outfitted could have made it over the Falls with everything tied down and waterproofed; with rocker in the boat. Some people might prefer a shorter boat; a canoe could carry a load of 400 or 500 lbs over the Falls. Tr. 10/23/15, at 833-35 (Fuller).

702. Depending on the type of boat, and the load of supplies, lining might be better than portaging around Quartzite Falls. Portaging might take an hour to an hour and a half; lining would take less time. Tr. 5/19/16, at 5144-46 (Fuller).

703. Tyler Williams is a professional river guide and author of seven books, including *Paddling Arizona*. He has boated Segments 2 and 3 many times. Tr. 10/21/15, at 274-79 (Williams).

704. Mr. Williams lined a raft through Quartzite Falls before it was dynamited in 30 minutes and he has also portaged the rapid. He believes there is a nearly 100 percent success rate when lining Quartzite and that lining would be preferred to portaging. Tr. 10/21/15, at 284, 372-73, 347-48, 379.

705. Mr. Mickel portaged Quartzite before 1993 at high flows, although he would line the boat at the median flow. Lining entails attaching a rope to your boat and pushing it through the rapid while you stand aside holding the rope. Tr. 10/21/15, at 395-96.

706. Photographs show Arizona Game and Fish personnel canoeing through the [post-dynamited] Quartzite Falls with their supplies. Tr. 10/20/15, at 123-24 (Fuller); C030-364, at 218, 219 (Fuller PPT); *see also* C028-275 (photographs of boating through Quartzite Falls).

707. Jerry Baldwin started a commercial whitewater outfit, Salt River Canyon Raft Trips, in 1978 when he invested $15,000 in equipment and in training guides, and after obtaining permission from the White Mountain Apache Tribe. As of 1986 he had 50 rafts and additional equipment, totaling $40,000, and he hired 20 guides. Weekend trips cost $245 and

include transportation from Globe to a campsite in Salt River Canyon, food, and everything else except sleeping bags. Trips take place from April to September. Baldwin subsequently received permission from the USFS to boat through National Forest land on five-day excursions from Cibeque Creek to the [288] bridge at Roosevelt [in Segment 3]. C018-25.

708. Alex Mickel is a river outfitter based in Durango, Colorado. Among other places, he has operated on the Upper River as "Mild to Wild" since 1998, generally from late February-early March to the end of May-early June. Seasonally, he employs 20 to 25 people in Arizona. He offers trips of varying lengths to people looking to experience whitewater rafting in rafts (12' to 16' long) or inflatable kayaks, carrying from four to eight persons plus a guide, and another boat generally carries the gear plus a couple of passengers. A half-day trip costs about $85, and a five-day trip costs about $900. Tr. 10/21/15, at 384-89 (Mickel).

709. Mr. Mickel's commercial whitewater operation is permitted jointly by the White Mountain Apache Tribe and the USFS; he runs from the U.S. 60 bridge to Gleason Flats; below Gleason Flats only the Forest Service permit is required. Tr. 10/21/15, at 390 (Mickel).

710. Mr. Mickel starts his trips at Big Eddy or just below Apache Falls on river-right (the White Mountain Apache side). Most day runs take out at Hoodoo (about ten miles below Apache Falls), but they take out at Cibecue (about seven miles down the River) when the creek is too high to cross. Tr. 10/21/15, at 415-16, 460-61 (Mickel).

711. Mr. Mickel has wide experience of boats and rivers in the Southwest and across the United States. He has boated Segment 2 "hundreds" of times. 10/21/15, at 385-87; 396, 406-08, 465 (Mickel).

712. The lowest trip that Mr. Fuller has taken in this Segment is at 188 cfs (measured at Chrysotile). Tr. 5/19/16, at 4931 (Fuller); *see* C018-255 (Jon Fuller photos, 11/8/2014, showing boating at and near Chrysotile gage at 188 cfs [Natural Median estimated 277 cfs at

Chrysotile, *see* Attachment 1]).[15]

713. For photographs of modern boats and landscapes in Segment 2, *see* C028-355 and -357, and in Segment 5, *see* C028-356.

714. Three types of boating take place in Segments 2 and 3: private recreation, seasonal commercial recreation, and other people getting paid to boat the river outside of commercial recreation. Tr. 10/22/15, at 601 (Fuller).

715. Four commercial companies operate in Segments 2 and 3, doing roughly 7,500 user days' worth of business during a wet year and about 1,040 user days' worth during a dry year. Tr. 10/22/15, at 605; C030-365, PPT 272.

716. Numerous boating guides describe boating in this Segment. *See* supra, Section V(F).

C. Segment 3

717. This Segment runs 37.9 miles from Sleeper Rapid to near Roosevelt Dam, in the canyon in which Roosevelt Dam is built and mostly through National Forest land. Tr. 10/20/2015, at 98-100 (Fuller); C030-364, at 66 (Fuller PPT).

718. The White Mountain Apache reservation is on river-right and the San Carlos Apache Tribe reservation is on river-left for a short distance near the put-in. Tr. 10/21/15, at 339 (Williams).

719. Below Gleason Flat the Salt River Canyon Wilderness officially begins on river-left; river -right remains White Mountain Apache land until the Lower Corral Canyon. Tr. 10/21/15, at 318 (Williams).

1. Hydrology and geomorphology

720. This is a gaining reach. Tr. 10/21/15, at 491 (Fuller); C030-364, at 223 (Fuller PPT).

[15] The Chrysotile gage is located one-quarter of a mile upstream of the U.S. 60 bridge. 5/19/16, at 5028 (Fuller).

721. This riffley part of the River is perennial, with a pool and riffle pattern; the channel is straight/sinuous, and there are five Class II rapids and no others. Tr. 10/20/2015, at 100 (Fuller); C030-364, at 66, 67; 212 (Fuller PPT).

722. The Salt River Canyon Wilderness Boating Map lists three Class II rapids and no others. C043-370.

723. Mr. Williams does not mention any rapids in the river part of Segment 3 in his book Paddling Arizona. C049-5, at 214.

724. Mr. Mickel did not say that any rapids in Segment 3 need to be approached with caution and described the Segment as "much milder" than Segment 2. Tr. 10/21/15, at 400.

725. The greatest changes [since the River was in its natural condition] are the presence of Roosevelt Lake at the lower end and the diversion dam at Livingston. Tr. 10/22/15, at 591-92 (Fuller); C030-364, at 257-258 (Fuller PPT).

726. There are bedrock canyons in the upper part and flats at Horseshoe Bend, Redman, and Tonto; tributaries are Cherry, Pinal, Pinto, and Tonto Creeks. Tr. 10/20/2015, at 100 (Fuller); C030-364, at 67 (Fuller PPT). In the lower part of the reach, the slope is flatter. Tr. 10/20/2015, at 107 (Fuller).

727. There are some upstream diversions. Tr. 10/20/2015, at 100 (Fuller); C030-364, at 66 (Fuller PPT).

728. Before the Dam and Lake, this part of the Segment had a mostly single channel and no rapids. This assessment is based on the geology (underlaid by alluvium); geomorphology (flat and wide); no nearby tributaries; the lack of historical descriptions of rapids or problems; the 1909 USGS map; and comparing it to Gleason Flat and Horseshoe Bend. Tr. 10/20/2015, at 105-08 (Fuller); C030-364, at 72, 73 (Fuller PPT).

729. The confluence at Tonto Creek and the constriction resulting from the River entering into the narrower canyon of Segment 4 forms a delta and deposits sediment; a

multiple channel is more likely to form there. Tr. 11/18/15, at 1412-15 (Fuller); C030-364, at 141, 143 (Fuller PPT).

730. Based on full USGS stream data for the medians of each calendar day derived from the near-Roosevelt gage, and taking into account the data proposed by Dr. Mussetter and depletions proposed by Mr. Burtell, this Segment's mean annual flow is 859 cfs, median annual flow is 641 cfs, 10% duration is 221 cfs; median daily (50%) flow rate is 385 cfs; 90% duration is 1,990 cfs, and its two-year flood is 14,400 cfs. Tr. 5/18/16, at 4749-56 (Fuller); C053-385, at 81-83, 85, 88 (Fuller Rebuttal PPT). *See also* "Attachment 1", Recommended Ordinary & Natural Flow Data.

731. Based on these USGS flow numbers, and taking into account criticisms posed by Dr. Mussetter, Mr. Burtell, and Mr. Gookin, the range of depths for this Segment is from 1.2 feet to 3.0 feet: the mean annual = 2.3'; median annual = 2.0'; 10% (entire year) = 1.2'; median daily (entire year) = 2.5'; 90% (entire year) = 3.0'; and the high-flow boating season (from February through May) ranges from 2.5' - 2.8'. The "median daily (entire year)" number most readily demonstrates the kinds of boating that could occur. Tr. 5/18/16, at 4774-4802, 5122-25 (Fuller); C055-398, at 102 (corrected page of C053-385). *See also*, "Attachment 2", Recommended Flow Depth Estimates by River Segment for the Ordinary & Natural Condition.

732. Boating could occur in canoes and low-draft maneuverable flatboats year-round, and on seasonal high flow loaded small boats with low draft could also navigate the River in this Segment. All of these boats would be carrying a load. Tr. 5/18/16, at 4803-04; 5/19/16, at 5139-41 (Fuller); C053-385, at 104 (Fuller Rebuttal PPT).

733. Mr. Mickel estimated that a loaded historical wooden flatboat could navigate flows between 400 and 4,000 cfs, which correspond to about five months a year in Segment 3. A historical wooden canoe could navigate between flow rates of 100 to 3,000 cfs, which

corresponds to year-round in Segment 3. Tr. 10/21/15, at 397-98 (Mickel); C053-396, at 11 (Salt River Rebuttal: Hydrology).

734. Mr. Williams testified that a loaded wooden historical flatboat or canoe could successfully navigate the upper part of Segment 3 most of the year. Tr. 10/21/15, at 289-90.

735. This Segment could have been boated historically by a flatboat loaded with mining equipment or animal skins, totaling 500 to 1,000 lbs. This opinion is based on Mr. Williams's wide knowledge of U.S. and Arizona rivers. Tr. 10/21/15, at 329-30, 361 (Williams).

736. Photographs from Webb's *Ribbon of Green*, show the River at the Chrysotile gage from 1935, 1964, and 2000, in a condition which is essentially unchanged in Segments 1, 2, and 3. Tr. 10/20/15, at 187 (Fuller); C030-364, at 139 (Fuller PPT).

737. The upper part of Segment 3 is located on a stretch of the River that is similar geologically and hydrologically today as it was in its ordinary and natural condition, and is frequently boated. The lower part of Segment 3 is inundated beneath what is now Roosevelt Lake and differs significantly from its ordinary and natural condition. C030-364, at 257-58 (Fuller PPT); Tr. 10/22/15, at 591-92; Tr. 5/18/16, at 4949-50 (Fuller).

738. Roosevelt dam was completed in 1909. C030-364, at 119 (Fuller PPT).

2. Historical Descriptions and Events

739. Hiram Hodge, author of an 1877 guidebook to Arizona, said of the River: "At low water it is a clear, beautiful stream, having an average width of two hundred feet for a distance of one hundred miles above its junction with the Gila [Segments 6, 5, 4, and part of 3], and a depth of two feet or more." U027, at 3-26 (ASLD Report).

740. Pioneer archaeologist Adolph Bandelier, visiting the Tonto Basin in late May of 1883, described the River as: "a broad, blue, rushing stream, wider than the Gila, with clear and very alkaline waters" and called it "the finest large river in the Southwest," that flowed

through a "beautiful green valley, planted with grain, emerald green, where the ranches of Mr. Danforth and of Mr. Robertson lie." U027, at 3-26 (ASLD Report).

741. On the same trip, near the mouth of Pinto Creek, Bandelier noted that "Chico [presumably his horse] did not like to cross Salt River, which is very swift, and as broad as the Gila at San Carlos, but only 'belly deep'." U027, 3-26 to 3-27 (inner quotation marks in original). Bandelier also noted that the River at that location was "alive with trout." U027, at 3-27 (ASLD Report).

742. John Black, Commissioner of Immigration, noted in 1890 that the Sierra Anchas was a "timber region . . . of especial excellence, and, being easily accessible from Salt River, there seem to be no obstacles in the way of floating the logs down Salt River, even to Phoenix." C018-271 (*Arizona: Land of Sunshine and Silver*).

743. Arthur Powell Davis of the USGS reported in 1903 that the Apache Indian Reservation was almost entirely covered with forest and grass, whereas the Tonto Creek Basin was closely pastured and delivered some silt into streams during sudden floods. C002-24, at 41 (Water Storage on Salt, USGS).

744. Tonto Basin was described as "a garden spot" with the range looking better than it had for fifteen years and livestock of all kinds in good condition. C018-27 (*Arizona Silver Belt*, 5/4/1905).

745. A sawmill was developed in the Sierra Anchas mountains; an intake dam was constructed 40 miles up the River to develop power to the Roosevelt dam site; a cement mill was begun; and the town of Roosevelt was developed. C018-46, at 79-82 (*Doctor on Horseback*); C018-54 (photograph of Roosevelt town before the filling of Roosevelt Lake).

746. The intake dam (the Powerline Diversion Dam) was situated not far from where Pinal Creek joins the River, and was well under construction in 1905. Tr. 2/23/16, at 2779 (Burtell).

747. A sawmill used in the construction of the Powerline Diversion Dam was closed down in 1905 and moved to Roosevelt, the engineers having finished their lumbering enterprises except for "hauling to Roosevelt about a half million feet that is still in the hills." Moreover, the available timber in the immediate vicinity had been "worked up." C028-324 (*Arizona Republican*, 9/28/1905).

748. A January 14, 1904, photograph from the Bureau of Reclamation's archives shows the Big Island in Lake Roosevelt; the River is a single channel, and the flow is 224 cfs. Tonto Creek comes in from the left, causing a little more multiple channel activity. This is what the River looked like before Roosevelt Dam. Tr. 10/20/15, at 190-92 (Fuller), C030-364, at 143 (Fuller PPT).

749. A March 1906 photograph shows the Camp Roosevelt construction community, looking into the head of the canyon. There is evidence of the recent (1905) floods. The flow rate was probably 1,500 cfs - above the median discharge. The photograph shows Tonto Creek coming in. Tr. 10/20/15, at 192-93; C030-364, at 145 (Fuller PPT).

750. Post-statehood photographs show the River near the Roosevelt Dam site (showing the 288 bridge in the background) show some major changes in vegetation, probably due to range land management and invasion of tamarisk. Tr. 10/20/15, at 188-89 (Fuller); C030-364, at 141 (Fuller PPT).

751. F.A. Cook, a member of King Woolsey's campaign against the Apache, recalled crossing the River twice between the mouths of Pinto and Tonto creeks in 1864; he described fishing in the River as "verry [sic] fine sport for we had to go into the river and in some places it was up to our necks." C002-34, at 156 (Davis, *Man and Wildlife in Arizona*).

752. In late February 1874, army surgeon Colonel W.H. Corbusier crossed the River near Roosevelt and observed that "the water was so high and turbulent that we could not cross, and it was some time before we found a fording place." Tr. 10/20/15, at 183 (Fuller);

C030-364, at 134 (Fuller PPT).

753. Biologist F.M. Chamberlain examined the River between Livingston and Roosevelt in 1904 and described it as follows:

> a shallow, rather broad stream, 10 to 50 ft. or more in width, and from a few inches to a foot or more in average depth. The bottom is sand or gravel with large boulders in places. The water is roily . . . Throughout this stretch are small pools of enough depth to protect fish . . . Just below Roosevelt the Salt River enters a canon and there forms good size pools. In this region, protected by its inaccessibility, it is said salmon of marketable size can still be taken. I did not investigate it. At the entrance to this box the Tonto is building a dam that is to convert this part of the valley into a reservoir.

C021-1, at 8, ¶ 40 (Burtell Declaration).

3. Historical Boating

754. Sometime before May 1873 Mr. Logan and three companions passed through this Segment in a "stout [wooden] boat." C053-392, at 42 (Carl Hayden, *Charles Trumbull Hayden, Pioneer*); Tr. 5/17/16, at 4640-42 (Fuller); C053-385, at 39 (Fuller Rebuttal PPT).

755. Jim Meadows and three other men boated the Salt River between Livingston[16], near present-day Roosevelt Dam, and Tempe [in Segment 6] in 1883, likely in a flat boat. L030, at 3-19 - 3-21, Table 3-2 (ASLD Report); Tr. 10/20/15, at 214-19 (Fuller); C030-364, at 167, 205 (Fuller PPT); U027, at 3-34; C028-320 (*Arizona Republican*, 10/04/1909); Tr. 5/17/16, at 4566-72; C053-385, at 23 (Fuller Rebuttal PPT).

756. William Burch, a sawmill operator, launched a boat (that James Logan had built) in the River four miles above Tonto Creek in June 1885. The party of five men, including Logan, John Meaders, and William Robinson, successfully boated the River in an 18 foot by 5 foot flatboat from Eddy's Ranch, four miles above the Tonto Creek confluence to Tempe (a distance of about 100 miles), five or six days later. The men's purpose was to see whether logs could be floated down the River. Burch reported that floating railroad ties to

[16] Livingston is 10 miles above the River's confluence with Tonto Creek. Tr. 2/24/16, at 2974 (Fuller).

Tempe would "open to this Valley the timber belt of the Sierra Ancha." Mr. Meaders also noted that timber existed "in the Four Peak range in large quantities." Along the way, the party caught large quantities of Salt River trout, some weighing eight and ten pounds. The men described the stream as being six to twenty feet deep. The "undisputed conclusion" was that logs can be floated down to Tempe, but the main difficulty would be getting the logs to the River, which are 10 miles away. L030, at 3-19 - 3-22, Table 3-2 (ASLD Report); C018-132 to 135 (*Arizona Gazette*, 6/03/1885 - 6/08/1885); C018-196 (*Daily Phoenix Herald*, 6/5/1885 [Logan's account of the trip]). June is a low-flow month. Tr. 10/20/15, at 220 (Fuller). The party probably intended to log in the Sierra Anchas and bring the logs to the River. Tr. 10/20/15, at 219-22 (Fuller); C030-364, at 168 - 170, 205 (Fuller PPT); Tr. 10/20/15, at 222-24 (Fuller); Tr. 5/17/16, at 4575-81 (Fuller); C053-385, at 23, 24 (Fuller Rebuttal PPT).

757. James Logan published an account of the Burch trip. As the party "sailed" from Judge Eddy's ranch to the mouth of Tonto Creek, they passed safely over four or five smooth rapids and landed for the night. They saw some fish, some two to three feet long, through the clear water (*i.e.* the River was not in flood). Tr. 10/20/15, at 224-26 (Fuller); C030-364, at 169 (Fuller PPT); C018-196 (*Daily Phoenix Herald*, 6/5/1885); Tr. 5/17/16, at 4581-82 (Fuller).

758. The Gila County Board of Supervisors advertised for bids for a wire cable for a ferry at Robertson's Crossing in 1890 and for a ferryboat to be delivered there. C018-8 (*Arizona Silver Belt*, 1/11/1890); C018-239 (*Arizona Silver Belt*, 1/04/1890).

759. A survey party for the Hudson Reservoir and Irrigation Company boated in canvas boats from the diversion dam to the exit of the river from Tonto Basin in late May 1893. One of the boats overturned, smashing two of its ribs, nearly rendering the boat unserviceable. The chief engineer reported that the survey of the riverbed would be

completed in early June. C018-60 (*Arizona Republican*, 6/2/1893).

760. A ferry at Roosevelt was probably used during the dam construction [in Segment 4], and a ferry at Livingston in 1905, helped bring supplies from the Tonto Basin out to Globe. Tr. 10/20/15, at 254-56; C030-364, at 194-196 (Fuller PPT); C018-243; C002-7 ("upwards of 600 teams and 1,400 people were ferried across during January," *Tombstone Epitaph*, 2/21/09); C018-27 ("a ferry across the River would be a paying proposition" *Arizona Silver Belt*, 5/4/05).

761. Chas. Clark of the Globe Power Company was having a boat built for use on the River from the mouth of Cherry creek to Redman flat in connection with the construction of hydroelectric works. Their old boat had washed away overnight on July 5, 1906, at which time there was a mean daily discharge of 765 cfs, and the daily discharge for the prior week was 385 cfs. C053-384 (*Arizona Silver Belt*, 7/12/1906); Tr. 5/17/16, at 4646-48 (Fuller); C053-385, at 40, 41 (Fuller Rebuttal PPT).

762. A photograph of three people in a rowboat, is entitled "Boating on the Salt River" and was probably taken above "Granite Reef Dam [or] perhaps in the Roosevelt area" pre-1910. U027, at 3-37; Tr. 10/20/05, at 55-56 (Gilpin). The water may be ponded behind the Dam under construction at Roosevelt, and the boat is a flat-water boat. Tr. 10/20/2015, at 188 (Fuller); C030-364, at 140 (Fuller PPT).

763. Boats were used on Roosevelt Lake in 1909: "several boats started out in the morning for the rendezvous" but had to give up because of high winds, and a ferry was in operation at the town of Roosevelt. C028-320 (*Arizona Republican*, 10/4/1909).

764. In June 1910, Roy Thorpe and James Crawford rowed, either from the town of Roosevelt or from just above the Dam [in Segment 4], to Granite Reef Dam. Although the boat became "dilapidated" on the trip and one of its three bottoms was worn through, the trip was successful. They mention a rapid. The flow was deep enough that their dog had to swim

much of the River. U027, at 3-37; Tr. 10/20/2015, at 248-50 (Fuller); C030-364, at 191, 207 (Fuller PPT); L012, Part 3, Doc. 22, Ex. 106 (*Arizona Republican*, 6/28/1910); Tr. 11/18/2015, at 1239-41 (Fuller). This trip occurred while the reservoir behind the Dam was filling, so the water was low, even for June, which is a normally dry month. Tr. 10/20/05, 47 (Gilpin). At the McDowell gage, the water was below average at 145 cfs, less than 10% duration. Tr. 5/17/16, at 4625-30 (Fuller); C053-383, PPT 37.

4. Modern Boating

765. It took Jon Fuller a day and a half to raft from Horseshoe Bend (at the end of Segment 2) below Sleeper to where the Lake begins at the 288 bridge, with 1,000 lbs of equipment plus people and the River at 700 cfs; this is about two-thirds of the reach. The rest of this Segment is now Roosevelt Lake. Tr. 10/20/2015, at 99-100 (Fuller).

766. The modern boating that occurs in Segment 2 also occurs in Segment 3 and may be incorporated into this Segment. C030-364, at 268-281 (Fuller PPT); Tr. 10/22/15, at 600-618 (Fuller).

767. Jerry Baldwin, of Salt River Canyon Raft Trips, has permission from the USFS to boat through National Forest land on five-day excursions from Cibeque Creek to the [288] bridge at Roosevelt [in Segment 3]. C018-25.

768. The White Mountain Apache Tribe requires a day permit (a self-serve system that is downstream of the U.S. 60 bridge). Tr. 10/21/15, at 340 (Williams).

769. Mr. Williams has boated in this Segment, which is a little flatter than Segment 2 and has fewer rapids. Tr. 10/21/15, at 288-89 (Williams).

770. The Arizona River and Streams Guide states that the River from Horseshoe Bend to the diversion dam just above Roosevelt Lake can be run by low water boaters year-round. C018-1, at 118-19.

D. Segment 4

771. This Segment is 35.5 miles long and runs from Roosevelt Dam to Stewart Mountain Dam, *i.e.* underneath Apache, Canyon, and Saguaro reservoirs and through Tonto National Forest land. Tr. 10/20/2015, at 108-09 (Fuller); C030-364, at 74, 75 (Fuller PPT).

1. Hydrology and geomorphology

772. This is a gaining reach. Tr. 10/21/15, at 491 (Fuller); C030-364, at 223 (Fuller PPT).

773. This reach is perennial. Based on the reach's geology and canyon morphology, undammed reaches upstream, particularly in Segment 3, the lack of significant tributaries, a 1907 USGS map, and historical boating accounts, this Segment had a pool and riffle pattern and likely no rapids larger than Class II in its natural condition. Tr. 10/20/2015, at 108-118 (Fuller); C030-364, at 74-76; 79-86; 212 (Fuller PPT).

774. Jon Fuller used the account written by James Logan of the Burch party, which boated through this Segment in June 1885, to help him form his conclusions about the type of occasional rapids that would have existed below today's lakes. Tr. 10/20/15, at 224, 226 (Fuller); C018-196 (*Phoenix Daily Herald*, 6/5/1885).

775. Based on full USGS stream data for the medians of each calendar day derived from the sum of the near-Roosevelt gage and the gage on Tonto Creek above Gun Creek, and taking into account the data proposed by Dr. Mussetter, and depletions proposed by Mr. Burtell, this Segment's mean annual flow is 1,005 cfs, median annual flow is 727 cfs, 10% duration is 224 cfs; median daily (50%) flow rate is 405 cfs; 90% duration is 2,229 cfs, and its two-year flood is greater than 14,400 cfs. Tr. 5/18/16, at 4749-56 (Fuller); C053-385, at 81-83, 85, 89 (Fuller Rebuttal PPT). *See also,* "Attachment 1", Recommended Ordinary & Natural Flow Data.

776. Based on these USGS flow numbers, and taking into account criticisms posed

by Dr. Mussetter, Mr. Burtell, and Mr. Gookin, the range of depths for this Segment is from 1.2 feet to 3.2 feet: the mean annual = 2.6'; median annual = 2.2'; 10% (entire year) = 1.2'; median daily (entire year) = 2.6'; 90% (entire year) = 3.2'; and the high-flow boating season (from February through May) ranges from 2.5' - 3.0'. The "median daily (entire year)" number most readily demonstrates the kinds of boating that could occur. Tr. 5/18/16, at 4774-4802, 5122-24 (Fuller); C055-398, at 102 (corrected page of C053-385). *See also*, "Attachment 2", Recommended Flow Depth Estimates by River Segment for the Ordinary & Natural Condition.

777. Boating could occur in canoes and low-draft maneuverable flat boats year-round, and on seasonal high flow loaded small boats with low draft could also navigate the River in this Segment. All of these boats would be carrying a load. Tr. 5/18/16, at 4803-04; 5/19/16, at 5139-41 (Fuller); C053-385, at 104 (Fuller Rebuttal PPT).

778. There is frequent modern boating on the reservoirs. The Segment was in its natural condition until Roosevelt Lake and consequent flow regulation occurred. Tr. 10/22/15, at 593-94 (Fuller); C030-364, at 259-261 (Fuller PPT). *See* C018-257 (Jon Fuller photographs taken 3/5/2015 of Apache Lake); C018-260 (Jon Fuller photographs taken 9/12/2014 of Canyon and Saguaro Lakes).

2. Historical Descriptions and Events

779. Mike Burns, a Yavapai Indian who had been captured at the age of seven, wrote about the river as it had been in the 1860s and 1870s, noting that it was then difficult to cross in the winter because of the high water from White River and Tonto Creek [Segment 4]. U027, at 3-24 (ASLD Report).

780. Hiram Hodge, author of an 1877 guidebook to Arizona, said of the River: "At low water it is a clear, beautiful stream, having an average width of two hundred feet for a distance of one hundred miles above its junction with the Gila [Segments 6, 5, 4, and part of

3], and a depth of two feet or more." U027, at 3-26 (ASLD Report).

781. As preparations for a dam at the Salt-Tonto site got underway, a freight road, later called the Apache Trail, was built from Mesa as a cost-effective means of supplying the vast quantities of materials and laborers needed for the dam construction. L024-5, at 94 (Zarbin: *A History to 1911*).

782. Power transmission cables and telephone lines would follow the road down from the dam, while foodstuffs and workers would travel up from the Valley. L024-5, at 76 (Zarbin: *A History to 1911*).

783. Workers began constructing a cement plant at the Roosevelt dam site in 1904. Tr. 2/25/16, at 3362-63 (Littlefield), C045-B, PPT 6. Lubken photos also show the cement plant in 1905 (PPT 7) and 1910 (PPT 8).

784. The Apache Trail could also transport cement from the dam plant down to the Valley to feed its growing demand for cement for irrigation ditches, sidewalks and construction. Local leaders such as Joseph Kibbey characterized the road as "a proper business move . . . which would increase prosperity." L024-5, at 88 (Zarbin: *A History to 1911*).

785. To see what the River looked like in 1904, before dam construction began, see C030-364, at 143 (single channel with Tonto Creek coming in form right; River not braided) (Fuller PPT). Tr. 10/20/15, at 190-92 (Fuller).

786. Preliminary work on the dam began in 1905. The company set up its headquarters on the north side of the River just below its junction with Tonto Creek, installed a suspension foot bridge across the canyon, strung two steel wire cables across the canyon to handle equipment and material; and laid plans for a stone quarry and a coffer dam and ditch (to carry water around the dam site while excavating the river bed to bed rock and several feet into the solid rock). C018-46, at 124 (*Doctor on Horseback*).

787. Photographs show the dam site before construction: C030-364, at 142 (Fuller PPT) (the River in April 1906 at about 10,000 cfs; it is not braided - there is a single channel and a little riffle), PPT 146 (from 1904, showing a single channel and no strong rapids; it is plenty wide enough for a boat), PPT 147 (two photographs: the site in 1903 and in March 1906 at about 1,500 cfs, 200 feet wide, no rapids, braiding, boulders, or beaver dams), 148 (shows no beaver dams, braiding, or rapids); C018-261 (undated map "Roosevelt Dam and Vicinity" showing dam site, camping grounds, contractors camp, hospital, commissary, mess tent, power canal, roads to Phoenix and to Globe, town of Roosevelt, limestone quarry and cement works, etc.); C019 (photos at dam site, 1898 and circa 1906).

788. The cement plant was finished in 1905. Tr. 2/25/16, at 3763 (Littlefield). Construction of the dam began in 1906. Tr. 10/20/15, at 188-95 (Fuller); C018-136 - 141 (photographs of the dam site and town, 1906); Tr. 2/25/16, at 3363-65 (Littlefield); C045-B, PPT 10 (stonemasons from around the world at the dam site, 1906); PPT 9 (dam under construction in 1909).

789. By 1906, construction of the dam was well underway; there was a diversion for the power canal, and coffer dams held back the water to allow construction right at the dam site. The River was no longer in its natural condition. Tr. 1/28/16, at 2364-65 (Mussetter); C038-D, at 87-97.

790. In 1906-08, the U.S. Reclamation Service built the Granite Reef Diversion Dam three miles below the confluence with the Verde [in Segment 6] to replace the Arizona Diversion Dam and in conjunction with the construction of Roosevelt Dam. U027, at 3-21 - 3-22 (ASLD Report); by 1910, Granite Reef was taking water off the River south and north. Tr. 2/25/16, at 3365 (Littlefield); C045-B, at 11.

791. Water began to be stored behind the incomplete Roosevelt Dam in 1908. L036, at 18, PPT 4/07/03 (Roberts [SRP]).

792. A 1908 photograph shows the River looking upstream into the Tonto Basin and showing one small Class I rapid. Tr. 10/20/15, at 192 (Fuller); C030-364, at 144 (Fuller PPT).[17]

793. For photographs of the Dam under construction in 1909, 1910, looking upstream, see C030-364, at 202 (Fuller PPT); Tr. 10/20/15, at 259 (Fuller).

794. A photograph of Horse Mesa Dam Site in 1924, before the dam was constructed, shows no rapids or braiding; the water is calm and looks boatable. Tr. 10/20/15, at 195 (Fuller); C030-364, at 149 (Fuller PPT).

795. The River near Mormon Flat in 1916 had a single channel, no rapids, beaver dams, or braiding, and looked boatable. Tr. 10/20/15, at 196 (Fuller); C030-364, at 150 (Fuller PPT).

796. Maps of River prior to the lakes show a predominantly single channel, with a few areas where the channel splits and a main channel is indicated in writing on the map, and no notations of rapids. C039-1, at 67-73.

3. Historical Boating

797. Sometime before May 1873 Mr. Logan and three companions passed through this Segment in a "stout [wooden] boat." C053-392, at 42 (Carl Hayden, *Charles Trumbull Hayden, Pioneer*); Tr. 5/17/16, at 4640-42 (Fuller); C053-385, at 39 (Fuller Rebuttal PPT).

798. Jim Meadows and three other men boated the Salt River between Livingston, near present-day Roosevelt Dam, and Tempe [in Segment 6] in 1883, likely in a flat boat. The party encountered one shallow area in the second box canyon. They probably got hung up on a "sleeper" rock [one hidden under the water], were in a pool and rolled the rocks to a downstream rapid to raise the pool level to unstick the boat. They got back in their boat and completed the trip successfully. L030, at 3-20 - 3-21 (ASLD Report); L030, at 3-19, Table 3-

[17] This photograph was erroneously marked as being in Segment 3, but it in fact depicts the River in Segment 4.

2; Tr. 10/20/15, at 214-19 (Fuller); C030-364, at 167, 205 (Fuller PPT); U027, at 3-34; C028-320 (*Arizona Republican*, 10/04/1909); Tr. 5/17/16, at 4566-72; C053-385, at 23 (Fuller Rebuttal PPT).

799. In June of 1885, the party of five men, including Logan, John Meaders, and William Robinson, successfully boated the River in this Segment for the first time in an 18 foot by 5 foot flatboat from Eddy's Ranch, four miles above the Tonto Creek confluence to Tempe (a distance of about 100 miles), five or six days later. At one point the boat was upset, but "the undisputed conclusion is that such work [log floating] can be successfully carried on." The men described the stream as being six to twenty feet deep. L030, at 3-19 - 3-22, Table 3-2 (ASLD Report); C018-132 to 135 (*Arizona Gazette*, 6/03/1885 - 6/08/1885); C018-196 (*Daily Phoenix Herald*, 6/5/1885 [Logan's account of the trip]). June is a low-flow month. Tr. 10/20/15, at 220 (Fuller); Tr. 5/17/16, at 4575-81 (Fuller); C053-385, at 23, 24 (Fuller Rebuttal PPT).

800. The Hudson Reservoir & Irrigation Company conducted a commercial survey of the riverbed in May/June 1893 in canvas boats through the canyon to the confluence area where Tonto Creek comes in. C018-60 (*Arizona Republican*, 6/02/1893). Data from 1903 show the maximum flow for May at 1,500 cfs, minimum at 257 cfs, mean at 602 cfs; and for June, maximum at 222 cfs, minimum at 93 cfs, and mean at 143 cfs. Tr. 10/20/15, at 234-36 (Fuller); C030-364, at 178, 205 (Fuller PPT); Tr. 5/17/16, at 4609-16 (Fuller); C053-385, at 33 (Fuller Rebuttal PPT).

801. Freight was sometimes hauled four miles up the River in a boat to Roosevelt Dam before the High Line road was completed; the spring of 1905 had above-average flows - typically greater than 4,000 cfs, and perhaps even 8,000 cfs. This was somewhat high water but not a flood. The water was receding at this point. Tr. 10/20/15, at 241-44 (Fuller); C030-364, at 183-185, 206 (Fuller PPT); C018-249 (*Arizona Republican*, 4/20/1905); Tr. 5/17/16,

at 4624 (Fuller); 5/19/16, at 4987 (Fuller). "There were two ways to get the supplies to the camp: one choice was to send it via pack trains and the other was to haul the goods upriver in a boat. Neither method was appealing, but until the river went down or the Roosevelt road was completed, those were the options." L24-5, at 101 (Zarbin, *Roosevelt Dam*). Hauling a boat upstream is how it was done in the Southeast U.S., according to SRP's expert, Dr. Newell (Tr. 3/30/16, at 4210-12): the boat was winched and hauled with muscle power on ropes to drag it upriver; this is a fairly normal way of getting upstream on steep rivers or rivers that had riffle or high velocities. Tr. 5/17/16, at 4620-25 (Fuller); C053-385, at 36 (Fuller Rebuttal PPT).

802. The *Arizona Silver Belt* (5/04/1905) ran an article suggesting that a ferry at Roosevelt would be a good idea. C018-27.

803. In 1908, George Greenwald, a Reclamation Service carpenter, drowned while floating a raft of lumber down the River toward Roosevelt Dam with two other men. The raft drifted too far north into the main current. The other men jumped off and swam to safety, but Greenwald stayed on the raft, trying to save the lumber. The rushing current swept him and the lumber downstream, drowning him. U-027, 3-38 (ASLD Report); Tr. 10/20/15, at 259 (Fuller); C030-364, at 201 (Fuller PPT); C018-252 (*Arizona Republican*, 2/19/1908); C-018-253 (*Tombstone Epitaph*, 2/23/1908).

804. In June 1910, Roy Thorpe and James Crawford rowed, either from the town of Roosevelt [in Segment 3] or from just above the dam, to Granite Reef Dam. The boat was worn on one of its three bottoms, but the trip was successful. They mention a rapid. U027, at 3-37; Tr. 10/20/2015, at 248-50 (Fuller); C030-364, at 191, 207 (Fuller PPT); L012, Part 3, Doc. 22, Ex. 106 (*Arizona Republican*, 6/28/1910); Tr. 11/18/2015, at 1239-41 (Fuller). This trip occurred while the reservoir behind the Dam was filling, so the water was low, even for June, which is a normally dry month. Tr. 10/20/05, at 47 (Gilpin). At the McDowell gage, the

water was below average at 145 cfs, less than 10% duration. Tr. 5/17/16, at 4625-30 (Fuller); C053-383, PPT 37.

805. Government boats acted as ferries at Roosevelt after reclamation work destroyed the crossing. C002-2 (*Arizona Republican*, 5/26/1911).

806. A ferry boat, steam launch, and row boat were delivered to Mesa for transportation to Roosevelt for use on the River. C018-244 (*Daily Arizona Silver Belt*, 8/21/1908).

807. Herbert Ensign and Donald Scott canoed from just above Roosevelt Dam to Phoenix [in Segment 6] over four days in May 1919. Their canoe was built extra strong but light for this trip. C018-62 (*Arizona Republican*, 6/28/1919). The flow above the Dam was about 230 cfs, 650 cfs during the month. The flow rate below the Dam depended on releases, but they would likely be within the same range as natural flow. Tr. 10/20/15, at 250-54 (Fuller); C030-364 at 192, 193, 207 (Fuller PPT); Tr. 5/17/16, at 4630-39 (Fuller); C053-385, at 38 (Fuller Rebuttal PPT).

4. Modern Boating

808. Modern recreational boating takes place on the reservoirs, and below the reservoirs whenever flow is released from the dams. U27, at 6-6 (ASLD Report). There is popular boating on the reservoirs, by hard-shell canoes 90% of the time (330 days a year); and by flatboats seasonally (winter and monsoons) 50% of the time (180 days a year). Tr. 10/22/15, at 593-94 (Fuller); C030-364, at 259-61, 270, 281 (Fuller PPT).

E. Segment 5

809. This short Segment runs 9.2 miles through Tonto National Forest land from Stewart Mountain Dam to the Verde confluence. Tr. 10/20/2015, at 131-32 (Fuller); C030-364, at 87 (Fuller PPT).

1. Hydrology and geomorphology

810. This is a gaining reach. Tr. 10/21/15, at 491 (Fuller); C030-364, at 223 (Fuller PPT).

811. This mostly-alluvial Segment is perennial, with a pool and riffle pattern, and a channel that is relatively straight, sinuous. Tr. 10/20/2015, at 131-32 (Fuller); C030-364, at 88 (Fuller PPT).

812. Historical maps show a mostly single channel; a comparison of historical and modern maps shows little change in the channel. Tr. 10/20/15, at 144; 146-47 (Fuller); C030-364, at 94-96 (Fuller PPT).

813. There is one Class II-minus rapid; nothing above that, and there are no major tributaries. Tr. 10/20/15, at 131-32 (Fuller); C030-364, at 89, 212 (Fuller PPT).

814. There are a couple of gravel bars, mostly along the channel margins. Tr. 10/21/15, at 491-92 (Fuller); C030-364, at 223 (Fuller PPT).

815. Based on full USGS stream data for the medians of each calendar day derived from the sum of the near-Roosevelt gage and the gage on Tonto Creek above Gun Creek, and taking into account the data proposed by Dr. Mussetter, and diversions proposed by Mr. Burtell, this Segment's mean annual flow is 1,005 cfs, median annual flow is greater than 727 cfs, 10% duration is greater than 224 cfs; median daily (50%) flow rate is greater than 405 cfs; 90% duration is greater than 2,229 cfs, and its two-year flood is greater than greater than 14,400 cfs. Tr. 5/17/16, at 4749-56 (Fuller); C053-385, at 81-83, 85, 90 (Fuller Rebuttal PPT). *See also,* "Attachment 1", Recommended Ordinary & Natural Flow Data. Water from the additional drainage area - 1,000-1,200 square miles of Segment 4 - is not accounted for in these numbers and therefore the estimate for Segment 5 is certainly low. Tr. 5/17/16, at 4763-64 (Fuller). There are several perennial streams and numerous springs within the drainage areas of Segment 4 that are not captured by any USGS gages. Tr. 5/19/16, at 5105-6 (Fuller).

Therefore, to be conservatively low, Mr. Fuller reported only that Segment 5 would have more water than Segment 4. He estimates, however, that it could be as much as 20 percent more. C053-396, at 8 (Salt River Rebuttal: Hydrology). If that were true, than Segment 5 would have a natural reconstructed median of roughly 485 cfs.

816. The modern hydrology differs slightly in time and amount from the natural hydrology in this Segment, but the ordinary and natural condition would have had similar flow rates as the modern flow rates. The dams above this Segment store water and release it for municipal and irrigation uses, which have the greatest demand in the summer months, from May to October. This timing differs from the natural hydrology when the greatest flow would have been during the spring snowmelt period, from February to May. All of the modern flow rates would have all occurred in the ordinary and natural condition of the River. Based on the impact of the dams, the River has become less navigable because the modern releases are effectively zero for at least four months of the year, eliminating the ability for even small boats like canoes to navigate; the natural hydrology would seldom have been below 300 cfs and would have been boatable by small boats year-round. Floods still occur. Tr. 5/18/16, at 4825-28 (Fuller); C053-385, at 117-119 (Fuller Rebuttal PPT).

817. The chart of the flow across a year for both the natural reconstructed flow and the modern flow shows that the modern condition is less navigable because the water is turned off for approximately four months a year. C053-385, at 118 (Fuller Rebuttal PPT).

818. The median daily flow before Roosevelt Dam was greater than 400 cfs, and the median daily flow after the Dam is 700 cfs. This Segment is boatable at both flows. Tr. 5/19/16, at 5090-92 (Fuller); C053-385, at 118 (Fuller Rebuttal PPT).

819. Based on the USGS flow numbers, and taking into account criticisms posed by Dr. Mussetter, Mr. Burtell, and Mr. Gookin, the range of depths for this Segment is from 1.1 feet to 3.8 feet: the mean annual = 2.6'; median annual = 2.3'; 10% (entire year) = 1.1';

median daily (entire year) = 1.6'; 90% (entire year) = 3.8'; and the high-flow boating season (from February through May) ranges from 1.7' - 3.6'. Tr. 5/18/16, at 4774-4802; 5/19/16, at 5122-24 (Fuller); C055-398, at 102 (corrected page of C053-385). *See also*, "Attachment 2", Recommended Flow Depth Estimates by River Segment for the Ordinary & Natural Condition.

820. The "median daily (entire year)" number most readily demonstrates the kinds of boating that could occur. Tr. 5/18/16, at 4774-4802 (Fuller); C055-398, at 102 (corrected page of C053-385).

821. Thus, boating could occur in canoes and low-draft maneuverable flat boats year-round, and on seasonal high flow loaded small boats with low draft could also navigate the River in this Segment. All of these boats would be carrying some load, some more than others. Tr. 5/18/16, at 4803-04; 5/19/16, at 5139-41 (Fuller); C053-385, at 104 (Fuller Rebuttal PPT).

822. The River's physical condition in this Segment is very similar to that of its ordinary and natural condition; any changes have not improved navigability. Tr. 10/22/15, at 594-97 (Fuller); C030-364, at 262-264 (Fuller PPT); Tr. 5/18/16, at 4828-48 (Fuller); C053-385, at 119-130 (Fuller Rebuttal PPT).

823. The Salt River's conditions in Segment 5 and the first mile of Segment 6 are not "substantially improved regarding its navigability." The modern conditions are substantively similar to natural conditions. Tr. 5/18/16, at 4848-49.

824. The low-flow channel may move over time, but this has no effect on navigability. Tr. 5/18/16, at 4824-25, 28-31 (Fuller); C053-385, at 120 (photographs of the channel in 1903 and in 2007, show no significant change) (Fuller Rebuttal PPT).

825. There has been no significant change in the River's width. Tr. 5/18/16, at 4831 (Fuller); C053-385, at 121 (photographs from 1934 and 2010) (Fuller Rebuttal PPT).

826. Photographs from 1934 and 2010 (C053-385, at 121 [Fuller Rebuttal PPT]) show more vegetation on the floodplain but not on the River's banks. Tr. 5/18/16, at 4831-32 (Fuller). Similarly, photographs from 1938 and 1979 (after a flood) show less vegetation in 1979 than in 1938. Tr. 5/18/16, at 4832 (Fuller); C053-385, at 122 (Fuller Rebuttal PPT).

827. No evidence exists that the River has experienced post-dam degradation (deepening) after Stewart Mountain Dam was built; Dr. Mussetter's slide 66 demonstrates that the River's bed is in the same or higher position in 2001 than it was in 1903. Tr. 5/18/16, at 4835-40 (Fuller); C053-385, at 124, 125 (Fuller Rebuttal PPT); *see also* C055-398, at 126 (photographs of Sheep Bridge in 1910 and same site on 5/14/16, with piers still in place, water at 700 cfs, show today's river as wider and shallower than in 1910) (corrected page of C053-385).

828. No evidence exists of downcutting below Stewart Mountain Dam, perhaps because, among other reasons, the bed has much coarse material (cobbles), and bedrock is near the surface. Tr. 5/18/16, at 4840-47 (Fuller); C053-385, at 128 (Fuller Rebuttal PPT).

2. Historical Descriptions

829. In the 1820s, beaver abounded on the River, and trappers, such as James Ohio Pattie and Ewing Young, traveled along the River as they trapped. L-030, 3-6, 3-10. In 1826 James Ohio Pattie described the River at its confluence with the Verde [junction of Segments 5 and 6] as "afford[ing] as much water at this point as the [Gila] . . . We found it to abound with beavers. It is a most beautiful stream, bounded on each side with high and rich bottoms." U027, at 3-24 (ellipses in original) (ASLD Report); L030, at 3-14 (ASLD Report).

830. Hiram Hodge, author of an 1877 guidebook to Arizona, said of the River: "At low water it is a clear, beautiful stream, having an average width of two hundred feet for a distance of one hundred miles above its junction with the Gila [Segments 6, 5, 4, and part of 3], and a depth of two feet or more." U027, at 3-26 (ASLD Report).

831. A 1910 photograph shows the River at Sheep Bridge (in an area now known as Shotgun Riffle and Tubing reach); the channel looks to be about 100 or more feet wide. Tr. 10/20/15, at 196-97 (Fuller); C030-364, at 151 (Fuller PPT).

832. A 1908 photograph shows the Salt/Verde confluence [Segments 5/6] with four people in a boat, and no rapids, braiding, or beaver dams. Tr. 10/20/15, at 197 (Fuller); C030-364, at 152 (Fuller PPT).

833. In March 1875, Indian Commissioner Dudley caused a group of Indians to cross the River [in Segment 5 or 6] when the water was running swiftly and was about waist deep to a tall man. Tr. 10/20/15, at 183 (Fuller); C030-364, at 34 (Fuller PPT).

3. Historical Boating

834. Sometime before May 1873 Mr. Logan and three companions passed through this Segment in a "stout [wooden] boat." C053-392, at 42 (Carl Hayden, *Charles Trumbull Hayden, Pioneer*); Tr. 5/17/16, at 4640-42 (Fuller); C053-385, at 39 (Fuller Rebuttal PPT).

835. Jim Meadows and his companions, boating from Livingston [in Segment 3] to Tempe [in Segment 6] in 1883 had no trouble in this Segment. L030, at 3-20 - 3-21 (ASLD Report); L030, at 3-19, Table 3-2; Tr. 10/20/15, at 214-19 (Fuller); C030-364, at 167, 205 (Fuller PPT); U027, at 3-34; C028-320 (*Arizona Republican*, 10/04/1909).

836. William Burch, John Meadows, William Robinson, and James Logan, also reported no incidents in this Segment: "[W]e floated quietly and pleasantly along till we arrived at Dr. W.W. Jones ranch above the mouth of the Verde." C018-196 (*Daily Phoenix Herald*, 6/5/1885 [Logan's account of the trip]).

837. A photograph from the Hayden Collection, entitled "At the Junction of the Verde and the Salt," shows a party of four persons in a canoe while a dog watches them from the shore. U027, Appendix B-10 (to Chapter 3, ASLD Report); Tr. 10/20/05, at 54-55 (Gilpin). Although the caption refers to this photo as having been published in 1910, it was

actually published in 1908. U27, at 3-37 (ASLD Report).

838. In June 1910, Roy Thorpe and James Crawford had no trouble rowing their boat in this Segment, although the water was low, even for June. Tr. 10/20/05, 47 (Gilpin). The flow at McDowell read about 145 cfs, and 209 cfs a little farther down. This is below the ordinary and natural range. Tr. 10/20/2015, at 248-50 (Fuller); C030-364, at 191, 207 (Fuller PPT); L012, Part 3, Doc. 22, Ex. 106 (*Arizona Republican*, 6/28/1910).

839. Herbert Ensign and Donald Scott canoed without incident in this Segment on their way to Granite Reef Dam [in Segment 6]. C018-62 (*Arizona Republican*, 6/28/1919). The flow rate below the Dam depended on releases. Tr. 10/20/15, at 250-54 (Fuller); C030-364 at 192, 193, 207 (Fuller PPT); Tr. 5/17/16, at 4630-39 (Fuller); C053-385, at 38 (Fuller Rebuttal PPT).

4. Modern Boating

840. There is extensive recreational boating and some tubing in this Segment, particularly when water is released from Stewart Mountain Dam; this is the most commonly boated part of the River. Tr. 10/20/15, at 132-34 (Fuller); C030-364, at 89 (Fuller PPT); C028-356 (photographs of modern boats in this Segment).

841. Kayaks are rented at Saguaro Ranch; there is a shuttle service and buses. Tr. 10/20/15, at 133 (Fuller).

842. John Colby of Cimarron Adventures ran raft trips from time to time in this Segment. Tr. 10/20/15, at 133-34 (Fuller).

843. One of Mr. Colby's commercial guides wrote a letter to the Commission in 2005 stating that Cimarron Adventures conducts day trips on the Salt River in Segment 5 with groups of up to 150 people in 18 ft. rafts during every month of the year. The company has been in operation since the 1980s. The guide has personally run hundreds of commercial trips in that stretch. U033.

844. Jon Fuller has seen all kinds of boats in this Segment: kayaks and canoes, inflatable and hard wooden boats, 18-foot rafts, motorboats, small fishing boats, jet boats, an air boat that the Sheriff's Department runs, catarafts, dories, and there is also a lot of commercial boating. Tr. 10/20/15, at 134-35 (Fuller).

845. When Mr. Fuller and Mr. Dimock took their replica boats on the River in August 2015 from Saguaro Ranch to just above Granite Reef, the flow was 653 cfs above the Verde confluence and 746 cfs below the confluence. In this Segment, the daily median is something greater than 405 cfs; median annual flow is 819 cfs; 10% to 90% duration is greater than 224 cfs to greater than 858 cfs. Tr. 5/17/16, at 4704 (Fuller). C053-396, at 8 (Salt River Rebuttal: Hydrology).

846. The record contains photographs of the River at 8 cfs, at 850 cfs, and at 631 cfs. Tr. 10/20/2015, 140, 146 (Fuller); C030-364, at 91, 92 (Fuller PPT); C018-258 (Jon Fuller photographs taken 3/15/2014: River at 8 cfs); and C018-259 (Jon Fuller photos taken 8/23/2014: River at 653 cfs).

847. Several boat rental and commercial guiding companies operate in this Segment. C028-282, C028-284, C028-285, C028-286. Sonoran Kayak Rentals' website states one can kayak the Salt River year-round, and describes Segment 5 as "a fun, easy river."

848. This Segment could have been boated historically by flat boat or canoe loaded with goods. Tr. 10/21/15, at 294-95 (Williams).

849. This Segment was successfully boated on August 31, 2015, by the 1911 replica boat the Edith, loaded with 850 lbs of weight. *See* supra V(E): "Modern Boating with the 1911 Replica Edith."

F. Segment 6

850. This 41.3 mile stretch runs from the Verde confluence to the Gila confluence. The surrounding lands are Tonto National Forest, reservations (Fort McDowell Apache Tribe,

Salt River Pima Maricopa Indian Community, and, on the lower end the Gila River Indian Community), and some private land. Its major tributaries are the Verde River and Indian Bend Wash (which is ephemeral). Tr. 10/20/15, at 147 (Fuller); C030-364, at 98, 99 (Fuller PPT).

1. Hydrology and geomorphology

851. This is now a losing reach from around Granite Reef down to Tempe Butte where there is some gain, and it loses again as it approaches the Gila confluence due to pumping and excess irrigation. Tr. 10/21/15, at 491 (Fuller); C030-364, at 223 (Fuller PPT).

852. However, no evidence exists that the River loses 200 cfs between Tempe Butte and the Gila confluence to a historic channel. Tr. 5/17/16, at 4729-30 (Fuller), C053-385, at 77 (Fuller Rebuttal PPT); *cf* Gookin, C034, PPT 22.

853. This Segment was once perennial but its hydrology is now controlled by dams on the Salt and Verde Rivers and is now mostly dry. It has a pool and riffle pattern with no known rapids; its channel is sinuous to straight; and the Segment is within a miles-wide alluvial valley. Tr. 10/20/15, at 147-48 (Fuller); C030-364, at 98 (Fuller PPT). Maps from 1902 and 1903 (thus before the large 1905 flood) show many canals, some double channel reaches, and lots of single channel reaches. Tr. 10/20/15, at 150-51 (Fuller); C030-364, at 103-106 (Fuller PPT).

854. This Segment has a main-flow channel that has migrated laterally [since 1871] up to one mile in response to flood events. The River does not have a braided channel because it lacks the numerous sub-channels of nearly equal magnitude characteristic of braided rivers. Although the River's banks are poorly defined, "[w]ithin these limits is a well-defined low-flow, invert, or main-flow channel" with "banks from 1 to 8 meters high and a width ranging from 66 to 328 meters." Tr. 5/19/16, pp. 4892-093 (Fuller); C042-366, pp. 125, 127 (Graf: *Flood-Related Channel Change*).

855. Graf's description of the 1871 channel is as close to natural as could be found in the modern record. Tr. 1/28/16, at 2549 (Mussetter, on Graf's *Flood-Related Channel Change*).

856. Gravel mines in the channel have contributed to down-cutting of the main-flow channel. Mr. Fuller did a comparison of bed elevations through this reach for the Maricopa Flood Control District using detailed 1999 topography and the 1903 topo set and reached the same conclusion as Dr. Graf's: the degradation was limited to the central portion of Dr. Graf's reach, and upstream of the sand and gravel mines there was no evidence of degradation since 1903. Tr. 5/18/16, at 4880-82 (Fuller); C042-366, at 128, Fig. 2 (Graf, *Flood Related Channel*).

857. Based on full USGS stream data for the medians of each calendar day derived from the sum of the near-Roosevelt gage, the gage on Tonto Creek above Gun Creek, and the Verde Tangle Creek gage, and Thomsen & Pocello's mean and median numbers, this Segment's mean annual flow = 1,690 cfs, median annual flow = 1,230 cfs, 10% duration = 522 cfs; median daily (50%) flow rate = 819 cfs; 90% duration is 3,251 cfs, and its two-year flood (using the ASLD report) is about 20,000 cfs. Tr. 5/18/16, at 4758-61 (Fuller); C053-385, at 84, 85, 91 (Fuller Rebuttal PPT). *See also,* "Attachment 1", Recommended Ordinary & Natural Flow Data.

858. There is a little modern boating, mostly during floods. The stream conditions downstream of Granite Reef are completely altered by flow depletion, sand and gravel mines, channelization, levy construction, squeezing the channel for urbanization, encroachment of the floodplain in the main channel. Tr. 10/22/15, at 597-600 (Fuller); C030-364, at 265-267 (Fuller PPT).

859. The first mile of Segment 6, from the Verde confluence to before the backwater effect from Granite Reef dam, still has water, and the River's condition is substantially similar

to its ordinary and natural condition. Tr. 10/22/15, at 598-600 (Fuller); Tr. 5/18/16, at 4848-49 (Fuller); C030-364, at 266 (Fuller PPT).

860. The flow numbers discussed in the Kibbey decree range from a high of "thousands of cubic feet per second" to a minimum of 300 cfs. Tr. 11/18/15, at 1396-98 (Fuller); U032 (*Wormser, et al. v. Salt River Valley Canal Co., et al.*, Dist. Ct. Az. Territ., No. 708, 3/31/1892).

861. Based on USGS flow numbers, and taking into account criticisms posed by Dr. Mussetter, Mr. Burtell, and Mr. Gookin, the range of depths for this Segment is from 1.1 feet to 3.8 feet: the mean annual = 2.2 - 4.9'; median annual = 1.9 - 4.2'; 10% (entire year) = 1.3 - 2.6'; median daily (entire year) = 1.6 - 3.4'; 90% (entire year) = 2.8 - 5.8'; and the high-flow boating season (from February through May) ranges from 1.7' - 5.5'. The "median daily (entire year)" number most readily demonstrates the kinds of boating that could occur. Tr. 5/18/16, at 4774-4802 (Fuller); C055-398, at 95, 102 (corrected page of C053-385). *See also*, "Attachment 2", Recommended Flow Depth Estimates by River Segment for the Ordinary & Natural Condition.

862. These depths are in ranges because they illustrate the variation among ten cross-sections. Tr. 5/19/16, at 5078 (Fuller); C055-398, at 102 (corrected page of C053-385).

863. A moderately loaded typical canoe could go through this Segment at a depth of one foot. Tr. 1/28/16, 2517 (Mussetter).

864. Mr. Fuller used historical boating accounts; photographs and maps of the River; his own experience boating the River; talks with expert boaters, including Mr. Dimock who builds historical replica boats; in addition to applying the Hyra standards, to conclude that the River's depths were sufficient to float the types of boats listed by the *Utah* Special Master, with some exceptions. Tr. 11/18/15, at 1390-91 (Fuller); C030-364, at 282 (Fuller PPT).

865. The first mile of this Segment is close to its natural and ordinary condition (as is

Segment 5 - *see* discussion in Section VII(E)(1)). Therefore, the Edith would have been boated in 1911 in about the same conditions as in its 2015 trip. Tr. 5/18/16, at 4849 (Fuller), C053-385, at 130 (Fuller Rebuttal PPT).

866. Boating could occur in canoes and low-draft maneuverable flat boats year-round, and on seasonal high flow loaded small boats with low draft and loaded flat boats with moderate draft could also navigate the River in this Segment based on an increase in flow from the Verde River entering. All of these boats would be carrying a load. Tr. 5/18/16, at 4803-04; 5/19/16, at 5139-41 (Fuller); C053-385, at 104 (Fuller Rebuttal PPT).

867. The criterion boat that Dr. Mussetter used in the Mosquito Fork River case in Alaska - wooden poling boat, 20' long, top width 4', sloping sides, bottom width 2 1/2', with some rocker, and a load of 2,00 to 3,000 lbs - could be used on the River. Tr. 5/19/16, at 4898-99 (Fuller).

2. Historical Descriptions

868. Father Sedelmayr described this area in 1748 as "[a] very pleasant country . . . the eye is regaled with creeks, marshes, fields of reed grass and an abundant growth of elders and cottonwood." C028-301, at 24.

869. James Ohio Pattie observed in 1826 that the River "affords as much water . . . as the [Gila] . . . It is a most beautiful stream." C028-312, at 43/122 (*Pattie Narrative*).

870. John Bartlett, in 1852, stated the following: "The river we found to be from eighty to one hundred and twenty feet wide, from two to three feet deep, and both rapid and clear. . . . The water is perfectly sweet, and neither brackish nor salty, as would be inferred from the name . . . . We found the river clear and rapid, as at the first camp, with many trout, whose silvery sides glittered in the translucent stream. The quantity of water passing down the Salinas is more than double that of the Gila." C028-303, at 240-44 (Bartlett, 1852);

871. In the 1860s, the River was a deep and narrow stream with a permanent flow.

(Halseth, L016, at 189 [Littlefield Report, 1996]).

872. Federal surveyors in the 1860s saw the River as it was already being changed by settler irrigation. Their notes reveal the following comments: "at the time of running this line while the water at the lower ford was so deep as to render fording impracticable the water at upper ford was not more than 3 ft deep" (C028-335, Book 1357, at 4-5 [Pierce, 1867]); the River is "a fine stream of pure water . . . it is fordable during six or seven months of the year . . . [and has] cottonwood and willows on both banks" (C028-334, Book 1, at 605 [Ingalls, 1868]); "Salt River is at this season of the year at least a large stream" (L030 at 3-15 [Ingalls, 1868]).

873. In September 1870, General George Stoneman and John Huguenot Marion crossed the River at Phoenix and called the River the next largest Arizona stream after the Colorado. L016, at 171-172 (Littlefield Report, 1996).

874. Both Hiram Hodge, in 1877, and personnel from Wallace W. Elliot Co., in 1884, described the River as a "a clear beautiful stream, having an average width of 200 feet for a distance of 100 miles above its junction with the Gila, and a depth of two feet or more." U027, at 3-26 (ASLD Report); L030, at 3-8, Table 3-1.

875. Two photographs taken in 1926 from Tempe Butte looking downstream show the bridge and the River; the flow rate was 70 cfs. Tr. 10/20/15, at 198 (Fuller); C030-364, at 155 (Fuller PPT).

876. In March 1875, Indian Commissioner Dudley caused a group of Indians to cross the River [in Segment 5 or 6] when the water was running swiftly and was about waist deep to a tall man. Tr. 10/20/15, at 183 (Fuller); C030-364, at 134 (Fuller PPT).

877. In an undated account, a pioneer recollected his early days in Buckeye:

> [T]ime was when the river bottoms of the Salt and Gila were beautiful places—where there were rocks and ripples visible, many pretty peddle beaches, and cottonwood trees growing on the banks of a beautiful stream. We used to go fishing in the Salt and to have picnics on the river bank . . .

C028-308, at 203 (House by the Buckeye Road).

878. In 1884, personnel from Wallace W. Elliot & Co. described the River in Territorial times as being capable of irrigating vast stretches of land. After giving a general description of the River from its confluence with the White and Black Rivers to its confluence with the Gila, they continued:

> The river was named the Rio Salado by the early Spanish and Jesuit explorers, on account of its waters being highly impregnated with salt, which is easily noticed at low water. This is caused by a heavy salt formation, through which the river passes about one hundred miles above Phoenix. At low water it is a clear beautiful stream, having an average width of 200 feet for a distance of 100 miles above its junction with the Gila, and a depth of two feet or more. . . . [I]t flows through the largest body of agricultural land in the Territory after it leaves the canon.

L030, at 3-8, Table 3-1 (ASLD Report).

3. Historical Boating

879. Sometime before May 1873 Mr. Logan and three companions boated as far as Tempe in their "stout [wooden] boat" in this Segment C053-392, at 42 (Carl Hayden, *Charles Trumbull Hayden, Pioneer*); Tr. 5/17/16, at 4640-42 (Fuller); C053-385, at 39 (Fuller Rebuttal PPT).

880. The *Weekly Arizona Miner* reported in May 1873 that the "Salt River is navigable for small craft as, last week, L. Vandemark and Wm. Kilgore brought five tons of wheat, in a flat boat, from Hayden Ferry, down the river to the mouth of Swilling canal and thence down the canal to Hellings & Co's mill." L030, at 3-18, 3-19, Table 3-2 (ASLD Report). C002-5 (*Arizona Weekly Miner*, 5/03/1873). The flow rate (for May) was likely near the median. Tr. 10/20/15, at 199-202 (Fuller); C030-364, at 158 (Fuller PPT). This trip was a success. C030-364, at 204 (Fuller PPT). Mr. Fuller estimates that the load had a volume of about 203 cubic feet weighing 50 lbs per cubic foot, and the load could have

measured 10 by 5 by 4. Tr. 11/18/15, at 1325-30 (Fuller). The River there was representative of the River downstream of the 1879 Tempe diversion. The trip was commercial; it went from where people had marketable goods to where there was a market. The median daily discharge for mid-April was about 1,900 cfs, with a depth of about 2.2 feet. Tr. 5/17/16, at 4507-16 (Fuller); C053-385, at 5, 6 (Fuller Rebuttal PPT).

881. Charles Hamilton, R.W. Jordan, and E.R. Halesworth, built a skiff for $10 in Phoenix and paddled it down to Yuma in January 1879; the party encountered no problems on the Salt River and called this trip successful. They reported that the route was "perfectly practicable for navigation" with no difficulties mentioned on the Salt and one narrow spot on the Gila. The newspaper also reported the men believed the river "would then have easily floated down a flat-boat loaded with grain, pumpkins, or other fruits of the 'Orchard of Arizona,' and drawing two feet of water." C018-128 (*Arizona Sentinel*, 1/25/1879). Typically, January has the fourth highest month, by average flow. This was not a flood year. Tr. 10/20/15, at 207-08 (Fuller); C030-364, at 161 (Fuller PPT); Tr. 5/17/16, at 4553-59 (Fuller); C053-385, at 16 (Fuller Rebuttal PPT).

882. It was announced in the *Arizona Republican*, 10/02/1920, under the headline "Forty Years Ago Today" that "Supt. James Stewart of the stage company will launch his boat in the Salt river tonight [10/02/1880]." C018-75; Tr. 10/20/15, at 208 (Fuller); C030-364, at 162, 204 (Fuller PPT). Normal flow for October was less than 500 cfs, with a corresponding depth of about 1' to 2.5'-2.6'. Tr. 5/17/16, at 4560 (Fuller).

883. In February 1881, two men - Cotton and Bingham - were reported to be preparing to travel from Phoenix to Yuma in an 18-foot, flat-bottomed skiff. L030, at 3-19 - 3-20, Table 3-2 3-20 (ASLD Report); L012-3, Doc. 5 (*Arizona Gazette*, 12/3/1881). February is in the season of high flow and there were no major floods in 1881. Tr. 10/20/15, at 209; C030-364; at 163, 204 (Fuller PPT).

884. In late November and early December 1881, Bucky O'Neill and two other men tried to boat from Phoenix to Yuma ("Yuma or Bust") in a 20' x 5' flatboat. L030, at 3-19, Table 3-2. The men arrived in Yuma six days after leaving Phoenix, although they reported wading in the water up to their knees, pulling their boat at a point about twelve miles below Phoenix, and drinking heavily. L030, at 3-20 (ASLD Report). The flow for December approaches but is below the median. Tr. 10/20/15, at 210-11; C030-364, at 164, 204 (Fuller PPT).

885. In February 1883, North Willcox and Dr. G.E. Andrews, U.S.A., floated a canvas skiff from Fort McDowell on the Verde River to Barnum's pier (Swillings Ditch) on the Salt River Valley Canal, passing six dams before Swillings Ditch. The only discomfort the party experienced was overnight rain while they camped. The newspaper opined that the "Salt River is a navigable stream and should be included in the Rivers and Harbors appropriation." February is a time of normal high-flow. No evidence exists that the River was in flood. L030, at 3-19, 21, Table 3-2; U027, at 3-34 to 3-35; C018-248 (*Arizona Gazette*, 2/14/1883); Tr. 10/20/15, at 212-13 (Fuller); C030-364, at 165, 166, 204 (Fuller PPT); C018-248 (*Arizona Gazette*, 2/14/1883); Tr. 5/17/16, at 4560-66; C053-385, at 19-21 (Fuller Rebuttal PPT). A skiff is a shallow draft boat. Tr. 10/20/05, at 42 (Gilpin).

886. Jim Meadows and the three other men had no trouble in this Segment on their trip from near present-day Roosevelt Dam in 1883. They completed their trip successfully. L030, at 3-20 - 3-21 (ASLD Report); L030, at 3-19, Table 3-2; Tr. 10/20/15, at 214-19 (Fuller); C030-364, at 167, 205 (Fuller PPT); U027, at 3-34; C028-320 (*Arizona Republican*, 10/04/1909).

887. A wedding party boated down the River in March 1884. C018-126 (*"Weekly Phoenix Herald*, 3/13/1884).

888. William Burch, who owned a steam sawmill, and his companions successfully

completed their trip from four miles above Tonto Creek to Tempe in June of 1885 and "the undisputed conclusion is that such work [log floating] can be successfully carried on." Tr. 10/20/15, at 219-22 (Fuller); C030-364, at 168 - 170, 205 (Fuller PPT). From the W.W. Jones ranch, a few miles upriver from the mouth of the Verde, they continued down the River, lifted the boat over the Arizona dam and "shot over two others, then entered the head of the Tempe canal and sailed down within four miles of Tempe." The "good boat" was only "slightly chafed by coming in contact with the rocks." C018-196 (*Daily Phoenix Herald*, 6/5/1885). The main difficulty with the proposed logging was getting the logs to the River, the trees being ten miles from the banks in the Sierra Anchas. Tr. 5/17/16, at 4645 (Fuller).

889. The *Phoenix Daily Herald* reported in December 1888 that Major Spaulding and Captain Hatfield canoed from Fort McDowell, [duck-]shooting as they traveled to Phoenix. C028-323. Unfortunately, the Major accidentally shot himself dead while lifting the boat over the Mesa Dam. C028-323 (*Phoenix Daily Herald*, 12/12/1888). The River was at about 1,800 or 1,900 cfs, within the range of ordinary and natural seasonal variations. Tr. 10/20/15, at 227-28 (Fuller); C030-364, at 171-173, 205 (Fuller PPT). Tr. 5/17/16, at 4588 (Fuller); C053-385, at 25, 26 (Fuller Rebuttal PPT).

890. During a winter in the early 1890s, Stanley Sykes and Charlie McLean, built a light, canvas-over-wood frame boat at Five Points in Phoenix. Where they put the boat in the River, the River was 15 to 20 feet wide and a foot or so deep; they encountered some dry reaches until they reached the Gila River several days later. The River's flow was depleted by diversion dams at that time. Tr. 10/20/15, at 229-31; C030-364, at 175, 205 (Fuller PPT); C018-18 (*Coconino Sun*, 9/07/1945); C018-184, at 238 ("A Westerly Trend"); C018-185, at 214 (Giclas, "Stanley Sykes," *Journal of Arizona History*, Summer 1985); Tr. 5/17/16, at 4589-90, C053-385, at 27 (Fuller Rebuttal PPT).

891. Scott Soliday, research historian at the Tempe Historical Museum, stated that in

1890 or 1891 the *Mesa Free Press* reported that after Fort McDowell was abandoned, A.J. Chandler had logs or sawn timber from the Fort floated down the Verde for use at the head gates of the Consolidated Canal [at Granite Reef Dam]. L030, at 3-19 (ASLD Report); U027, at 3-36.

892. In an article entitled "A Long Boat Ride," Frank McCoy and M.L. Brown were reported on April 11, 1891, to be leaving "next Monday" for the mouth of the Colorado River to prospect that country for mineral, with a two-day stop in Yuma. The boat they were to use was last used in a flood; they had "put [it] in good trim for the trip." C062-413 (*Arizona Republican*, 4/11/1891).

893. On September 1, 1891, J.K. Day and his brother George left Camp Verde on the Verde River in a small boat on a trapping expedition and arrived in Yuma nearly six months later with a large quantity of beaver and otter furs for market. They took the train home, having made a "very remunerative profit" from their trapping. It was stated that the furs "always command good prices, the demand for such pelts being always greater than the supply." This was their fifth such trip and they planned to do it again. Segment 6 was certainly boated because the newspaper reported, "After leaving the Verde, the Rio Salado, or Salt River was entered . . . ." C002-8 (*Arizona Sentinel*, 4/02/1892). No evidence exists that they dragged their boat with its load of furs or that they boated on canals, which were not conducive to boating. Tr. 5/17/16, at 4592-98; 4606-09; 4789-90, C053, 385, PPT 28, 29. Several years later, J.K. Day became Fish and Game Commissioner for Arizona. C018-226. In his obituary, Mr. Day was described as a "greatly respected man, of quiet habits and never indulged in liquor" and "an experienced mountaineer and trapper." C018-225.

894. J.K. Day was a professional hunter, experienced mountaineer and trapper, who had been the fish and game commissioner for Arizona and who knew more about game, especially big game, than anyone else, died on February 26, 1902. C018-226 (*Arizona*

Republican, 10/15/1898); C018-233 (*Florence Tribune,* 6/22/1901); (*Arizona Republican,* 2/27/1902).

895. Lumber from Fort McDowell was floated down the River in May 1894, with 300 cords of lumber placed in the River; however, the scheme was abandoned because of the threat to the Arizona Dam. Tr. 10/20/15, at 238-39 (Fuller); C030-364, at 181 (Fuller PPT); C045-A (*Salt Lake Herald*, 5/3/1894).

896. Two brothers, fur trappers, were completing a boat in 1894 in which they intended to trap their way down from about six miles upriver from Phoenix to and onto the Gila river. The men said that beaver trapping was profitable (skins were worth $8.00 to $20.00 each) and that it was "possible to drift in their canoe for whole days and never see a sign of human habitation." The furs "commanded a ready market" and the trappers "found the Arizona variety much more valuable" than Alaskan furs. C053-383 (*Arizona Republican*, 2/11/1894); Tr. 5/19/16, at 5113-14 (Fuller); C053-385, at 31, 42 (Fuller Rebuttal PPT). In January and February 1894, the water ranged from a low of 494 cfs to a high of 591 cfs, which are typical conditions. Tr. 5/17/16, at 4648-53 (Fuller).

897. In February 1895 Amos Adams and G.W. Evans boated, in a homemade 18 x 3.5 foot wooden flat boat that had a cabin, from the San Francisco River to Clifton and down the Gila to Sacaton. The men then hauled the boat overland to Phoenix from where they boated down the Salt and Gila Rivers to Yuma. C029-360 (*Phoenix Daily Herald*, 2/18/1895); C029-361 (*Phoenix Daily Herald*, 2/25/1895); C029-362 (*Arizona Daily Gazette*, 2/26/1895); C029-363 (*Arizona Sentinel*, 3/09/1895); C030-364, at 180 (Fuller PPT). Data (from A.P. Davis) show an average flow for February 1895 of 3,061 cfs; and a minimum flow of 951 cfs, numbers which are within the ordinary range. Tr. 10/20/15, at 238 (Fuller); C030-364, at 180, 206 (Fuller PPT); Tr. 5/17/16, at 4617-19 (Fuller); C053-385, at 35 (Fuller Rebuttal PPT).

898. Jacob Shively ("Capt." Schreiver) built a keeled wooden boat in March 1905 at the Chamberlain Lumber Co. (the "Phoenix ship building yards"), intending to float it to Yuma. During the trip, Shively added some freeboard. Later that month, he and his boat were sighted at Arlington and Buckeye on the Gila River (which was at about 20,000 cfs), headed for the Wolfley Dam. L030, at 3-19, 3-23 (ASLD Report); Tr. 10/20/15, at 239-40 (Fuller); C030-364, at 182, 206 (Fuller PPT); C018-81 (*Arizona Republican*, 3/24/1905), C018-201 (*Arizona Republican*, 3/29/1905). Shively had some difficulties along the route, mainly on the Gila, but arrived in Yuma on March 29, 1905. C018-203 (*Arizona Republican*, 4/3/1905). By 1905, the River was significantly dammed and diverted. C030-364, at 117 (Fuller PPT).

899. An advertisement in the *Arizona Republican*, 5/23/1905 (C018-66), sought participants for a flatboat hunting and fishing trip down the River from Phoenix to Yuma, leaving May 24 or 25. The flow at that time was at about 3,500 cfs - slightly above average for May. Tr. 10/20/15, at 244-45; C030-364, at 186, 206 (Fuller PPT).

900. The *Arizona Republican* reported on December 9, 1905 (C041-15) that engineers, Fowler, McDermott, and McClung, from the Reclamation Service of the Department of the Interior traveled by boat from below the Arizona Dam to the head of the Consolidated Canal. L030, at 3-19, 3-23 - 3-24 (ASLD Report); Tr. 10/20/15, at 245-46 (Fuller); C030-364, at 187, 188, 206 (Fuller PPT).

901. A photograph of the River at Granite Reef dam in 1906 shows one man standing in a boat and another standing beside it; the boat probably had a draw of a few to several inches, and the sides are a foot to a foot and a half high. The mean daily flow at the Roosevelt gage at that time was 1,320 cfs. Tr. 1/28/16, at 2523-25 (Mussetter); C038-D, PPT 158 (Mussetter).

902. A photograph from the Hayden Collection, published in 1908 and entitled "At

the Junction of the Verde and the Salt," shows a party of four persons in a canoe while a dog watches them from the shore. U027, Appendix B-10 to Chapter 3 (ASLD Report); Tr. 10/20/05, at 54-55 (Gilpin).

903. In 1909, Tom Rains reported to the Sheriff that his boat, which he kept on the River at Seventh Avenue, had been stolen. The boat was subsequently discovered about nine miles downriver where four boys had floated it. The boys were duly reprimanded. C018-73 (*Arizona Republican*, 4/29/1909); Tr. 10/20/15, at 246-47 (Fuller); C030-364, at 189, 207 (Fuller PPT).

904. An article in The *Arizona Republican* of June 27, 1909, reported that Louis Selly "is turning out to be a master boat builder." Selly had completed a boat recently, had another almost completed, and had orders for two or three more. C018-61; Tr. 10/20/15, at 247-48; C030-364, at 190, 207 (Fuller PPT).

905. A party of men was being gathered in October 1909 for a foray to Tiburon Island in the Gulf of California to mine "rich mineral deposits." The article also describes how Lieutenant Robinson and two companions had boated from Phoenix to Yuma in 1893 on their way to the Gulf of California, where Robinson and Logan had been killed by Indians on the Island. C018-15, at 177 (*Hayden Flour Mill*); C018-76 (*Bisbee Daily Review*, 10/06/1909); Tr. 10/20/15, at 236-37 (Fuller); C030-364, at 179, 206 (Fuller PPT); C062-423 (*Coconino Weekly Sun*, 1/23/1896); C060-1 (*Arizona Sentinel*, 6/23/1894); C060-2 (*Arizona Republican*, 6/27/1894); C060-3 (*Arizona Republican*, 7/28/1902 "It was . . . learned that Robinson and one of his companions had actually been murdered by the Indians.").]

906. In June 1910, Roy Thorpe and James Crawford had no trouble rowing their boat through this Segment to Granite Reef. The men pronounced themselves well pleased with the trip. Tr. 10/20/2015, at 248-50 (Fuller); C030-364, at 191, 207 (Fuller PPT); L012, Part 3, Doc. 22, Ex. 106 (*Arizona Republican*, 6/28/1910); Tr. 5/17/16, at 4625-30 (Fuller); C053-

385, at 37 (Fuller Rebuttal PPT).

907. Herbert Ensign and Donald Scott canoed without incident into this Segment in 1919 from the Verde confluence to Granite Reef Dam from where they boated on the Arizona Canal where they encountered some problems. C018-62 (*Arizona Republican*, 6/28/1919). Tr. 10/20/15, at 250-54 (Fuller); C030-364 at 192, 193, 207 (Fuller PPT); Tr. 5/17/16, at 4630-39 (Fuller); C053-385, at 38 (Fuller Rebuttal PPT).

908. The newspaper reported that "Supt. James Stewart of the stage company will launch his boat in the Salt river tonight." C018-75 (*Arizona Republican*, 10/2/1920).

909. A second photograph from the Hayden Collection, entitled "Boating on the Salt River," shows three people in a rowboat and was probably taken above "Granite Reef Dam or perhaps in the Roosevelt area [in Segment 3 or 4]." U027, at 3-37; Tr. 10/20/05, at 55-56 (Gilpin).

910. A boy in a canoe on the Lower Salt is pictured in an undated photograph in a 1960 book by Seargeant. Tr. 10/20/2015, 198-99 (Fuller); C030-364, at 156 (Fuller PPT); C028-308 (*House on Buckeye Road*).

4. Modern Boating

911. Modern boating that occurs in Segment 5 occurs in Segment 6 as well, above Granite Reef Dam. *See* supra "Modern Boating" for Segment 5. There is very little modern boating in this Segment below Granite Reef Dam because the River is dry. Some people go out in floods and some boat on effluent discharges and other water that just sits in the River. Tr. 10/20/15, at 149 (Fuller); C030-364, at 99 (Fuller PPT); Tr. 10/22/15, at 598-99 (Fuller). Some boaters paddle upriver from Granite Reef, and some go up the Verde. Tr. 10/20/15, at 150 (Fuller); C030-364, at 101, 102 (photographs of the River between the Verde and Granite Reef) (Fuller PPT). S*ee also* C018-258 (Jon Fuller photographs taken 3/15/2014: River at 8 cfs [Natural Median estimated > 342 cfs @ Stewart Mountain since upstream natural median

estimated 341 cfs @ Roosevelt]), and C018-259 (Jon Fuller photos taken 8/23/2014: River at 653 cfs [Natural Median estimated > 341 cfs @ Stewart Mountain since upstream natural median estimated 341 cfs @ Roosevelt]).

912. The 1911 Edith replica boat also boated the first few miles of this Segment, including the first mile, which is still in its substantially ordinary and natural condition. Tr. 10/22/15, at 598-99 (Fuller). The Edith successfully boated a portion of Segment 6 on August 31, 2015, loaded with 850 lbs of weight. *See* supra V(E): "Modern Boating with the 1911 Replica Edith."

G. Ferries

913. At least six ferries operated on the River between Granite Reef Dam and the Gila River between 1860 and 1915. In later years, the number of ferries diminished as the River's ordinary and natural flow was impounded in reservoirs, and diverted to canals, and as bridges over the River were constructed. L-030, 3-25 (ASLD Report). Ferries were necessary during several [winter and spring] months of the year. L030, at 3-26, 7-17, Table 7-14 (ASLD Report). Their use extended in the 1900s. Tr. 10/20/15, at 254-57 (Fuller). For a list of ferries, *see* L030, at 3-25, Table 3-3 (ASLD Report); C030-364, at 195 (Fuller PPT).

914. The U.S. Army maintained a boat in 1867 at the lower crossing of the River for use when the Salt was flooded. L030, at 3-25, Table 3-3; C030-364, at 195 (Fuller PPT).

915. In 1867, General James Rusling had to borrow a boat from a German settler on the Gila to get across the Gila and Salt Rivers. L030, at 3-25, Table 3-3; C030-364, at 195 (Fuller PPT).

916. The Marysville Ferry on the Fort McDowell-Maricopa Road operated from 1868 to 1874. L030, at 3-25 (ASLD Report); C030-364, at 195 (Fuller PPT).

917. Charles Hayden moved to Phoenix in 1870 and established the first [permanent] ferry in the area. L030, at 3-7, 3-25, Tables 3-1, 3-3. Hayden's ferry, the best known of the

ferries, operated from 1874 until a wagon and automobile bridge was completed in 1913. L030, at 3-25 (Table 3-3); C030-364, at 195 (Fuller PPT); C018-12, at 2-5 ("Ash Avenue Bridge"); C018-56 (circa 1900 photograph of ferry transporting a horse and buggy across the River near Tempe Bridge).

918. A raft was being constructed to ferry goods across the River. C018-241 (*Weekly Phoenix Herald*, 2/21/1884).

919. The stage coaches used boats to cross the Gila and Salt Rivers, but when a "track has been made through the quicksand bottoms, one of the boats will be dispensed with." C018-74 (*Herald*, 3/20/1884).

920. Members of the Ferry and Bridge Company met to discuss the building of boats and the location of ferries. C018-74 (*Herald*, 3/20/1884).

921. Other ferries operated in 1884. For example, the *Phoenix Herald* wrote that "Jesse Bryant and H.H. Hufstetter have a good and safe ferry running." L030, at 3-27 (ASLD Report); L012-3, Ex. 123 (*Phoenix Herald*, 3/24/1884).

922. The Haws and Finch Ferry, about three miles above Maricopa Dam began operating in 1884 and was still operating in 1898. L030, at 3-25, 3-28 (ASLD Report); C030-364, at 195 (Fuller PPT); C028-314 (*Arizona Republican*, 2/1/1898).

923. A mail skiff, that usually left the shore a little behind the cable ferry, collided with the ferry, upsetting the skiff and the mail and some of the mail was lost; this was the first accident that occurred in transferring mail across the River. C018-84 (*Herald,* 4/17/1884).

924. The *Arizona Gazette* reported in 1884 that the Salt and Gila Ferry Co. was operating downstream of Phoenix, and the Shureman and Singletary ferry operated above the bridge at Tempe. L030, at 3-25 (ASLD Report); L012-3, Ex. 125 (*Arizona Gazette*, 4/21/1884); C030-364, at 195 (Fuller PPT). This ferry skiff was washed downstream in 1884 and struck a larger ferry boat. L030, at 3-25, Table 3-3.

925. Ferries were used to haul commercial freight, including passengers, mail, and large loaded freight wagons with team; a man was reported to have had a boat built to haul 60,000 pounds of freight across the River in 1884 at a profit of 12 ½ cents per 100 [wt]. L030, at 3-26 - 3-28 (ASLD Report).

926. A new ferry was expected to be in running order "to-morrow." C018-240 (*Weekly Arizona Herald*, 5/8/1884).

927. Ferry boats ran in July of 1884 in Phoenix and Tempe. C018-9 (*Arizona Republican*, 4/16/1904).

928. Mail crossed the River in a skiff after guy wires holding the ferry boat broke. C018-125 (*Weekly Phoenix Herald*, 1/1/1885).

929. Rates of ferriage listed prices for people, horses, wagons of various kinds, government teams, government ambulances, freight, hay, flour and lumber. C018-234 (*Weekly Phoenix Herald*, 1/15/1885).

930. The *Tombstone Daily Prospector* in January 1889 reported that the Gentry and Cox large ferry boat that had operated on the Salt River at the Maricopa crossing was floated about 20 miles down the River with five men aboard toward the Gila Bend crossing. Forty miles below Phoenix [on the Gila River] the boat struck a snag and was cut in two. L030, at 3-19, (Table 3-2), 3-23, 3-25 (Table 3-3), 3-28; (ASLD Report); C028-325 (*Tombstone Daily Prospector*, 1/14/1889); C018-247 (*Tombstone Daily Prospector*, 1/24/1889). The River was at about 2,100 cfs at the Arizona Dam. Tr. 10/20/15, at 229 (Fuller); C030-364, at 174, 206 (Fuller PPT). (Maricopa crossing was located at the bottom of 7th Avenue in Phoenix. Tr. 2/25/16, at 3382 [Littlefield].)

931. A photograph of Hayden's Ferry from 1890 (or 1904) shows the ferry with a horse-drawn wagon and a boat crossing the river with several people aboard; the photograph also shows a cable used to help guide the boat. Tr. 10/20/15, at 198 (Fuller); C030-364, at

154 (Fuller PPT).

932. Another photograph of Hayden's Ferry, this one from January 1901, shows a horse-drawn wagon and some men on board. (Littlefield Declaration, C020, App. 4-48, Fig. 59). The load appears to be approximately 8,000 lbs and the draw 5" or 6"; USGS upstream gages indicate that the flow in January 1901 was 504 cfs, a number that does not account for any downstream diversion losses. Tr. 5/18/16, at 4786-88 (Fuller).

933. In the "First News" after a flood, it was noted that E.A. Murphy had constructed a smaller ferryboat and "expects to have it running today" if he can get his cable out of the River. His large boat is in good shape. It was also commented that the flood probably came from Tonto Creek and that it quickly subsided. At least two ferries crossed the River at Tempe, one from each side. C018-250 (*Arizona Republican*, 2/21/1891). The next day, it was reported that Murphy's large ferry boat was out of commission but that ferriage was secured by a new and large row boat built by Murphy and a skiff managed by Robert Goodwin. C062-412 (*Arizona Republican*, 2/22/1891).

934. A notice appeared in the newspaper that "Murphy's cable ferry-boat will be running across Salt river tomorrow." C018-82 (*Arizona Republican*, 2/26/1891).

935. The ferryman was reportedly too afraid to cross the River with heavy teams because of high winds and high water. C018-238 (*Arizona Republican*, 3/24/1891). A few days later, it was reported that ferries on the Salt and Gila were running, so that "teams have no trouble in reaching Maricopa." C018-237 (*Arizona Republican*, 3/27/1891).

936. Ferries on the River were so numerous in 1893 that the newspapers had trouble keeping track of them. L030, at 3-28 (ASLD Report).

937. Wilson's ferry ran in 1900, between Hayden's Crossing and Maricopa Crossing (near 7th Avenue). Tr. 2/25/16, at 3382 (Littlefield); C020, App. B: 49, Fig. 60 (Littlefield Decl.).

938. Thomas Rains operated a ferry from the foot of Seventh Street (Grey's Crossing) in 1905. C018-236 (*Arizona Republican*, 4/23/1905); C018-7 (*Arizona Republic*, 4/24/1905); C018-235 (*Arizona Republican*, 5/13/1905).

939. A small row boat was built to carry men across the River at Granite Reef Dam. C018-251 (*Arizona Republican*, 12/23/1906).

940. A 1912 photograph shows a ferry carrying a tractor; flow estimates show that the River was unusually low at that time. Tr. 10/20/15, at 256-57 (Fuller); C030-364, at 197 (Fuller PPT); C018-6 (*Arizona Republican*, 2/19/1912).

H. Swimming in the River

941. Swimming in the River was popular in the early 20th Century; there were still some swimming holes in the 1930s. Tr. 10/20/2015, at 257 (Fuller); C030-364, at 198, 199 (Fuller PPT). *See* C018-68 (*Arizona Republican*, 7/14/1913 ["Swimming is undoubtedly the most popular pastime in Tempe this summer"]); C018-69 (*Arizona Republican*, 6/16/1914 ["the most popular amusement resort in Tempe"]); C018-70 (*Arizona Republican*, 6/23/1914 "Swimming in Salt river just north of the buttes is daily gaining in popularity"]); C018-254 (photo of bathers in the River at Tempe); C018-67 (*Arizona Republican*, 6/24/1920 ["swimming is excellent - large parties enjoy themselves every evening in the deep and rapid waters"]); C018-58 (photo of a person diving into the River in 1917 and of ASU students on a log and swimming in 1930).

CONCLUSIONS OF LAW

IX. The Public Trust and Equal Footing Doctrines

942. In 1985, the State of Arizona began asserting ownership claims to the beds of navigable Arizona watercourses based on the "public trust doctrine." *See Arizona Center for Law in the Public Interest v. Hassell*, 172 Ariz. 356, 359, 837 P.2d 158, 161 (App. 1991) ("*Hassell*").

943. Under the public trust doctrine, States in their capacities as sovereigns hold title to the beds under navigable waters, as a "high prerogative trust . . . a public trust for the benefit of the whole community." *Hassell*, 172 Ariz. at 359, 837 P.2d at 161; *see also PPL Montana, LLC v. Montana*, 132 S.Ct. 1215, 1226 (2012) (*"PPL Montana"*). *Hassell* described the doctrine in general terms:

> A state's title to lands under navigable waters "is a title different in character from that which the State holds in lands intended for sale . . . . It is a title held in trust for the people of the State that they may enjoy the navigation of the waters, carry on commerce over them, and have liberty of fishing therein freed from the obstruction or interference of private parties."

172 Ariz. at 364, 837 P.2d at 166, quoting *Illinois Cent. R.R. v. Illinois*, 146 U.S. 387, 452 (1892).

944. The public trust doctrine originated under English common law, where the Crown held title to the riverbed and soil of tidal waters and the public retained the right of passage and the right to fish in the stream. *PPL Montana*, 132 S.Ct. at 1226-27. With respect to non-tidal inland waters, riparian landowners retained title to the center of the stream and the exclusive right to fish, but the public retained the right of water passage. *Id.*

945. After the American Revolution, courts deemed the tidal rule of navigability previously adopted from England ill-suited to the United States because of its vast number of inland rivers upon which navigation could be sustained. The public trust doctrine was extended to navigable inland watercourses as well. *Hassell*, 172 Ariz. at 359, 837 P.2d at 161.

946. Under the Equal Footing Doctrine, the United States Supreme Court held that the principles of the public trust doctrine followed by the original 13 states applied to states later admitted to the Union because all states are coequal sovereigns under the U.S. Constitution. *PPL Montana*, 132 S.Ct. at 1227-28. On the day in which individual states enter

the Union, title to the lands under territorial navigable watercourses is transferred from the federal government to the newly-established state government. *Id.*

947. "A key justification for sovereign ownership of navigable riverbeds is that a contrary rule would allow private riverbed owners to erect improvements on the riverbeds that could interfere with the public's right to use the waters as a highway for commerce." *PPL Montana*, 132 S.Ct. at 1230.

948. Because the U.S. Constitution itself is the basis for granting a state title to these lands, any questions of navigability for title are governed by federal law. *PPL Montana*, 132 S.Ct. at 1227; *Defenders of Wildlife v. Hull*, 199 Ariz. 411, 420, 18 P.3d 722, 731 (App. 2001) ("*Defenders*" or "*Hull*").

949. Thus, when Arizona achieved the Constitutional status of a state on February 14, 1912, it acquired title to the lands below high-water mark in all navigable watercourses within its boundaries. *Hassell*, 172 Ariz. at 360, 837 P.2d at 162.

X. *The Daniel Ball* Test

950. The basic formulation of the federal law test used for title navigability is set forth in *The Daniel Ball*, 77 U.S. 557, 563 (1870):

> Those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.

This test has been further defined in many subsequent federal and state cases.

951. *The Daniel Ball* test has been used to assess both navigability for title under the Equal Footing Doctrine – the issue in this Salt River matter – and navigability for other federal regulatory authority issues such as federal interstate navigability. *PPL Montana*, 132 S.Ct. at 1228-29. The test is not applied in the same manner for all purposes. For example, for title purposes the test is applied based on the ordinary and natural condition of the

waterway at the time of statehood. *Id.* In contrast, for federal regulatory authority over interstate waters, the test may be applied based on the potential for navigability if improvements are made. *Id.*

952. When considering the precedential value of cases, the context in which a navigability determination is made must be considered, but "a case applying the *Daniel Ball* test provides guidance." *State of Alaska v. United States*, 754 F.2d 851, 854 (9th Cir. 1985); *compare PPL Montana*, 132 S.Ct. at 1233 (citing the commerce clause navigability case *United States v. Appalachian Elec. Power Co.*, 311 U.S. 377, 416 (1940) to explain how evidence of recreational use bears upon susceptibility in a title navigability case), *with PPL Montana*, 132 S.Ct. at 1231-32 (stating that using the Court's decision in *The Montello* regarding portages is not controlling because *The Montello* was deciding whether a river was a navigable water of the United States and portages are treated differently when the issue is navigability for title purposes).

XI. Prior Proceedings on Navigability

953. Until 1985, Arizona had only asserted a public trust ownership claim under the Equal Footing Doctrine to the bed of the Colorado. *Land Dep't v. O'Toole*, 154 Ariz. 43, 46, 739 P.2d 1360, 1363 (App. 1987) ("*O'Toole*").

954. In 1985, the State of Arizona proposed asserting a public trust ownership claim under the Equal Footing Doctrine to the beds of all navigable Arizona watercourses other than the Colorado River. *O'Toole*, 154 Ariz. at 44, 739 P.2d at 1361. This proposal prompted a declaratory judgment claim which was dismissed by the Arizona Court of Appeals in *O'Toole* as inappropriate because the State had not yet asserted ownership of the beds of navigable watercourses. *Id.* at 47, 739 P.2d at 1365.

955. In response to the State's ownership claim, the Legislature enacted House Bill 2017 in 1987. 1987 Ariz. Sess. Laws, ch. 127 ("1987 Act"). The 1987 Act was a blanket

quitclaim of any public trust land interests the State may have to the beds of all watercourses other than the Colorado, Gila, Salt, and Verde Rivers. *Id.* In addition, the 1987 Act set forth a process for which record title holders who had land in the beds of the Gila, Salt, and Verde Rivers could obtain quitclaim deeds with the payment of a small fee in order to "compensate this state for relinquishing the claim in those areas where the state's claim may be more viable." *Id.; see Hassell*, 172 Ariz. at 360, 837 P.2d at 162.

956. The Arizona Center for Law in the Public Interest ("ACLPI") challenged the constitutionality of multiple parts of the 1987 Act, including the $25 per acre quitclaim fee for which any record titleholder of lands in or near the beds of the Gila, Salt, or Verde Rivers could obtain a quitclaim deed and relinquish the State's equal footing interest in such lands, as well as the part in the 1987 Act that provided that every State land patent issued henceforth will convey the State's equal footing interest in the patented land. *Hassell*, 172 Ariz. at 360-61, 837 P.2d at 162-63.

957. The Arizona Court of Appeals in *Hassell* reversed the trial court's ruling and found the 1987 Act violated the Public Trust Doctrine and the gift clause of the Arizona Constitution, article IX, § 7. *Hassell*, 172 Ariz. at 371, 837 P.2d at 173.

958. The public trust and gift clause analysis was reached because the court found that "appellants submitted substantial evidence from which a factfinder might conclude that portions of rivers and streams other than the Colorado met the applicable standard of navigability at the time that Arizona became a state." *Hassell*, 172 Ariz. at 363, 837 P.2d at 165; *see Hull*, 199 Ariz. at 416, 18 P.3d at 727.

959. In reaching its decision, the court stated it must give public trust dispensations "a close look" and that "there is no unfairness or immorality in a state's pursuit of ownership claims based on the Equal Footing Doctrine, even claims that have lain dormant for decades." *Hassell*, 172 Ariz. at 369, 837 P.2d at 171. Because the State has fiduciary obligations to

maintain the public trust, the State must have a "systematic investigation and evaluation of each of the state's claims" before disclaiming its interest in any of Arizona's watercourse bedlands. *Id.* at 370, 837 P.2d at 172.

960. Responding to *Hassell*, the Legislature established the Arizona Navigable Stream Adjudication Commission ("Commission") in 1992. 1992 Ariz. Sess. Laws, ch. 297 ("1992 Act"). The five-member Commission was to be appointed by the Governor, and was to gather information from the investigative efforts of the State Land Department, as well as hold its own public hearings. The Commission would then issue a final administrative determination of navigability or non-navigability for each watercourse. This administrative adjudication would be subject to judicial review. *See* A.R.S. §§ 37-1121 to -1129 (1993).

961. After the Commission began taking evidence, in 1994 the Legislature made significant changes to the statutes governing the Commission ("1994 Act"). The changes made the Commission a fact-finding, legislative advisory committee rather than an adjudicatory body. In addition, the Commission was restricted to using specifically enumerated evidence, and certain presumptions of non-navigability were established. *See* 1994 Ariz. Sess. Laws, ch. 278. The 1994 Act made it almost impossible for an Arizona watercourse to be determined navigable, instead of supporting Arizona's right to these lands as public trust holdings. *Hull*, 199 Ariz. at 426, 18 P.3d at 737.

962. In 1998, legislation was passed declaring that many of Arizona's watercourses were non-navigable and disclaiming all rights and title of the state to those waterways. *See* Ariz. Sess. Laws 1998, Ch. 43, § 2.

963. The Arizona Court of Appeals in *Hull* struck down the legislation stating that the 1994 Act was inconsistent with *The Daniel Ball* standard for determining navigability. *Hull*, 199 Ariz. at 426, 18 P.3d at 737. The court stated:

> We find that the particularized assessment necessitated by *Hassell* was neither performed in accordance with the applicable federal law nor done

> in a manner consistent with the public trust doctrine. When this assessment is so abrogated, public trust land may be forfeited. Potential forfeiture of the watercourse bedlands in S.B. 1126, by being functionally identical to the outright disclaimer of H.B. 2017 in *Hassell*, is a violation of the public trust doctrine and the Arizona Constitution's gift clause.

Id. at 427-28, 18 P.3d at 738-39. [18]

964. In response to the *Hull* decision, in 2001, the Legislature revised the statutes by reinstating the Commission as the adjudicatory body and eliminating the additional statutory requirements deemed invalid. *See* 2001 Ariz. Sess. Laws, ch. 166, § 1. The 2001 legislation, A.R.S. §§ 37-1101 through 37-1156, now governs the Commission in making its findings with respect to the Salt River.

965. On September 21, 2005, the Commission issued its report finding that the Lower Salt River was non-navigable. *See* Report, Findings and Determination Regarding the Navigability of the Lower Salt River From Granite Reef Dam to the Confluence with the Gila River.

966. The State Land Commissioner filed a judicial appeal of the Commission's 2005 decision, State *of Arizona, acting by and through Mark Winkleman, State Land Commissioner, and the Arizona State Land Department* v. Arizona Navigable Stream Adjudication Comm'n, Maricopa Superior Court Case No. LC2006-000413 ("Lower Salt River Appeal Proceedings").

967. On December 13, 2007, the Commission issued its report finding that the Upper Salt River was non-navigable. *See* Report, Findings and Determination Regarding the

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[18] For example, the lack of inclusion in the Rivers and Harbors Act was a presumption that the *Defenders* court struck down as contrary to *The Daniel Ball* test. *Defenders,* 199 Ariz. at 425, 18 P.3d at 736. The *Defenders* Court found that "it cannot be deduced that the provisions of the Rivers and Harbors Act have been brought to bear on every navigable watercourse in the United States. In other words, simply because the Rivers and Harbors Act applies to navigable watercourses, it does not follow that it *actually has been applied* to every navigable watercourse, nor does it follow that application of the Rivers and Harbors Act is something of a prerequisite to becoming a navigable watercourse." *Defenders*, 199 Ariz. at 425, 18 P.3d at 736.

Navigability of the Upper Salt River from the Confluence of the White and Black Rivers to Granite Reef Dam.

968. The State Land Commission filed a judicial appeal of the Commission's 2007 decision, *State of Arizona, acting by and through Mark Winkleman, State Land Commissioner, and the Arizona State Land Department* v. Arizona Navigable Stream Adjudication Comm'n, Maricopa Superior Court Case No. LC 2008-000602-001 ("Upper Salt River Appeal Proceedings").

969. The parties agreed to stay the proceedings of the Upper Salt River Appeal Proceedings until the resolution of the Lower Salt River Appeal Proceedings.

970. The Arizona Court of Appeals issued its opinion on the Lower Salt River Appeal Proceedings in 2010. *State ex rel. Winkleman v. Arizona Navigable Stream Adjudication Comm'n*, 224 Ariz. 230, 229 P.3d 242 (App. 2010) ("*Winkleman*"). The court of appeals vacated the superior court's judgment that had upheld ANSAC's administrative determination that the Lower Salt River was non-navigable, and the case was remanded for further proceedings consistent with the decision. *Id.* at 245, 229 P.3d at 257.

971. In reaching its decision in *Winkelman*, the court of appeals determined that the Commission did not apply the proper legal standard because it did not sufficiently consider *"both* the River's ordinary condition *and* its natural condition in determining its navigability." *Id.* at 242, 229 P.3d at 254. (Emphasis in original). In addition, although the court did not substitute its judgment for that of the Commission, it did agree with the *Hassell* court that "substantial evidence exists from which a factfinder might conclude that [the River] met the applicable standard of navigability at the time that Arizona became a state . . . ." *Winkelman*, 224 Ariz. at 242, 229 P.3d at 254.[19]

[19] The *Winkleman* Court found that *Salt River Pima-Maricopa Indian Cmty. v. Arizona Sand & Rock Co.*, D. Ariz. (CIV 72-376-PHX) (Apr. 13, 1977) was irrelevant to its decision, and soundly rejected the doctrines of *res judicata* and collateral estoppel. 224 Ariz. at 243-245, 229 P.3d at 255-257.

972. Based upon the *Winkleman* decision, all parties agreed that the stayed appeals for all of the Commission's other determinations, specifically the Upper Salt, Gila, Verde, Santa Cruz, and San Pedro, should be remanded to the Commission as well, for reconsideration consistent with the *Winkleman* decision.

973. The Commission consolidated the Upper Salt and Lower Salt cases and heard additional testimony and received additional evidence on the Salt River's navigability starting in October 2015, through May 2016, as a result of the remand.

XII. Overview of Commission's Role

974. The Commission is charged with determining whether a particular watercourse was navigable at statehood, and for any watercourse deemed navigable, to identify the public trust values of that watercourse. A.R.S. § 37-1128.

975. Commission members must be unbiased and must not have interests affected by the Commission's determination. A.R.S. § 37–1121(B). The Commission may not begin its determination with any presumptions *against* navigability. *Winkleman*, 244 Ariz. at 239, 229 P.3d at 251 (emphasis in original).

976. The Commissioner's "approach and analysis must be wholly impartial and objective, while utilizing the proper legal test." *Winkleman*, 244 Ariz. at 239, 229 P.3d at 251.

977. In making its determination of navigability or non-navigability, "the Commission shall receive, review and consider all relevant historical and other evidence presented to the commission by the state land department and by other persons . . . ." A.R.S. § 37-1123.

978. The Commission's navigability determination of the Salt River must stand on its own facts. *United States v. State of Utah*, 283 U.S. 64, 87, 51 S.Ct. 438, 445 (1931). Comparisons of the Salt to other rivers are not determinative of navigability or non-navigability. *Id.*

979. "If the preponderance of the evidence establishes that the watercourse was navigable, the commission shall issue its determination confirming that the watercourse was navigable." A.R.S. § 37-1128.

980. If the Commission finds a watercourse navigable, it shall, in a subsequent proceeding, determine the public trust values associated with that watercourse, A.R.S. § 37-1128(B), those "public trust values" being defined as commerce, navigation and fishing, A.R.S. § 37-1101(9).

981. A navigable watercourse is defined in A.R.S. § 37-1101(5), which is a codification of *The Daniel Ball* test as:

> A watercourse that was in existence on February 14, 1912, and at that time was used or was susceptible to being used, in its ordinary and natural condition, as a highway for commerce, over which trade and travel were or could have been conducted in the customary modes of trade and travel on water.

982. Arizona Revised Statutes § 37-1101(3) defines "highway of commerce" as:

> [A] corridor or conduit within which the exchange of goods, commodities or property or the transportation of persons may be conducted.

XIII. Burden of Proof

983. Arizona Revised Statutes § 37-1128(A) states "[i]f the *preponderance of the evidence* establishes that the watercourse was navigable, the commission shall issue its determination confirming that the watercourse was navigable." (Emphasis added). This burden of proof standard is consistent with the holdings of Arizona navigability case law. *See O'Toole*, 154 Ariz. at 46 n.2, 739 P.2d at 1363 n.2; *Hassell,* 172 Ariz. at 363 n.10, 837 P.2d at 165 n.10; *Hull*, 199 Ariz. at 420, 18 P.2d at 731; *Winkleman*, 244 Ariz. at 238-39, 229 P.3d at 250-51.

984. The burden of proof lies with the proponents of navigability, who must prove navigability by a preponderance of the evidence. *Winkleman*, 224 Ariz. at 239, 229 P.3d at

251.

985. "The preponderance of the evidence standard requires that the fact-finder determine whether a fact sought to be proved is more probable than not." *Kent K. v. Bobby M.*, 210 Ariz. 279, 284, 110 P.3d 1013, 1018 (2005) (cited by *Winkleman*, 224 Ariz. at 239, 229 P.3d at 251). The risk of error is shared equally between the parties involved, meaning that while the burden is on one party, no presumption is made for either party and thus error is shared. *Id.*

986. In sharp contrast is the clear and convincing evidence standard that requires "'the thing to be proved is highly probable or reasonably certain.'" *Kent K.* 210 Ariz. at 284-285, 110 P.3d at 1018-1019 (quoting Black's Law Dictionary at 577). The clear and convincing standard reflects a heightened standard of proof by placing a heavier burden upon one party to prove its case to a reasonable certainty, and there is a larger margin for error for the unburdened party. *Id.* The two standards can lead to quite different results. *Id.* at 285, 110 P.3d at 1019.

987. In perhaps the most easily understood language, the Arizona Supreme Court defined the preponderance of the evidence standard in *Hewett v. Indus. Comm'n* as the following:

> Preponderance of the evidence means such evidence as when weighed with that opposed to it has more convincing force, and from which it results that a greater probability is in favor of the party upon whom the burden rests. It does not necessarily depend upon the number of witnesses; it merely means that the testimony which points to one conclusion appears to the trier of facts to be more credible than the testimony which points to the opposite one. *The capacity of the submitted testimony to enforce belief on the arbiter to whom it is submitted it (sic) the touchstone of preponderance as applied to the testimony of witnesses.*

72 Ariz. 203, 209, 232 P.2d 850, 854 (1951) (emphasis in original).

988. As stated herein in the *Overview of the Commission's Role*, while the burden is on the navigability proponents to meet the preponderance of the evidence standard, the court

of appeals in *Winkleman* underscored that ANSAC may not begin its determination with any presumptions against navigability. 244 Ariz. at 239, 229 P.3d at 251. *See* A.R.S. § 37-1121(B) (Commissioners must be unbiased and not have interests affected by the Commission's determination).

XIV. Segmentation

989. "To determine title to a riverbed under the equal-footing doctrine, this Court considers the river on a segment-by-segment basis to assess whether the segment of the river, under which the riverbed in dispute lies, is navigable or not." *PPL Montana*, 132 S.Ct. at 1229. *See also United States v. Utah*, 283 U.S. at 77 (Court is "concerned with long reaches with particular characteristics of navigability or non-navigability . . . . ").

990. "[S]hifts in physical conditions provide a means to determinate appropriate start points and end points for the segment in question. Topographical and geographical indicators may assist." *PPL Montana,* 132 S. Ct. at 1230.

991. The U.S. Supreme Court has *not* held that because a river has natural segment indicators that some of those segments must be non-navigable. *Id.* at 1229-30.

992. The non-navigable segment at issue in *PPL Montana* had obvious and substantial obstacles to navigation. *See PPL Montana*, 132 S.Ct. at 1223 (finding 17-mile segment of the Missouri river called the "Great Falls reach" non-navigable because of five waterfalls with heights of 87, 19, 48, 7, and 26 feet and continuous rapids in between); *United States v. Utah*, 283 U.S. at 80, 89-90 (finding 36-mile segment of the Colorado River non-navigable where it has "a long series of high and dangerous rapids").

993. The Commission finds the segmentation submitted by the State is consistent with the U.S. Supreme Court's holding that rivers may be naturally segmented and should be examined as such. The Commission also finds Segments 2 through 6 are navigable for the reasons contained herein.

XV. Rivers Must Be Examined In Their Ordinary and Natural Conditions

994. In *Winkleman,* the Arizona Court of Appeals held that the test for navigability requires the Commission to assess navigability based on "what the River would have looked like on February 14, 1912, in its ordinary (i.e., usual, absent major flooding or drought) and natural (i.e., without man-made dams, canals, or other diversions) conditions." 224 Ariz. at 241, 229 P.3d at 253.

995. The court of appeals instructed that both words "ordinary" and "natural" have specific and distinct meanings. *Id.* at 241, 229 P.3d at 253. The ordinary condition of a river is when the river is absent major flooding or drought, and is the normal, usual condition of the river. *Id.* at 241, 229 P.3d at 253. The natural condition of a river would be a river untouched by civilization, without purposeful interference, wild. *Id.* at 241, 229 P.3d at 253.

996. In *Winkleman*, the court of appeals stated that the natural condition of the Lower Salt River is "before the Hohokam people arrived many centuries ago and developed canals and other diversions that actively diverted the River." *Id.* at 242, 229 P.3d at 254. The Court acknowledged, however, that "little if any historical data exists from that period" and that Hohokam diversions "disappeared through non-use over the centuries" so that "by the 1800s, the River had largely reverted to its natural state." *Id.* The Court found, therefore, that "the River could be considered to be in its natural condition after many of the Hohokam's diversions had ceased to affect the River, but before the commencement of modern-era settlement and farming in the Salt River Valley . . . ." This corresponds to a date range for the natural condition of the Salt River from the beginning of the 1800's to the first major diversion on the Salt River, roughly the mid-1860s.

997. The Ninth Circuit has held that it is appropriate to use a date range for evidence that corresponds to a period when a river is in its ordinary, unimproved condition. *Oregon v.*

Riverfront Prot. Ass'n, 672 F.2d 792, 795 (9th Cir. 1982) (Parties stipulated that evidence from late 1800's and early 1900's was river's natural condition at statehood in 1859).

XVI. Time Period of Considered Evidence

998. Arizona Revised Statutes § 37-1123(A) directs the Commission to review all available evidence, and the court of appeals has stated that "all evidence should be examined during navigability determinations and no relevant facts should be excluded." *Winkleman*, 224 Ariz. at 243, 229 P.3d at 255 (citing *Defenders*, 199 Ariz. at 425, 18 P.3d at 736).

999. Although all evidence should be considered, "[e]vidence from that early period should be considered by ANSAC as the best evidence of the River's natural condition." *Winkleman*, 224 Ariz. at 242, 229 P.3d at 254. "[E]vidence of the River's condition after obstructions caused a reduction in its flow is likely of less significance than evidence of the River in its more natural condition, and may in fact have 'minimal probative value,'. . . ." *Winkleman*, 224 Ariz. at 243, 229 P.3d at 255.

1000. While the condition of a river is best assessed with evidence from the river's ordinary and natural condition, evidence received and considered after statehood is relevant upon the issue of the susceptibility of the rivers to use as highways of commerce at the time of statehood. *United States v. State of Utah*, 283 U.S. at 82; *see also PPL Montana*, 132 S.Ct. at 1233. *See Winkleman*, 224 Ariz. at 243, 29 P.3d at 255.

1001. Generally, when the Commission believes evidence has any reliability, the Commission is charged with determining the "relevance and weight to be afforded the evidence . . . ." *Winkleman*, 242 Ariz. at 243, 229 P.3d at 255.

XVII. The Test for Navigability Is A Disjunctive Test Met With Actual Or Susceptible Use

1002. The test for navigability is a disjunctive test where *either* actual use or susceptibility to use for travel and trade at the time of statehood can be shown to meet the test:

> Those rivers . . . are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce,

> over which trade and travel are or may be conducted in the customary modes of trade and travel on water.

The Daniel Ball, 77 U.S. at 563 (emphasis added); *see United States v. Utah*, 283 U.S. at 82 ("question of that susceptibility in the ordinary condition of the rivers, rather than of the mere manner or extent of actual use, is the crucial question.")

1003. In *United States v. Utah*, the Court explained why it used a disjunctive test that includes the susceptibility standard instead of solely relying on actual use. 283 U.S. at 83:

> [A]s the title of a state depends upon the issue, the possibilities of growth and future profitable use are not to be ignored. Utah, with its equality of right as a state of the Union, is not to be denied title to the beds of such of its rivers as were navigable in fact at the time of the admission of the state either because the location of the rivers and the circumstances of the exploration and settlement of the country through which they flowed had made recourse to navigation a late adventure or because commercial utilization on a large scale awaits future demands. The question remains one of fact as to the capacity of the rivers in their ordinary condition to meet the needs of commerce as these may arise in connection with the growth of the population, the multiplication of activities, and the development of natural resources. And this capacity may be shown by physical characteristics and experimentation as well as by the uses to which the streams have been put.

See also PPL v. Montana, 132 S.Ct at 1233 ("True, river segments are navigable not only if they were used but also if they were susceptible of being used . . . .") (internal quotations omitted).

XVIII. Actual Use of The River

1004. What constitutes actual use was first articulated in *The Daniel Ball*, where the U.S. Supreme Court stated that rivers are actually used when they are "highways for commerce, over which trade and travel are...conducted in the customary modes of trade and travel on water." 77 U.S. at 563.

1005. In *The Montello*, the U.S. Supreme Court expounded on their previous decision and made it clear that the actual use test is broad and inclusive of many uses:

> [T]he true test of navigability of a stream does not depend upon the mode by which commerce is, or may be, conducted, nor the difficulties attending navigation. . . . It would be a narrow rule to hold that in this country, un-

> less a river was capable of being navigated by steam or sail vessels, it could not be treated as a public highway.

20 Wall. 430 (1874), quoted with approval in United States v. Utah, 283 U.S. at 76; see also United States v. Holt State Bank, 270 U.S. 49, 56 (1926).

1006. Controlling courts consistently use the standard for actual use, set forth as precedent in *The Montello*, when reviewing evidence for navigability. *See Utah v. United States*, 403 U.S. 9, 12 (1971) (finding sufficient actual use on lake where use was characterized as "sporadic and their careers were short" because that "does not detract from the basic finding that the lake served as a highway and it is that feature that distinguishes between navigability and non-navigability"); *see also Appalachian Elec. Power Co.,* 311 U.S. at 404 (stating that there is no "formula which fits every type of stream under all circumstances and at all times"); *State of Alaska v. United States*, 754 F.2d 851, 854 ("We recognize that navigability is a flexible concept and '[e]ach application of [the *Daniel Ball* test] . . . is apt to uncover variations and refinements which require further elaboration.' For this reason, we have liberally construed the phrase 'customary modes of trade and travel on water,' taking into account transportation methods in use at the time of statehood.")

1007. *The Daniel Ball* test requires that the mode of transport be available at the time of statehood and used to conduct trade and travel on the river, and that the river be used as a highway for commerce. *See United States v. Utah*, 283 U.S. at 76; *see also PPL Montana*, 132 S.Ct. at 1233. No court has ever held that a river is navigable only if it sustains upstream travel. *See Defenders,* 199 Ariz. at 422, 18 P.3d at 733.

A. Mode of Transport

1008. Qualifying actual use is not limited to large scale vessels because both the U.S. Supreme Court and the Ninth Circuit Court of Appeals have recognized the importance of small boats like canoes as valuable transports of people and goods. *See The Montello*, 20 Wall. at 441-442 (finding fur trade which utilized canoes evidence of a navigation on a

channel for useful commerce; "[i]t would be a narrow rule to hold that in this country, unless a river was capable of being navigated by steam or sail vessels, it could not be treated as a public highway." *Econ. Light & Power Co. v. United States*, 256 U.S. 113, 117 (1921) (finding actual use where Desplaines River was used by the kinds of craft common to early fur-trading days, including canoes); *Alaska v. Ahtna, Inc.*, 891 F.2d 1401, 1403 (9th Cir. 1989) (finding lower Gulkana navigable where actual use at statehood was by hunters and fishermen using 16 to 24 ft boats); *see also Nw. Steelheaders Ass'n, Inc. v. Simantel*, 112 P.3d 383, 389-90, 392 Or. App. (2005) (finding John Day river navigable and stating "qualifying travel and trade is not limited to large-scale commercial or multiple passenger vessels of the sort typically engaged in modern commerce" because "courts have recognized the relevance of the historic role of small boats to transport goods in volumes that might seem insignificant by modern standards.").

1009. It is also not necessary that the actual use be for the purpose of making money. *Utah v. United States*, 403 U.S. 9 (1971) (finding the Great Salt Lake navigable where boats were used from time to time to haul cattle and sheep from the mainland to one of the islands, not by a carrier for the purpose of making money).

1010. Where actual historic use has not been deemed sufficient for proving navigability, boats were dragged instead of floated, *PPL Montana*, 132 S.Ct. at 1233 (*citing United States v. State of Oregon*, 295 U.S. 1, 20-21, (1935)), and further small craft could be used only at exceptionally high water, *The Montello*, 87 U.S. at 442.

XIX. Highway of Commerce

1011. The river is used as a highway of commerce if it is "a corridor or conduit within which the exchange of goods, commodities or property or the transportation of persons may be conducted." A.R.S. § 37-1101(3). The statutory definition does not require the transport of goods; the transportation of persons alone is sufficient to establish a "highway for

commerce."

1012. The U.S. Supreme Court has held that the "gist of the federal test" is whether a watercourse was or can be used as a highway for commerce. *Utah v. United States*, 403 U.S. at 11. The details of the operation such as if it was profitable or extensive are largely irrelevant as long as the basic finding is that the watercourse can serve as a highway. *Id.* In *Utah v. United States*, evidence that some owners hauled their livestock across the Great Salt Lake was sufficient to meet the highway for commerce requirement. *Id.*

1013. The Ninth Circuit in *State of Alaska v. United States,* 754 F.2d at 854, attempted to further clarify the highway of commerce element of *The Daniel Ball* test stating "the central theme remains the movement of people or goods from point to point on the water." In *Alaska*, the court found no showing of the use of a river as a highway of commerce because floatplanes did not fall within the meaning of using a river as a highway or channel. 754 F.2d at 855.

1014. The Ninth Circuit found that guided fishing and sightseeing trips were relevant evidence of commercial use of the Gulkana River. *Alaska v. Ahtna*, 891 F.2d at 1405; *Defenders,* 199 Ariz. at 424, 18 P.3d at 735 ("guided fishing and sightseeing trips, although merely recreational, are 'transportation for profit' and can be considered commercial activity.")

1015. The Arizona Court of Appeals has interpreted "highway for commerce" under the federal test to "neither require both trade and travel together nor that the travel or trade be commercial." *Defenders*, 199 Ariz. at 421, 18 P.3d at 733 (citing *Utah v. U.S.*, 403 U.S. at 11. Additionally, the Arizona Court of Appeals has stated "nothing in *The Daniel Ball* test necessitates that the trade or travel sufficient to support a navigability finding need be from a 'profitable commercial enterprise.'" *Id.* at 422, 18 P.3d at 733. Lastly, the Arizona Court of Appeals struck down the non-navigability presumption that required sustained trade and travel

both upstream and downstream. *Defenders,* 199 Ariz. at 422, 18 P.3d at 733.

1016. "It is not the size of the articles transported in commerce that establishes the navigable character of a waterway. Navigability depends upon the stream's usefulness as a transportation mechanism for commerce." *Puget Sound Power & Light Co. v. Fed. Energy Regulatory Comm'n,* 644 F.2d 785, 789 (9th Cir. 1981).

XX. Susceptibility to Navigation

1017. While actual use of the Salt River as a highway for commerce is well documented and is sufficient for a navigability determination, the Commission also finds the Salt River navigable based on its susceptibility to navigation.

1018. The U.S. Supreme Court has consistently held that for title navigability determinations "[t]he question of that susceptibility in the ordinary condition of the rivers, rather than of the mere manner or extent of actual use, is the crucial question." *United States v. Utah,* 283 U.S. at 81-82, *also quoted with approval in PPL Montana,* 132 S.Ct. at 1233. It is the susceptibility of rivers to use as a highway of commerce that is the "true criterion of the navigability of a river, rather than the extent and manner of that use" because the susceptibility is the fact that affords the public right of control over navigation on the river. *United States v. Utah,* 283 U.S. at 83 (internal citations omitted). "The extent of existing commerce is not the test." *Id.* at 82.

1019. The U.S. Supreme Court has recognized that susceptibility is the appropriate test when rivers are located in areas of the country "where conditions of exploration and settlement explain the infrequency or limited nature of such use . . . ." *United States v. Utah,* 283 U.S. at 82. "[A state] is not to be denied title to the beds of such of its rivers as were navigable in fact at the time of the admission of the state either because the location of the rivers and the circumstances of the exploration and settlement of the country through which they flowed had made recourse to navigation a late adventure or because commercial

utilization on a large scale awaits future demands." *Id.* at 83, *cited with approval in Winkleman*, 224 Ariz. at 243, 229 P.3d at 255.

1020. Recently, the Oregon Court of Appeals reinforced the fact that there is no precondition for susceptibly and navigability proponents do not need to demonstrate an absence of human habitation to show the susceptibility of a river for navigation. *Hardy v. State Land Board*, 274 Or. App. 262, 360 P. 3d 647 (2015). In *Hardy*, the court explained:

> We also reject petitioners' suggestion (at oral argument) that the "susceptibility of use" standard is applicable only where the area in question was essentially uninhabited or only sparsely settled at the time of statehood. Although those may have been the extant circumstances in *United States v. Utah*, the Supreme Court did not then, and has not since, held that the susceptibility-of-use standard is so limited. Indeed, the Court, in *PPL Montana*, cited *United States v. Utah* for the proposition that a river's "potential" for commercial use at the time of statehood is the "crucial" question. *PPL Montana*, 565 U.S. at ___, 132 S Ct at 1233 ("'[E]xtensive and continued [historical] use for commercial purposes' may be the 'most persuasive' form of evidence, but the 'crucial question' is the potential for such use at the time of statehood, rather than 'the mere manner or extent of actual use.'" (Quoting *United States v. Utah*, 283 U.S. at 82-83 (brackets in *PPL Montana*).)). Notably, the Court did not circumscribe consideration of that "crucial" question to circumstances where only an absence of human habitation could explain the lack of evidence of actual use of the river for commercial purposes. Petitioners' suggestion to the contrary is not well taken.

274 Or. App. at 279, 360 P. 3d at 658.

1021. A lack of commercial traffic is not a bar to a conclusion of navigability "where personal or private use by boats demonstrates the availability of the stream for the simpler types of commercial navigation." *Appalachian Elec. Power Co.*, 311 U.S. at 416; *see PPL Montana*, 132 S.Ct. at 1233. "Evidence of recreational use, depending on its nature, may bear upon susceptibility of commercial use at the time of statehood." *PPL Montana*, 132 S.Ct. at 1233.

1022. The law is so well-established on this point that on May 3, 2016, the federal district court for the District of Alaska found that in litigation brought by the State of Alaska

to quiet title in the Mosquito Fork River, the Bureau of Land Management's (BLM) argument that non-commercial use could not be used to establish navigability was so frivolous as to support an award of attorneys' fees. *Alaska v. United States,* Case No. 3:12-cv-00114-SLG, 2016 U. S. Dist. LEXIS 58880 (May 3, 2016). Specifically, the district court identified the following arguments (among others made by BLM)[20] as being contrary to well-established law:

> "[P]ersonal use is not evidence of navigability in fact or of susceptibility for commercial use. The United States does not dispute that riverboats, launches, scows, airboats, and canoes were available in the area at the time of statehood, but disputes that they were used for commercial purposes. Their use was primarily for personal subsistence activities, such as hunting and fishing, rather than for commercial use."
>
> "Q: Would it be commercial use if you're just transporting travelers and they don't have any goods? A. Not under the definition that I'm using. Q: What definition are you using? A: Freighting."

Id. at *22. Although counsel for the United States attempted to claim that it was only arguing that private use could not be considered because jet boats and modern inflatable boats were not available at the time of statehood, the court disagreed observing that:

> [T]he statements of the United States and its counsel, laid out above, demonstrate that counsel was more clearly asserting that only "freighting" or commercial use could be considered as a matter of law. This position is at odds with both Ninth Circuit and United States Supreme Court precedent, which expressly directs consideration of non-commercial use in determining navigability. The Court finds that counsel's refusal to follow binding precedent that private use may be relevant and its position that Ninth Circuit precedent did not bind it unless expressly "adopted" by BLM was frivolous. And the Court finds that these frivolous arguments were at least recklessly, if not knowingly, raised.

Id. at *22-23.

A. Physical Characteristics

1023. "The capacity of the rivers in their ordinary condition to meet the needs of commerce . . . may be shown by physical characteristics and experimentation as well as by the

[20] BLM had also argued, erroneously, that it was not bound by the Ninth Circuit's decision in *Ahtna, supra.*.

uses to which the streams have been put." *United States v. Utah*, 283 U.S. at 83; s*ee also FPL Energy Maine Hydro LLC v. F.E.R.C.*, 287 F.3d 1151, 1156 (D.C. Cir. 2002) (finding Messalonskee a navigable water of the United States based solely on three non-commercial, non-recreational test canoe trips and the physical characteristics of the Messalonskee).

XXI. Modern Use

1024. "Evidence of present-day use may be considered to the extent it informs the historical determination whether the river segment was susceptible of use for commercial navigation at the time of statehood." *PPL Montana*, 132 S. Ct. at 1233.

1025. Present-day use includes recreational use. *Id.* Present-day, recreational use may be used if it "shows the river could sustain the kinds of commercial use that, as a realistic matter, might have occurred at the time of statehood." *Id.*

1026. In order for present-day use to be considered, it must also meet two specific criteria: "(1) the watercraft are meaningfully similar to those in customary use for trade and travel at the time of statehood; and (2) the river's post-statehood condition is not materially different from its physical condition at statehood." *Id.*

1027. Modern watercraft must not "permit navigability where historical watercraft would not, or if the river has changed in ways that substantially improve its navigability, then the evidence of present-day use has little or no bearing on navigability at statehood." *Id.*

1028. "Modern recreational fishing boats, including inflatable rafts and lightweight canoes or kayaks, may be able to navigate waters much more shallow or with rockier beds than the boats customarily used for trade and travel at statehood." *Id.* at 1234.

1029. In *Hardy*, in proceedings before the State Land Board regarding the navigability of a reach of the Rogue River, the State of Oregon sought to prove navigability based on modern recreational boating. The state introduced evidence regarding the draft and flow requirements of modern watercraft and the draft and flow requirements of dugout canoes and

other watercraft commonly used by Native Americans in the Oregon Territory at the time of statehood. According to the Oregon Court of Appeals, this evidence demonstrated that "watercraft in 1859 would permit navigability to the same or similar extent as modern watercraft." 274 Or. App. at 286-87.

1030. The *Hardy* court further found that the State had satisfied the second requirement that the river's post-statehood condition not be "materially different" than its condition at statehood by showing:

> [Through] cadastral maps, historical data from USGS survey gauges, and information drawn from [modeling], that the river's flow [through the designated reach] was "most likely greater at the time of statehood * * * than it is today" due to the construction of dams and the withdrawal of water from the river for irrigation and domestic and municipal use. Thus, the state's evidence indicates that, if anything, navigation is likely *more* difficult today than it was at statehood.

Id. at 287-288 (emphasis in original). In light of this showing, the court concluded that, "the board's analysis of the physical conditions of the river, as well as its comparative assessment of watercraft in use at statehood and today satisfies the requirements of PPL Montana and permits the conclusion that the upper portion of the river was capable--at statehood--of sustaining travel and trade by means of dugout canoes." *Id.* at 288.

1031. The Commission finds that boating with meaningfully similar boats on an often depleted, altered river is evidence that boating could also occur on the Salt River in its ordinary and natural condition at statehood.

XXII. Obstacles

1032. The U.S. Supreme Court has consistently held that occasional obstructions and small portages do not defeat navigability.

1033. In *Econ. Light & Power Co*, the Court stated that "[n]avigability, in the sense of the law, is not destroyed because the water course is interrupted by occasional natural obstructions or portages; nor need the navigation be open at all seasons of the year, or at all

stages of the water." 256 U.S. at 122. The Court found that the Desplaines River had "a rapid, and in places shallow water with boulders and obstructions, yet these things do not affect its navigable capacity. . . ." *Id.* at 118.

1034. In *United States v. Utah*, the Court stated that a river may still be navigable in fact "although its navigation may be encompassed with difficulties by reason of natural barriers, such as rapids and sand-bars." 283 U.S. at 86-87. The Court found that the presence of sandbars causing impediments to navigation does not make a river non-navigable. *Id.* at 86. The Court also found that evidence of navigability is valid if not confined to "exceptional conditions or short periods of temporary high water. . . ." *Id.* at 87; *see also United States v. Holt State Bank,* 270 U.S. at 56 (occasional difficulties do not render a river otherwise as non-navigable).

1035. Finally, in *PPL Montana*, navigability of the Great Falls reach of the Missouri River was at issue, that consisted of a 17-mile segment with five waterfalls with heights of 87, 19, 48, 7, and 26 feet and continuous rapids in between. 132 S.Ct. at 1223. The segment required Lewis and Clark to portage their boats and supplies around the reach over the course of at least 11 days. *Id.* at 1231. The Court ultimately, held that the Great Falls reach was non-navigable. *Id.* at 1232. While the Court's determination of navigability was limited to the record before it, the Court did opine that "the law might find some non-navigable segments so minimal that they merit treatment as part of a longer, navigable reach . . . ." *Id.* at 1230. In addition, the Court appeared to establish that a day-long portage is the minimum threshold length for a non-navigability determination based on a portage. *Id.* at 1231.

1036. The Ninth Circuit has held that occasional obstacles do not defeat navigability. *Oregon v. Riverfront Prot. Ass'n*, 672 F.2d at 795. A river "need not be without difficulty, extensive, or long and continuous." *Id.* The court found the McKenzie river navigable where log drives were difficult due to uncontrollable flooding, too little rain that caused gravel bars,

boulders, and shoals, and conditions that might create obstacles that take a log moving crew three or four days to overcome. *Id.*

XXIII. Surveys and Land Patents

1037. Courts have consistently held that meanders have no bearing on the issue of navigability. *Oklahoma v. Texas,* 258 U.S. 574, 586 (1922). As the United States Supreme Court explained:

> A legal inference of navigability is said to arise from the action of the surveying officers who, when surveying the lands in that region, ran a meander line along the northerly bank and did not extend the township and section lines across the river. But this has little significance. The same thing was done on the Platte and other large western streams known to be unnavigable. Besides, those officers were not clothed with power to settle questions of navigability that surveyors and therefore their actions regarding meandering rivers have little significance, and they were known to meander both navigable and nonnavigable streams.

State of Oklahoma v. State of Texas, 258 U.S. 574, 585 (1922). *See also Railroad Co. v. Shurmeir,* 74 U.S. 272, 286 (1868) ("Express decision of the Supreme Court of the State was, that the river, in this case, and not the meander-line, is the west boundary of the lot, and in that conclusion of the State court we entirely concur."); *Micellis v. Andrus,* 61 Or. 7, 88-89 (1912) ("[N]avigability in law can never exist independent of navigability in fact, and the fitness of a river in its original condition for the transportation…can never be settled by fiat or by meandering the banks of the stream.")

1038. With respect to relying on federal patents as evidence of a navigability determination, the United States Supreme Court specifically stated that "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.'" *Choctaw Nation v. Oklahoma*, 397 U.S. 620, 648 (1970).

XXIV. Determination of Navigability

1039. Based upon the evidence submitted, the controlling federal and state law, and

the guiding law, the Commission finds Segments 2 through 6 of the Salt River were both used and susceptible to use for navigation in its ordinary and natural condition on or before February 14, 1912. Those segments of the Salt River are "navigable" as defined by the Arizona Revised Statutes and case law.

DATED: August 17, 2016.

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The foregoing, along with seven copies and a CD of this document as a pdf was mailed for filing this 17th day of August, 2016, to:

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A COPY in pdf format of the foregoing e-mailed with delivery receipt this 17th day of August, 2016, to each party listed on the ANSAC website, http://www.ansac.az.gov/parties.asp, with "SERVICE OF ANSAC DOCUMENT, Nos. 03-005-NAV and 04-008-NAV (Consolidated) (Salt)" written in the subject line.

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Attachment 1

Recommended Ordinary & Natural Flow Data for Use by ANSAC in Making Navigability Determinations

C053-396 p. 8, (Salt River Rebuttal Hydrology)

Table 2. Recommended Ordinary & Natural Flow Data for Use by ANSAC in Making Navigability Determinations

Segment	Flow Descriptor (cfs)							
	Mean Annual	Median Annual	10% Duration	Median Daily (50%)	75% Duration	90% Duration	2-Year Flood	Seasonal Fluctuation
1	556	410	67	167	468	1,492	>7,500	Use median daily discharge by day – See Chart
2	632	482	158	277	592	1,501	10,200	Use median daily discharge by day – See Chart
3	859	641	221	385	800	1,990	14,400	Use median daily discharge by day – See Chart
4	1,005	727	224	405	858	2,229	>14,400	Use median daily discharge by day – See Chart
5	>1,005	>727	>224	>405	>858	>2,229	>14,400	Use median daily discharge by day – See Chart
6	1,690	1,230	522	819	1,361	3,251	~20,000	Use median daily discharge by day – See Chart

Notes:

1. All flow data obtained from the USGS website for each gaging station.
2. Flow depletion estimates were not added to the mean annual and median annual values listed.
3. Segment 5 values are likely to be underestimated, i.e., they should be higher, because the USGS gages miss significant contributing drainage area (~1,230 mi2) between the Roosevelt and Tonto gages and upstream end of Segment 5. The missed area includes several perennial streams and numerous springs. Therefore, the listed values are shown with the greater than symbol. Estimates may be as much as 20% higher than shown.
4. The Segment 6 mean annual and median annual estimates were obtained from Thomson & Porcello report, published by the USGS.
5. 2-year discharge estimates were obtained from the USGS Water Resources Investigation Report 98-4225 (Pope et. al, 1998). The Segment 1 value is for the Black River only, addition of the White River flood potential would increase the estimate. The Segment 6 value is obtained from the ASLD report for the Lower Salt River.
6. Methodology for determining listed estimates described elsewhere in this document.

Attachment 2

Recommended Flow Depth Estimates by River Segment for the Ordinary & Natural Condition

C055-400, p. 18 (corrected p. 18 of C053-397 [Salt River Rebuttal Rating Curves])

Table 6. Recommended Flow Depth Estimates by River Segment for the Ordinary & Natural Condition

Segment	Flow Rate Type					
	Mean Annual	Median Annual	10% (Entire Year)	Median Daily (Entire Year)	90% (Entire Year)	High-Flow Boating Season
2	2.2 ft	2.0 ft	1.2 ft	1.6 ft	3.0 ft	1.3-2.8 ft
3	2.3 ft	2.0 ft	1.2 ft	2.5 ft	3.0 ft	2.5-2.8 ft
4	2.6 ft	2.2 ft	1.2 ft	2.6 ft	3.2 ft	2.5-3.0 ft
5	2.6 ft	2.3 ft	1.1 ft	1.6 ft	3.8 ft	1.7-3.6 ft
6	2.2-4.9 ft	1.9-4.2 ft	1.3-2.6 ft	1.6-3.4 ft	2.8-5.8 ft	1.7-5.5 ft.

Notes:

1. Segments 2-4: Depths are for conditions at the head of a riffle, i.e., they are limiting depths not typical depths.
2. Segment 5: Depths shown are for non-pool sections of the river, i.e. they are limiting depths.
3. Segment 6: The low-end depths shown are for limiting conditions in shallow riffles, i.e., they are limiting depths.
4. Average depth of the rating section is shown for Segment 2.
5. Maximum depth of the rating section is shown for Segments 3, 4, 5, & 6.
6. The high-flow, or boating, season depths are based on the high and low median daily flow rates during the period from mid-February to mid-May.