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BEFORE THE
ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION

IN THE MATTER OF THE NAVIGABILITY OF THE GILA RIVER FROM THE NEW MEXICO BORDER TO THE CONFLUENCE WITH THE COLORADO RIVER, GREENLEE, GRAHAM, GILA, PINAL, MARICOPA AND YUMA COUNTIES, ARIZONA	No. 03-007-NAV **ARIZONA STATE LAND DEPARTMENT'S CLOSING BRIEF ON THE NAVIGABILITY OF THE GILA RIVER FOR STATE TITLE PURPOSES**

I. Introduction: The Gila is a Navigable River.

The Arizona State Land Department ("ASLD" or the "State") files this memorandum in response to the Arizona Navigable Stream Adjudication Commission's ("ANSAC" or "Commission") question whether the Gila River ("Gila" or the "River") was navigable in its natural and ordinary condition at statehood. The Commission should find that all segments of the Gila were navigable in their ordinary and natural conditions as of the date of statehood, pursuant to the test of navigability for title purposes as first articulated by the United States Supreme Court in *The Daniel Ball*, 77 U.S. (10 Wall.) 557 (1870), and as interpreted by subsequent federal and state cases, including the Arizona Court of Appeals' most recent decision, *State ex rel. Winkleman v. Ariz. Navigable Stream Adjudication Comm'n,* 224 Ariz. 230, 229 P.3d 242 (App. 2010).

This Commission, as a matter of law, must perform two separate and distinct tasks: (1) determine if segmentation of the river system is appropriate based upon the dictates of *PPL Montana, LLC v. Montana*, 565 U.S. ___, 132 S.Ct. 1215 (2012), and, if segmentation is appropriate, determine the start and end point of each of the segments; and (2) assess the navigability of each segment in the River's ordinary and natural condition, prior to dams and the massive diversion of the River's waters for irrigation that began in the mid-to-late nineteenth century, prior to Arizona's statehood.

At stake, ultimately, is the title to the bed and banks of the Gila River. While ANSAC does not determine title to any particular parcel of property, if ANSAC finds the Gila navigable, the State may proceed with a quiet title process. If the State has title to the bed and banks of the Gila, one of the few major rivers in Arizona may be held in trust for the benefit of the general public, to be used by current and future generations of Arizonans. If the State does not have title, the Gila's bed and banks will be restricted by the mandates of a multitude of separate private, tribal and federal landowners.

II. The Test for Navigability-for-Title.

ANSAC previously held hearings, and made a determination regarding the navigability of the Gila River and issued its report on January 27, 2009. This case and the others now before ANSAC were remanded to the Commission with instructions that they be decided consistent with the Arizona Court of Appeals' decision in *Winkleman*. *See Winkleman,* 224 Ariz. at 245, 229 P.3d at 257 (remanding the Lower Salt River case with instructions for ANSAC to assess the river in its ordinary and natural condition). The *Winkleman* Court found that the River must be assessed in its ordinary and natural condition, absent man-made diversions. In the meantime, the U.S. Supreme Court decided the navigability case *PPL Montana*, finding that a river may need to be segmented for a navigability determination. *PPL Montana,* 132 S.Ct. at 1229-31.

A. The State Appropriately Segmented the River.

A determination of navigability is based fundamentally on *The Daniel Ball* test, and the subsequent rulings by Arizona and federal courts, and the codification of *The Daniel Ball* test in the Arizona Revised Statutes. The determination, however, must be made 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. Therefore, before the Commission analyzes navigability, it must first define the segments of the River.[1]

In its ordinary and natural condition, the Gila from the New Mexico border to the Colorado River confluence is naturally divided based on its hydrology, geomorphology, geography, and navigability characteristics. Although it is appropriate to segment the Gila based on its diverse physical characteristics, the River is not subject to the same discrete and insurmountable physical characteristics found in the non-navigable Great Falls reach of the Upper Missouri River. *See PPL Montana*, 132 S.Ct. at 1222-1224, 1231 (Great Falls reach is 17 miles of a "constant succession of rapids and falls," with five waterfalls with heights of 87, 19, 48, 7, and 26 feet). In contrast, the Gila has no waterfalls, and rapids of any type are rare. Tr. 6/16/14, p. 215:10-12 (Fuller).

Over its length, which spans the diverse terrain of the entire State of Arizona, the Gila flows through alternating reaches of narrow bedrock canyons and broad, alluvial, river valleys. 002, pp. 4-6, 8-5 (ASLD Upper Gila Report); Tr. 6/16/14, p. 122-23 (Fuller). Hydrologically, some segments of the River are gaining

[1] On June 8, 2012, the State submitted a Memorandum to ANSAC on the United States Supreme Court's decision in *PPL Montana*, 132 S.Ct. 1215 (2012). In its *PPL Montana* Memorandum, the State recommended segments for the Gila River.

segments, and some are losing. X020-79, PPT 30-31 (Fuller Nav.); Tr. 6/16/14, p. 149-50 (Fuller). And finally, some segments had deeper water and more historical use than others. *Id.*; Tr. 6/16/14, p. 265:11-24 (Fuller). On the basis of these navigability characteristics, the River should be segmented into eight segments: Segment 1- New Mexico boundary to Hwy 191 Bridge (the Duncan Valley)[2]; Segment 2 – Hwy 191 Bridge to the Dry Canyon Confluence (the Gila Box); Segment 3 – Dry Canyon Bridge to Coolidge Dam (Safford Valley); Segment 4 – Coolidge Dam to Hwy 77 (San Carlos Canyon); Segment 5 – Hwy 77 to Ashurst-Hayden Dam; Segment 6 – Ashurst-Hayden Dam to the Salt River Confluence; Segment 7 – the Salt River Confluence to Dome; and Segment 8 – Dome to the Colorado River Confluence.

The specific characteristics of each segment are described in the following sections. None of the parties at the recent hearings have presented any meaningfully different alternative segmentation analysis of the River. *See* X008-2, p. 3 (Burtell Decl.); Tr. 6/20/14, p. 1042:10-17 (Burtell); X009, p. 1 (Gookin 2014 Rpt.); X003, p. 2 (Mussetter 2014 Rpt.). Therefore, ANSAC should determine that it is appropriate to segment the River, and should adopt ASLD's segmentation of the River.

B. The Gila River Meets *The Daniel Ball* Test.

A navigability determination by ANSAC must be consistent with *The Daniel Ball* test as paraphrased in A.R.S. § 37-1101, and Arizona and federal case law. *The Daniel Ball* test states:

> 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.

77 U.S. (10 Wall.) 557, 563 (1870).

At its core, the test requires that ANSAC determine the River's ordinary and natural characteristics and whether the River was used or was susceptible to being used as a highway for commerce. *Winkleman,* 224 Ariz. at 239, 229 P.3d at 251; *see Utah v. United States,* 403 U.S. 9, 12 (1971); *United States v. Utah,* 283 U.S. 64, 77-81 (1931) ("*Utah* 1931"); *United States v. Holt State Bank,* 270 U.S. 49, 52-53, 56-57 (1926). The U.S. Supreme Court has stated that the "questions of susceptibility in the ordinary condition of the rivers, rather than of the mere manner or extent of actual use, is the crucial question .... The extent of existing commerce is not the test." *Utah* 1931, 283 U.S. at 82. As the *Winkleman* Court instructed, ANSAC must determine "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) condition." *Winkleman,* 224 Ariz. at 241, 229 P.3d at 253; *see PPL Montana,* 132 S.Ct. at 1228 (title navigability determined at statehood

[2] Note that the maps submitted by ASLD erroneously showed the boundary between Segments 1 and 2 slightly downriver of the Hwy 191 Bridge. X012-72 (Gila Maps). In testimony, Mr. Fuller referred to the Highway 191 Bridge as the boundary. Tr. 6/16/14, p. 124, 131 (Fuller).

based on the "natural and ordinary condition").

The River meets the test. As set out below, all of the River's segments not only *could* have supported navigation but were *actually* navigated even the River's being depleted by diversions.

III. Overview of Evidence.

The Commission should consider evidence of the Gila's hydrology, geomorphology, historic descriptions of the River's physical characteristics, historic boating incidents, and the records of modern boating in determining that the Gila is navigable in its ordinary and natural condition at statehood.

A. The Hydrology and Geomorphology of the River Demonstrate that in its Ordinary and Natural Condition in Approximately 1860, the River Was Navigable.

1. The River was in Its Ordinary and Natural Condition as of Approximately 1860.

At statehood, in 1912, the Gila was not in its ordinary and natural condition. The *ordinary* condition of a river is defined as a river in its usual condition, absent major flooding or drought. *Winkleman*, 224 Ariz. at 241. The *natural* condition of a river is defined as the river without man-made dams, canals, or other diversions. *Id.*

To assess the Gila in its ordinary condition ANSAC must therefore analyze the River in its non-flood and non-drought condition. To assess the Gila in its natural condition, ANSAC should analyze the River as it was in 1860. The date 1860 is appropriate because the Arizona Court of Appeals has already determined that the natural period for the Salt River was the early to mid-1800s, and the Gila has a similar history of use. *See Winkleman*, 224 Ariz. at 254, 229 P.3d at 242; *see also* Arizona State Land Department's Memorandum filed on the Gila River 1/27/12 (No. 03-007-NAV) (Gila River's natural condition is before 1860s). The *Winkleman* Court determined that the natural period for the Salt River was after the Hohokam had abandoned their diversions and before modern-era settlement and farming diversions began approximately in the early- to mid-1800s. *Winkleman*, 224 Ariz. at 254, 229 P.3d at 242. Here, the River and its tributaries, including the Salt River, had comparable Native American diversions and subsequent, substantial modern-era settlement and farming diversions. 004, p. VI-1 (ASLD Lower Gila Report). While the Native American diversions continued through modern-era settlement, these Native American diversions were minimal compared to the effect of the modern-era diversions. Tr. 6/18/14, p. 721:8-20 (Fuller).

The first of the modern-era diversions affecting the Gila began in the late 1860s, with the construction of Swilling ditch on the Salt River. Tr. 11-16-05, p. 206-207 (Jackson). By 1899, on the Upper Gila there were 45 diversions in the Duncan and Safford Valleys (002, p. 7 (ASLD Upper Gila Report)); on the Lower Gila, the United States Geological Survey ("USGS") recorded that 220,000 acres were being irrigated through 420 miles of ditches. 004, p. IV-62 (ASLD Lower Gila Report). The modern-era diversions caused substantial depletions of flow, in some areas eliminating all water in the River. X020-79, PPT 174-87 (Fuller Nav.). A list of the major diversions by the 1930s are found in X008-2, Tables 7-9 (Burtell Decl.), and 004, pp. IV-52–IV-55 (ASLD Lower Gila Report).

The Commission should use as a guide the hydrological and geomorphological characteristics of the River in the early- to mid-1800s, and should further recognize that the natural condition of the River largely continued until about 1860, until the construction of Swilling ditch. This timeframe is further supported by other experts. *See* Tr. 8/18/14, p. 1418:12-21 (Littlefield); Tr. 6/20/14, pp. 1157:23–1159:1 (Burtell); Tr. 8/19/14, p. 1711 (Mussetter); Tr. 8/20/14, p. 1787:13–1788:2 (Mussetter). Therefore, the best evidence of the River's navigability comes from that date or before. *See Winkleman*, 224 Ariz. at 242-43, 229 P.3d at 254-55. It is appropriate to assess *both* the channel and the flow at that time. Once the River's flow began to be substantially depleted, the channel began to change unnaturally due to the consistently decreased flow, including erosion of the channel from decreased large native vegetation like cottonwoods, channel constriction from subsequent invasive non-native vegetation like tamarisk, and an unnatural change in sediment distribution. Tr. 6/16/14, pp. 145, 251, 244 (Fuller).

2. The Geomorphology Shows a Single and Stable Boating Channel.

The River flows through alternating reaches of narrow bedrock canyons and broad alluvial river valleys, with a pool and riffle pattern. X020-79, PPT 30-31, 33, 36, 39, 41, 45, 48, 57, 60 (Fuller Nav.). Riffles are areas where the water is shallower and moves faster, and pools are deeper with slower moving water. Tr. 6/16/14, p. 132:9-11 (Fuller). Bedrock canyons occur in the Gila Box, Segment 2, downstream of the Duncan Valley and upstream of Safford; in the San Carlos canyon, Segment 4, downstream of Coolidge dam and upstream of Winkelman; and between Kelvin and the Hayden-Ashurst Dam, the later part of Segment 5. X020-79, PPT 30-31, 33, 36, 39, 41, 45, 48, 57, 60 (Fuller Nav.). The remainder of the River flows in alluvial valleys–areas where alluvium has been deposited by the River. *Id.* Tr. 6/16/14, p. 123 (Fuller). Bedrock canyons have greater topographic confinement, channel stability, and could have more rapids based on the increased confinement of the watercourse. Tr. 6/16/14, pp. 67:21–68:5 (Fuller). Alluvial valleys are often the first to be depleted by irrigation diversions based on their accessibility and proximity to farmland, but bedrock canyons still suffer reduced flow from upstream diversions in the alluvial valleys.

In its alluvial sections, the Gila is characterized as a compound channel, which consists of braided flood channels and a sinuous to meandering single thread low flow or primary channel.[3] X035-129 (Huckleberry Decl.). It is the low-flow or primary channel that is considered the typical "wet" part of the river, and the portion of the river upon which boating would be most likely to occur. *Id.* While some minimal

[3] Throughout this brief, the low-flow or primary channel cited by Huckleberry (the wet part of the river where boating would occur) will also be referred to as the "boating channel." Tr. 6/16/14, pp. 101-02 (Fuller). The floodplain (normally dry part of the River that is inundated occasionally) will be called the "floodplain" or "floodplain channel." *Id.*

braiding may occur in the low-flow or primary channel in certain parts of the River, the primary channel is without question a single thread channel overall, as attested to by the widely cited expert on the geomorphology of the Gila, Dr. Gary Huckleberry, who did his PhD dissertation on the River (X032-126, p. 18 (Huckleberry Rpt.)), and as attested to by ASLD's hydrologist and boating expert, Jon Fuller, who is the only scientific expert in this case to have actually boated the Gila. X035-129 (Huckleberry Decl.); Tr. 6/16/14, p. 110:2-7 (Fuller).[4] Significant braiding only occurs when the Gila is in flood, which is less than 1% of the time. Tr. 6/16/14, p. 218:1-6 (Fuller); 002, p. 4-33, Table 21 (ASLD Upper Gila Report). The navigability of the Gila is not and never was impeded by any significant braiding. Tr. 6/16/14, pp. 110, 202:13-18 (Fuller). Furthermore, braiding, where it may occur on a river, does not itself prohibit navigation. *Id.*; *see also* Tr. 8/19/14, p. 1734:20-25, 1735:1 (Mussetter) (Braided rivers can be navigable and this is consistent with Dr. Schumm's previous testimony).

While the river channel in bedrock sections is geomorphologically restricted to a single channel, in alluvial sections of the River, the channel is more subject to change. During large flood events, the flood channels of the Gila are widened through powerful and constant erosive water. X035-129 (Huckleberry Decl.); Tr. 6/16/14, p. 107:6-8 (Fuller). There is a temporary increase in the degree of braiding within the floodplain, the area beneath the flood waters, as the low-flow channel is temporarily overcome by flood waters. Large floods might relocate the low-flow channel in a different part of the floodplain but a low-flow channel is reformed as the flood waters recede. X035-129 (Huckleberry Decl.).

As previously mentioned, ANSAC should consider the channel of the Gila during the period of the mid-1800s, and the channel at that time was in its ordinary and natural condition, with a non-braided low-flow channel. If ANSAC considers the channel of the Gila at statehood in 1912, it should still find that the Gila had a non-braided low-flow or boating channel. The large floods that occurred from 1905 to 1906 certainly affected the alluvial segments of the Gila, causing the River to widen and more braiding to occur, but there is a "high probability" of the re-formation of a more defined low-flow channel that would have occurred prior to statehood, six years after the major floods. X035-129 (Huckleberry Decl.). In any case, any widening and braiding that occurred because of the major floods of 1905 and 1906 that is speculatively still present six years later was not typical of the long term condition of the River, and therefore would not be an assessment of the Gila in its ordinary and natural condition. X035-129 (Huckleberry Decl.).

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[4] The experts for the non-navigability proponents also agree the Gila had a single channel in its ordinary and natural condition. Tr. 8/19/14, p. 1699:7-14 (Mussetter) ("...it is clear from the anecdotal evidence that portions of the Gila River in the mid-1800s did have a single-thread channel..."), p. 1734:9; Tr. 6/20/14, p. 1161-62:4-9 (Burtell) ("So in response to your question then about the conditions of the Gila River that I studied prior to – or from you said I think 1800 through the 1880s, all of the accounts and analyses I've looked at indicated that it was a single meandering channel.").

3. The Hydrology Shows the Gila had Sufficient Depth for Boating.

The River's physical characteristics including its flows and depths must be evaluated in order to properly assess navigability. With average or median yearly depths ranging from about one foot to three feet over the course of the River, the Gila had sufficient depth to be used as a highway for commerce. *See* Exhibit A. *See also Alaska v. Ahtna,* 891 F.2d 1401, 1402 (9th Cir. 1989) (finding Gulkana River navigable where at points it was a foot and a half deep, diminishing to a foot during low season, and on average was 125-150 feet wide and 3 feet deep).

ASLD used several methods to derive flow data and corresponding depths: (1) USGS gage data were used as the primary source (002, p. 5-2 (ASLD Upper Gila Report); 004, p. VI-4 (ASLD Lower Gila Report)); (2) direct measurement (002, p. 5-15 (ASLD Upper Gila Report)); (3) direct observations by explorers and early residents (002, Chapter 3 (ASLD Upper Gila Report); 004, Chapter IV (ASLD Lower Gila Report)); (4) stream flow reconstructions based on tree-ring data (004, p. VII-3 (ASLD Lower Gila Report)); and (5) field observations by Mr. Fuller during site visits and boating trips. There is no USGS data for the River pre-1900s, after which it was largely depleted and not in its natural condition, X020-79, PPT 136 (Fuller Nav.). Data began to be recorded in 1899 at Coolidge, but for another point, Calva, the collection of data did not begin until 1929. *Id.* Therefore, since USGS data was used as the primary source the calculated ASLD depths of the depleted River shown in Exhibit A are lower than what the depths would have been in 1860. *See* X020-79, PPT 143-151 (Fuller Nav.).

Even so, ASLD's depleted depth estimates provide a consistent picture of perennial and reliable flow in the Gila with depths sufficient to sustain boats using the River as a highway for commerce. X020-79, PPT 28 (Fuller Nav.). Depleted depth estimates exceed the depths needed for boats to be used as a highway for commerce, including modern and historic canoes, flatboats, and in some segments steamboats. *Compare* Exhibit A, ASLD data *with* boating depth requirements in X020-80, PPT 76, 116, 117 (Fuller Boating). Thus, the River in its ordinary and natural condition would have had more water, greater depths, and would certainly be more susceptible to navigation. The Gila was also wide enough for boating, and no party has asserted otherwise. Tr. 6/16/14, pp. 263-265 (Fuller).

Where other reliable experts have attempted to reconstruct the ordinary and natural depths of the Gila, those depths substantially *exceed* the minimum depths needed for small boats.[5] *Compare* Exhibit A Burtell and Hjalmarson data *with* boating depth requirements in X020-80, PPT 76, 116, 117 (Fuller Boating). Mr.

[5] Gookin admitted that he miscalculated depths. Tr. 6/18/14, pp. 763-766 (Gookin). ASLD's expert Jon Fuller testified that Gookin's depths were low due to the use of an incorrect n-value of 0.02 instead of 0.035, a 75% percent difference. Tr. 6/17/14, pp 507-509 (Fuller). Robert Mussetter, an expert for the proponents of non-navigability, also testified that Gookin's depths are low based on an incorrect n-value. Tr. 8/19/14, pp. 1743-1745 (Mussetter).

Burtell, an expert for non-navigability proponents, combined gage data with what is known about the man-made diversions and developed theoretical reconstructed maximum mean depths for Segments 1 through 4, depths that he believes would have existed around 1860 when the river was in its natural condition. X008-2, p. 17, Table 10 (Burtell Decl.). At all points where Mr. Burtell reconstructed flow, the depths exceed those needed for small boats. *Compare* Exhibit A Burtell data *with* X020-80, PPT 76, 116, 117 (Fuller Boating). Mr. Burtell's lowest mean depth reconstruction occurs at Bonita Creek where he lists a mean range of < 1.1-2.5 ft. (X008-2, Table 10 (Burtell Decl.), and Exhibit A), and the low end of that range is still sufficient depth for small boats. X020-80, PPT 76, 116, 117 (Fuller Boating). Mr. Fuller testified that this section of the Gila is boatable year-round and is one of the more popular recreationally boated areas. Tr. 6/16/14, p 134:10-13 (Fuller). Similarly, Mr. Hjalmarson reconstructed natural flows for Segments 7 and 8. Exhibit A; 023, p. 12 (Hjalmarson 2002 Rpt.). His flows used with ASLD's corresponding rating curves show depths that *far exceed* the depths needed for small boats and even larger boats such as steamboats. Exhibit A; X020-80, PPT 17, 116-17 (Fuller Boating).

These depth estimates are low compared to historic accounts of the River, as described later in the segment sections and compared to the experience of ASLD's two boating experts, Jon Fuller and Don Farmer. Historic estimates generally describe a river that is one to four feet deep. X020-79, PPT 98 (Fuller Nav.). ASLD is the only party that has presented for its case in chief two boating experts who have *actually navigated the river*. Where the Gila is navigable today in its depleted condition, both experts have testified that depths are sufficient to float small boats such as canoes and that depths in the relevant boating channel are actually deeper than Exhibit A portrays, even in today's unnatural condition. *See generally* Tr. 6/18/14, p. 542-577 (Farmer); Tr. 6/16/14, p. 8-266 (Fuller). Moreover, both experts also testified that the theorized depths shown in Exhibit A for segments that are navigable today are low, and actual navigated depths are greater. Rather than simply theorizing about depths and whether they would be sufficient to float boats, the State's experts actually successfully navigated the Gila using meaningfully similar boats to those that existed at statehood. *Id.*

In fact, ASLD's expert Mr. Fuller is the only expert to see significant portions of the River on the ground, in person. *See* X020-81 through 85 (Fuller Photographs). Mr. Hjalmarson, a navigability proponent expert, has done field work in the area where Segments 5 and 6 meet. X015-12 (Thomsen and Hjalmarson, *Manning's Coefficients*). Non-navigability proponent experts Mr. Burtell and Mr. Mussetter have never studied the river on the ground, in person, and have never boated the Gila. Tr. 6/20/14, pp. 1169:17–1170:2, 1171:1-19 (Burtell); Tr. 8/19/14, pp. 1708:18–1709:3 (Mussetter). Mr. Gookin's report primarily focused on Segment 6. Tr. 6/18/14, p. 753:3-7 (Gookin).

B. There Are No Rapids or Other Obstacles Sufficient to Impair Trade or Travel.

Whether something is an obstacle to navigation depends on many factors, including the type of boat, the boater's experience, and the flow rate. X020-80, PPT 78-79 (Fuller Boating); Tr. 6/16/14 pp. 66-67 (Fuller). Examples of potential obstacles to small boats are rapids (Class VI only) and waterfalls (some). *Id.* Potential obstructions that may cause some small difficulties include beaver dams, sand bars, strainers and sweepers, but these are not barriers to navigation. *Id.*

Long, continuous, and major rapids could be an obstruction. X020-80, PPT 80 (Fuller Boating); Tr. 6/16/14, p. 68 (Fuller). Rapids are rated on an international scale from I to VI. *Id.* Unlike the rivers described in *PPL Montana*, the Gila River has no significant obstacles or obstructions that would require portaging and this make the River non-navigable. X020-79, PPT 131 (Fuller Nav.); *see PPL Montana,* 132 S.Ct. at 1223, 1231 (Great Falls reach is 17 miles long with distinct drops including five waterfalls and continuous rapids in between and always required portaging). In contrast, there are no waterfalls on the Gila, and the rapids are minor and infrequent. *Id.*; *see also* X020-80, PPT 83, 98 (Fuller Boating); Tr. 6/18/14, p. 566:10-12 (Farmer). There are only 17 Class II rapids and one Class III rapid. X012-72 (Gila Maps). There are no Class IV or higher rapids on the Gila. *Id.* No expert testified that there were significant rapids or waterfalls on the River.

The evidence also shows that there were likely very few, if any, beaver dams on the River. X020-80, PPT 96 (Fuller Boating); Tr. 6/16/14, pp. 75:23–76:14, 190:23–191:25 (Fuller); X025-101, p. 43 (Strong, *Beavers*); Tr. 6/18/14, p. 566:13-23 (Farmer). There are no court cases that hold that beaver dams are an obstacle to navigation, however, even in the beaver-heavy areas of the northwest. This makes sense because beaver dams are temporary obstructions, easily boated over or removed. Tr. 6/16/14, p. 76:8-14 (Fuller); Tr. 6/18/14, pp. 566:24–567:14 (Farmer). Nonetheless, there is no evidence supporting the presence of substantial number of beaver dams on the Gila.

The *Utah* Court found that sand bars were not an obstacle to navigation. *U.S. v. Utah*, 283 U.S. at 86, 57 S.Ct. at 445. This finding is confirmed by the evidence from Mr. Fuller and Mr. Farmer, who both testified that sand bars are easily avoided. X020-80, PPT 100-102 (Fuller Boating); Tr. 6/16/14, pp. 77:12–78:18 (Fuller); Tr. 6/18/14, pp. 572:12–573:2 (Farmer). It is further confirmed by the fact that the navigable Colorado and Mississippi Rivers are both noted for the number and density of sandbars. X020-80, PPT 101 (Fuller Boating).

Sweepers and strainers are fallen trees in the channel or overhanging bank vegetation. X020-80, PPT 103 (Fuller Boating); Tr. 6/16/14, p. 79:1-19 (Fuller). Like beaver dams, strainers and sweepers are, at best, temporary difficulties to boating. Tr. 6/16/14, p. 79:16-19 (Fuller). No cases have held that sweepers or strainers are a barrier to navigability. They are easily removed or easily avoided. X020-80, PPT 103 (Fuller

Boating); Tr. 6/16/14, p. 79:1-24 (Fuller). No expert testified sweepers or strainers impacted navigability on the Gila.

Unlike the obvious obstacles that always required portaging in the *PPL Montana* case, in this case historical accounts from the Gila clearly demonstrate that no obstacles exist that always require portaging or where all or even most boaters had difficulties. *See PPL Montana*, 132 S.Ct. at 1232 (Seventeen mile Great Falls reach never had been navigated).

C. Historic Descriptions and Photographs of the River Confirm the River's Navigability.

Historic descriptions of the River vary but generally confirm the hydrologic and geomorphologic evidence that the Gila was navigable at statehood. X020-79, PPT 76-88, 98 (Fuller Nav.). Historical descriptions almost exclusively describe the River with a single low-flow channel. *Id.* Absent diversions, the descriptions typically describe a River from one to four feet deep (although there are certainly deeper areas) and 20 to 150 yards wide. *Id.* Historical photographs, which will be discussed in more detail in the specific segments below, also typically show a single low-flow channel, and where depth can be determined (e.g., photographs of fords) the photographs confirm the depths asserted by ASLD. X021-Photo 1; X020-79, PPT 89-96 (Fuller Nav.); X033-127, PPT 97 (Fuller Nav.); X008-2, Figure 7 (Burtell Decl.); X002, p. 134 (Littlefield 2013). Historic descriptions and photographs generally describe a navigable river, and confirm the State's analysis of depths.

D. Historic Boating Incidents Show the River was Actually Used for Trade and Travel and was Susceptible to Such Use.

In addition to the specific river descriptions discussed below for each segment, several general descriptions confirm the hydrologic and geomorphologic evidence that the River was once navigable, and useful as a highway for commerce. Arizona statutes define "highway for commerce" as "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(5). The United States Supreme Court has liberally construed what is sufficient for the highway for commerce component of *The Daniel Ball* test. In *Utah v. United States,* the Court found that nine boats which ranchers used occasionally to haul their livestock from the mainland to one of the islands or vice-versa was sufficient evidence to show that the Great Salt Lake was used as a highway for commerce, concluding that "[t]he Lake was used as a highway and that is the gist of the federal test." 403 U.S. at 11; *see North Dakota ex rel. Bd. of Univ. and School Lands v. Andrus,* 671 F.2d 271, 277-278 (8th Cir. 1982), *rev'd on other grounds sub nom. Block v. North Dakota ex rel. Bd. of Univ. and State Lands,* 461 U.S. 273 (1983) (canoe travel at the time of North Dakota's statehood represented a viable means of transporting persons and goods), *see also Alaska v. United States,* 754 F.2d 851, 854 (9th Cir. 1985) (stating that the "central theme remains the movement of people or goods from point to point on the water").

The State provided evidence of the types of commercial uses that did occur and could have realistically occurred at statehood if the River had been in its ordinary and natural condition. X020-80, PPT 6, 17, 27, 30, 36, 46, 49 (Fuller Boating) (typical trade and travel uses at statehood include hauling goods and passengers among other uses); Tr. 6/16/2014, p. 20 - 21 (Fuller); *see PPL Montana,* 132 S.Ct. at 1233 (present day, recreational use evidence must show that river "could sustain the kinds of commercial use that, as a realistic matter, might have occurred at the time of statehood."). These uses fulfill the requirements under the Federal test and the Arizona statutes. It is not necessary that a river actually was used for commerce so long as the river was capable of commercial use. *United States v. Utah*, 283 U.S. at 82, 83. Significant numbers of historical boating accounts are documented in each segment, and are discussed in more detail in the segments in which they occurred. Historic boating incidents prove every segment of the River could have been and was used for trade and travel purposes.

In addition to the segment specific, historic boating accounts discussed below, the Gila was actually historically boated by Native Americans, although no specific information exists concerning the exact location of these boating events on the River. Native Americans, principally the Apache, historically used the River. 002, p. 3-3 (ASLD Upper Gila Report). The Chiricahua Apaches were known to construct boats made of bull hides ("bullboats") stretched over wooden frames for crossing streams. 002, p. 3-5 (ASLD Upper Gila Report). Father Kino, in 1698 describes small boats built and used on the River by Native Peoples. X006-9, p. 3 (Hjalmarson Citations). Some native tribes have traditional stories that include boats. 016, p. 19 (Tellman Papers). No archaeological evidence exists of such boats, but this is not surprising considering the nature of the materials out of which those boats would have been constructed. X020-80, PPT 60 (Fuller Boating). The Spanish named the River "Rio de Las Balsas" (River of Rafts), either because the explorers were forced to cross the River on rafts or because the Indians used wicker baskets to cross the River. 002, p. 3-6 (ASLD Upper Gila Report); X025-110, p. 260 (Granger).

Some of the earliest users of the River for trade and travel were trappers, who entered the Southwest in the 1820s. X030-121, p. 5 (Davis Thesis). Trapping in what was ultimately to become the State of Arizona was risky; not only were there multiple native peoples who objected to trapping in their territory (sometimes quite violently), but also the Spanish and Mexican governments, who exercised jurisdiction over much of Arizona until the Treaty of Guadalupe Hidalgo in 1848 and rigorously controlled trapping. X030-120, pp. 3-4 (Blomstrom, *Fur Trading*). Until 1821, trapping beaver in what was to become Arizona was illegal. *Id.* Even after 1821, licenses were difficult to obtain and tariffs were common. *Id.* After the treaty, the Spanish government maintained control over the south bank of the Gila. In addition, most if not all trappers were close-mouthed and protective of their trapping methods and territory. X030-121, p. 11 (Davis Thesis). All these circumstances lead to a dearth of evidence on beaver trapping in Arizona.

One narrative of the beaver trade in Arizona survives, however: the narrative of James Ohio Pattie. Pattie first trapped on the Gila in 1824-25. X030-120, p. 10 (Blomstrom, *Fur Trading*). In his journal, Mr. Pattie describes building a dugout canoe to assist with setting traps, and floating down the river in it. X006-8, pp. 65-66 (Pattie Narrative). He records no difficulty using the dugout on the Gila, and indeed the story seems to be included more to give an account of a taste of typical trapping life, not as a grand adventure. *Id.* In separate expeditions, both Ewing Young and William Wolfskill trapped the Gila prior to 1831. X030-120, p. 20-24 (Blomstrom, *Fur Trading*). Indeed, Mr. Wolfskill likely trapped the Gila several times. *Id.*

> By 1826, parties under Sylvester Pattie, Ewing Young, Michael Robideau, George Yount and others had traversed the course of the Gila to its confluence with the Colorado. In the process, they had discovered and trapped practically every tributary of that river ... Hill estimates of this period that, 'The number of American trappers engaged in the business during this period reached into the hundreds, and the beaver fur that was caught brought the trappers more than a hundred thousand dollars.'

Id. at p. 26. Based on Mr. Pattie's one account, at least one trapper found the Gila suitable for boating, and indeed used a boat on the River, thus it is entirely logical and probable that other, undocumented trappers did the same thing. 016, p. 21 (Tellman Papers).

The Apache wars did not end until 1886, so for much of the historic period, a hostile Native American threat was a reality in terms of settling, using and occupying the River by settlers, traders and trappers. Tr. 6/16/14, p. 168:3-11 (Fuller). For travelers and those engaged in commerce, there were a number of alternatives to boating the River. By 1871, the railroad was available and the population of Arizona began to rise shortly thereafter. X020-79, PPT 73 (Fuller Nav.). Competition from the railroads was fierce, and after the railroads arrived, the steamboat industry on the Gila quickly fell apart. *See* X028, pp. xiii, 49, 71, 73, 86 (Lingenfelter, *Steamboats*). Traders, trappers, settlers and the military travelled over land to get to Arizona. They arrived by wagon or horseback, so it made no sense to abandon their horses and wagons, build a boat, go west and if trading or trapping work their way back upstream. X020-80, PPT 65-71 (Fuller Boating). *See United States v. Utah*, 283 U.S. at 82 ("... [W]here conditions of exploration and settlement explain the infrequency or limited nature of such use, the susceptibility to use as a highway of commerce may still be satisfactorily proved.") Furthermore, the marketplace for furs and other goods of trade was not Yuma, it was St. Louis. Tr. 6/16/14, pp. 169:19–170:24 (Fuller).

Boats of many types were available in Arizona before 1900. Whether trapper, trader or settler, prior to the establishment of towns and marketplaces, there was not an abundance of lumber and other materials along the River from which settlers or travelers could build a boat on the spot. Tr. 6/16/14, p. 171:12-19 (Fuller). Mr. Fuller illustrated this point by discussing the boating account of Lieutenant Joseph Ives wherein Mr. Ives stated, "[f]or want of tools and materials to construct a raft this would have been difficult, if not an impractical undertaking, had we not been provided with one of Buchanan's portable boats." Tr. 6/16/14, pp. 26:18–27:10, 171:16-19 (Fuller). Nonetheless, when needed or desired, small boats in Arizona were commonly homemade from lumber or driftwood. 016, pp. 30-31 (Tellman Papers). Canvas and wood boats could be ordered by mail from Sears or Montgomery Ward. Tr. 6/16/14, p. 39:6-14 (Fuller). Historic canoes and flat boats could have easily been utilized with a heavy load of cargo in depths of one foot, based upon their similarity to modern boats. X020-80, PPT 116-17 (Fuller Boating); Tr. 6/16/14, pp. 88:23–90:4 (Fuller).

Ferries crossed the Gila in multiple places until they were replaced with bridges. X020-79, PPT 120 (Fuller Nav.); Tr. 6/16/14, p. 208:8-21 (Fuller). While the ferry itself may not show navigability the fact that large boats regularly navigated the river shows its susceptibility to use. *Holt State Bank*, 270 U.S. at 56 ("[N]avigability does not depend on the particular mode in which such use is or may be had-whether by steamboats, sailing vessels or flatboats- nor on an absence of occasional difficulties in navigation....") (citations omitted). Additionally, scattered throughout the record are numerous accounts that show that small boats were available when and where they were needed, sometimes at a moment's notice. *See* X019 (Maricopa Supp.); 021, pp. 16-17 (Jackson PowerPoint); X020-79, PPT 96, 119 (Fuller Nav.); Tr. 6/16/14, pp. 185:20–186:10 (Fuller). It seems unlikely that such a large group of boats would be available if the River were not regularly and routinely navigated.

E. Modern Boating Evidence Confirms the River's Navigability.

As noted in *PPL Montana*, 132 S.Ct. at 1233, "[e]vidence of recreational use, depending on its nature, may bear upon susceptibility of commercial use at the time of statehood." *PPL Montana* requires a court to consider evidence of modern boating if two conditions are satisfied: (1) modern boats are meaningfully similar to the boats available at statehood; and (2) the river's post-statehood physical condition is not easier to boat now than it would have been at statehood. *PPL Montana*, 132 S.Ct. at 1233-1234; *see also Alaska v. Ahtna, Inc.*, 891 F.2d 1401, 1405 (9th Cir. 1989) (finding that present recreational guided fishing and sightseeing trips are "commercial activity" under *The Daniel Ball* test and can prove a river's susceptibility for commercial use at the time of statehood); *Adirondack League Club, Inc. v. Sierra Club*, 706 N.E.2d 1192, 1194 (1998) (holding that evidence of a river's capacity for recreational use is in line with the traditional test of navigability).

ASLD's experts, Jon Fuller and Don Farmer, were the only experts who provided credible testimony on the types of boats available at the time of Arizona's statehood, and the depth and durability requirements of such boats. ASLD's evidence demonstrates that historic canoes and flatboats were similar to modern canoes and flatboats in their design and depth requirements. X020-80, PPT 109-117 (Fuller Boating); Tr. 6/16/14, pp. 43:19–44:6, 85:6–86:6, 88:23–89:4 (Fuller); Tr. 6/18/14, pp. 548:21–549:7 (Farmer). For example, a modern canoe requires a minimum river depth of six inches, and a historic canvas canoe requires a minimum river depth of three inches. X020-80, PPT 116 (Fuller Boating); Tr. 6/16/14, pp. 88:23–89:18 (Fuller). Mr. Fuller and Mr. Farmer both testified that while some historic materials were less durable then some modern materials, the expectations of historic boaters were that they could and would repair boats on the river as necessary. X020-80, PPT 114-115 (Fuller Boating); Tr. 6/16/14, pp. 86:20–88:22 (Fuller); Tr. 6/18/14, pp. 550:22–551:17 (Farmer). ASLD's evidence also demonstrated that manufactured canoes and flatboats as well as home-built canoes and flatboats were both available and used in Arizona at and before the time of statehood. X020-80, PPT 30, p. 46 (Fuller Boating); Tr. 6/16/14, p. 39:6-14 (Fuller). The evidence conclusively shows that modern canoes and flatboats are meaningfully similar to those available at statehood.

Moreover, the evidence also demonstrates that the Gila is not easier to boat now than it was historically. X020-80, PPT 118 (Fuller Boating); Tr. 6/16/14, pp. 90:5–91:2 (Fuller). Far from it: experts in the case generally agree that historically the Gila would have had more water (in in some cases substantially more) but for diversions of its flows. Tr. 6/20/14, p. 1158:5-10 (Burtell); Tr. 8/19/14, p. 1700:3-9 (Mussetter); Tr. 6/19/14, pp. 966:20–967:10, 967:20-25 (Gookin). The additional water would have made the Gila more boatable, not less. Tr. 6/16/14, p. 90:12-16 (Fuller). ANSAC must consider evidence of modern boating in determining whether the River was susceptible to use for commercial navigation at statehood.

IV. All Segments of the Gila River Are Navigable.

A. Segment 1: New Mexico to Gila Box.

Segment 1 is in the Duncan Valley and extends from the Arizona/New Mexico border to the upstream end of the Gila Box at the Highway 191 Bridge. Tr. 6/16/14, pp. 124, 131 (Fuller). All the experts who opined on this Segment agree it is and was a perennial stream with reliable flow throughout the year. 002, p. 5-32 (ASLD Upper Gila Report); X008-2, p. 5 (Burtell Decl.). It has a compound river channel which consists of a braided flood channel and a sinuous to straight single thread low flow channel where boating would occur. X020-79, PPT 33 (Fuller Nav.); X035-129 (Huckleberry Decl.). There are no rapids or natural obstructions within Segment 1. Tr. 6/16/14, p. 125:9-10 (Fuller). There are also no major tributaries to the River within this Segment. Tr. 6/16/14, p. 125:10-11 (Fuller); X020-79, PPT 33 (Fuller Nav.). In Segment 1, the River valley has an average width of about 300-600 feet, with floodplains that alternate from side to side, as the low-flow channel meanders across the valley bottom. 002, p. 4-6 (ASLD Upper Gila Report). Segment 1 is distinguished from Segment 2 based on its broad alluvial valley, degree of historical disturbance, fewer rapids, and slightly lower flow rate.

The experts agree that the theoretical historic depth of flow in Segment 1 is between a median of 0.9 (ASLD post-statehood depth) and 1.8 feet (Burtell reconstructed). *See* Exhibit A. A study on the Upper Gila River by Mussetter Engineering shows hydraulic depths at the Virden Bridge site near the Arizona-New

Mexico boundary that range between .5 and 4 feet. Of particular interest in this report are the plotted cross sections, which show a single or double low-flow channel (with one channel being clearly deeper) at flows between 60 and 220 cfs. X035-130, pp. C.34-53 (Mussetter 2006). Since modern flow depths are sufficient to support canoes and flatboats 146 days per year (~40% of the time) and canoes alone 329 days per year (~90%) of the time, (X020-79, PPT 158 (Fuller Nav.); Tr. 6/16/14, pp. 225:1–226:4 (Fuller)) historic depths would have been more than sufficient to support trade and travel year round.

Historic descriptions of the River in Segment 1 confirm Mr. Fuller's analysis that the Segment was navigable. Johnson, a member of Kearny's 1846 mapping expedition, described the Gila in Segment 1 as follows: "30 ft. wide, 1 ft. deep on the shallows, pebbly bed, fringed with trees." X020-79, PPT 81 (Fuller Nav.). Also in 1846, Emory described the river as 50 feet wide and an average of two feet deep. X008-2, Table 1 (Burtell Decl.). Certain Forty-Niners (in 1849) described Segment 1 as: "12 yds. wide, 1.5 ft deep . . . abounds in trout." X020-79, PPT 83 (Fuller Nav.). In April 1904, scientist Frederic Morton Chamberlain surveyed the Gila for fish, and described the River about 15 miles above Duncan as 10-50 feet wide and two feet deep. X004-46, p. 109 (Brown, *Territorial*). A historical photograph of the River in Duncan Valley shows a wet, single low-flow channel. X020-79, PPT 91 (Fuller Nav.). Again, these descriptions describe a river at the top end of the median depth projections necessary for navigation.

Documented accounts demonstrate actual use of the River for trade and travel, and confirm Mr. Fuller's analysis that the Segment historically was deep enough to support navigability. Between November 1890 and April 1891 two unnamed men boated the entire River from the New Mexico Highlands to Yuma in a homemade wooden boat. X004-20 (*Tombstone Epitaph*). Their purposes was commercial, hunting and trapping. X004-20 (*Tombstone Epitaph*). Their boat was lost during a flood and they built a new one and completed their successful journey. X004-20 (*Tombstone Epitaph*); X020-79, PPT 109 (Fuller Nav.); Tr. 6/16/14, pp. 198:10–199:5 (Fuller). In 1901 Charles Duvall used a small boat to boat down the Gila. X019, p. 18 (Maricopa Supp.). Mr. Duvall had started his journey at Bear Creek in New Mexico, and had experienced no difficulties by the time he reached Safford. X019, p. 18 (Maricopa Supp.). He intended to continue his journey down to the junction with the Colorado, but was being forced to boat in canals in the alluvial valley portions of the River because of dams on the River. X019, p. 18 (Maricopa Supp.). Mr. Duvall's purpose was ultimately to travel to Washington State. X019, p. 18 (Maricopa Supp.). In terms of historical recreational use of the Gila, there is an unconfirmed report that Stanley Sykes boated the entire River in 1909. X025-110, p. 259 (Granger). A statement to this effect is made in Granger's *Arizona Names*, but no confirming documentation has been found. *Id.* Mr. Sykes authored an article talking about a winter trip in the 1890's from Phoenix to Yuma, but does not mention a subsequent entire Gila trip. X004-62 (*Coconino Sun*).

It is important to point out for this Segment, as well as for the entire Gila, that the absence of reported boating does not mean boating was not occurring along the River's course regularly. According to the 1870 U.S. census, the population of Arizona was less than 10,000 people–far less than half of these lived along Arizona rivers. X020-80, PPT 64 (Fuller Boating). At statehood, there were only 204,000 people living in Arizona and the River was already highly diverted. X025-104 (AZ Census). There were not a lot of people to make report or to read those reports. Trips occurred that did not make the news. For example, in 1892 the Arizona Sentinel Newspaper reported that J.K. and George Day has just finished J.K's fifth trip down the river for trade and travel purposes, and that they intended to repeat the trip the following year.[6] X019, p. 13 (Maricopa Supp.). No reporting of their prior or subsequent trips was found by ASLD or disclosed by any of the parties.

Today, Segment 1 is rarely boated due to substantial flow removal for irrigation within the Duncan Valley and elsewhere, fences, poor scenery, minimal adventure, and its distance from major urban centers. X020-79, PPT 157 (Fuller Nav.); X020-81 (Segments 1 and 2 modern photos). Mr. Fuller notes in his recent testimony that there has been a fair amount of encroachment into the valley, a loss of native vegetation and an invasion of non-native tamarisk. X020-79, PPT 157 (Fuller Nav.). Mr. Fuller successfully boated a portion of this Segment in February 2014 with 300 pounds of gear in his canoe, including his own weight, and flow rates between 50 and 38 cfs, rates well below even the modern median of 91 cfs. X020-79, PPT 159 (Fuller Nav.); Tr. 6/16/14, p. 234:7-14 (Fuller). Another modern boater was M.H. Salmon, who boated down the entire Upper Gila [Segments 1, 2, 3] at a flow rate ranging from more than 1,000 cfs to about 260 cfs in May of 1983. 002, p. 6-5 (ASLD Upper Gila Report). He described his trip as "a piece of cake . . . most anyone could have done it had he or she the interest and the time." *Id.*

Mr. Fuller's field photographs taken on his February 2014 trip show he was able to successfully navigate this Segment in his fully loaded canoe. X020-81 (Segments 1 and 2 modern photos). Mr. Fuller also presented this Commission with a Google Earth flyover of Segment 1 which clearly shows a wet, single low flow channel that is boatable even at today's substantially diminished flows. X012-69 (Video Flyover).

In summary, Segment 1 in its ordinary and natural condition and today has a compound channel pattern through a broad alluvial valley and is a perennial stream. Its low-flow channel is of a pool and riffle nature and is a single boating channel that runs through the valley. The low-flow channel is not and was not at statehood braided. This Segment does not have any rapids or natural obstructions and has no major tributaries. X020-79, PPT 32, 33 (Fuller Nav.). The loss of flows from significant agricultural diversions has affected the recovery of the natural channel after flooding and has caused the loss of native vegetation and the incursion of invasive species. X020-79, PPT 130, 131 (Fuller Nav.). Historical descriptions of the River and historical and

[6] This trip will be discussed further in Segments 7 and 8, where the trip actually occurred.

modern boating accounts confirm that this Segment was navigable. This Segment is navigable today and was susceptible to navigation and actually navigated before and at statehood.

B. Segment 2: Gila Box.

This Segment extends through the Gila Box Canyon and Wilderness Area. Segment 2 is located mostly within relatively narrow canyons of the Central Mountain Province. 002, p. 4-6 (ASLD Upper Gila Report). Therefore, the geomorphology of most of the Upper Gila River is controlled by bedrock outcrops in the bed or at the margins of these canyons. 002, p. 4-6 (ASLD Upper Gila Report). The average width of the canyons in Segment 2 is about 500 feet, with very narrow floodplain terraces. 002, p. 4-6 (ASLD Upper Gila Report). Segment 2 is located primarily within the Bureau of Land Management Gila Box Riparian National Conservation Area. 002, p. 5-5 (ASLD Upper Gila Report). Segment 2 is perennial, with reliable flow throughout the year. 002, p. 4-7 (ASLD Upper Gila Report). Segment 2 has a pool and riffle pattern, with several minor rapids. X020-79, PPT 36 (Fuller Nav.). Segment 2 runs through bedrock canyons; this distinguishes it from Segment 3. *See* Tr. 6/16/14, pp. 131:25–132:21 (Fuller).

There are no major irrigation diversions within Segment 2, but its three major tributaries, the San Francisco River, Eagle Creek and Bonita Creek have been significantly diverted since the 1870s, substantially reducing historic, ordinary and natural flows within this Segment. Tr. 6/16/14, pp. 132:22–133:22 (Fuller). Obviously, the upstream diversions of water within Segment 1 also serve to reduce the flows and water depths within Segment 2.

The experts agree that the theoretical historic depth of flow was between a median of 1.0 (ASLD post-statehood) and a mean of 2.5 feet (Burtell's reconstructed). *See* Exhibit A. Modern flow depths show that Segment 2 is boatable by canoes and flatboats 183 days per year (~50% of the time) and by canoes 329 days per year (~90% of the time). X020-79, PPT 160-62 (Fuller Nav.). Historic flow depths were more than sufficient to support trade and travel year round.

Historic photographs from the 1930s show a single thread low-flow channel without any rapids or obstacles. X008-2, Figure 4 (Burtell Decl.), Downstream from near Clifton (August 1930) and Downstream from Bonita Creek (April 1932). Historical descriptions of the Gila Box also confirm that the river was susceptible to use for trade and travel. Lt. Emory described the River as 70 feet wide and 2 feet deep in October 1846. X008-2, Table 1 (Burtell Decl.). Governor Safford indicated that in places the River was deep enough that they were forced to swim while crossing it in July-August of 1872. X008-2, Table 1 (Burtell Decl.).

Despite the fact that this is a canyon reach, three additional historical boating accounts were found for this section. Perhaps the additional accounts are due to the proximity of Clifton, where historic populations were slightly higher. The three new accounts, in addition to the three accounts discussed above in Segment 1, confirm the River's navigability at and before statehood. A prospector in a dugout set sail from Clifton headed for Florence in 1886. X004-12 (*Arizona Silver Belt*); X020-79, PPT 118 (Fuller Nav.). He had no reported difficulties in Segment 2, and indeed no problems until "within 15 miles of Riverside [in Segment 5]". X004-12 (*Arizona Silver Belt*). An unnamed party set forth from Clifton headed for Yuma in 1889. X019, p. 16 (Maricopa Supp.). Except for a portage in the San Carlos Canyon, the trip was uneventful. *Id.* It is not clear if the purposes of the trip were recreational or commercial. *Id.* Finally, in January – February 1895, W.A. "Amos" Adams and J.W. Evans boated from Clifton in Segment 2 to Sacaton in Segment 6 in an 18 x 3.5 foot homemade wooden flatboat with a cabin. X014-33 (*Arizona Sentinel*); X020-79, PPT 111 (Fuller Nav.); 021, p. 12 (Jackson PowerPoint). After a side trip to Phoenix, Adams and Evans rejoined the Gila at the Salt River confluence and traveled down to Yuma. *Id.* There were no issues in Segment 2 from their starting point 35 miles above Solomonville. X014-33 (*Arizona Sentinel*). These trips confirm the River's suitability for trade and travel.

Segment 2's suitability for trade and travel is also confirmed by the modern boating use of this Segment. Segment 2 is one of the more popular recreationally boated areas. Most boating takes place in the Spring, but this Segment is boatable year-around. Tr. 6/16/14, pp. 134:10-20, 225:18–226:13, 237:20–238:12 (Fuller); X020-79, PPT 161, 162 (Fuller Nav.). The Segment 2 Google Earth flyover that Mr. Fuller played for the Commission also shows this Segment of the River as a single, meandering low flow channel with sufficient flow and depth upon which one can float a canoe. X012-69 (Video Flyover). The modern boater M.H. Salmon also reported no problems in this Segment in May 1983. 002, p. 6-5 (ASLD Upper Gila Report).

The State's boating expert, Don Farmer, has also boated Segment 2 along its entire course on multiple occasions within the last five years. Most of his boating trips have been in the Spring with flow rates of 300 cfs to 900 cfs. The range of depths he has experienced are from the shallowest spots in some riffles of about 16 inches to the deepest spots in holes of 20 feet. He has not boated, but has seen the River in the summertime at low flows and has never seen it dry. He has never had to get out of his boat and portage it because of any obstacle or obstruction. Tr. 6/18/14, pp. 554:7–557:22 (Farmer).

As described above, Segment 2 is a perennial stream that has a sinuous single low flow channel with a pool and riffle flow pattern through a bedrock canyon. It has three major tributaries all of which have been substantially affected by human diversion. X020-79, PPT 36 (Fuller Nav.); Tr. 6/16/14, pp. 131:25–134:13 (Fuller). Historical and modern boating accounts confirm that this Segment is boatable for a substantial portion of the year. Despite substantial diversions this Segment is navigable today and was susceptible to navigation at statehood.

C. Segment 3: Gila Box to San Carlos Reservoir.

This perennial segment extends from the Dry Canyon confluence through the Safford Valley to Coolidge Dam (holding back the San Carlos Reservoir). Segment 3 is located within a deep alluvial valley (X020-79, PPT 39 (Fuller Nav.); 002, p. 4-6 (ASLD Upper Gila Report)) and has a pool and riffle pattern, with no rapids (X020-79, PPT 39 (Fuller Nav.)). This Segment is distinguished from Segment 4 based on its alluvial river valley location, ease of access, and historical disturbance.

The experts agree that the theoretical historic depth of flow was between a median of 0.5 (ASLD post-statehood) and a mean of 2.0 feet (Burtell reconstructed). *See* Exhibit A. At modern flow depths Segment 3 is boatable by canoes and flatboats 292 days per year (~80% of the time) and by canoes 329 days per year (~90% of the time). X020-79, PPT 164-166 (Fuller Nav.). Historic flow depths, which would have been deeper than those used for this calculation, were more than sufficient to support trade and travel year round.

Several historical photographs confirm the geomorphic character of this Segment as susceptible to use for trade and travel. An 1885 photograph near Ft. Thomas shows a wide single low-flow channel. X020-79, PPT 89 (Fuller Nav.). An 1885 photograph taken near San Carlos shows a wide single low-flow channel river with the water in the middle close to chest deep on the horses. X021-Photo 1; X020-79, PPT 90 (Fuller Nav.). Presumably, the military would not choose the deepest place to try and cross the river. A May 1909 photo near Geronimo shows a single thread low-flow channel with perhaps very minor braiding. X020-79, PPT 92 (Fuller Nav.). An 1880 photograph shows a covered wagon and trailer crossing the River near Calva. X008-2, Figure 7 (Burtell Decl.). Although the photo is difficult to see, it shows a single thread low-flow channel with water at least up to the hubs of the wagon wheels. Mr. Burtell opined that, based upon this photograph, that the River was less than 100 feet wide and 1-2 feet deep. X008-2, p. 7 (Burtell Decl.). Again, it seems unlikely that settlers would choose a deep section of river to try and cross. Also, if, as some of the experts opined, the River was braided through this section, it seems odd that settlers would try and cross a single thread deeper low-flow channel rather than crossing a multiple thread shallower one. In Figure 4 Mr. Burtell presents several 1930's era photographs of the River. A 1932 photo upstream from Calva shows a braided flow channel. X008-2, Figure 4 (Burtell Decl.). The photo upstream of the Coolidge Dam site and the photo downstream from Blue Creek (July 1931) are also in this Segment. X008-2, Figure 4 (Burtell Decl.). Despite the fact that the flows shown in these photographs are substantially depleted and after the damaging floods of 1905-6, these photos generally show a single thread low-flow channel with only minor braiding. X008-2, Figure 4 (Burtell Decl.).

In 1867, Chapin, Commander of Camp Goodwin, observed that the Gila was 50 feet wide with an average depth of 2 feet. X008-2, Table 1 (Burtell Decl.). In April of 1904, Frederic Morton Chamberlain

Surveyed the Gila for Fish, and observed that below Safford, even with irrigation diversions, the River was 20 feet wide and three feet deep. X004-46, p. 111 (Brown, *Territorial*). Mr. Weech, in 1879, describes the River as difficult to cross except at the ford and indicates that it was deep enough that a horse was swept away trying to swim it. X008-2, Table 1 (Burtell Decl.). These historic descriptions again confirm the River's suitability for trade and travel.

Records for this Segment include three additional boating accounts in addition to the three trade and travel trips noted above (two unnamed men in 1890-91 to hunt and trap (X004-20 (*Tombstone Epitaph*)), Charles Duvall travelling to Washington State in 1901 (X019, p. 18 (Maricopa Supp.)), and the unnamed prospector in his dugout in 1886 (X004-12 (*Arizona Silver Belt*)) and, in addition to the three recreational or unknown purpose trips listed above (Sykes' unverified 1909 trip (X025-110, p. 259 (Granger)), Adams' and Evans' 1895 trip (X014-33 (*Arizona Sentinel*)), and the 1889 unnamed party (X019, p. 16 (Maricopa Supp.))). None of the six previously mentioned trips had any difficulties through Segment 3. In 1869, troops near Ft. Goodwin found the River deep enough to need a raft to cross while they swam their stock across. X004-19 (*Weekly Arizona Miner*); X020-79, PPT 118 (Fuller Nav.); X008-2, Table 15 (Burtell Decl.). In July 1849 the Stanistaus Lasselle party attempted to build rafts to transport an injured member of their party, but were unsuccessful in trying to navigate the low-water with the unwieldy craft. X016-7 (*Gila Trail*). It is noteworthy that apparently many members of this large party thought the idea was worth attempting. *Id.* In 1905, J.E. Carpenter and George W. Todd boated this Segment for the purposes of travelling to a hunting site. X019, p. 30 (Maricopa Supp.). Although no launch location was given, they were apparently headed for the hills around San Carlos. *Id.*

Today, Segment 3 is rarely boated due to substantial flow removal, diversions, fences, poor scenery, minimal adventure and its distance from major urban centers. X020-79, PPT 166 (Fuller Nav.); Tr. 6/18/14, p. 558:4-13 (Farmer). Mr. Fuller's Google Earth flyover confirms that this Segment currently has a pool and riffle pattern, sand and gravel bed, and a sinuous low-flow channel within a broad alluvial valley, much like Segment 1. X012-69 (Video Flyover).

In its ordinary and natural condition this Segment was perennial with higher flow coming into it from Segment 2 and its tributaries. Historic photographs and descriptions confirm that this section was actually used, as well as susceptible to use, for trade and travel in its ordinary and natural condition.

D. Segment 4: San Carlos Canyon.

This perennial Segment flows within a deep, narrow, bedrock canyon from Coolidge Dam to State Route 77. X020-79, PPT 41-42 (Fuller Nav.). The River here has a sinuous single low flow channel pattern with a pool riffle sequence, with a number of small rapids and no major tributaries. Tr. 6/16/14, p. 141:3-21

(Fuller); X020-79, PPT 42 (Fuller Nav.). Since statehood, the flow through this section had been regulated to optimize downstream irrigation. X020-79, PPT 169 (Fuller Nav.). Segment 4 is distinguished from Segment 5 based on its canyon topography, limited river access, and historical disturbance.

The experts agree that the historic depth of flow was between a mean of 1.8 (ASLD post-statehood) and a median of 2.7 feet (Burtell reconstructed). *See* Exhibit A. Modern flow depths show that Segment 4 is boatable by canoes and flatboats 256 days per year (~70% of the time) and by canoes 329 days per year (~90% of the time). X020-79, PPT 167-70 (Fuller Nav.). Historic flow depths, which would have been deeper than those used in this calculation, were more than sufficient to support trade and travel year round.

Historic boating accounts for this Segment include the three commercial uses of the river explained above (1883 prospector (X004-12 (*Arizona Silver Belt*)), two men in 1890-91 (X004-20 (*Tombstone Epitaph*)), and Mr. Duvall in his tiny boat (X019, p. 18 (Maricopa Supp.))) and the recreational trips by Adams and Evans (X014-33 (*Arizona Sentinel*)), Sykes (X025-110, p. 259 (Granger)), and the unnamed party in 1889 (X019, p. 16 (Maricopa Supp.)). This Segment contains the only Class III rapid on the River (Needles Eye Rapid) (X012-72 (Gila Maps)), which unsurprisingly was treated cautiously by some historic river users. However, unlike the rivers at issue in *PPL Montana*, not all boaters were required to or even chose to portage this small portion of this Segment.[7] *See PPL Montana*, 132 S.Ct. at 1232 (Seventeen mile reach of the river had never been navigated.) The prospector in 1886 apparently had no difficulties with the rapids, and neither did the two unnamed men in 1890. There are no records for how Mr. Duvall or Stanley Sykes did in this Segment, but there is no indication that they experienced any difficulties. Adams and Evans lined some of the rapids in this section. X014-33 (*Arizona Sentinel)*. Mr. Evans apparently stood on shore letting the boat down by a rope, and Mr. Adams rode in the boat through the rapids. *Id* At one point the rope broke and Mr. Evans recounts an exciting journey swimming and climbing downriver to where the boat awaited, slightly damaged (the repair took only a few hours) but still afloat and with its watertight compartments intact. *Id*. The unnamed party also took the cautious path, choosing to portage a portion of this reach. X019, p. 16 (Maricopa Supp.).

Confirming the navigability of this Segment, two photographs of this Segment (from 1928 and 1994) below Coolidge Dam show the River with a wet, primarily single, sinuous, low-flow channel. X020-79, PPT 93 (Fuller Nav.). The navigability is also confirmed by the Google Earth flyover video (X012-69 (Video Flyover)) and modern photographs of Segments 4 and 5 (X020-83 (Photos Seg. 4-5)).

Access is difficult for modern boaters on this Segment because the roads are often locked with gates. A number of websites describe the boating conditions–it is a modern boating reach. Tr. 6/16/14, pp. 243:17–

[7] Mr. Fuller provided a video of running Needles Eye Rapid in a canoe, which he believes should be characterized as a Class II rapid, as part of his boating PowerPoint. *See* X020-80, PPT 87

244:25 (Fuller); X020-79, PPT 167-171 (Fuller Nav.). On February 21, 2014, Mr. Fuller boated Segment 4 into Segment 5 in his 15 foot canoe, at a flow rate of 220 cfs. X020-83 (Photos Seg. 4-5); X020-79, PPT 171 (Fuller Nav.); Tr. 6/16/14, pp. 245:1–246:20 (Fuller). He was carrying about 500 pounds of gear. *Id.* The States boating expert, Don Farmer, and his wife also boated in a second fully loaded canoe. *Id.*

Mr. Farmer has boated this Segment on several occasions by canoe. He observes that Segment 4 is a "dam-flow regime." In the wintertime this Segment is completely dry because water is being stored behind the Coolidge Dam, with the major flows occurring in the summertime during agricultural releases. Mr. Farmer's experience is during summertime boating. He has boated this Segment in flows between 50 and 450 cfs with an average depth of 2 to 4 ft. He has never had to get out of his canoe to portage because of low depths, obstacles, or obstructions. Tr. 6/18/14, pp. 559:13–562:1 (Farmer).

Segment 4 of the Gila River is today and was clearly susceptible to navigation in its ordinary and natural condition, as confirmed by hydrologists, boaters, historic accounts, uses and descriptions.

E. Segment 5: San Carlos Canyon to Ashurst-Hayden Dam.

This perennial Segment extends from Winkelman to the Hayden-Ashurst Irrigation Diversion Dam. X020-79, PPT 45 (Fuller Nav.); Tr. 6/16/14, p. 146:4-12 (Fuller). The River in Segment 5 flows within a moderately deep valley between low mountains and hills, mostly through private lands. *See Id.* The sinuous, low flow channel has a pool and riffle pattern, with a single Class II rapid and no Class III or higher rapids. Tr. 6/16/14, p. 147:2-15 (Fuller); X012-72 (Gila Maps). Segment 5 is distinguished from Segment 6 based on its more reliable flow, confined geometry, and its record of historical and modern boating. *See* Tr. 6/16/14, pp. 146:4–147:25 (Fuller); X020-79, PPT 45, 176, 179 (Fuller Nav.).

The only depth information submitted to ANSAC for this Segment comes from ASLD, who calculated a median post-statehood depth of 1.3 feet. *See* Exhibit A. Modern flow depths show that Segment 5 is boatable by canoes and flatboats 329 days per year (~90% of the time). X020-79, PPT 172-6 (Fuller Nav.). Historic flow depths, which would have been deeper than those used in this calculation, were more than sufficient to support trade and travel year round.

Historic boating accounts for this Segment include the three trade and travel uses of the River explained above (1883 prospector (X004-12 (*Arizona Silver Belt*)), two men in 1890-91 (X004-20 (*Tombstone Epitaph*)), and Mr. Duvall in his tiny boat (X019, p. 18 (Maricopa Supp.))), and the recreational trips by Adams and Evans (X014-33 (*Arizona Sentinel*)), Sykes (X025-110 (Granger)), and the unnamed party in 1889 (X019, p. 16 (Maricopa Supp.)). In this Segment no recorded historic boater had any difficulty except for the prospector, who hit a strainer somewhere in the Segment, which caused his dugout to capsize. X004-12 (*Arizona Silver Belt*); Tr. 6/16/14, pp. 204:4–206:4 (Fuller). Submerged trees are hazards that can be encountered on any navigable river. *See* X020-80, PPT 103 (Fuller Boating); Tr. 6/16/14, p. 79:1-19 (Fuller). It is ironic that after boating the most difficult portion of the River successfully, the prospector lost his cargo and boat in this more tranquil section of the River.[8]

Photographs taken in 1908 after a massive flood show Segment 5 near Kelvin with some braiding in the low-flow channel. X020-79, PPT 95 (Fuller Nav.). A photo taken in a similar location in 1915 shows a single thread meandering low-flow channel. X020-79, PPT 94 (Fuller Nav.); Tr. 6/16/14, p. 185:16-20 (Fuller).

Historical descriptions confirm that the River's ordinary and natural low-flow channel and flows could have supported navigation. In the late 16th Century, Coronado described the River within Segment 5 as being a deep and reedy stream. X020-79, PPT 78 (Fuller Nav.); Tr. 6/16/14, p. 176:3-6 (Fuller). After the signing of the Gadsden Purchase in 1853, the United States surveyed the 32nd parallel for the proposed railroad route. Lt. John G. Parke led the surveying party. He described the Gila near the San Pedro as follows:

> The water was clear and palatable, flowing with a moderate current over an alternating bed of sand, pebbles, and rock. The stream was, in July [1855], about twenty feet wide and twelve inches deep. Its banks were fringed throughout with cotton-wood and willow thickets, with mesquite at the base of the terraces.

X004-3, p. 109 (Davis, *Man and Wildlife*). The Journal of Capt. A.R. Johnston, with Kearny's expedition, notes on Nov. 7 that the Gila about 6 miles below the San Pedro was 18 inches deep in the shallows, "and canoes might pass down it very readily, and good-sized boats if it were not for the round rocks in its bed." X008-2, Attachment "C", Johnston Journal at 593 (document page 111) (Burtell Decl.).

The Google Earth flyover for Segment 5 shows the River's flow at 130 cfs, which is below the long-term ordinary and natural flow, but nonetheless navigable. Tr. 6/16/14, pp. 148:1–150:15 (Fuller). There is some recreational use of the River in small draft boats. Tr. 6/16/14, pp. 247:13–248:8 (Fuller); X020-79, PPT 172-176 (Fuller Nav.). Indeed, as noted above, on February 21, 2014, Mr. Fuller boated Segment 4 into Segment 5 in his 15 foot canoe, at a flow rate of 220 cfs. He was carrying about 500 pounds. The States boating expert, Don Farmer, and his wife also boated in a second canoe. X020-83 (Photos Seg. 4-5); Tr. 6/16/14, pp. 245:1–246:20 (Fuller). They encountered no difficulties and found it very boatable. Tr. 6/16/14, pp. 247:10-11, 18-19, 248:6-8 (Fuller).

Segment 5's history of boating use, historic descriptions and photographs, geomorphic and hydraulic evidence, and history of modern use show a segment that is navigable today and was susceptible to navigation at statehood.

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[8] If the prospector truly lost his gear after capsizing his boat, it indicates that the River was significantly deeper than suggested by modern rating curves.

F. Segment 6: Ashurst-Hayden Dam to Salt River Confluence.

This Segment extends from the Ashurst-Hayden Diversion Dam to the confluence with the Salt River. The River in this Segment runs through broad alluvial valleys going past Florence to the Salt River confluence. This Segment is often referred to as the Middle Gila River. 004, p. VII-4 (ASLD Lower Gila Report); Tr. 6/16/14, p. 150:15-19 (Fuller); X020-79, PPT 47, 48 (Fuller Nav.). Before Anglo settlement in the 1860s, the Middle Gila River had a perennial flow that may have run dry near the Pima Villages on rare occasions. *See* X020-79, PPT 180 (Fuller Nav.); Tr. 6/16/14, pp. 151:13-16, 152:3-10, 252:7-21 (Fuller). This Segment has a compound floodplain channel with a pool and riffle, single low-flow channel and a sand and gravel bed. X020-79, PPT 48 (Fuller Nav.). It had no rapids. *Id.* There is essentially no modern boating in Segment 6 as the River upstream has been totally dammed and diverted. Tr. 6/16/14, pp. 251:11–252:6 (Fuller); X020-79, PPT 178 (Fuller Nav.).

ASLD estimates that the median natural depth of the River through this Segment was 1.5-2.0 feet. *See* Exhibit A. Although Mr. Gookin provided depth estimates for this Segment, he admitted that the Mannings "n" values he used were incorrect (*see* X029 (GRIC Supp.)). Interestingly, however, Mr. Gookin testified that Segment 6 was navigable by canoe in its natural and ordinary condition. Tr. 6/19/14, p. 857:3-7 (Gookin).

From the Pima Villages in Segment 6 down to the junction with the Colorado in Segment 8, there were significant records of historical boating. For instance, there were the two unnamed men who started in the New Mexico highlands in November 1890, and in this Segment, they were still contentedly boating down the Gila. X004-20 (*Tombstone Epitaph)*. Also continuing their journey from Segment 1, are Charles Duvall in his tiny boat (X019, p. 18 (Maricopa Supp.)) and (if historian Ms. Granger is to be believed) Stanley Sykes in 1909. X025-110 (Granger). From Segment 2, W.A. Adams and J.W. Evans reached Sacaton in this Segment and decided to make a side trip to Phoenix, hauling their boat with them. X014-33 (*Arizona Sentinel)*. They rejoined the River when they boat down the Salt to the confluence. *Id.* Also reported in this Segment are the unnamed party boating from Clifton to Yuma in 1889. X019, p. 16 (Maricopa Supp.).

Several historic parties and individuals got on the Gila in Segment 6 and boated down to the confluence with the Colorado. These include the Howard family in October 1849, Lt. Gully and Mr. Richardson prior to 1896 (X004-17 (*Arizona Weekly Citizen*)), HMT Powell in 1849 (X020-79, PPT 117, Fuller Nav.), and some unknown navigators who apparently boated the Gila to the confluence with the Santa Cruz River in 1883 (X004-13 (*Arizona Weekly Citizen*)).

At least two accounts of a trip down the Gila by Howard and his family exist, and demonstrate the River's actual use for trade and travel. One account, written by E.H. Howard of Eureka, California, in 1885, describes Mr. Howard bringing with him a 16-foot boat wagon, that had first been used on Lake Michigan, for use in his travels to California. X004-14 (*Arizona Weekly Citizen*). He embarked in it at the Pima Villages with his wife and one child, a doctor and a Baptist minister, and eventually reached Yuma–250 miles away–in three and one half days. *Id.* During the voyage a boy was born to Mrs. Howard. *Id.* Another account, written in 1930, describes Mr. Howard making two raft-boats out of wagons and sailing them down the Gila. X004-47, pp. 249-51 (Hannum, *Quaker Forty-niner*). This account reports that the baby born on the trip was a girl. *Id.* In both accounts the Howard family, and some additional men, made the trip to Yuma safely and swiftly. Other groups of forty-niners also used the River as an alternative to wagon travel. X006-9, pp. 3-4 (Hjalmarson Citations).

Historic descriptions again confirm the River's navigability in this Segment. Members of the de Anza expedition in 1775 traveling from the Casa Grande Ruin in Segment 6 to the Colorado River in October-November described various reaches of the River as "dry," "half way up his legs," "reaching to the shoulder-blades of the horses," and "very deep and ran very slowly." 004, p. IV-1 (ASLD Lower Gila Report). Forty-Niner George Evans traveling west described the River in Segment 6 in August 1849 as a "deep, narrow, and rapid stream of warm muddy water, with the banks covered with a dense growth of wild willow and weeds, tall cottonwoods. 001-18, p. 99 (Tellman, *Arizona's Changing Rivers*); X004-3, p. 48 (Davis, *Man and Wildlife*). A 1910 photo of the Gila near Welton Crossing show a generally single thread low-flow channel. X002, p. 108 (Littlefield 2013).

Segment 6 in its ordinary and natural condition was a perennial stream with a sinuous to straight low-flow channel running through broad alluvial valleys. Historical boating records, photographs, descriptions, and hydraulic and geomorphological evidence all confirm that this Segment was navigable in its ordinary and natural condition.

G. Segment 7: Salt River Confluence to Dome.

Segment 7 was a perennial, navigable stream in its ordinary and natural condition. 004, p. VII-6 (ASLD Lower Gila Report). Damming and diversion on the Salt River and its tributaries significantly impacted flow in this Segment before statehood. Tr. 6/16/14, pp. 155:7–157:24 (Fuller). The River in Segment 7 runs through a broad, alluvial valley and has a compound floodplain channel pattern with a historically single, sinuous to straight low-flow channel. X020-79, PPT 57 (Fuller Nav.); Tr. 6/16/14, p. 155:15-18 (Fuller). It has a sand and gravel bed, with no rapids. *Id.* Segment 7 is distinguished from Segment 8 based on its record of historical boating.[9] Tr. 6/16/14, pp. 253:8–256:13 (Fuller); X020-79, PPT 57 (Fuller Nav.).

[9] Archeological evidence shows Indian use of wooden rafts on the lower Gila [Segments 7, 8] and possibly on the middle Gila [Segment 6]. Tr. 6/16/14, p. 166 (Fuller).

Mr. Hjalmarson's flow estimates, used in conjunction with ASLD's depth rating curves for this Segment, show the theoretical historic depth of the Gila through Segment 7 was between 2 ½ and 3 feet. *See* Exhibit A. At these depths, the Gila would have been easily boated by canoes and flatboats 329 days per year (~90% of the time). X020-79, PPT 184 (Fuller Nav.). These estimates are confirmed by the historical descriptions and use of the River.

Historical descriptions confirm that this Segment had sufficient depth and flow to support navigation. According to the Mormon Battalion's Captain Cooke, the River near Gila Bend in January 1847 was four or five feet deep and 150 yards wide. X015-1, p. 152 (Corle). In addition, about 55 miles below the Salt-Gila confluence, a member of Kearney's party commented: "The River here is some 60 to 80 yards wide–on an average 3 feet deep and rapid." X021-112, p. 214 (*A Doctor Comes to California)*. According to U.S. government documents, in 1846-47, the River was 60-80 yards wide and three feet deep at Gila Bend, and in 1847-48 it measured 150 yards wide and three to four feet deep. 025, p. 47 (Hjalmarson Notes). A mid-1850s illustration shows the River near Gila Bend, apparently about 300 feet wide with tree-lined banks and containing enough water for swimmers. 025, p. 7 (Hjalmarson Notes). In 1889, Mr. John Montgomery, a rancher, described the River as being clear, five or six feet deep and containing many fish. 004, p. VII-6 (ASLD Lower Gila Report). In 1907, government surveyor Hesse described the River in its depleted condition near its confluence with the Agua Fria as eighteen inches to two feet deep. 012, p. 33 (Littlefield 2005).

Historical documentation of the River's use for trade and travel is fairly robust. There are the successful boating accounts from the two unnamed men in 1890-91 (X004-20 (*Tombstone Epitaph*)), Mr. Duvall in 1901 (X019, p. 18, (Maricopa Supp.)), and Mr. Sykes in 1909 (X025-110, p. 259 (Granger)) who continued on their way with no issues noted in Segment 7. Further, Mr. Adams and Mr. Evans, after spending some time visiting Phoenix, resume their journey and boat down the Salt to the Gila and on down, again recording no difficulties whatsoever. X014-33 (*Arizona Sentinel)*. The Howard family, and Lt. Gully and Mr. Richardson also record no difficulties in Segment 7. Additionally, other parties of 49ers used the Gila for travel. 021, p. 10 (Jackson PowerPoint).

In December 1846, members of Col. Cooke's command decided to boat supplies from Segment 7 down to Yuma. X006-9, p. 7 (Hjalmarson Citations); X020-79, PPT 102 (Fuller Nav.); Tr. 6/16/14, pp. 192:2–194:11 (Fuller). They tied together two wagon beds and lashed cottonwood logs to the wagons. *Id.* They then filled up this awkward boat and shoved off. *Id.* Unsurprisingly, the craft was difficult to steer and ran aground repeatedly on sandbars. *Id.* Nonetheless, after modification they were able to successfully boat to Yuma. *Id.* Col. Cooke recorded that the River at the point where they launched the craft was 3-4 feet deep and 150 yards wide. X006-9, p. 7 (Hjalmarson Citations).

In January 1879, Charles Hamilton, R.W. Jordan and E.R. Halesworth arrived in Yuma after having boated down the Salt River from Phoenix in their home-built skiff. X004-15 (*Arizona Sentinel*). They experienced a single narrow spot at Gila Bend (in Segment 7), but otherwise reported no difficulty. *Id.* Although the purpose of their trip is unknown, they reported that the River would support commerce in the form of flatboats of produce from Phoenix. *Id.* Also, in February 1881, Mr. Cotton and Mr. Bingham boated from Phoenix to Yuma. 021, p. 11 (Jackson PowerPoint). In November 1881, William "Buckey" O'Neil launched a boat in Phoenix headed for Yuma. X020-79, PPT 107 (Fuller Nav.); Tr. 6/16/14, pp. 196:19–197:12 (Fuller); 021, p. 11-12 (Jackson PowerPoint). Apparently his craft was not particularly nimble, as the article reports he and his party had to push it while standing in water up to their knees. *Id.* There is also some indication that a certain amount of liquor was consumed by the boaters. *Id.* There is some confusion about whether the trip made it to Yuma or stopped in Gila Bend (in Segment 8). *Id.* In any event, Mr. O'Neil successfully boated through Segment 7. *Id.*

In 1890, Frank Burke and George Davis were transporting gold from the Harqua Hala mines when their boat overturned near Sentinel (in Segment 8). X019, p. 25 (Maricopa Supp.). Thus, they successfully boated through Segment 7. Later, in 1892, J.K and George Day boated down the Verde to the Salt, down the Salt to the Gila, and finally down the Gila to Yuma. X019, p. 13 (Maricopa Supp.). This was J.K's 5th trip for the purpose of hunting and trapping. *Id.* They experienced no difficulties. *Id.* In addition, sometime in the 1890's, Stanley Sykes and Charlie McLean decided to travel by boat to Yuma from Phoenix. X004-62 (*Coconino Sun*). They built a canvas covered boat and set off. *Id.* There was insufficient water on the Salt to support boating because of the irrigation diversions. *Id.* However, once they reached the River there was sufficient water to boat. *Id.* They overturned the boat while boating over an irrigation diversion dam, but had no other difficulties on the Gila. *Id.*

While the State has offered Mr. Fuller's entire Google Earth flyover in evidence as Exhibit X012-69 (Video Flyover), he did not play the Segment 7 portion during his presentation and testimony before ANSAC because, as he noted in his testimony, there is not a lot of boating in this Segment since it is usually dry due to depletions of the River's flow, except for a small reach into which a sanitation plant at 99th Avenue discharges effluent just downstream of Phoenix, near Buckeye to near Gillespie. X020-79, PPT 182 (Fuller Nav.). Most of the effluent flow comes out at Gillespie. Tr. 6/16/14, p. 253:20-25 (Fuller).

Mr. Fuller did present photographs of his 2003 canoe trip down the effluent fed portion of this Segment from about Buckeye to State Route 85. X020-85 (Fuller Photos). They show this small reach of Segment 7 to have beautiful scenery and a single low-flow channel with overgrown, non-native vegetation. Tr. 6/16/14, pp. 254:20–256:1 (Fuller); X020-85 (Photos Seg. 7). Mr. Fuller's presentation and testimony confirm that most of the time, the flow was at or near optimum conditions for recreational boating on the Lower Gila [Segments 7, 8] based on the U.S. Bureau of Outdoor Recreation's 1977 criteria. 023, p. 25 (Hjalmarson 2002

Rpt.).

Historical descriptions and boating accounts confirm the River's depth and stable channel, which indicate that Segment 7 was navigable in its ordinary and natural condition.

H. Segment 8: Dome to Colorado River.

This Segment extends from Dome to the Colorado River confluence. The River's characteristics are almost identical to Segment 7, but the historical evidence distinguishes this Segment from the prior one. Tr. 6/16/14, p. 157:14-24 (Fuller). In Segment 8, there was historic steamboat use as well as the floating of logs, two additional, significant types of trade and travel use. *Id.* Segment 8 is a perennial stream in its ordinary and natural condition with a compound floodplain channel pattern, and a single, sinuous, low-flow channel with a pool and riffle flow pattern, along with a sand and gravel riverbed running through a broad alluvial valley. X020-79, PPT 60 (Fuller Nav.); Tr. 6/16/14, p. 158:5-7 (Fuller). There were no rapids in this Segment. *Id.* There is little modern boating in Segment 8 because the water is depleted. Tr. 6/16/14, p. 256:20-21 (Fuller); X020-79, PPT 187-189 (Fuller Nav.).

ASLD and Mr. Hjalmarson are again the only experts to provide flow or depth estimates for this Segment. These experts agree that the depth range historically was a median of 2.5–3 feet, (*See* Exhibit A) with a mean depth of 3.1 feet, with an estimated maximum depth of 4.8 feet. Tr. 11/17/05, p. 244 (Hjalmarson); 023, p. 29 (Hjalmarson PPT). At these depths the Gila would have been boatable by canoes and flatboats 329 days per year (~90% of the time). X020-79, PPT 186-189 (Fuller Nav.). Additionally, this Segment was boatable by steamboats 182 days per year (approximately 50% of the time). *Id.* These estimates are confirmed by the historical use of the River.

The historical boating accounts are the same as those found in Segment 7, with the exception of Mr. Shobley, who apparently stopped his journey in Gila Bend (021, p. 13, Jackson PowerPoint), and possibly Buckey O'Neil, who may also have stopped in Gila Bend. None of the travellers encountered difficulties in Segment 8, with the exception of Burke and Davis, who apparently overturned their boat near Sentinel (X019, p. 25 (Maricopa Supp.)) and Hamilton, Jordan and Haleseworth who apparently felt that the river was too narrow at one point near Gila Bend (X004-15 (*Arizona Sentinel*)). In addition to the robust record from Segment 7 and above, additional upriver travel from Yuma was documented in this Segment.

Steamboats on the Gila likely ran up as far as where Dome is today, about 20 miles upstream from Yuma. X014-73, pp. 4-5 (*Arizona Sentinel*). For a time, there was competition between two rival steamer companies on the Gila, carrying men and provisions to Gila City (a few miles from Dome) involving the steamer Arno and another steamship. X028-13, p. 31-33 (Lingenfelter, *Steamboats*). The Steamboat Uncle

Sam was employed on the Colorado River in 1852-53[10]. X028-13, p. 163 (Lingenfelter, *Steamboats*). The Uncle Sam was a sidewheeler, 65 feet long, with a 16 foot beam and a capacity of 40 tons. *Id.* The Uncle Sam apparently regularly travelled "some distance" up the Gila in search of firewood during her one year of service. X004-15 (*Arizona Sentinel)*. In 1858, George Johnson bought the steamboat Explorer, which had operated on the Colorado, and put it to work hauling firewood on the Gila. X004-33 (Muther, *Paddle-wheelers*). In 1864 the Steamboat Explorer sank on the Colorado after coming out of the Gila, where she had also been engaged transporting firewood. X006-1 (Robertson, *Yuma*)[11]. In 1894 the owners of the Steamer Aztec created a destination five miles up the Gila, and transported up to three loads of passengers a night. X019, pp. 17, 34 (Maricopa Supp.). The Aztec was a sternwheeler 62 feet long, with a 21 foot beam and a capacity of 50 tons on 20 inches of water. X028-13, p. 86 (Lingenfelter, *Steamboats*).[12] The Tombstone Epitaph reported in May of 1894 that steamboat excursions up the Gila "are the rage." X004-21 (*Tombstone Epitaph*). In 1897 the Schooner McCord also reportedly went upriver on the Gila to transport firewood. X019, p. 18 (Maricopa Supp.). Finally, the Steamboat Retta took a commercial excursion up the Gila with children on board in June, 1901. X004-16 (*San Francisco Chronicle*). The Retta was a 36 foot long, 6 foot beam paddle wheel boat. X028-13, p. 95 (Lingenfelter, *Steamboats*). Apparently the residents of Yuma travelled upriver on more than just steamboats, in 1890 residents were urged to boat the "Gila Laguna." X019, p. 15 (Maricopa Supp.). Logs were also floated in this portion of the River to supply firewood to Yuma Prison, which further demonstrates the River's navigability. X004-18 (*Los Angeles Herald*); *see State of Oregon v. Riverfront Protection Ass'n*, 672 F.2d 792, 795-796 (9th Cir. 1982) (floating logs sufficient to demonstrate highway for useful commerce).

Although Mr. Lingenfelter, author of Steamships on the Colorado, opined that steamboat travel up the Gila was rare, (X008-3, p. 3-4 (Lingenfelter Aff.)) it appears from the record, and Mr. Lingenfelter's own book (X028-13, p. 31-33 (Lingenfelter, *Steamboats*)) that travel on the Gila was regularly conducted to seek firewood, haul cargo and people and for pleasure excursions. Mr. Lingenfelter claims that steamboat use on the Gila was solely on Colorado River backwater, but this contradicts his own work and the evidence in the record on backwater that indicates that the backwater reached no more than 2.5 miles up the Gila (001-22, (Stantec Report)). The Gila was navigable by steamboats far above the backwater point.

Government surveyor Martineau found the River deep in September and October 1890 and more than five chains wide in some places, requiring him to swim to reach the other bank. 012, p. 47 (Littlefield 2005).

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[10] The Uncle Sam was commissioned in 1852 and sank on the Colorado in 1853.

[11] Although Mr. Lingenfelter's book fails to give specifics on the Explorer, a lithograph of the ship is reproduced on the front cover of his book. X028-13 (Lingenfelter, *Steamboats*).

[12] Mr. Lingenfelter's book contains two photos of the Aztec, one with a band on her decks, which are crowded with people. X028-13, pp. 87, 89 (Lingenfelter, *Steamboats*).

Martineau's field notes indicate that the River was 12 to 15 feet deep [near Blaisdell and Kinter, west of Dome]. Tr. 11/17/05, pp. 106-07 (Littlefield).

Segment 8 of the River was navigable in its ordinary and natural condition by canoes, flatboats and steamships. Its robust history of trade and travel, combined with unrefuted historic depth calculations, demonstrates that this Segment of the Gila was actually used for and was susceptible to use for trade and travel in its ordinary and natural condition.

V. Conclusion.

The issue before this Commission is straightforward: were all eight of the Gila River segments navigable within the parameters of *The Daniel Ball* test and the *Winkleman* holding when they were in their ordinary and natural condition such that title passed to the State on February 14, 1912? None of the other parties to this adjudication provide a meaningful alternative to the segmentation analysis of the State which divided the River in eight segments in compliance with *PPL Montana, LLC v. Montana*, 132 S.Ct. 1216 (2012). The only remaining issue for this Commission to decide is whether the Gila River, on a segment by segment basis, in its ordinary and natural condition was susceptible to navigation at statehood, all in accord with the holding of the court in *State ex rel. Winkleman v. Ariz. Navigable Stream Adjudication Comm'n*, 224 Ariz. 230, 229 P.3d 242 (App. 2010).

The hydrological data, the many historic descriptions of the River, the reported accounts of historic boating, and the fact that modern boating occurs within Segments 1, 2, 3 and 4 in a highly dammed and diverted river system, all as set forth above, demonstrate that the entire River was not only susceptible to navigation when it was in its ordinary and natural condition, but that it was actually navigated. Moreover, unlike the rivers at issue in *PPL Montana*, the River has no obstructions that always require portaging or where all or even most boaters had difficulties.

The Commission therefore should find that the entire River was both navigated and susceptible to navigation in its ordinary and natural condition.

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EXHIBIT "A"

Table 1

Comparison of Expert's Theoretical Depths[1] (feet)
In Natural (nat.) and Not Natural (not nat.) Conditions of the River

Segments[2]	**1**			**2**		**3**			**4**	**5**	**6**			**7**		**8**	
Gage[3]	Virden	York	Clifton	Clifton	Bonita Ck	Solomon	Ashurst	Calva	Coolidge Dam	Kelvin	Below Kelvin	Olberg	Above Salt Confluence	Laveen	Buckeye	Dome	Yuma
ASLD[4]	0.9 (**not** nat.)	--	1.0 (**not** nat.)	1.0 (**not** nat.)	--	1.3 (**not** nat.)	--	< 0.5 (**not** nat.)	2.7 (**not** nat. mean)[5]	1.3 (**not** nat.)	--	1.5-2.0 (nat.)[6]	--	2.5-3.0 (nat.)[7]	1.0-3.0 (nat.)[8]	2.5-3.0 (nat.)[9]	--
Burtell[10] (nat)	<1.7-1.8	<1.6	<2.0	<2.0	1.1-2.5	<2.0	<2.0	<1.8	<1.8-2.0	--	--	--	--	--	--	--	--
Gookin[11] (nat)	--	--	--	--	--	--	--	--	--	--	0.55 (error)	--	0.74 (error)	--	--	--	--
Hjalmarson[12]	--	--	--	--	--	--	--	--	--	--	--	--	--	2.5-3.0	--	--	2.5-3.0
Summary of Opinions[13]	**0.9-1.8**	**1.6**	**1.0-2.0**	**1.0-2.0**	**1.1-2.5**	**1.3-2.0**	**<2.0**	**0.5-1.8**	**1.8-2.7**	**1.3**	**0.55 (error)**	**1.5-2.0**	**0.74 (error)**	**2.5-3.0**	**1.0-3.0**	**2.5-3.0**	**2.5-3.0**

[1] These are just theoretical depths and should be used in conjunction with historical and modern accounts of the river.

[2] Segmentation based on ASLD segments.

[3] At some locations actual USGS gages exist, at other locations, experts used gage data from a different location to estimate that specific location's depth.

[4] Where indicated "not nat." ASLD's hydraulic depths are based on flows from post-statehood gage readings, when the river was largely depleted and was not in its ordinary and natural condition; ordinary and natural condition depths would be deeper. X020-79, PPT 136, 143-151.

[5] ASLD did not calculate a median flow, but did calculate a mean flow. X020-79, PPT 146 (Fuller). This would be slightly higher than an expected median in depleted, not ordinary and natural conditions.

[6] ASLD did not calculate a median flow rate at Olberg but did calculate depths based on various flows. X020-79, PPT 148 (Fuller). Olberg is nearby Gookin's "Below Kelvin" location, and as Gookin was the only expert to calculate median flow in that area, Gookin's median flow rate was used with ASLD's corresponding depth range. X009 ("Summary" table).

[7] ASLD did not calculate a median flow at this location, but did calculate depths based on various flows. X020-79, PPT 149 (Fuller). Hjalmarson was the only expert to calculate median flow in the area of Laveen (below the Salt River confluence). 023, p. 12 (Hjalmarson 2002 Rpt.). His flow rate was used with ASLD's corresponding depth range.

[8] ASLD did not calculate a median flow at this location, but did calculate depths based on various flows. X020-79, PPT 150 (Fuller). The entire range calculated is listed.

[9] ASLD did not calculate a median flow at this location, but did calculate depths based on various flows. X020-79, PPT 151 (Fuller). Hjalmarson was the only expert to calculate median flow in the area of Dome (Yuma). 023, p. 12 (Hjalmarson 2002 Rpt.). His flow rate was used with ASLD's corresponding depth range.

[10] Burtell's hydraulic depths are reconstructed maximum mean depths for the natural condition of the river. X008-2, p. 17, Table 10 (Burtell Decl.).

[11] Gookin reconstructed natural depths. X009 ("Summary" table). Gookin admitted that he miscalculated depths. Tr. 6/18/14, pp. 763-766 (Gookin). ASLD's expert Jon Fuller testified that Gookin's depths were low due to the use of an incorrect n-value of 0.02 instead of 0.035, a 75% percent difference. Tr. 6/17/14, pp 507-509 (Fuller). Robert Mussetter, an expert for the proponents of non-navigability, also testified that Gookin's depths are low based on an incorrect n-value. Tr. 8/19/14, pp. 1743-1745 (Mussetter).

[12] Hjalmarson reconstructed depths at two points: just below the confluence with the Salt (ASLD's Laveen) and at the mouth of the Gila (ASLD's Yuma). 023, p. 12 (Hjalmarson 2002 Rpt.).

[13] This summary does not necessarily reflect comparable depths because some depths are for the not natural condition of the river and some depths are for natural reconstructed depths.