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GRDA
Grand River Dam Authority

December 29, 2022

VIA ELECTRONIC FILING

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: Pensacola Hydroelectric Project, FERC Project No. 1494-438
Response to Comments on Updated Study Report

Dear Secretary Bose,

The Grand River Dam Authority (GRDA) is relicensing the Pensacola Project (FERC No. 1494) using the Federal Energy Regulatory Commission's (FERC or Commission) Integrated Licensing Process (ILP). Pursuant to the ILP, after completing its final study season, GRDA filed its Updated Study Report (USR) with the Commission on September 30, 2022.[1] On October 12 and 13, 2022, GRDA held virtual USR meetings to discuss the USR. On October 28, 2022, GRDA filed its USR meeting summary with the Commission.[2] Comments on the USR and meeting summary were filed by relicensing participants through November 29, 2022.[3]

Pursuant to section 5.15(f) of the Commission's regulations, 18 C.F.R. § 5.15(f), and in accordance with the ILP Process Plan and Schedule,[4] GRDA hereby files its Response to Comments on the Updated Study Report (Response).

Since the Commission's issuance of its initial study plan determination in 2018,[5] GRDA has now completed four years of environmental studies to support its relicensing proposal—twice the time that is allotted for studies in the ILP.[6] In

1 Updated Study Report, Project No. 1494-438, Accession Nos. 20220930-5106 & 20220930-5107 (filed Sep. 30, 2022).

2 ; Summary of Updated Study Report Meeting, Project No. 1494-438, Accession Nos. 2022-1028-5112 & 2022-1028-5112 (filed Oct. 28, 2022).

3 Comments on the USR were filed by Commission staff; Bureau of Indian Affairs; Cherokee Nation; City of Miami, Oklahoma; LEAD Agency; Quapaw Nation, and U.S. Fish and Wildlife Service.

4 *Grand River Dam Auth.*, 168 FERC ¶ 62,145 (2019) (Appendix A).

5 Study Plan Determination for the Pensacola Hydroelectric Project, Project No. 1494-438, Accession No. 20181108-3052 (issued Nov. 8, 2018).

6 18 C.F.R. § 5.15.

fact, the Commission extended the current license term for the precise purpose of accommodating this extensive environmental study program.[7]

Having now satisfied all requirements of the Commission-approved Study Plan, no further studies or other information gathering are necessary to support GRDA's relicensing application and the Commission's obligations under the Federal Power Act, National Environmental Policy Act, and other federal programs governing the Commission's issuance of a new license for the Project. As presented in the attached Response, GRDA has carefully considered all requests for modified and new studies submitted in response to GRDA's USR. None of these requests meet established regulatory criteria for justifying new or modified studies at this very late juncture in this relicensing process—which, again, has been ongoing for four years.

Instead, Commission staff and relicensing participants should focus their attention on GRDA's *Draft Application for License for Major Project – Existing Dam for the Pensacola Hydroelectric Project (FERC Project No. 1494)* (Draft Application). According to the Commission's Process Plan and Schedule, the Draft Application is to be filed by January 1, 2023, but GRDA expects to file it tomorrow.

GRDA appreciates the continuing participation in this relicensing process by Commission staff, resource agencies, Indian Tribes, and all relicensing participants and looks forward to receiving Commission staff's resolution of study disagreements by January 28, 2023, as established by the Commission's Process Plan and schedule. If you have any questions regarding the enclosed Response, please contact Jacklyn Smittle, GRDA's Director of Hydropower Projects, at (918) 981-8473, or by email at jacklyn.smittle@grda.com.

Sincerely,

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Grand River Dam Authority

Enclosure:
Response to Comments on the Updated Study Report

cc. Distribution List (attached)

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7 *Grand River Dam Auth.*, 168 FERC ¶ 62,145 (2019), *on reh'g*, 170 FERC ¶ 61,027 (2020).

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GRAND RIVER DAM AUTHORITY

PENSACOLA HYDROELECTRIC PROJECT

FERC No. 1494

RESPONSE TO COMMENTS

ON

UPDATED STUDY REPORT

December 29, 2022

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List of Abbreviations and Terms

1D	one-dimensional
ABB	American Burying Beetle
APE	Area of Potential Effect
BIA	Bureau of Indian Affairs
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHM	Comprehensive Hydraulic Model
City	City of Miami, Oklahoma
City of Miami	City of Miami, Oklahoma
Commission	Federal Energy Regulatory Commission
Corps	United States Army Corps of Engineers
CRWG	Cultural Resources Work Group
DLA	Draft License Application
DHM	Downstream Hydraulic Model
EPA	Environmental Protection Agency
ESA	Endangered Species Act
Extension Order	*Grand River Dam Auth.*, 168 FERC ¶ 62,145 (2019)
FERC	Federal Energy Regulatory Commission
FLA	Final License Application
FPA	Federal Power Act
FRM	Flood Routing Model
GIS	Geographic Information System
Grand Lake	Grand Lake O' the Cherokees
Grand River	Grand/Neosho River
GRDA	Grand River Dam Authority
H&H Study	Hydrologic and Hydraulic Modeling Study
HEC-RAS	Hydrologic Engineering Center River Analysis System
HPMP	Historic Properties Management Plan
ILP	Integrated Licensing Process
ISR	Initial Study Report
Kerr Dam	Robert S Kerr Dam (Markham Ferry Hydroelectric Project)
kW	kilowatt
LEAD	Local Environmental Action Demanded Agency, Inc.
NAVD	North America Vertical Datum of 1988
NDAA 2020	National Defense Authorization Act for Fiscal Year 2020
NGVD	National Geodetic Vertical Datum of 1929
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NWI	National Wetlands Inventory
OAS	Oklahoma Archaeological Survey
OM	Operations Model

OWRB.....Oklahoma Water Resources Board
PAD ..... Pre-Application Document
pcf..... per cubic foot
PD .....Pensacola Datum
Project ..... Pensacola Hydroelectric Project, FERC No. 1494
PRP ..... potentially responsible parties
PSP ..... Proposed Study Plan
REAS.....Real Estate Adequacy Study
Response ..... Response to Comments on the Updated Study Report
RM..... River Mile
ROI..... Region of Influence
RSP .....Revised Study Plan
RWM ..... RiverWare Model
SD2 .....Scoping Document 2
SHPO .....State Historic Preservation Officer
SMD.....Study Modification Determination
SPA ..... Southwest Power Administration
SPD ..... Study Plan Determination
STM..... Sediment Transport Model
TCP ..... Traditional Cultural Properties
THPO ..... Tribal Historic Preservation Officer
TSMD .....Tri-State Mining District
UHM ..... Upstream Hydrologic Model
USACE ..... United States Army Corps of Engineers
USFWS ..... US Fish and Wildlife Service
USGS ..... United States Geological Survey
USP ..... Updated Study Plan
USR..... Updated Study Report
VFS .....very fine sand
WSEL ..... Water Surface Elevation

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1.0 Overview

This Response to Comments on the Updated Study Report (Response) for the Pensacola Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC or Commission) Project No. 1494, presents the Grand River Dam Authority's (GRDA) response to proposed study modifications, new study requests, and comments received following the Updated Study Report (USR), the USR meetings, and GRDA's submission of the USR meeting summary, as required by 18 C.F.R. § 5.15(f). The September 30, 2022 USR builds on the September 30, 2021 Initial Study Report (ISR) and describes GRDA's overall progress in implementing its FERC-approved relicensing study plan and schedule. It contains a complete and exhaustive reporting of all studies undertaken since the ISR and is the culmination of the environmental study phase of this relicensing effort. With the filing of the USR, GRDA has now completed the Commission-approved study plan for the relicensing of the Project, including all elements of staff's November 2018 Study Plan Determination (SPD),[1] as well as its February 24, 2022 Study Modification Determination (SMD), and its May 2022 determination regarding the Sedimentation Study Plan.[2]

1.1 Project Description

The Pensacola Project is located on the Grand/Neosho River (Grand River) in Craig, Delaware, Mayes, and Ottawa counties, Oklahoma (Figure 1.1-1). The Pensacola Dam is located at river mile (RM)[3] 77 on the Grand River and creates Grand Lake O' the Cherokees, also known as Grand Lake. The Project as licensed consists of: (a) a reinforced-concrete dam with a multiple-arch section 4,284 feet long, a spillway 861 feet long containing twenty-one radial gates, a non-overflow gravity section 451 feet long, and two non-overflow abutments, comprising an overall length of 5,950 feet and a maximum height of 147 feet; (b) a reinforced-concrete, gravity-type spillway section 886 feet long containing twenty-one radial gates and located about 1 mile east of the main dam; (c) the Grand Lake reservoir, which has a surface area of approximately 45,200 acres and a storage capacity of 1,680,000 acre-feet at normal maximum water surface elevation (WSEL) of 745 feet Pensacola Datum (PD),[4] below which is known as the conservation pool; (d) six, 15-foot-diameter steel penstocks supplying flow to six turbines each rated at 17,466 kilowatts (kW) attached to six generators each rated at 24,000 kilovolt amp or 21,600 kW, and one 3-foot-diameter penstock supplying flow to one turbine rated at 500-kW3 attached to an identically rated generator, located in a powerhouse immediately below the dam; (e) a tailrace approximately 300 feet wide and a spillway channel approximately 850 feet wide, both about 1.5 miles long; and (f) appurtenant facilities.[5]

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1 Study Plan Determination, Project No. 1494-438 (issued Nov. 8, 2018) [hereinafter, 2018 SPD].

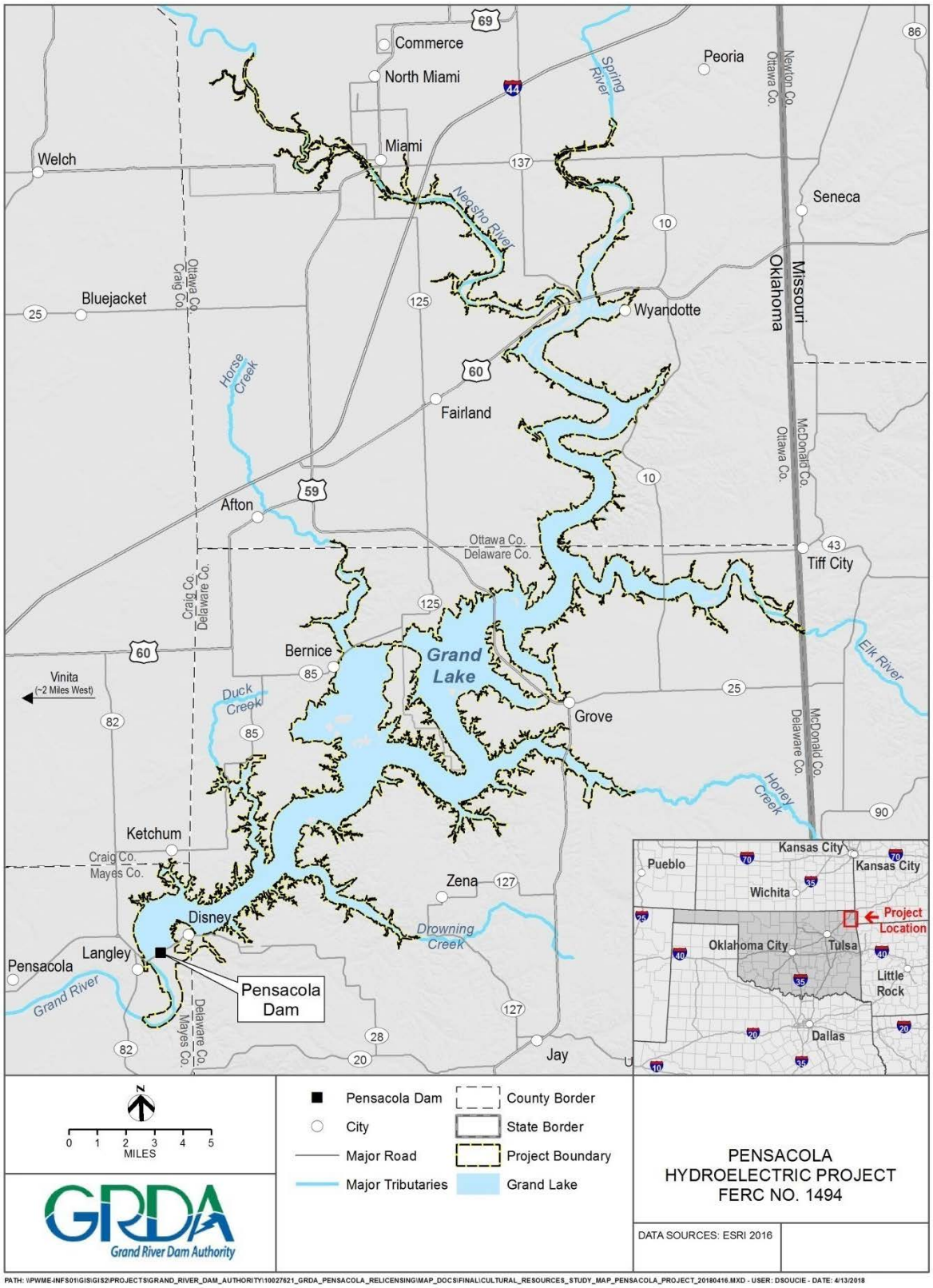
2 FERC's Determination on Requests for Study Modifications and New Studies, Project No. 1494-438 (issued Feb. 24, 2022) [hereinafter, Feb. 2022 SMD].

3 River miles in this document are based on a dataset created by U.S. Geological Survey (USGS) November 14, 2016, NHD at 1:24,000 scale, unless otherwise noted.

4 Unless otherwise noted, all elevations referenced are relative to PD. PD elevations can be converted to National Geodetic Vertical Datum of 1929 (NGVD) by adding 1.07 feet and to North American Vertical Datum of 1988 (NAVD) by adding 1.40 feet (for example, elevation 745 feet PD = 746.07 feet NGVD = 746.4 feet NAVD88).

5 *Grand River Dam Auth.*, 77 FERC ¶ 61,251, at p. 62,007 (1996).

Figure 1.1-1. Pensacola Hydroelectric Project.



The Project is owned and operated by GRDA, which is a non-appropriated agency of the State of Oklahoma, created by the Oklahoma legislature in 1935 to be a "conservation and reclamation district for the waters of the Grand River." As licensed by FERC, the Project serves multiple purposes, including hydropower generation, water supply, public recreation, and wildlife enhancement. As directed by Congress under the Flood Control Act of 1944,[6] and the National Defense Authorization Act for Fiscal Year 2020 (NDAA 2020),[7] the U.S. Army Corps of Engineers (USACE or Corps) has exclusive jurisdiction over Grand Lake for flood control purposes.

In addition, GRDA operates and maintains five FERC-approved recreation sites at the Project including: (1) Duck Creek Bridge Public Access Ara; (2) Seaplane Base Public Access; (3) Monkey Island Public Boat Ramp; (4) Big Hollow Public Access; and (5) Wolf Creek Public Access. These facilities provide public access to Grand Lake for boating, fishing, and other recreational activities.

The Project Boundary is defined by a combination of a metes and bounds description and generally follows contour elevation 750 feet. It encompasses 53,965 acres, including the 45,200 acres of the Project reservoir (at the upper extent of the conservation pool of 745 feet PD). The Project Boundary encompasses all Project facilities and works, Project recreation areas, and a shoreline buffer around the entire reservoir (generally between 745 and 750 feet PD).

1.2 Relicensing Background

The current schedule in this integrated licensing process (ILP) began with GRDA's filing of its Notice of Intent (NOI) to relicense the Project and Pre-Application Document (PAD) on February 1, 2017. Since that time, the ILP has been modified twice: first, to hold the ILP in abeyance until the outcome of a then-pending license amendment application; and second, to extend the license term to allow more time for GRDA to complete a bathymetric study requested by the City of Miami, Oklahoma (City of Miami or City), and required by the Commission in its SPD.

Following GRDA's filing of the NOI and PAD, FERC issued Scoping Document 1 on January 12, 2018; held agency and public scoping meetings in February 2018; and issued Scoping Document 2 (SD2) on April 27, 2018. In response to stakeholder comments filed on the PAD and Scoping Documents, GRDA filed its Proposed Study Plan (PSP) in April 2018,[8] in accordance with the deadline established under the Commission's August 2017 order lifting the abeyance and providing an ILP process plan and schedule.[9] Meetings to discuss the PSP were held in May 2018.

6 33 U.S.C. § 709.

7 Pub. L. No. 116-92, § 7612(b)(2).

8 Proposed Study Plan, Project No. 1494-438 (filed Apr. 27, 2018) [hereinafter, 2018 PSP].

9 Letter Order Lifting Abeyance and Providing a Revised ILP Process Plan and Schedule, Project No. 1494-438 (issued Aug. 24, 2017).

On September 24, 2018, GRDA filed its Revised Study Plan (RSP) pursuant to 18 C.F.R. § 5.13(a).[10] The RSP included significant revisions to the PSP, including three new studies addressing aquatic species, terrestrial species, and wetlands and riparian habitat. On November 8, 2018, the Commission issued its SPD, in which it approved the RSP with certain staff recommended modifications.[11] The SPD required GRDA to undertake the following studies:

- Hydrologic and Hydraulic Modeling;
- Sedimentation;
- Aquatic Species of Concern;
- Terrestrial Species of Concern;
- Wetlands and Riparian Habitat;
- Recreation Facilities Inventory and Use;
- Cultural Resources;
- Socioeconomics; and
- Infrastructure.

On May 20, 2019, GRDA requested a modification of the relicensing plan and schedule, on the basis that unanticipated delays due to the abeyance process, the time required to complete the staff-recommended bathymetry study, and the need to integrate the new bathymetric data into the Hydrologic and Hydraulic Modeling Study (H&H Study). On September 9, 2019, the Commission issued an order extending the license term and modifying the relicensing plan and schedule (Extension Order).[12] The Extension Order extended the license term to May 31, 2025,[13] waived the one-year requirement under 18 C.F.R. § 5.15(c)(1), and established the deadline for submitting the ISR as September 30, 2021.[14]

1.3 GRDA's ISR and Response to Comments

On September 30, 2021, GRDA filed its ISR for the relicensing of the Project, pursuant to 18 C.F.R. § 5.15(c)(1). In addition to providing a progress report on the completion of the studies, GRDA recommended modifications to the Sedimentation Study and Terrestrial Species of Concern Study.

GRDA also listed variances for the H&H Study, Sedimentation Study, Cultural Resources Study, and Infrastructure Study. For the Sedimentation Study, GRDA requested a schedule variance to provide the calibrated Sediment Transport Model (STM) by December 31, 2021.

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10 Revised Study Plan, Project No. 1494-438 (filed Sep. 24, 2018) [hereinafter, 2018 RSP].

11 *See generally* 2018 SPD.

12 *Grand River Dam Auth.*, 168 FERC ¶ 62,145 (2019).

13 Before FERC's Extension Order, the license term was set to expire on Mary 31, 2022. Thus, the Extension Order extended the license term by two years and two months.

14 *Grand River Dam Auth.*, 168 FERC ¶ 62,145, at Appendix A (2019).

Lastly, the ISR included an agenda for the ISR meeting required to be held within 15 days of the filing of the ISR.

Consistent with the requirements of 18 C.F.R. § 5.15(c)(2), GRDA held a series of meetings with federal and state agencies, Native American tribes, local governmental entities, Commission staff, and other relicensing participants on October 12 and 13, 2021. On October 29, 2021, GRDA filed its ISR Meeting Summary with the Commission. Thereafter, comments on the ISR and Meeting Summary were filed by Commission staff, federal and state resource agencies, Native American Tribes, and other relicensing participants.

In accordance with 18 C.F.R. § 5.15(c)(5), and within 30 days of receipt of the request for modifications and new studies, GRDA, on December 29, 2021, filed its response to comments on the ISR. In addition to the responses to comments, GRDA included an updated Grand Lake Sedimentation Report,[15] proposed several enhancements and modifications to the study plans for the final study season including a detailed proposed modified study plan for the Sedimentation Study, and an invitation for relicensing participants to attend a technical meeting about the proposed modified study plan on January 14, 2022.

1.4 Sedimentation Study Technical Meeting

On January 14, 2022, GRDA held a virtual technical meeting for the Sedimentation Study. The purpose of the technical meeting was to review the results of the Sedimentation Study since the ISR and discuss GRDA's proposed modified study plan for the study as described in its December 29, 2021 response.

Based on comments received from agencies and other relicensing participants during this technical meeting, GRDA modified its second season study plan for the Sedimentation Study from the proposal set forth in its December 29, 2021 ISR response.

1.5 Determination on Requests for Study Modifications/New studies

Comments on the ISR were submitted by the Bureau of Indian Affairs (BIA), U.S. Fish and Wildlife Service (USFWS), Cherokee Nation, Oklahoma Department of Wildlife Conservation, Oklahoma Archaeological Survey (OAS), and the City of Miami. GRDA responded to comments received on the ISR on December 7, 2021 in addition to its December 29, 2021 Response.

On February 24, 2022, pursuant to 18 C.F.R. § 5.15(c)(5), the Commission issued its SMD containing determinations on requests for modifications to the approved study plans.[16] According to section 18 C.F.R. § 5.15(d), requested study modifications must include a showing of good cause and must include a demonstration that the approved study was not conducted as provided for in the approved study plan or the study was conducted under anomalous environmental conditions or environmental conditions have

[15] In the September 30, 2021 ISR, GRDA proposed a schedule variance to provide an updated report, including a calibrated STM, by December 31, 2021.

[16] *See generally* Feb. 2022 SMD.

changed in a material way. Based on this standard, Commission staff in its February 24 SMD recommended modifications to the H&H Study, Aquatic Species of Concern Study, and the Infrastructure Study.[17]

According to section 18 C.F.R. § 5.15(e), requests for new studies must include an explanation of any material change in any applicable law or regulation, why the goals and objectives of the approved study could not be met with the approved methodology, why the request was not made earlier, significant new information has become available, and why the new study satisfies the criteria of 18 C.F.R. 5.9(b). Based on this standard, Commission staff deferred the City of Miami's request for a Contaminated Sediment Transport Study.

Finally, Commission staff's February 2022 SMD also deferred its decision regarding the Sedimentation Study. Instead, staff allowed relicensing participants 30 days to file comments on the first study season report on the Sedimentation Study, followed by a 30-day period for GRDA to respond to comments. Staff's February 2022 SMD indicated that they would issue its decision on the Sedimentation Study following their review of these comments.

1.6 Second Proposed Study Modification for Sedimentation Study

In response to the Commission's creation of additional opportunities to provide comments on the Sedimentation Study, the City of Miami filed comments on March 28, 2022.[18] GRDA responded to the City of Miami's comments in its April 27, 2022 filing.[19]

In addition to responding to the City of Miami's comments, GRDA proposed a compromise solution in an effort to resolve the difference of opinion between GRDA and the City of Miami on how best to investigate sedimentation in Grand Lake.[20] The Updated Study Plan (USP) proposed by GRDA in its April 27 filing satisfied the goals and objectives established by Commission staff for the Sedimentation Study and proposed a new approach that the STM would use the Hydrologic Engineer Center River Analysis System (HEC-RAS), but truncated to the upper reach of Grand Lake and the Neosho and Spring Rivers in which the City has expressed its greatest interest. The new approach also considered other methodologies to address the complexities of the silts and clays dominating the system.

1.7 Operations Model Technical Conference

On April 20, 2022, GRDA held a technical conference to allow relicensing participants to ask questions regarding the Operations Model (OM), discuss planned improvements to the model, and present the results of two historical validation cases recommended by the Commission.

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[17] *Id.* at 4.

[18] City of Miami's Supplemental Comments on GRDA's Untimely Request to Modify Sedimentation Study and Requests for Study Modifications to Conform with Approved Study Plan, Project No. 1494-438 (filed Mar. 28, 2022).

[19] GRDA's Response Comments on Sedimentation Study and Submission of Updated Study Plan for Approval, Project No. 1494-438 (filed Apr. 27, 2022).

[20] The Commission later refers to the Updated Study Plan in its May 27, 2022 determination letter as the second proposed plan modification.

1.8 Determination on Requests for Study Modifications to Sedimentation Study Plan

On May 27, 2022, pursuant to 18 C.F.R. § 5.15(c)(5), the Commission provided a letter containing determinations on requests for modifications to the approved Sedimentation Study plan.[21] Commission staff approved the following modifications to the Sedimentation Study Plan:

- Extend the downstream modeling limit for HEC-RAS to the U.S. Route 59 crossing at RM 100.
- Analyze the effects of sediment on storage capacity in Grand Lake using hydraulic outputs and the USACE sediment trapping efficiency calculations downstream of RM 100.
- Run the Upstream Hydrologic Model (UHM) model with the 2019 geometry to provide a baseline for comparison against predicted geometry results.
- Run the UHM using, at a minimum, starting reservoir elevations of 740, 745, and 750 feet PD to understand the effects of Project operation and predicted channel geometry on upstream water levels.
- Run the UHM with the predicted channel geometries and starting reservoir elevations of 740, 745, and 750 feet PD and using, at a minimum, the simulated 100-year inflow event and the historic July 2007 inflow event to determine operational scenarios most likely to result in significant effects on the upstream WSELs.

Commission staff rejected all other proposed modifications to the Sedimentation Study Plan.

1.9 Reporting timeline through USR Process

Following submittal of GRDA's USR, GRDA held meetings with resource agencies, Native American Tribes, Commission staff, and other interested parties to discuss the results of the USR. These meetings were held on October 12 and 13 and were conducted virtually.

Pursuant to 18 C.F.R. § 5.15(c)(3), GRDA filed a USR Meeting Summary with the Commission on October 28, 2022. Pursuant to 18 C.F.R. § 5.15(c)(4), Commission staff and interested parties had until November 29, 2022 to file requests for modified and new studies. The following entities submitted filings with the Commission in response to the URS and Meeting Summary:

- BIA
- Cherokee Nation
- City of Miami
- FERC Staff
- Local Environmental Action Demanded Agency, Inc. (LEAD)
- Quapaw Nation
- Southwest Power Administration (SPA)[22]

[21] Determination on Requests for Study Modifications for the Pensacola Hydroelectric Project, Project No. 1494-438 (issued May 27, 2022) [hereinafter, May 2022 SMD].

[22] Because SPA did not file its comment with the Commission, it is included in Appendix A.

- USFWS

In this Response, GRDA provides its technical response to requests for modified and new studies, as well as pertinent technical comments included in relicensing participants' comments. Because the sole purpose of these comments and GRDA's Response is to inform the Commission's resolution of the relicensing Study Plan,[23] this Response does not address any comments from relicensing participants related to proposed protection, mitigation, or enhancement measures; alleged Project effects; or other comments that are not relevant to the question before Commission staff at this time as to whether the Study Plan should be revised. GRDA reserves the right to respond to these other comments, as appropriate, as the relicensing process moves forward.

Pursuant to 18 C.F.R. § 5.15(c)(6), within 30 days of GRDA's response, or by January 28, 2023, FERC staff will resolve any remaining disagreements and amend the study plan as appropriate.

2.0 GRDA's Updated Study Report

Appendices 2 through 11 of the USR contain the individual reports for the ten studies identified in the Commission-approved RSP. A summary of the studies and the status of each is provided in Table 2.0-1.

Table 2.0-1. Summary of studies included in the USR.

Study	Study Consultant(s)	Study Status
Hydrologic and Hydraulic Modeling	Mead & Hunt	Study complete.
Bathymetry	United States Geological Survey (USGS)	Study complete.
Sedimentation	Anchor QEA (Freshwater Engineering) and Simons and Associates	Study complete.
Aquatic Species of Concern	Olsson & Bio-West	Study complete.
Terrestrial Species of Concern	Horizon Environmental Services	Study complete.
Wetlands and Riparian Habitat	Horizon Environmental Services	Study complete.
Recreation Facilities Inventory and Use	Mead & Hunt	Study complete.
Cultural Resources	Wood E&I Solutions Algonquin Consultants, Inc.	Study complete.

[23] *See* 18 C.F.R. §§ 5.15(f), 5.15(c)(2)-(7).

Study	Study Consultant(s)	Study Status
Socioeconomics	Enercon	Study complete.
Infrastructure	Mead & Hunt	Study complete.

3.0 Fulfillment of Study Objectives and Requirements

The following descriptions provide in detail how the objectives and requirements of each of the approved study plans have been fulfilled. The descriptions demonstrate that no further modifications to any of the approved study plans are warranted.

3.1 Hydrologic and Hydraulic Study

The objective of the H&H Study is to provide information, through modeling and mapping, to support the determination of the effects, if any, of GRDA's operations under the FERC-issued license for the Project upon several resource areas. Specifically, the H&H Study was intended to: (1) determine the duration and extent of inundation under the current license operations of the Project during several measured inflow events; (2) determine the duration and extent of inundation under any proposed change in these operations that occurs during several measured or synthetic inflow events; (3) provide the model results in a format that can inform other analyses (to be completed separately) of Project effects, if any, in several resource areas; and (4) determine the feasibility of implementing alternative operation scenarios, if applicable, that may be proposed by GRDA as part of the relicensing effort.

More specifically, the H&H Study met the objectives of the study by following the recommendations outlined in the RSP, staff's November 8, 2018 determination letter and its February 24, 2022 determination letter which recommended the following activities to be completed. In the list of activities below all items have been completed and each item identifies where in each study report the activity is discussed:

- Develop a Comprehensive Hydraulic Model (CHM) using updated 2019 bathymetry and calibrate the CHM using several historical events.
    - Section 2 of the UHM report in Appendix E-9 of the Draft License Application (DLA) explains how the UHM was developed using a HEC-RAS model, previously developed by Tetra Tech on behalf of the City of Miami, as the base for UHM development. A detailed review of Tetra Tech's model was conducted and identified ways in which the model should be improved. As part of the study, the Tetra Tech model was transformed by updating the version of HEC-RAS from a beta version to a full release version, modifying the geometry to contain larger flood events and to improve model stability and accuracy, updating bridge geometry, adding the Spring River and the Elk River, replacing the reservoir bathymetry to reflect newly surveyed conditions, and by using computational parameters recommended by the HEC-RAS development team. This resulted in an improved hydraulic model of Grand Lake and the river system upstream of Pensacola Dam.

  - Section 2 of the Downstream Hydraulic Model (DHM) report in Appendix E-9 of the DLA explains how the DHM was developed using a one-dimensional (1D) HEC-RAS model extending from just downstream of Pensacola Dam and through Lake Hudson to the Robert S. Kerr Dam (also referred to as Kerr Dam or the Markham Ferry Hydroelectric Project), where flood control operations are also regulated by USACE. The model geometry was developed from the best available topographic and bathymetric data. Bridge structures within the model were represented based on record drawings obtained from various agencies.

  - Section 3 of the UHM report in Appendix E-9 of the DLA documents how the model was calibrated using measured data, including USGS gage elevations, high water marks, and recorded data from loggers installed by the study team. Six historical events were used to calibrate the model. Manning's n-values were adjusted until simulated WSELs reasonably matched measured data. Flow roughness factors were used to fine-tune the model.

  - Section 2 of the DHM report in Appendix E-9 of the DLA documents how the model was calibrated to four historical events based on measurements at the USGS stream gage near Langley, OK (USGS Gage No. 07190500) and observed WSEL at Kerr Dam.

- Validate model results against RiverWare Model (RWM) output.
  - Section 5 of the OM report in Appendix E-9 of the DLA provides an explanation of how the OM was validated against the RWM using the common metrics of the Coefficient of Determination and the Nash-Sutcliffe Efficiency to evaluate modeled total discharge and elevation.

- Compare WSELs observed at the USGS gage on the upstream side of the dam to simulated stage hydrographs for the December 2015 and October 2009 inflow events.
  - Section 5.3 of the OM report in Appendix E-9 of the DLA provides an explanation of how the OM was validated by comparing the WSEL results to USGS gage data upstream of Pensacola Dam for the historical events recommended by the Commission.

- Run a sensitivity analysis on the effect of switching to the most recent (i.e., 2019) bathymetry data in the OM.
  - Section 5.4.4 of the OM report in Appendix E-9 of the DLA provides an explanation of how sensitivity of OM results to stage-area-storage table updates were calculated and summarizes the results.

- Perform a flood frequency analysis of peak inflow to estimate a 100-year event flow at Pensacola Dam.
  - Section 4 of the UHM report in Appendix E-9 of the DLA clarifies how a flood frequency analysis was performed for the study area using data from USACE. Data from 1940 (dam construction date) to 2019 (latest available data at time of data delivery from USACE) were

used and a graphical frequency analysis of peak inflows was performed. The analysis estimated a 100-year event flow at Pensacola Dam of approximately 300,000 cubic feet per second. The largest events of recent record did not meet or exceed the 100-year event threshold at Pensacola Dam. The July 2007 event was scaled so the peak flow at Pensacola Dam approximately matched the estimated 100-year event, with a daily inflow volume to Pensacola Dam that approximately matched the results of a statistical analysis of historical inflow volumes.

- Determine the duration and extent of inundation under the current license (baseline) operations of the Project and anticipated change in these operations that occurs during several measured inflow events starting at elevation 734 feet PD up to and including elevation 757 feet PD.
    - Sections 7 through 10 of the UHM report demonstrate how the calibrated UHM was used to analyze five historical inflow events and one synthetic event with a range of starting pool elevations at Pensacola Dam. Maximum WSEL values, inundation extents, and duration of inundation were extracted from HEC-RAS and analyzed.

    - Sections 3 through 6 of the DHM report in Appendix E-9 of the DLA demonstrate how the calibrated HEC-RAS model was used to analyze a range of operating conditions at Pensacola Dam utilizing results from the OM. Five historical flow events and one synthetic event were analyzed for a range of starting pool elevations at Pensacola Dam. An additional suite of simulations was computed to analyze an alternate operational scenario anticipated by GRDA for Pensacola Dam. Inflows to Lake Hudson for the synthetic 100-year event were derived from a statistical analysis of historical inflow volumes. Maximum WSEL values, inundation extents, and duration of inundation were extracted from HEC-RAS and analyzed.

- Report the frequency, timing (i.e., seasonality), amplitude (i.e., elevation), and duration for each of the simulated inflow events with starting elevations between 734 feet PD and 757 feet PD for the baseline analysis and under any anticipated change in operations.
    - Section 6 of the OM report in Appendix E-9 of the DLA presents the methods used to simulate baseline and anticipated operations using the OM. The OM produced stage hydrographs that were used as boundary conditions in the UHM and DHM.

    - Sections 8 and 9 of the UHM report in Appendix E-9 of the DLA demonstrate that starting pool elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream WSELs, inundation, and duration for a range of inflow events. Compared to starting elevations within GRDA's anticipated operational range, only a different natural inflow event caused an appreciable difference in maximum WSEL, maximum inundation extent, or duration. The differences in WSEL, inundation extent, and duration due to the size of the natural inflow event were orders of magnitude greater than the differences in WSEL, inundation extent, and duration due to the initial stage at Pensacola Dam. The maximum impact of nature typically ranged from over 10 times to

over 100 or even over 1,000 times the maximum simulated impact of GRDA's anticipated operational range.

- Even if extreme, hypothetical starting pool elevations outside GRDA's anticipated operational range are used, the maximum impact of nature is much greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet. The impact of nature typically ranged from 2 times to 10 or even 100 times the impact of the extreme, hypothetical starting stage range.

- Section 10 of the UHM report in Appendix E-9 of the DLA demonstrates that, compared to baseline operations, anticipated operations have an immaterial impact on maximum WSELs, maximum inundation extent, and duration.

- Sections 4 and 5 of the DHM report in Appendix E-9 of the DLA demonstrate that initial stages at the Project within GRDA's anticipated and extreme, hypothetical operational ranges have an impact on downstream WSELs and out-of-bank inundation. As the analysis shows, downstream WSELs, stages at Kerr Dam, and inundation extents are dependent on the magnitude and volume of releases from the Project, which in turn are dependent on initial stage at the Project. Out-of-bank inundation downstream of the Project is the result of spillway releases which are directed by the USACE. Under authority of Section 7 of the 1944 Flood Control Act, the Tulsa District of the USACE is responsible for prescribing and directing the flood control operations of the Project. The USACE is also responsible for directing spillway releases in accordance with the procedures for system balancing of flood storage outlined in the Arkansas River Basin Water Control Master Manual.[24] This authority is reinforced by NDAA 2020, which states: "The Secretary [of the Army] shall have exclusive jurisdiction and responsibility for management of the flood pool for flood control operations at Grand Lake O' the Cherokees."[25]

- Section 6 of the DHM report in Appendix E-9 of the DLA demonstrates that, compared to baseline operations, anticipated operations have an immaterial impact on maximum WSELs, maximum inundation extent, and duration downstream of Pensacola Dam.

- Section 11 of the UHM report in Appendix E-9 of the DLA explains the analysis for the timing (seasonality) information requested to inform other analyses of Project effects.

- Provide the model results in a format that can inform other analyses (to be completed separately) of Project effects, if any, in several resource areas including the production of Lentic and Lotic Maps for baseline and anticipated operations, as needed, in the Aquatic Species of Concern, the Terrestrial Species of Concern, and the Wetland and Riparian Study.

[24] USACE 1980.

[25] Pub. L. No. 116-92, § 7612(c), 133 Stat. 1198, 2313 (2019).

  - Section 11 of the UHM report in Appendix E-9 of the DLA explains the simulations that were run to inform other analyses to assess changes in Project effects from changing from the baseline operations to anticipated operations.

- Provide the means necessary to complete any additional return (flood) frequency analysis that may be deemed necessary following review of the USR.
  - As outlined in Section 1.3 of the UHM report in Appendix E-9 of the DLA, GRDA has included the return frequency analysis (i.e., flood frequency analysis) as an electronic attachment to the USR.

- Determine the feasibility of implementing anticipated operations scenarios, if applicable, that may be proposed by GRDA as part of the relicensing effort.
  - Section 10 of the UHM report in Appendix E-9 of the DLA compares anticipated operations to baseline operations for a suite of simulations that spanned the FERC-requested range of starting pool elevations and inflow event magnitudes. The results of the UHM demonstrate that anticipated operations have an immaterial impact on upstream WSELs, inundation, and duration as compared to baseline operations.

  - Section 6 of the DHM report in Appendix E-9 of the DLA compares anticipated operations to baseline operations for a suite of simulations that spanned the FERC-requested range of starting pool elevations and inflow event magnitudes. The results of the DHM demonstrate that anticipated operations have an immaterial impact on downstream WSELs, inundation, and duration as compared to baseline operations.

The H&H Study has been complete since the USR, and no additional work is planned.

3.2 Sedimentation Study

Since sediment transport processes in the Project area were relatively unknown, and as such, the linkages between Project operations, bed changes, and potential upstream flooding were not clearly understood, the primary objective of the Sedimentation Study was to determine the potential effect of Project operations on sediment transport, erosion, and deposition in the lower reaches of tributaries to Grand Lake upstream of Pensacola Dam. Additionally, the Sedimentation Study is designed to provide an understanding of the sediment transport processes and patterns upstream of Grand Lake on the Neosho, Spring, and Elk rivers and Tar Creek. The Sedimentation Study complements GRDA's H&H Study in determining the impact of Project operations, if any, on bathymetric changes and upstream inundation levels.

The objective of the Sedimentation Study is also to investigate the overall trends and impact of sedimentation within the Project Boundary. Specifically, this study analyzes the amount of sedimentation that has occurred in the reservoir; evaluates sediment transport, erosion, and deposition in Grand Lake and its tributaries; and characterizes the impact that sedimentation may have on flood extents and duration throughout the study area under potential future operation scenarios.

More specifically, the Sedimentation Study meets the objectives of the study by following the recommendations outlined in the RSP, the SPD, and the May 27, 2022 determination letter which recommended the following activities to be completed:

- Compile existing data and review literature on suspended sediments, sediment properties, flow, and water levels.
    - Section 2 of the Sedimentation Study report in Appendix E-7 of the DLA explains the efforts to compile existing data on suspended sediments, sediment properties, flow and water levels.

- Collect additional field measurements and data.
    - Section 2 of the Sedimentation Study report in Appendix E-7 of the DLA also outlines efforts in collecting additional field measurements and data resulting in a major change in available information that the sediment moving through the study area was dominated by cohesive material rather than sand and gravel.

- Collect sediment core samples at ten locations in the delta feature.
    - Section 2.2.5 of the Sedimentation Study describes the subsurface investigations completed in the delta feature.

- Conduct a bathymetric change analysis.
    - Section 4.5 of the Sedimentation Study report in Appendix E-7 of the DLA outlines how the quantitative analysis of sediment transport consists of using the basic data and quantitative tools to analyze the hydrology, hydraulics, and resulting effect on sedimentation in Grand Lake.

    - The analysis uses the historical bathymetric data combined with the hydraulic analysis of historical flows and reservoir operation to develop a relationship between hydraulic shear stress and sedimentation pattern. Hydraulic shear stress is the driving force behind the transport and deposition of sediment. Hydraulic shear stress is the basic variable used in many sediment transport equations for both cohesive and non-cohesive sediments to determine whether sediment is eroded or deposited, and the rate at which sediment is transported.

- Develop a STM using HEC-RAS to determine the fate of sediment upstream of RM 100.
    - Section 5 of the Sedimentation Study report in Appendix E-7 of the DLA explains how the STM was developed using HEC-RAS v. 6.2 as available from USACE. The software is one of the leading fluvial system modeling packages and is frequently used for flood evaluations, hydrologic and hydraulic studies, and sediment transport estimates. The original version of the STM as submitted in December 2021 was built in HEC-RAS v. 5.0.7. This decision to use the newer software was made to take advantage of more robust sediment transport code that was included with the software updates.

- The STM directly models the system above RM 100. Truncating the STM at RM 100 allows more accurate modeling of sediment deposition patterns by focusing primarily on the non-cohesive portion of sediment loading (and cohesive sedimentation not defined by density currents) and its impacts on water levels, which HEC-RAS was developed to evaluate. HEC-RAS is less well-suited to model the cohesive sediment that is found lower in the reservoir.

- The results of the STM were exported to a 1D UHM for hydraulic evaluation. The 1D UHM was based on the STM and was developed in HEC-RAS v. 6.2 to maintain consistency with the STM. The 1D UHM is distinct from the UHM and STM. It was run in fully unsteady hydraulic-only mode.

- Calibrate the STM to measured bed changes based on the historical surveys.
  - Section 6 of the Sedimentation Study report in Appendix E-7 of the DLA describes how the STM calibration was performed in two components. As with any model calibration procedure, it is easiest to start with the simplest format available, ensure accuracy, then increase complexity. For the STM, that meant beginning with hydraulic calibration and neglecting sediment movement, erosion, and deposition. Once the hydraulics were well-calibrated, sediment transport was added to the STM, and the sediment model parameters were finalized.

  - Sediment calibration and validation simulations ran from 1942 to 2019. Results were then compared against measured data from Real Estate Adequacy Study (REAS) surveys, the 2009 Oklahoma Water Resources Board (OWRB) survey, and USGS surveys performed in 2017 and 2019.

  - The overall goal of this step was to create a baseline geometry using the 2019 terrain dataset that could be used to predict future sediment transport, erosion, and deposition patterns.

- Complete a qualitative analysis to understand the general trends in the system and how the stream has evolved over time.
  - Section 3 of the Sedimentation Study report in Appendix E-7 of the DLA outlines in the qualitative analysis how several physical features affect the geomorphology of the rivers in the study area that either exist naturally or have been constructed. Such features include Pensacola Dam, bridges, and geologic and geomorphic features.

  - The analysis shows that sediment forming the delta feature is transported a considerable distance downstream into the reservoir. Because sands and gravels tend to drop out of the water column sooner, if a significant portion of the sediment load consisted of bed material load (sand and gravel), the delta feature would have begun forming much farther

upstream near the head of the reservoir. Therefore, the delta feature location further supports what field sampling showed: the feature consists primarily of fine sediment.

- Because bridges constrict flow, the analysis shows they typically cause backwater effects upstream of the bridge. The backwater effects include increased WSELs and reductions in velocity. At the bridges themselves, the reduced flow areas result in increased velocities. Bridges also potentially trap debris such as floating logs, which further constricts the flow and increases the backwater effect. The effects of hydraulic constrictions at bridges potentially cause sediment deposition upstream of the structure due to the reduced velocities. An extreme example of bridge encroachment on the river and floodplain is the railroad bridge just downstream of the Twin Bridges area below the confluence of the Neosho and Spring rivers. At the bridge, flow is constricted to just 20% of the river width upstream of the railroad embankment, creating significant backwater at this location.

- Vertical rock banks are evident in various reaches along the Neosho River. Reaches of river that are confined by vertical rock banks disconnect the floodplain and confine the flow to a relatively narrow cross section, which constricts the flow, potentially causing upstream backwater effects and sediment deposition.

- Separate from the geologic features, there are also flood protection levees upstream that disconnect the river from the floodplain and confine the flow to a relatively narrow cross section, which constricts the flow, potentially causing upstream backwater effects and sediment deposition.

- Submerged ridges in the now-submerged valley can act as stable points. Many of these ridges are perpendicular to downstream flow in the valley and can also cause sediment to deposit between and amongst the submerged ridges. These stable points are also capable of contributing to the creation and evolution of the delta feature that is shown in the 2019 USGS profile and the 2009 OWRB profile from RM 100 upstream to RM 122. The Ozark Uplift causes the narrowing and stable points (grade control) in the now-submerged valley. V Dendritic drainage patterns from the surrounding uplands entering the submerged valley impede the transport of sediment downstream into the lower reaches of the reservoir and cause aggradation of sediment in these sections of submerged river valley. Additional evidence of ridges composed of limestone and chert within the now-submerged valley can be observed in the grade changes of the 1938 bank line elevation profile (the other profile lines display submerged thalweg elevations not submerged valley elevations). The bank line grade change begins at RM 108 and extends upstream to approximately RM 115.

- At a confluence of a tributary, some of the sediment load from the tributary is frequently deposited, forming a tributary bar within the river. Tributary bars form because the slope of the tributary is typically steeper than the river into which it flows, so some portion of the sediment load cannot be readily transported downstream resulting in sediment deposition.

This process also occurs when the tributary transports a high sediment load or a coarser sediment load than the main river. The Ozark Uplift crosses the Neosho River at the confluence of the Elk River. This feature, combined with the steeper slope of the Elk River and the attendant potential for the formation of a tributary bar, suggest a natural tendency for sediment deposition at this location. Although these geomorphic features affect potential sedimentation patterns at this location, it is not possible to quantify these effects on the overall sedimentation pattern.

- Complete a quantitative engineering analysis of sediment transport in the study area focusing on the delta feature and downstream of RM 100.
    - Section 4 of the Sedimentation Study report in Appendix E-7 of the DLA describes the quantitative analysis and how it developed a relationship between hydraulic shear stress and the pattern of sedimentation specifically in terms of the percent of sediment passing each cross section based on the change in historical bathymetry using historical flows and operation.

    - The quantitative analysis of the future 50 years of hydrology and operation shows no significant sediment deposition on top of the delta feature that would adversely affect existing hydraulic control in upstream reaches. Most of the sediment delivered to the reservoir is transported past the top of the delta feature, farther downstream to the downstream face of the feature. Approximately 98% to 99% of the incoming sediment load is transported past RM 110. The future flows with baseline operations cause slightly reduced deposition on the downstream face of the delta feature and shift the deposition slightly downstream compared to the anticipated operation. This comparison of computed sediment deposition pattern demonstrates the very small effect of Project operations on sedimentation rates and patterns.

    - In addition, after evaluation, the results indicated that sediment deposition would occur primarily on the downstream face of the delta feature, which follows typical evolution patterns of such deposits. The delta feature is not expected to grow in height over the next 50 years.

- Characterize Sedimentation impacts on upstream water levels over a 50-year period for baseline and anticipated operations.
    - Section 7 of the Sedimentation Study report in Appendix E-7 of the DLA shows after model calibration, predictive simulations were performed to evaluate future conditions within the study area and evaluate the impact of sedimentation on upstream water levels.

    - The results indicate that the impacts of sedimentation on WSEL are immaterial in urbanized areas, regardless of loading rates, Project operations, or future versus current geometry. This finding further confirms the fact that Project operations are not a major contributor to increased upstream water levels in the City of Miami or other urbanized

portions of the study area. Downstream of Miami, sediment loading, a natural phenomenon outside GRDA's control, has the biggest impact on WSEL.

- Analyze the effects of sediment on storage capacity in Grand Lake using hydraulic outputs from the STM and the USACE sediment trapping efficiency calculations downstream of RM 100.
    - Section 4 of the Sedimentation Study report in Appendix E-7 of the DLA explains, based on the quantity of sediment computed using the sediment transport rating curves over the 50-year future scenario, approximately 109 million tons of sediment are delivered to Grand Lake. This converts to a volume of 71,587 acre-feet at 70 per cubic foot (pcf) and 86,398 acre-feet at 58 pcf (assuming a 100% trapping efficiency). This volume of sediment (storage loss from the reservoir) would be distributed according to the results of the hydraulic shear stress analysis for the anticipated (or baseline) operations. The analysis shows that virtually no sediment is deposited upstream of RM 116, approximately 10% of the sediment is deposited between RM 116 and RM 105 (Elk River confluence), approximately 22% is deposited between RM 105 and RM 100, and the remaining 68% is deposited between RM 100 and the dam.

The Sedimentation Study has been complete since the USR, and no additional work is planned.

3.3 Aquatic Species of Concern Study

The objective of the Aquatic Species of Concern Study is to gather existing and additional information on certain species of concern to assess the effects of the Project, if any, on those species. The sensitive species reviewed as part of this study are the Neosho mucket, rabbitsfoot, winged mapleleaf, Neosho madtom, Neosho smallmouth bass, and paddlefish.

More specifically, the Aquatic Species of Concern Study meets the objectives of the study by following the recommendations outlined in the RSP, the SPD, and the SMD, which recommended the following activities to be completed. In the list of activities below, all items have been completed and each item identifies where in each study report the activity is discussed:

- Gather existing information and map areas of known areas of paddlefish spawning.
    - Known areas of paddlefish spawning were identified and outlined in Figures 4 through 6 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA.

- Review existing information (including density) for Neosho mucket to characterize the physical habitat preferences and spatial and temporal patterns of the species.
    - Existing information for Neosho mucket was identified and outlined in Section 3 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA and was utilized to determine parameters for additional field studies on the species.

- Review existing information (including density) for Neosho madtom to characterize the physical habitat preferences and spatial and temporal patterns of the species.

  - Existing information for Neosho madtom was identified and outlined in Section 4 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA and was utilized to determine parameters for additional field studies on the species and it has been repeated in the USR.

- Review existing information for Neosho smallmouth bass to characterize the physical habitat preferences and spatial and temporal patterns of the species.
  - Existing information for Neosho madtom was identified and outlined in Section 4 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA.

- Review existing information (including density) for rabbitsfoot mussel to characterize the physical habitat preferences and spatial and temporal patterns of the species.
  - Existing information for rabbitsfoot mussel was identified and outlined in Section 4 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA.
- Review existing information (including density) for winged mapleleaf mussel to characterize the physical habitat preferences and spatial and temporal patterns of the species.
  - Existing information for winged mapleleaf mussel was identified and outlined in Section 4 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA.

- Section 3 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA explains how targeted field surveys for Neosho mucket were conducted in the Spring River between Warren Branch and the confluence with the Neosho River and in the Neosho River between the City of Miami and the confluence with the Spring River, after consultation with the USFWS, EcoAnalysts, and Tar Creek Trustee Council on the survey design to develop density estimates, availability of spawning habitat during the spawning season, and estimates of the distribution of the species in relevant reaches.
  - Targeted surveys for Neosho mucket were completed during the week of July 28, 2022 at thirteen sites.

  - Twelve species were collected. Bluefer (*Potamilus purpuratus*) was the most abundant species. The next most abundant species was Fragile Papershell (*Leptodea fragilis*). Threehorn Wartyback (*Obliquaria reflexa*) and Pink Papershell (*Potamilus ohiensis*) were the next most abundant species overall. No Neosho Muckets were collected during this study.

- Section 3 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA documents targeted field surveys for Neosho madtom to develop density estimates, availability of spawning habitat during the spawning season, and estimates of the distribution of the species in relevant reaches.
  - Targeted surveys for Neosho mucket were completed on the Neosho on Spring Rivers in July and August of 2022. Neosho madtoms were found to be present on the Neosho River, but not found on the Spring River.

- Included in Sections 3 and 4 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA respectively, GRDA assesses potential effects of Project operation, if any, on the Neosho mucket and Neosho madtom.
    - As described in Section 11 of the H&H Study UHM report contained in Appendix E-9 of the DLA, maps were generated from the results of the CHM to depict the change in inundation areas due to anticipated operations. The shape file information from the maps was used to overlay aerial photography to evaluate the impacts to aquatic habitat in the area where the species were identified during the surveys. Specifically, using historical data to represent normal events including 1-year flood events, the output of the H&H Study produced a comparison of the median WSEL under baseline operations versus the median WSEL under anticipated operations for the May 15 to July 8 each year.

    - The UHM also calculated section-averaged velocities for cross-sections extracted at each Neosho madtom sampling location under both the baseline and anticipated operations.

- Included in Section 4 of the Aquatic Species of Concern Study report in Appendix E-12 of the DLA, GRDA assesses potential effects of Project operation, if any, on the Neosho smallmouth bass.
    - As described in Section 11 of the H&H Study UHM report contained in Appendix E-9 of the DLA, maps were generated from the results of the CHM to depict the change in inundation areas due to anticipated operations. The shape file information from the maps was used to overlay aerial photography to evaluate the impacts to aquatic habitat in the area where the species were identified during the surveys. Specifically, using historical data to represent normal events including 1-year flood events, the output of the H&H Study produced a comparison of the median WSEL under baseline operations versus the median WSEL under anticipated operations for the May 15 to July 8 period each year (a critical time for the species).

The Aquatic Species of Concern Study has been complete since the USR, and no additional work is planned.

3.4 Terrestrial Species of Concern Study

The objective of the Terrestrial Species of Concern Study is to gather existing and additional information on certain species of concern and assess the effects of the Project, if any. The sensitive species reviewed as part of this study are the American Burying Beetle (ABB) and gray bat.

More specifically, the Terrestrial Species of Concern Study meets the objectives of the study by following the requirements of the RSP. In the list of requirements below all items have been completed and each item identifies where in each study report the activity is discussed:

- Section 4 of the Terrestrial Species of Concern report in Appendix E-20 of the DLA discusses how maps were produced that delineate the riverine reaches that would be converted to lentic habitat, over a range of inflow conditions, as the result of water level management associated with Project operations.

- As described in Section 11 of the H&H Study UHM report contained in Appendix E-9 of the DLA, maps were generated from the results of the CHM to delineate areas that would be converted to lentic habitat under the anticipated operations. The shape file information from the maps can be used to determine if areas that support ABB are impacted under the anticipated operations more than the baseline operations.

- Section 4 of the Terrestrial Species of Concern report in Appendix E-20 of the DLA assesses the degree to which anticipated Project operations would inundate the main entrance to Beaver Dam Cave and compare the frequency of inundation with that associated with baseline operations.
  - The CHM analysis shows under the anticipated operations of the Project, the Grand Lake Reservoir will exceed 746 feet PD, the reservoir elevation at which water flows into the entrance of cave DL-2 (Beaver Dam), is 16.5% under baseline operations and 16.9% under anticipated operations. The anticipated operations will cause this situation to occur 0.4% more frequently.
  - Evacuation of DL-2 generally does not begin to occur until Grand Lake reaches an elevation of approximately 751 feet PD. According to the CHM analysis, under the anticipated operations of the Project, the Grand Lake Reservoir will exceed 751 feet PD, 2.9% under baseline operations and 2.7% under anticipated operations. The anticipated operations will cause this situation to occur 0.2% less frequently.
  - A Grand Lake Reservoir elevation of 752 feet PD results in a complete inundation of the cave passage in DL-2 forcing evacuation. According to the CHM analysis, under the anticipated operations of the Project, the Grand Lake Reservoir will exceed 752 feet PD, 1.9% under baseline operations and 1.9% under anticipated operations. The anticipated operations will cause this situation to occur the same percentage of time as the baseline operations.

- Sections 3 and 4 of the Terrestrial Species of Concern report in Appendix E-20 of the DLA determined whether the secondary exit at Beaver Dam Cave suffices to provide an alternative access by gray bats to the cave (during times of inundation).
  - The average post-maternity colony size illustrates relative consistency, ranging from 15,200 to 29,905 bats with an average colony size of 19,877 gray bats for the past 10 years. Efforts should be concentrated on maintaining strong ties with the landowner of the access to cave DL-2, so that similar security efforts can continue there for the long-term. In sum, the gray bat colony sharing caves DL-2 and DL-91 each summer appears to maintain a stable population size.
  - The findings of the gray bat study indicate the secondary exit suffices to provide an alternative access by gray bats in cave DL-2. Regardless of the efficacy of the alternative access, the entrance to cave DL-2 does not become completely inundated to elevations 751 feet PD and greater (complete inundation is 752 feet PD) any more frequently under the anticipated operations than it becomes inundated under the baseline Project operations.

- Section 3 of the Terrestrial Species of Concern report in Appendix E-20 of the DLA outlines the sampling for ABB during the active season in locations that are determined in consultation with the USFWS during the first study and final study season.
    - Sampling for ABB in consultation with the USFWS on trap locations was completed 2021 and 2022. Six traps were set on July 18, 2021 and six traps were set on June 9, 2022.

- Section 3 of the Terrestrial Species of Concern report in Appendix E-20 of the DLA explains the ABB survey results. If ABB were found within the study area, GRDA would compare distributions of beetles to inundation maps generated by the CHM for characterizing the effects of Project operations. If areas that support beetles would be inundated as the result of Project operations, GRDA would coordinate with the USFWS to estimate the level of impact, if any.
    - As outlined in the Terrestrial Species of Concern report, ABB surveys were completed in 2021 and 2022 in consultation with the USFWS on the locations to place traps. No ABBs were collected during the 2021 and 2022 surveys. Therefore, it is unnecessary to characterize the effects of anticipated operations on the distribution of beetles.

The Terrestrial Species of Concern Study has been complete since the USR, and no additional work is planned.

3.5 Wetland and Riparian Habitat Study

The objective of the Wetland and Riparian Habitat Study is to gather existing and additional information to assist in the evaluation of potential Project effects to wetlands and riparian habitat.

More specifically, the Wetland and Riparian Habitat Study meets the objectives of the study by following the requirements of the RSP. In the list of requirements below, all items have been completed and each item identifies where in each study report the activity is discussed:

- Develop base maps in Geographic Information System (GIS), using source data from the National Wetlands Inventory (NWI) and potentially other resources, of wetland cover types in the Project study area. Cover type maps will be produced from existing resources that will include riparian and wetland vegetation throughout the study area.
    - Wetland and riparian habitat maps from the NWI were developed and included in the ISR.

- Use the results of the H&H Study to produce maps that depict the change in inundation areas due to anticipated operations versus baseline operations overlayed on the wetland base maps showing the current Project Boundary.
    - As described in Section 11 of the H&H Study UHM report contained in Appendix E-9 of the DLA, maps were generated from the results of the CHM to depict the change in inundation areas due to anticipated operations. The shape file information from the maps is being used to overlay wetland base maps to evaluate the impacts to wetlands are greater under the anticipated operations more than the baseline operations.

  - As described in Section 2 of the Wetland and Riparian Habitat Study report in Appendix E-11 of the DLA, overall, GRDAs anticipated operations result in water level fluctuations ranging from 742 to 745 feet PD or three feet. Whereas, baseline operations result in water level fluctuations ranging from 741 to 745 feet PD or four feet. As a result, overall impacts to wetlands are expected to be less under the anticipated operations than the baseline operations.

- Assess potential impacts to wetlands and riparian areas by identifying the extent, duration, and seasonality (timing) of inundation occurring in the Project area.
  - As outlined in Section 2 of the Wetland and Riparian Habitat Study report, using historical data to represent normal events including 1-year flood events, the output of the H&H Study produced a comparison of the median WSEL under baseline operations versus the median WSEL under anticipated operations for the growing season period (March 30-November 2). The mapped output, when overlayed on other sources of data included the NWI data, showed very small differences along shorelines that result in a net increase in wetlands because the anticipated operations have a higher median elevation during the growing season than do the baseline operations.

- Verify the accuracy of the base maps through ground-truthing if it is determined anticipated operations are impacting wetlands. Ground-truthing is only required for any major deviations from the preliminary wetland cover-type maps.
  - As discussed in Section 2 of the Wetland and Riparian Habitat Study report, no major deviations from the preliminary wetland cover-type maps that could not be resolved using other accurate desktop methods such as aerial photography were identified that required ground-truthing.

The Wetland and Riparian Habitat Study has been complete since the ISR, and no additional work is planned.

3.6 Recreation Facilities Inventory and Use Study

The goals of the Recreation Facilities Inventory and Use Study are to gather information regarding current recreational use and identify recreation resources and activities that may be affected by the continued operation of the Project. Consistent with FERC's study request, the specific objectives of the study are to:

- Characterize current recreational use of the Project area,

- Estimate future demand for public recreation use at the Project,

- Gather information on the condition of GRDA's FERC-approved recreation facilities,

- Identify any need for improvement, and

- Evaluate the potential effects of continued operation of the Project on recreation resources and public access in the Project area.

More specifically, the Recreation Facilities Inventory and Use Study meets the objectives of the study by following the recommendations outlined in the RSP and the SPD, which recommended the following activities to be completed. In the list of activities below, all items have been completed, and each item identifies where in each study report the activity is discussed:

- Conduct recreation observation surveys at the required recreation facilities.
    - Section 5 of the Recreation Facilities Inventory and Use Study report in Appendix E-22 of the DLA contains the data gathered as part of the recreation observation surveys. Surveyed recreation sites range in size, usage, facilities, and accessibility. Survey results indicate the most popular sites include three state parks (Bernice, Honey Creek, Little Blue) and one FERC-approved site (Wolf Creek). Most of these sites are relatively large, easily accessible, and have diverse facilities. Little Blue State Park has one of the highest number of visitors even though it is a smaller site. This site cannot be expanded due to topography. Little Blue State Park provides a scenic setting, and the high volume of visitors can be attributed to its seasonal access point to the river channels and water below the easternmost spillway of the Pensacola Dam system. It is a popular destination for swimming and shoreline fishing, as well as other activities.

    - The most popular recreational activities at the surveyed sites include camping, shoreline fishing, boat fishing, boating, and picnicking. Visitors and vehicles that visited the sites during the 30 survey dates were counted. The counts are approximate and were tallied at each site over the course of the 30 one-hour visits.
- Conduct recreation visitor use interviews at the required recreation facilities.
    - Section 5 of the Recreation Facilities Inventory and Use Study report in Appendix E-22 of the DLA explains the visitor use interview. Visitor interviews were conducted at sites between May and September 2020, except for Big Hollow and Willow Park. The observed use at Big Hollow is minimal; no visitors were observed during survey times and therefore no visitors could be interviewed. Willow Park is a boat launch facility, and although visitors were observed, they generally were not available for interviews as they were on the water.

    - A total of 163 visitor interviews were conducted, with the majority (23) conducted at Bernice State Park. The number of interviews at each site reflects the availability of visitors at that recreation site. Sites with a greater number of campsites had more visitors to interview, while sites with high boating usage had fewer visitors to interview, as they were typically on the water. Repeat and regular site visitors were not interviewed more than once. Most repeat visitors utilized smaller sites such as Spring River, Connors Bridge, Riverview Park, Seaplane Base, and Council Cove. First time visitors were more likely to visit larger sites such as Bernice State Park and Honey Creek State Park. Regular visitors traveled an average of 48.8 miles to recreate in the vicinity of Grand Lake. By comparison, first time visitors traveled an average of 177.06 miles. On survey days with excessive amounts of rain and/or high water, no visitors were available for interviews.

- Conduct facility condition assessments at the required recreation facilities.
    - Section 5 of the Recreation Facilities Inventory and Use Study report in Appendix E-22 of the DLA outlines the process and results of the facility condition assessment. Both a recreation facility inventory and site condition assessment were completed at each of the five FERC-approved recreation sites on either September 22 or 23, 2020. Each site condition assessment is explained and any subsequent recommendations are made.

- Collect boat launch elevation data.
    - Section 5 of the Recreation Facilities Inventory and Use Study report in Appendix E-22 of the DLA explains boat launch elevations were photo-documented at all recreation sites with a boat launch. Photos are provided showing high water and low water elevations at these sites. Twin Bridges Upper State Park, Little Blue State Park, Cherokee Main State Park, and river channel sites do not have a boat launch. The top of the reservoir conservation pool is 745 feet PD. Over the course of the survey dates, Grand Lake elevation fluctuated between 742.20 and 748.29 feet PD. All survey dates and the corresponding reservoir elevation acquired from USACE are listed. The highest reservoir elevation was recorded on May 30, 2020, and the lowest on September 26, 2020 (last survey day). Inundation occurred at various sites on May 27 and May 30, 2020. GRDA assessed boat launch elevations to evaluate the reservoir surface elevation range at which the boat ramps are accessible. At the lowest recorded water elevation during the survey of 742.2 feet PD all boat launches appeared to be accessible. At the highest and second highest recorded water elevations during the survey of 748.29 or 747.83 feet PD, nine of the sixteen boat launch sites are accessible.

- Characterize current recreation use and future demand for recreation use at the required recreation facilities.
    - Section 6 of the Recreation Facilities Inventory and Use Study report in Appendix E-22 of the DLA explains the most popular sites include three state parks (Bernice, Honey Creek, Little Blue) and one FERC-approved site (Wolf Creek). Most of these sites are relatively large, easily accessible, and have diverse facilities. Little Blue State Park has one of the highest number of visitors because it provides a unique recreational experience.

    - The most popular recreational activities at the surveyed sites include camping, shoreline fishing, boat fishing, boating, and picnicking.

    - A comparison of projected population data for Ottawa, Craig, Delaware, and Mayes Counties shows that between the years 2010 and 2020, these counties had a population growth of (4.9%), (6.1%), 2.6%, and (5.4%) respectively. If the projected population growth experienced from 2010 to 2020 continues at this rate for the region, the public can further utilize any of the surveyed recreation sites that have unused capacity, which would absorb the needs of the growing population. It is generally not feasible to expand the highly used sites due to physical and/or geographical barriers, seasonal high water events, and private

property surrounding most sites. Very few visitor comments referenced overcrowding at recreation sites. Data indicates additional recreation sites or addition of camping sites to existing state parks is not necessary.

The Recreation Facilities Inventory and Use Study has been complete since the ISR, and no additional work is planned.

3.7 Cultural Resources Study

The objectives of the Cultural Resources Study are: (1) to identify historic properties within the Project's Area of Potential Effect (APE) that are being adversely affected by Project operations (if any), including properties of traditional religious and cultural importance; and (2) to develop a Historic Properties Management Plan (HPMP) in consultation with the State Historic Preservation Officer (SHPO), Oklahoma Archaeological Survey, and Native American Tribes that provides for the long-term management of historic properties within the APE over the term of the new license.

More specifically, the Cultural Resources Study meets the objectives of the study by following the recommendations outlined in the RSP and the November 8, 2018 determination letter which recommended the following activities to be completed. In the list of activities below all items have been completed and each item identifies where in each study report the activity is discussed:

- Complete background research and archival review.
    - In preparation for the Cultural Historic Investigations and any archaeological investigations and as outlined in Volume I, II, and III of the reports, background and archival research was completed as a precursor to any field investigations such that the requirements of Section 106 of the National Historic Preservation Act (NHPA) are fulfilled.

- Complete cultural resource investigations.
    - Section 4 of the Cultural Resources Study report in Appendix E-26 of the DLA explains how Volume III of the report contained in Appendix 9 builds upon the results contained in Volume I and Volume II of the report previously submitted with the Commission as sensitive information, pursuant to 18 CFR §§ 388.112(b) and 388.113(c)(1) and have special treatment of the reports in their entirety as Privileged material by maintaining these reports in the Commission's non-public file.

    - The total survey area for this study fell within the Pensacola Project APE. The 2021-2022 investigations consisted of relocating and assessing conditions at five previously recorded sites, surveying three Late Quarternary landforms determined to have a high potential for cultural materials, survey of an unnamed island, and completion of the visual inspection of exposed bluffs along the lake edge to identify potential rockshelters and caves.

- Develop a HPMP.

- As part of the approved Cultural Resources Study plan, GRDA has been developing an HPMP in consultation with the Cultural Resources Work Group (CRWG).

- The HPMP is a compliance and management document that integrates the entirety of federal and state cultural resources program requirements with ongoing practices such as hydropower generating activities, allowing for the identification of potential compliance and preservation actions that may occur over the course of a license period. The intent is to ensure that historic properties, as that term is defined under federal law, that may be affected by the generation of hydropower are appropriately managed for scientific research, education, and cultural, religious, and traditional uses for future generations. This HPMP is designed to comply with the requirements of applicable federal and state laws and regulations, including the NHPA, Native American Graves Protection and Repatriation Act of 1990, Archaeological Resources Protection Act of 1979, and the Commission guidelines for development of the HPMP.

- The HPMP will be included in the DLA and the final HPMP is expected to be included as a requirement of FERC's new license, which will become effective following expiration of the existing license.

- Conduct Tribe-specific Traditional Cultural Properties (TCPs) inventories.
  - GRDA completed an ethnographic study designed to obtain information about the locations, types, and number of TCPs within the Project APE from members of the Native American Tribes represented among the Cultural Stakeholders. This information was collected and compiled from interviews with Tribal members. Information about TCPs within the Project APE is considered privileged and confidential at the explicit request of Native American Tribes, and access to data on the nature and locations of individual TCPs is restricted to the cultural consultant conducting the study, to each respective Tribe, and to GRDA.

With the exception of development of a final HPMP, which GRDA expects to include in the Final License Application (FLA), the Cultural Resources Study Phase I work is complete, and no additional work is planned. Based on the results of the Phase I study, the final HPMP will address the recommended Phase II field work.

3.8 Socioeconomics Study

The goal of the Socioeconomics Study is to gather, synthesize, and report on existing information necessary to qualitatively evaluate the socioeconomic effects of the Pensacola Project in the study area.

More specifically, the Socioeconomics Study meets the objectives of the study by following the requirements of the RSP and the recommendations outlined in the SPD, which recommended the following activities to be completed. In the list of activities below, all items have been completed and each item identifies where in each study report the activity is discussed:

- Describe baseline economic conditions in the Project study area.
    - Section 1 of the Socioeconomic Study Report in Appendix E-23 of the DLA presents information on socioeconomics, including land use patterns, population, and employment, of the Project and the State of Oklahoma. The region of influence (ROI) for socioeconomic impacts are defined as Craig, Delaware, Mayes and Ottawa counties, Oklahoma, where the Project is located. Socioeconomic and demographic data establish baseline conditions that consist of publicly available information about the ROI and, to provide perspective, the State of Oklahoma.

- Broadly assess the cumulative socioeconomic impacts of the Project within the study area.
    - Section 3 of the Socioeconomic Study Report in Appendix E-23 of the DLA provides a cumulative impacts analysis that involves determining if there is an overlapping or compounding of the anticipated impacts of the continued operation of the Pensacola Dam during the proposed operating term with past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions.

- Identify the socioeconomic contribution of the Project within the study area.
    - Sections 1 and 3 of the Socioeconomic Study Report in Appendix E-23 of the DLA explains the economic activity of GRDA, demonstrating that the Project continues to contribute a large portion of the GDP in the ROI as well as a measurable contribution to the State. Job opportunities, low electricity rates, recreational opportunities, and quality of life will continue to attract individuals to Oklahoma and are expected to continue into the foreseeable future. As such, GRDA has a large beneficial impact to the local economy and, to a lesser extent, to the entire State of Oklahoma. Economic impacts due to additional local economic stimulation are expected to contribute to the large beneficial reasonably foreseeable effect that has a reasonably close causal relationship associated with the continued operation of the Project.

The Socioeconomic Study has been complete since the ISR, and no additional work is planned.

3.9 Infrastructure Study

The objective of the Infrastructure Study is to determine a range of inflow conditions for which H&H Study model results show Project operations may influence the frequency or depth of flooding. Specifically, the Commission requested maps and tables identifying the frequency and depth of inundation for each item of infrastructure.

More specifically, the Infrastructure Study meets the objectives of the study by following the recommendations outlined in the SPD and the February 24, 2002 determination letter, which recommended the following activities to be completed. In the list of activities below, all items have been completed, and each item identifies where in each study report the activity is discussed:

- In consultation with stakeholders, determine a list of infrastructure types to be included in the recommended infrastructure study.
    - Section 4 of the Infrastructure Study report in Appendix E-27 of the DLA explains how GRDA compiled infrastructure locations from available data sources. The primary data source for GIS features and location information was Oklahoma Digital Data Online. Features obtained from this source were supplemented with data obtained from the USGS Geographic Names Information System, Environmental Protection Agency's (EPA) Facility Registry Service, Federal Aviation Administration, and Homeland Infrastructure Foundation Level Database.

    - GRDA also refined and supplemented the list of infrastructure, as local emergency management agencies were contacted and given the opportunity to provide information on and/or the location of infrastructure features of concern to their jurisdictions. These contacts included county, city, and tribal emergency management entities, as well as the State of Oklahoma and USACE, Tulsa District Office.

    - Additional infrastructure locations identified through coordination with emergency management entities were added to the facilities GIS data layer.

- Analyze the impact of baseline and anticipated operation on the inundation of critical upstream infrastructure by providing maps and tables.
    - Sections 5, 6, and 7 of the Infrastructure Study report in Appendix E-27 of the DLA contains this analysis. According to analysis results, only 7% of the infrastructure locations studied experience an appreciable increase in maximum inundation depth for different starting reservoir elevations within GRDA's anticipated operational range of 742 feet PD to 745 feet PD. In addition, all appreciable increases in maximum inundation depth occur during high-flow conditions when the USACE controls the flood control operations under the Flood Control Act of 1944 and its other statutory mandates, including NDAA 2020, except when the time of maximum inundation depth is solely a function of inflow event arrival time and not reservoir elevation, meaning the time of maximum depth at the infrastructure location was completely independent of the Project reservoir elevation. The inflow event moved down the river and then arrived at the infrastructure location completely independent of Project operations. Therefore, infrastructure locations are not adversely affected by GRDA's Project operations.

    - Additionally, except for two parks, a reduction in reservoir operational elevation to 734 feet PD would not decrease the loss of infrastructure use for any of the inflow events studied. The first park, Wolf Creek Park, was designed (and partially funded) by GRDA to avoid being impacted by inflow events, and only a low-lying portion of the park near Grand Lake would experience a difference in inundation for the October 2009 (3 year) inflow event. Therefore, any potential adverse impacts have already been mitigated by GRDA through their assistance in designing and funding the recent improvements to the park.

- At the second park, Grove Springs Park, low-lying portions of the park would experience a difference in inundation for the October 2009 (3 year) inflow event if the reservoir operational elevation was reduced to 734 feet PD. Decreasing the low end of the anticipated operation range from 742 to 734 feet PD, a difference of 8 feet in operational elevation, would only change infrastructure adverse impacts slightly at Grove Springs Park.

- Because infrastructure such as parks are generally sited in areas that are subject to frequent flooding and are the most-resistant type of infrastructure being reviewed in this Study, the minor potential reduction in impacts to infrastructure identified through operating at an extreme, hypothetical elevation of 734 feet PD do not significantly decrease loss of infrastructure use at the Project.

- Extreme, hypothetical operational levels up to and including 757 feet PD were analyzed. If GRDA operated at 757 feet PD, a reservoir elevation that is 12 feet higher than the top of GRDA's anticipated operational range and an elevation equal to the top of dam, infrastructure locations would be inundated by depths similar to or greater than those depths for operational levels within GRDA's anticipated operational range. Practically speaking, increasing the top of the operational range to 757 feet PD is simply not possible.

- In summary, infrastructure locations are not adversely affected by GRDA's baseline or anticipated operations of the Project, which consist of reservoir levels within an operational range of 742 feet PD to 745 feet PD. Even under the hypothetical and extreme operational level of 734 feet PD, only two parks would experience a minor decrease in the loss of infrastructure.

The Infrastructure Study has been complete since the USR, and no additional work is planned.

4.0 Response to Comments on USR and USR Meeting Summary

Pursuant to 18 C.F.R. § 5.15(f), comments on GRDA's USR and Meeting Summary were filed by Commission staff, USFWS, BIA, Oklahoma Region, the Quapaw Nation, the Cherokee Nation, the City of Miami, and LEAD. Commenting parties requested several modifications to existing studies and in three cases, requested a new study. These requests for modifications and new studies are addressed in sections 4.2 and 4.3, below. GRDA's responses to specific comments and requests for clarification appear in section 4.4, below. Section 4.1 addresses thematic comments that were raised in several relicensing participants' comments.

4.1 Response to Thematic Comments Received from Relicensing Participants

Several overarching themes emerge from relicensing participants' comments on the USR. While none of these comments were specifically framed as a request for a modified or new study, these issues were often cited by relicensing participants as a justification for a new or modified study. Because of the prominence

of these issues in relicensing participants' comments, GRDA addresses them at the outset of this Response. Where appropriate, GRDA's response to specific study requests cites back to its response to these individual thematic comments.

4.1.1 The Commission Cannot Impose Conditions Regulating Project Reservoir Levels

Several relicensing participants continue to advance the claim that GRDA must conduct additional investigations that are aimed at determining water surface level requirements at Grand Lake during the new license term—whether to address flood control, species protection, recreational interests, or otherwise. However, in NDAA 2020, Congress spoke directly and clearly on this issue:

> (A) IN GENERAL.—Except as may be required by the Secretary [of the Army] to carry out responsibilities under section 7 of the Flood Control Act of 1944 (33 U.S.C. 709), the Commission or any other Federal or State agency shall not include in any license for the project any condition or other requirement relating to—
>
> (i) surface elevations of the conservation pool; or
>
> (ii) the flood pool (except to the extent it references flood control requirements prescribed by the Secretary).
>
> (B) EXCEPTION.—Notwithstanding subparagraph (A), the project shall remain subject to the Commission's rules and regulations for project safety and protection of human health.[26]

Relatedly, Congress in NDAA 2020 expressly removed any authority for the Commission to address flood control at the Project: "The Secretary [of the Army] shall have exclusive jurisdiction and responsibility for management of the flood pool for flood control operations at Grand Lake O' the Cherokees."[27] As stated by SPA in its comments on the USR:

> [T]here were continued discussions concerning flood releases and flood control operations at Pensacola during the USR meetings. Southwestern appreciates the acknowledgement from GRDA representatives that the National Defense Authorization Act for Fiscal Year 2020 gives sole authority "for management of the flood pool for flood control operations at Grand Lake O' the Cherokees" to the United States Army Corps of Engineers (Corps). Any action involving the management of the flood pool or flood control operations will be the responsibility of the Corps.[28]

For these reasons, the Commission must reject all proposed study plan modifications and requests for new studies that are aimed at determining whether the Commission or any other regulatory agency should impose license requirements related to surface elevations at Grand Lake. Such requests lack any nexus to

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[26] Pub. L. No. 116-92, § 7612(b)(2). 133 Stat. 1198, 2312.

[27] *Id.* § 7612(c), 133 Stat. at 2313.

[28] Letter from Ashley Corker, SPA, to Kimberly D. Bose, FERC, at 1 (Dec. 16, 2022). SPA's full comment letter on the USR appears in Appendix A.

"how the study results would inform the development of license requirements," as required by Study Criterion (5).[29]

In this regard, GRDA acknowledges comments from the BIA, Eastern Oklahoma Region, indicating that the U.S. Court of Appeals for the D.C. Circuit, in its recent decision in *City of Miami v. FERC*, determined that the Commission "never actually construed" NDAA 2020 and remanded the matter to the Commission to, among other things, "interpret [NDAA 2020]."[30] While the Commission must, as the D.C. Circuit requires, interpret these provisions of NDAA 2020, GRDA maintains that its interpretation is consistent with the plain language, structure, and purpose of the statute, as well as the Flood Control Act of 1944 and other applicable federal statutes governing this Project.[31] In its comments, BIA offers no alternative interpretation.

4.1.2 The Commission-Approved Study Plan Already Analyzes a Range of Reasonable Alternatives for NEPA Purposes

Relicensing participants incorrectly argue that the current set of modeling runs required by the Commission-approved Study Plan is "insufficient to inform an adequate [National Environmental Policy Act (NEPA)] analysis."[32] For the Commission to meet its responsibilities under NEPA,[33] it is well established that it need only consider "reasonable alternatives."[34] Courts have interpreted this requirement as including only alternatives "that are technically and economically practical or feasible and meet the purpose and need of the proposed action."[35] Thus, "[t]he goals of an action delimit the universe of the action's reasonable alternatives."[36] While in some cases, an agency might be required to consider alternatives beyond its jurisdiction to implement, the U.S. Supreme Court has held that NEPA is subject to a "rule of reason," finding that "the concept of alternative must be bounded by some notion of feasibility" and that an agency's NEPA review need not consider every conceivable alternative to a proposed action.[37]

In this case, GRDA intends to operate the Project between elevations 742 and 745 PD.[38] For the express purpose of improving the Project's ability to respond to electric market conditions. As explained above, any

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29 18 C.F.R. § 5.9(b)(5).

30 *City of Miami v.* FERC, 22 F.4th 1039, 1044 (D.C. Cir. 2022); *see* Bureau of Indian Affairs, Eastern Oklahoma Region, USR Comments at 2, Project No. 1494-438 (filed Nov. 29, 2022) [hereinafter, BIA USR Comments].

31 A detailed analysis of these other statutes appears in GRDA's Response to Comments on Initial Study Report § 4.2.1, Project No. 1494-438, (filed Dec. 29, 2021) [hereinafter, GRDA's Dec. 2021 ISR Response].

32 City of Miami's Requests for Study Modifications, and Request for Additional Study, Project No. 1494-438 at 10 (filed Nov. 29, 2022) [hereinafter, City's USR Comments].

33 42 U.S.C. § 4321 *et seq.*

34 *See, e.g., Duke Energy Carolinas, LLC*, 123 FERC ¶ 61,069, at P 31 (2008) ("The range of alternatives that must be considered is a matter within an agency's discretion but must be sufficient to permit a reasoned choice of alternatives, i.e., 'reasonable' alternatives.").

35 43 C.F.R. § 46.420(b).

36 *Citizens Against Burlington v. Busey*, 938 F.2d 190, 195 (D.C. Cir. 1991).

37 *See Eagle Crest Energy Co.*, 153 FERC ¶ 61,058, at P 69 (2015) (citing *Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council*, 433 U.S. 519, 551 (1978)).

38 *See* Draft License Application, Project No. 1494-438, Exhibit A at § 2 [hereinafter, DLA].

other proposed alternative is beyond the Commission's authority to require, pursuant to both section 7 of the Flood Control Act of 1944 and section 7612 of NDAA 2020.[39] GRDA recognizes that the Commission, for NEPA purposes, may nonetheless consider reasonable alternatives beyond the confines of its authority. However, the extreme modeling scenarios sought by relicensing participants—for example, analyzing effects of an operational scheme that maintains Grand Lake surface elevations 12 to 40 feet below or up to 12 feet higher than GRDA's anticipated operations during the new license term[40]—are neither feasible nor reasonable for NEPA purposes, for the following reasons:

- These investigations would cost GRDA and its electric customers hundreds of thousands of dollars and delay this relicensing process while GRDA compiles the results of these additional modeling investigations.

- GRDA has no intention of operating the Project in this manner, and pursuant to NDAA 2020, no agency can require GRDA to do so.

- The additional analyses advocated by relicensing participants unreasonably assume that the starting reservoir levels would be extremely high (well into the flood pool that is regulated exclusively by USACE) or extremely low—levels in which the Project has never regularly operated, or reservoir levels that were abandoned 40 years ago and never implemented under the current license.

4.2 Response to Specific Requests for Study Modifications

To place relicensing participants' requested study modifications into proper context, it is important to recognize that FERC's ILP regulations require an iterative and robust process for developing the Study Plan at the outset of the relicensing process—a process that occurred with this Project in 2017-18. This process requires Commission staff to issue a SPD after: (1) an opportunity for relicensing participants to file proposed studies;[41] (2) the applicant's preparation of a PSP;[42] (3) public meetings to review the applicant's PSP;[43] (4) a 90-day period for relicensing participants to comment on the PSP;[44] (5) the applicant's preparation of the RSP;[45] and (6) an opportunity for relicensing participants to comment on the RSP.[46]

[39] *See supra* § 4.1.1.

[40] City's USR Comments at 6 (requesting modeling runs at least as low as 730 feet PD and suggesting additional runs down to 705 feet).

[41] 18 C.F.R. § 5.9.

[42] *Id.* § 5.11(a).

[43] *Id.* § 5.11(e).

[44] *Id.* § 5.12.

[45] *Id.* § 5.13(a).

[46] *Id.* § 5.13(b).

Because of the deliberately iterative, resource-intensive, and exhaustive process required by the Commission's ILP regulations for developing the Commission-approved study plan—a process that takes nearly a year to complete—the ILP regulations intentionally provide only limited opportunities at the USR stage for justifying modifications to existing studies or new studies. At this advanced stage of the ILP—in this case, after four years of environmental studies have occurred—changes to the Commission-approved study plan are appropriate only in very limited circumstances. Indeed, the Commission, in issuing its regulations implementing the ILP, emphasized the need for certainty and a schedule-driven process, providing that "as the information-gathering and studies proceed . . . the standard for new requests will increase."[47]

Section 5.15(f) of the Commission's regulations impose this heightened standard for considering changes to the FERC-approved Study Plan at this late stage of the ILP, providing that any proposal to modify a required study at the USR stage must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[48]

In this proceeding, none of the proposals for modified studies submitted by relicensing participants meet these standards. No relicensing participant demonstrated that the requested modification meets the "good cause" standard, and in no instance did the requestor demonstrate that GRDA failed to conduct the study as provided in the Commission-approved Study Plan or that the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. While in many cases the requesting relicensing participant advances several reasons for the requested modification, none of those reasons have any relevance to the regulatory standard established in sections 5.15(d) and 5.15(f) of the Commission's regulations—as discussed below. Accordingly, the Commission must reject all requested study modifications.

In sum, as a direct result of the extensive consultation that GRDA has conducted over the last 4 years—which far exceeds the requirements of the ILP regulations—it is now unreasonable to require any modified study obligations in this relicensing effort. GRDA has diligently gathered all environmental, technical, and other relevant information supporting the Commission's review under the NEPA, as well as its consultation and decision-making under the Federal Power Act (FPA), Endangered Species Act (ESA), NHPA, and other statutory requirements. As the Commission has stated: "The purpose of an approved study plan is to bring, to the extent possible, pre-filing finality to the issue of what information gathering and studies will be required by the Commission to provide a sound evidentiary basis on which the Commission and other participants in the process can make recommendations and provide terms and conditions."[49]

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47 *Hydroelectric Licensing under the Federal Power Act*, 102 FERC ¶ 61,185, at P 71 (2003).

48 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

49 *Hydroelectric Licensing under the Federal Power Act*, Order No. 2002, FERC Stats. & Regs (Regs. Preambles) ¶ 31,150, at P 140 (2003).

GRDA has met this standard in this proceeding, and it is now time for the Commission to move forward with its review and decision-making after GRDA files its final relicensing application by May 31, 2023.

4.2.1 Request to Require Study of Pre-Project Conditions

Requested Modification:

The City of Miami urges FERC to "require GRDA to examine the contribution of the Project's presence and historical impacts to the ongoing problem of unauthorized, Project-caused flooding upstream."[50]

GRDA Response:

The Commission should once again reject the City of Miami's request to require foundational changes to the H&H Study and other components of the Commission-approved Study Plan to require an investigation of environmental conditions that may have prevailed prior to the initial construction of the Project over 80 years ago.[51] The City of Miami previously raised this issue in its comments on GRDA's PSP[52] and ISR.[53] Consistent with long-standing precedent, the Commission rejected these requests.[54] In its most recent attempt to convince the Commission to disregard decades of precedent on this matter, the City of Miami raises new arguments, none of which has any merit, as discussed below. Accordingly, the Commission should not adopt this proposed Study Plan modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[55] With regard to its requested study plan modification to require an investigation of pre-Project conditions, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Indeed, GRDA could not have possibly failed to meet the Commission-approved study plan regarding this matter, as the Commission has consistently rejected the City of Miami's attempt to include a study of pre-Project conditions. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

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50 City's USR Comments at 3.

51 *Id.* at 3.

52 Comments of the City of Miami, Oklahoma on GRDA's Proposed Study Plan at 6-7, Project No. 1494-438 (filed Jul. 26, 2018).

53 Initial Comments, Request for Supplemental Comment Period, Requests for Study Modifications, and Request for Additional Study at 3, Project No. 1494-438 (filed Nov. 29, 2021) [hereinafter, City's ISR Comments].

54 Feb. 2022 SMD at B-17 ("Further, consistent with standard Commission practice, we do not require applicants to study pre-project conditions, or conduct studies of other, non-project development activities' effects on cumulatively affected resources.").

55 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

For these reasons alone, the Commission must reject the City of Miami's request for an investigation on pre-Project conditions.

2. An Analysis of Past and Cumulative Actions Do Not Mandate an Investigation of Pre-Project conditions

Undeterred by the limits of the Commission's ILP regulations, the City of Miami argues that due to what it deems an " extraordinary case," the Commission should abandon its well-established and long-standing rule that the environmental baseline for hydropower relicensing proceedings consists of current, existing conditions—and instead should require GRDA to undertake an analysis of pre-Project conditions.[56] Despite the fact that U.S. Courts of Appeals have repeatedly sustained the Commission's environmental baseline rule, the City of Miami attempts to carve out an exception in this case based, as an initial argument, on its view that this type of analysis is "necessary for the Commission to conduct the analysis required by NEPA and other governing statutes."[57]

In advancing this argument, the City of Miami is patently incorrect in asserting that a pre-Project conditions analysis "is required by NEPA and other governing statutes."[58] This is simply a false statement. It is directly contrary to the Commission's bedrock environmental baseline rule, and the City fails to cite even a single instance in which the Commission has required an investigation of pre-project conditions, or in which a reviewing court has determined that the Commission's failure to require an investigation of pre-project conditions was in error.

Contrary to the City of Miami's unsupported allegation that NEPA and other statues require an investigation of pre-Project conditions, the Commission has held that "in either relicensing an existing project or issuing an original license for an existing, unlicensed project, our review necessarily reflects the fact that the project works already exist, and are part of the existing environment."[59] Indeed, the Commission has stated that it "sees nothing . . . that requires it to pretend that current projects do not exist, or to require applicants to gather information to recreate a 50-year old environmental base upon which to make present-day development decisions."[60] Rather, it has stated that "[w]e do not agree that, in order to assess whether relicensing is in the public interest, we must first examine what environmental conditions existed before a hydroelectric project was built."[61]

The U.S. Courts of Appeals have sustained the Commission's approach, finding that the "no action" alternative in a FERC relicensing context is the existing dam operations, as opposed to conditions that

56 City's USR Comments at 3.

57 *Id.*

58 *Id.*

59 *City of Tacoma*, 71 FERC ¶ 61,381, at p. 62,488 (1995).

60 *Eugene Water & Elec. Bd.*, 81 FERC ¶ 61,270, at p.62,327 (1997).

61 *City of Tacoma*, 71 FERC ¶ 61,381, at p. 62,491 (1995).

existed prior to the dam.[62] The 9th Circuit, in *American Rivers v. FERC*, found that the use of existing environmental conditions as a baseline is consistent with "the substantive and procedural requirements of both the FPA and NEPA."[63] The D.C. Circuit affirmed the use of existing environmental conditions, and held that use of an existing condition baseline was a reasonable construction of the FPA's requirements for protection of fish and wildlife.[64]

While the City of Miami is wrong that NEPA and other governing statutes require an investigation of pre-project conditions, it is correct that NEPA requires a review of cumulative effects, "which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."[65] But this requirement is unavailing to the City of Miami's request for a Study Plan modification to require an investigation of pre-Project conditions, for several reasons:

- The Commission relies on existing information, and not new environmental studies, to address cumulative impacts not associated with Project activities.[66]

- The H&H Study of the Commission-approved Study Plan meets the requirements for a cumulative impacts analysis by analyzing water level changes during some of the most significant precipitation events ever to occur in the Grand/Neosho River watershed—events in which the Corps was directing flood control operations at the Project pursuant to its exclusive jurisdiction under the Flood Control Act of 1944. Properly understood, therefore, the H&H Study satisfies the requirement under NEPA regulations related to cumulative effects, as it has examined the effects of GRDA's operations, combined with the actions taken by the Corps pursuant to the Flood Control Act of 1944. And the thousands of pages of analysis for the H&H Study unquestionably meet NEPA requirements to conduct "a realistic evaluation of the total impacts" and to avoid "isolat[ing] a proposed project, viewing it in a vacuum."[67]

- To obtain an accurate indication of pre-Project conditions of the Grand/Neosho watershed, a modeling report is neither required nor practical. The immense uncertainty that would result from developing a set of assumptions of pre-Project geomorphology, river geometry, floodplain condition and use, and other factors would only serve to exacerbate the ongoing

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62 *Conservation Law Found. v. FERC*, 216 F.3d 41 (D.C. Cir. 2000); *Am. Rivers v. FERC*, 201 F.3d 1186 (9th Cir. 2000).

63 201 F.3d 1186, 1195-96.

64 *Conservation Law Found.*, 216 F.3d at 46-47.

65 40 C.F.R. § 1508.1(g)(3); *see* City's USR Comments at 3.

66 *See* Feb. 2022 SMD at B-17 ("Further, consistent with standard Commission practice, we do not require applicants to study pre-project conditions, or conduct studies of other, non-project development activities' effects on cumulatively affected resources."); *e.g., Idaho Power Co.*, 108 FERC ¶ 61,129, at P 41 (2004) (finding that the Commission is not required "to have perfect information before it acts"); *Eagle Crest Energy Co.*, 153 FERC ¶ 61,058 (2015).

67 *Grand Canyon Trust v. FAA*¸ 290 F.3d 339, 345 (D.C. Cir. 2002).

technical disagreements between GRDA and the City. Therefore, a historical investigation of actual flooding events in the basin is a much more reliable source for understanding the extent to which the Grand/Neosho watershed was subjected to significant flooding prior to the construction of the Project. This extensive history is detailed in section 3.4.1.3 of the DLA.

2. An Investigation of Pre-Project Conditions Will Not Assist in Development of Mitigation Measures

Next, the City of Miami, relying heavily on *American Rivers v. FERC*,[68] asserts that the Commission should require an investigation of pre-Project conditions "to improve from present baseline and mitigate historic impacts."[69] Again, this argument makes no sense, in light of the fact that the Commission for decades has been meeting its obligations under NEPA and the FPA without requiring an investigation of pre-project conditions. And *American Rivers v. FERC* does not support the City's argument, as the City fails to disclose that the D.C. Circuit in that case did not mandate an assessment of pre-project conditions, nor did the court in that case purport to reverse decades of precedent holding that existing conditions establish the environmental baseline. In fact, the D.C. Circuit in *American Rivers v. FERC* does not even cite to the two leading cases upholding the Commission's environmental baseline rule.[70]

More foundationally, the City of Miami's request for an investigation of pre-Project conditions is aimed at its desire for the Commission to impose mitigation measures for flooding damages. Yet, the Commission has no authority to address this issue. Not only does NDAA 2020 prohibit the Commission from imposing any special condition to control WSELs at Grand Lake,[71] the Commission lacks any authority under the FPA to assess damages.[72]

Finally, even if the Commission were to have authority to address flooding impacts in the vicinity of the City of Miami (which it does not), the City of Miami erroneously claims that the Commission has an obligation to "improve from the present baseline and mitigate historic impacts."[73] Even on matters where it has jurisdiction, the Commission has held that the FPA does not require that "all past damage . . . caused by a project must be 'mitigated' in a relicense proceeding."[74]

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68 *Am. Rivers v. FERC,* 895 F.3d 32 (D.C. Cir. 2018).

69 City's USR Comments at 3.

70 *See Conservation Law Found. v. FERC*, 216 F.3d 41 (D.C. Cir. 2000)*; Am. Rivers v. FERC*, 201 F.3d 1186 (9th Cir. 2000).

71 Pub. L. No. 116-92, § 7612(b)(2). 133 Stat. 1198, 2312.

72 *See, e.g., S. Car. Pub. Serv. Auth. v. FERC*, 850 F.2d 788 (D.C. Cir. 1988).

73 City's USR Comments at 3.

74 *City of Tacoma*, 71 FERC ¶ 61,381, at p. 62,492 (1995).

3. The Commission Lacks Authority to Require Assessments to Address Damages Claims Under State Law

Finally, the City of Miami's claim that an analysis of pre-Project conditions is necessary "to ensure that the Commission's economic analysis of the Project includes GRDA's liability under Oklahoma law" asks the Commission to violate the limits of its powers under the FPA, as such an investigation necessarily would require the Commission to assess property damages that the Project may cause over the next license term.[75] This, the Commission cannot do. Not only is the Commission precluded from awarding damages,[76] the U.S. Court of Appeals for the 5th Circuit recently ruled that this prohibition on damages assessments extends to the Commission's development of a record identifying potential damages claims—[77] which is precisely what the City of Miami is requesting here.

Thus, the Commission has no authority to undertake the type of analysis that the City of Miami seeks. And while the City of Miami attempts to justify its inappropriate request by claiming—without any support—that flooding litigation is unique to this Project, even a cursory review of caselaw demonstrates, once again, that the City is plain wrong.[78] Moreover, several states—notably, California—impose strict liability standards on utilities, and the City of Miami's request seeks for the Commission to become embroiled in all these cases.

In sum, the D.C. Circuit has held that section 10(c) of the FPA "preserve[s] existing state laws governing the damage liability of licensees" and that "it follows that the Commission may not encroach upon this state domain by engrafting its own rules of liability."[79] The Commission should adhere to this well-established rule by declining to require the pre-Project investigation requested by the City of Miami.

4.2.2 Modifications to Hydrologic and Hydraulic Modeling Study

4.2.2.1 Pre-Releases in Hydraulic Model Runs

Requested Modification:

The City of Miami alleges:

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[75] "[T]he Commission's required evaluation of Project economic costs and benefits and financial viability over the next 30-50 years will need to take account of the financial drain of that liability (on GRDA) and of the expense and burden of proving or defending it (by GRDA and hundreds or thousands of others)." City's USR Comments at 4.

[76] *See, e.g., S. Car. Pub. Serv. Auth. v. FERC*, 850 F.2d 788 (D.C. Cir. 1988).

[77] *Midship Pipeline Co. v. FERC*, 45 F.4th 867 (5th Cir. 2022). While *Midship Pipeline* arose under the Natural Gas Act rather than the FPA, the U.S. Supreme Court has held that the relevant provisions of the two statutes "are in all material respects substantially identical." *FPC v. Sierra Pacific Power Co.*, 350 U.S. 348, 353 (1956). The Supreme Court has thus adopted an "established practice of citing interchangeably decisions interpreting the pertinent sections of the two statutes." *Ark. La. Gas Co. v. Hall*, 453 U.S. 571, 577 n. 7 (1981).

[78] *Simmons v. Sabine River Auth, State of La.,* 732 F.3d 469 (5th Cir. 2013); *Skokomish Indian Tribe v. United States,* 410 F.3d 506 (9th Cir. 2005); *DiLaura v. Power Auth. of N.Y.*, 982 F.2d 73 (2d Cir.1992); *S. Car. Pub. Serv. Auth.,* 850 F.2d at 795; *Allen v. United States*, 572 F.2d 411 (E.D. Mich. 2021); *Sanders v. Duke Energy Carolinas LLC*, 2021 U.S. Dist. LEXIS 252318 W.D. N. Car. Feb. 11, 2021); *Funderburk v. S.C. Elec. & Gas Co.*, 2019 U.S. Dist. LEXIS 99814 (D. S. Car. June 14, 2019); *Carrington v. City of Tacoma*, 276 F. Supp. 3d. 1035 (W.D. Wash. 2017).

[79] *S. Car. Pub. Serv. Auth.*, 850 F.2d at 795.

> [M]ost of GRDA's model runs fail to model the floods at the required starting [water surface elevations (WSEs)]. Though the model runs do start at the required elevations, the combination of arbitrary starting times and rapid pre-releases modeled by the Operations Model results in the actual floods starting at lower WSEs than the model runs. The Commission should require GRDA to correct this error and model each flood at the required WSEs.[80]

GRDA Response:

The Commission should reject the City of Miami's request to require GRDA to change the starting time for each modeling run. The City of Miami has had access to these modeling reports for well over a year—dating back to the ISR—and it is raising this issue for the first time at this very late juncture in the ILP. Moreover, the error alleged by the City of Miami is non-existent, and the City of Miami failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[81] With regard to its requested study plan modification to require a change in the starting time for each modeling run, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. GRDA Committed no Error in Determining the Start Time for Initiating Modeling Runs

In response to previous comments filed by the City of Miami following last year's ISR, FERC Staff's February 2022 SMD required: "To cover the full range of operating elevations and assess Project effects we recommend that GRDA run scenarios starting at an elevation of 734 feet and extending up to and including 757 feet PD."[82] GRDA's USR presents the results of these additional modeling runs, which concluded that "[a] starting reservoir elevation difference of 23 feet resulted in no appreciable difference in maximum water surface elevation at the City of Miami."[83]

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80 City's USR Comments at 8.

81 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

82 Feb. 2022 SMD at B-13.

83 *Id.*

The City alleges that the OM "obscures the actual effects of starting WSEs"[84] and that the OM simulates "inappropriate pre-releases."[85] What the City mischaracterizes as a "pre-release" is, in reality, the simulation of USACE flood control directives. The City's allegations are based on the fact that, when the FERC-requested starting pool elevations are equal to or above the minimum flood pool elevation (745 feet PD), the OM simulates USACE-directed flood control releases from Pensacola Dam. These starting pool elevations (e.g., 749, 753, or 757 feet PD) represent conditions where a major inflow event has occurred and USACE is still in the process of drawing down the flood control pool in accordance with the Pensacola Reservoir Water Control Manual. At the same time, a second inflow event is about to pass through one of the USGS gages near the upstream end(s) of the model. While these starting pool elevations are not anticipated operating conditions, they do represent extreme initial conditions for which FERC requested analysis.

Accordingly, what the City characterizes as "inappropriate pre-releases" or an obfuscation of modeling results is the simulation of USACE exercising its jurisdiction over flood control and a representation of what happens in real life. GRDA is simulating extreme initial conditions (a second flood arriving while USACE is still performing flood control for a first flood) recommended by FERC and such initial conditions involve USACE flood control operations.

The City claims that GRDA selected "apparently arbitrary start times" which "gives the Operations Model time to draw down the reservoir, often by several feet below the nominal WSE being modeled, before the flood arrives."[86] The City's claim ignores the fact that the UHM covers 75 miles of the Grand/Neosho River. The simulation must start when the flood hydrograph enters the model domain. To aid in understanding the care that GRDA took when selecting simulation start times, Appendix B of this Response displays the inflow hydrographs that GRDA used for both the ISR and the USR. These are the same inflow hydrographs presented in Appendix C.1 of the UHM ISR and USR, with additional inflow data added prior to the simulation start time and clarifying annotations added. To allow computational alignment with the Flood Routing Model (FRM), simulations must begin at midnight. With that stipulation, the figures show that GRDA selected the most appropriate starting date for the simulations and refute the City's claim that GRDA selected "apparently arbitrary start times."

Moreover, the City's characterization that the OM simulates "inappropriate pre-releases" stands in contradiction to the description of starting WSEs provided by the City's own technical consultant, Tetra Tech. In a memorandum included as Attachment 1 to the City's USR Comments, Tetra Tech acknowledges USACE flood control operations are not pre-releases when it states:

84 City's USR Comments at 7.

85 *Id.*

86 *Id.*

> starting WSEs higher than the rule-curve may occur when a second flood follows soon after the first and the WSE has not returned to the rule curve target due to the slow drawdown of the lake.[87]

In that specific description, Tetra Tech is correct. Yet Tetra Tech disagrees with itself later in its memorandum when it makes the following inaccurate statement:

> Based on historical data, the USACE rarely prescribes drawdown prior to a flood event; thus, Mead and Hunt's hydrographs do not represent likely operating conditions.[88]

Tetra Tech inaccurately conflates a drawdown "soon after the first" of two incoming events with a "drawdown prior to a flood event." Tetra Tech goes so far as to call USACE drawdowns of the flood pool "pre-releases."[89] However, when the pool is at an elevation of 745, 749, 753, or 757 feet PD and USACE draws the flood pool down, that is not a pre-release—or anything close to it. Tetra Tech's false characterization of a post-flood drawdown as a pre-release stands in complete contradiction to the Pensacola Reservoir Water Control Manual, which states that:

1. If the pool is forecasted to exceed 745 feet PD, USACE may direct that flood control releases be made, and
2. When the reservoir exceeds 745 feet PD, releases will be made.[90]

Based on the false characterization of a post-flood drawdown as a pre-release, Tetra Tech suggests that the OM should be reformulated to purposefully eliminate USACE's ability to draw down the flood pool as this second flood approaches Pensacola Dam. Tetra Tech admits that it had to change the mathematics of the OM to artificially hold the pool steady by "modifying the rule curve timing and elevations in the Operations Model."[91] This approach by Tetra Tech, which serves only to manufacture a worst-case scenario for the City of Miami, requires ignoring the reality that USACE will operate the reservoir during flooding events in accordance with the Pensacola Reservoir Water Control Manual. In a transparent effort to skew modeling results, Tetra Tech's approach denies the reality that when a natural flood approaches the study area, USACE performs flood control. USACE regularly assesses data from upstream USGS gages; to pretend that USACE would only begin flood control operations when the flood wave hits the upstream face of Pensacola Dam requires an inaccurate and irresponsible suspension of reality.

In contrast to Tetra Tech's analysis, GRDA faithfully applied the required methodology in the Commission-approved Study Plan. GRDA initiated modeling runs at an appropriate time, based on the reality that USACE begins directing flood control operations when the WSE at Grand Lake is forecasted to exceed 745

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87 *Id.* at Attachment 1, p. 6.

88 *Id.*

89 *Id.*

90 USACE 1992.

91 City's USR Comments at Attachment 1, p. 6.

feet PD—and not when the flood wave reaches Pensacola Dam, as advocated by the City of Miami. Far from an "inappropriate pre-release" as alleged by the City of Miami, GRDA's modeling result simply reflect the reality that USACE begins to exercise its flood control authority once water is on the ground and moving through the system.

Thus, the claims of excessive differences in flood water depths claimed by the City of Miami are simply incorrect, as its methodology is dangerously flawed and ignores reality.[92]

4.2.2.2 Use of a "More Realistic" 100-year Hydrograph

Requested Modification:

The City of Miami requests a modification to GRDA's study to use what the City of Miami characterizes as a "more reasonable 100-year flood scenario,"[93] Instead of the 100-year event already approved by the Commission.

GRDA Response:

The Commission should reject the City of Miami's request to modify the 100-year event. The City of Miami's request fails to meet the ILP regulatory standard for justifying a modification to the Commission-approved Study Plan, and the City of Miami has had ample opportunity throughout the study process to provide input into the establishment of the 100-year event.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[94] With regard to its request to change the 100-year flood event, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

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92 *Id.* at 7 (claiming water depth differences ranging from 0.43 to 1.7 feet).

93 *Id.* at 8.

94 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

2. The City of Miami Had Ample Input into Establishment of the 100-Year Flood Event

With regard to the substance of the City of Miami's claim that that it has now "developed a more reasonable 100-year hydrograph, based on FEMA's 100-year flow on the Neosho River, and distributing remaining flows across other tributaries to reach GRDA's calculated 100-year total reservoir flow,"[95] this claim undermines the Commission's determination earlier this year that approved GRDA's methodology:

> GRDA's approach is consistent with typical hydrological procedures where inflow estimations are made using a modeled volume-versus-peak flow relationship. In addition, we reviewed USGS flow data to validate the 100-year inflow value developed by GRDA and found that 300,000 cfs is a reasonable estimate.[96]

Moreover, the Commission made this determination following a robust exchange between GRDA and the City of Miami on this exact topic:

1. In its March 30, 2021 Model Input Status Report and associated Technical Conference on April 21, 2021, GRDA presented its inflow analysis, which included the 100-year peak flow, based on the July 2007 event.[97]
2. In its comments filed with FERC on June 23, 2021, the City of Miami noted that the entire July 2007 hydrograph was scaled and thus recommended changes to the hydrograph volume.[98]
3. In the ISR, GRDA presented a revised 100-year hydrograph that incorporated the City of Miami's recommendation by replacing the simple scaling with a volume adjustment supported by robust scientific methodology.[99]
4. In its comments on the ISR, the City of Miami reiterated 100-year hydrograph scaling complaints *that GRDA already applied in the ISR*.[100]
5. In its response to comments on the ISR, GRDA noted that it had already applied the robust volume adjustment.[101] Furthermore, as a courtesy to the City, GRDA simulated the inflow hydrographs from FEMA's 2019 study, which contains methodological flaws documented by GRDA but was preferred by the City. The simulation results, documented in Appendix B of GRDA's response, showed no appreciable difference in WSE in the City of Miami.[102]
6. In its February 24, 2022 determination, FERC recognized the City's requests, recognized that "GRDA's approach is consistent with typical hydrological procedures where inflow estimations are

[95] City's USR Comments at 8.

[96] Feb. 2022 SMD at B-15.

[97] *See* GRDA's Model Input Status Report § 5, Project No. 1494-438 (filed Mar. 30. 2021).

[98] *See* the 17th comment in Tetra Tech's redlined version of the Model Input Status Report, which is also reprinted in Appendix A of GRDA's ISR.

[99] Initial Study Report, Project No. 1494-438, § 5 (filed Sep. 30, 2021) [hereinafter, ISR].

[100] City's ISR Comments § III.2.

[101] GRDA's Dec. 2021 ISR Response § 4.3.1.9.

[102] *Id.* at Appendix B.

> made using a modeled volume-versus-peak flow relationship" and found GRDA's estimate of peak 100-year flow reasonable.[103] Lastly, FERC stated that "we do not recommend that GRDA repeat its 100-year flood analysis or change its methodology at this time."[104]

Unsatisfied with the Commission's decision, the City of Miami continues to claim that the approved 100-year flood hydrograph is "more like a 1,000-year flood."[105] This misleading and inaccurate claim is based solely on the City of Miami's continued refusal to acknowledge FERC's approved Study Plan, which expressly required that recurrence intervals (i.e., flood frequencies) were to be calculated *at Pensacola Dam* and not the *USGS gage near Commerce* on the Neosho River.[106]

However, for clarification, GRDA has performed a comparison using Tetra Tech's reported WSE value. Using this inflated WSE difference in Miami of 0.15 feet, which is based on a methodologically flawed 100-year hydrograph, the impact of nature ranges from 139 to 213 times the impact of Project operations, which are under USACE control. This is for an extreme difference in starting pool elevations of 16 feet (750 feet PD minus 734 feet PD). Thus, even if FERC were to reverse its determination and instruct GRDA to use Tetra Tech's methodologically flawed 100-year hydrograph, the study conclusion would not change. Therefore, there is no reasonable basis for the Commission to reverse course at this late period and require the time and expense of multiple modeling runs that will not have any impact on the overall modeling results.

4.2.2.3 "Materiality" Threshold and Study Conclusions

Requested Modification:

In comments at the USR meetings and in their filed comments, the City of Miami takes issue with GRDA's characterization that Project operation has "an immaterial impact" on upstream water elevations.[107] Rather, the City claims that GRDA and its consultants "lack any principled basis for their label of 'immaterial'" and attempted what the City deems "a pseudo-quantitative justification for this label, based on an irrelevant comparison of flooding difference caused by operations within GRDA's three-foot 'anticipated operations' range against the difference between the smallest and largest floods modeled, which it calls 'the impact of nature.'"[108] The City of Miami therefore requests that "the Commission should require GRDA to explain the basis for (or else omit) un-grounded terms like "immaterial" from the purported technical conclusions of its study."[109]

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103 Feb. 2022 SMD at B-15.

104 *Id.*

105 City's USR Comments at 8.

106 *See* 2018 RSP at Appendix B § 1.

107 City's USR Comments at 9.

108 *Id.*

109 *Id.* at 10.

GRDA Response:

The Commission should reject the City of Miami's request. After intense study of this issue for over four years, GRDA has implemented the most robust and accurate model ever produced for the Grand/Neosho watershed—under intense scrutiny and input from Commission staff, the City of Miami, and other relicensing participants. The results of this effort are consistent, obvious, and compelling: GRDA's operations of the Project do not materially contribute to upstream flooding in Miami. This conclusion is strongly buttressed by the historical record that predates Project construction.[110]

While the City of Miami obviously does not accept this reality, it is much too late for it to disavow the results—after GRDA began this effort using the exact HEC-RAS model that the City of Miami's own consultants had developed, and then refined and improved the model with strong input from Commission staff, the City of Miami and its consulting team, and other relicensing participants. And the City's last-ditch effort to criticize the modeling work as "pseudo-quantitative" is absurd.[111] The Commission-approved Study Plan never required GRDA to develop any sort of standard for determining materiality on this matter,[112] and the City of Miami never asked the Commission to impose such a standard until it became obvious that the modeling work was producing quantitative results that are inconsistent with the City of Miami's false narrative regarding upstream flooding.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[113] With regard to its request for the Commission to require GRDA to establish an "objective threshold or standard" for characterizing modeling results,[114] the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

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110 DLA § 3.4.1.3.

111 City's USR Comments at 9.

112 Of course, the Commission did require GRDA to develop a definition of "material difference" with regard to the upstream extent of model boundaries, which is now defined in Section 6 of the UHM USR per FERC's 2018 SPD. Tellingly, the Commission never required GRDA to develop, in consultation with other relicensing participants, a similar definition for the contribution of flooding in upstream communities.

113 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

114 City's USR Comments at 9.

2. GRDA's Interpretation of Modeling Results Is Strongly Supported by Voluminous Quantitative Data

In response to the City of Miami's claim that GRDA's interpretation of modeling results is somehow a "pseudo-quantitative justification" is both inaccurate and disingenuous.[115] Based on dozens of model simulations, GRDA aptly and reasonably concluded that there is an immaterial or *de minimis* influence of Project operations between the elevations of 742 and 745 feet PD on upstream flooding. These simulations, using starting pool elevations between 734 and 757 feet PD and a range of inflow magnitudes from 1-year to 100-year, were performed using the most detailed, robust, and comprehensive model ever built for the Grand-Neosho River. That model, on which Commission staff and both GRDA's and the City's consultants have had input, shows quantitatively that the flooding in the City of Miami is caused by nature and not Project operations. Simulation results showed that the impact of nature is 10, 100, or even 1,000 times greater than any maximum simulated impact of USACE-directed flood control operations.[116]

When formulating conclusions, GRDA relied on WSELs, areas of inundation, and durations of inundation—all of which are quantitative, not "pseudo-quantitative," values. In its February 2022 SMD, FERC required GRDA to study (1) a range of starting pool elevations and (2) a range of natural inflow events.[117] Any potential impact that Project operations (even if they are flood operations controlled by USACE and not GRDA) can have on upstream WSELs, areas of inundation, and durations of inundation must be considered in the context of the impact that nature has on those same metrics.

Regarding the City's claim that GRDA's determination of immateriality "pre-dates all the work done to update the ISR,"[118] GRDA conducted the work that FERC required in its February 24, 2022 SMD, including new simulations performed with the OM and the UHM. The numerical results of the entire updated library of simulations were used to reevaluate the conclusions made at the ISR, and nothing in the expanded library of simulations led to a different conclusion than GRDA reported in its ISR. During the USR meeting, GRDA's position was understood such that the following characterization was offered by one participant to clarify GRDA's position for the City: impacts due to nature are so extreme that all analyses proved the effect of operations was comparatively minor.

Similar to the City's statement that "[t]his exceedance constitutes unauthorized flooding,"[119] its repeated attempt to claim that "unauthorized flooding" is due to "operation of the Project" is founded on the false assumption that GRDA is causing flooding—an assumption that both the modeling work and the historical record have proven to be incorrect. All quantitative and historical evidence demonstrates that nature—not Project operations—is the cause of flooding.

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115 *Id.*

116 GRDA's Updated Study Report and Request for Privileged Treatment of Cultural Resources Information, Project No. 1494-438, § 4.1.2 (Sep. 30, 2022) [hereinafter, GRDA's 2022 USR]; *see also id.*, Appendix 2, §§ 9, 12.

117 Feb. 2022 SMD at B-8.

118 City's USR Comments at 9.

119 *Id.* at 7-8.

The City is correct, however, when it states that "no two floods are the same," a statement which recognizes the impact of nature on flooding. However, the City then leaps to the bizarre conclusion that "the next flood will mark out another band of flooded places that different Project operational decisions might have protected."[120] The City seems oblivious that the entire purpose of the dozens of simulations was to determine if "different Project operational decisions" could impact upstream flooding. That is why those simulations used various starting pool elevations. And the quantitative results of those simulations showed that Project operations have an immaterial or *de minimis* influence on every studied metric, with nature controlling by a factor of 10, 100, or 1,000.

4.2.2.4 Analysis of Physically Feasible Project Operations

Requested Modification:

The City's Comments on the USR contend that "the Commission should require GRDA to revise its flood modeling," including by analyzing "at least the range of physically feasible Project operations."[121]

GRDA Response:

The Commission should reject the City of Miami's request to modify the Study Plan by requiring GRDA to "a wider range of potential alternatives," including "the range of physically feasible Project operations."[122] The City of Miami's request fails to meet the ILP regulatory standard for justifying a modification to the Commission-approved Study Plan. Moreover, the existing Study Plan requirements, which GRDA has satisfied, already provide a reasonable range of relicensing alternatives to meet FERC's NEPA obligations.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[123] With regard to its request to require a wider range of potential alternatives, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

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120 *Id.* at 9.

121 *Id.* at 10.

122 *Id.*

123 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

2. GRDA Has Already Analyzed a Broad Range of Starting Pool Elevations

The City is mistaken in its claim that that GRDA did not "analyze the feasibility of any alternate operation scenarios."[124] The FERC-approved Study Plan required GRDA to simulate a broad range of starting pool elevations, each of which represents an alternative to GRDA's proposed operations with respect to flood routing.[125] In fact, City of Miami presented Figure C.10 from the UHM USR Appendix C in its comments.[126] Each stage hydrograph on this plot represents an alternative analysis. All 71 plotted series in Appendix C.2 of the UHM USR represent a library of alternative analyses. Thus, the City of Miami cannot reasonably claim that the Commission has not required GRDA to analyze a reasonable set of alternative operational scenarios.

Relatedly, the City of Miami is wrong in asserting that GRDA did not cover "the impacts of recent rule curve changes."[127] GRDA's simulated baseline operations included seasonal target elevations as low as 741 feet PD. GRDA simulated both (1) baseline and (2) anticipated operations over a broad range of starting pool elevations. Through these analyses, GRDA assessed a reasonable range of operational levels. Indeed, for over 40 years, GRDA's minimum operating elevation has generally remained between 741 and 742 feet PD, including for the entirety of the current license term.[128] Natural inflows from the 10,345 square mile watershed cause the reservoir to rise up to 745 feet PD on an almost annual basis.[129] More importantly, 745 feet PD is the bottom of the flood pool and intensive environmental review and public comment though the entire Arkansas River watershed would be required for the USACE to make these adjustments—which likely would involve Congressional oversight as well. Therefore, lowering the targeted minimum operating elevation to 730 or 734 feet PD—or even lower[130]—as requested by the City of Miami,[131] would increase the annual range of pool elevation fluctuation. That increased fluctuation would result in negative impacts on (1) the majority of, if not all, environmental categories because both the environment and the public have adapted to a minimum operating elevation in the range of 741 to 742 feet PD over the last 40 years, and (2) other Project uses.

Examples of adverse impacts resulting from increased annual fluctuation and overall reduction in reservoir acreage include:

1. Increased shoreline and wind erosion on exposed shorelines and reservoir bottom,

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[124] City's USR Comments at 10.

[125] *See* Feb. 2022 SMD at B-8; 2018 SPD at B-3.

[126] City's USR Comments at 7.

[127] *Id.* at 10.

[128] *See Grand River Dam Auth.*, 160 FERC ¶ 61,001 (2017); *Grand River Dam Auth.*, 77 FERC ¶ 61,251 (1996); *Grand River Dam Auth.*, 59 FERC ¶ 62,073 (1992).

[129] *See* USGS, Lake O' the Cherokees at Langley, OK, https://waterdata.usgs.gov/monitoring-location/07190000/%23parameterCode=00065&period=P7D.

[130] City's USR Comments at 6 (stating that "GRDA can apparently control reservoir levels much lower, citing elevation 705 feet PD as the top of the inactive pool).

[131] *Id.* at 18.

2. Reduced overall wetland and riparian habitat,
3. Reduced overall aquatic habitat,
4. Reduced recreation potential for recreation including boating and fishing,
5. Reduced overall power generation,
6. Reduced efficiency of power generation due to reduced available head,
7. Reduced economic health,
8. Reduced navigational safety,
9. Reduced storage for municipal water supply, and
10. Reduced protection for archaeological resources.

For these reasons, studying a target minimum pool elevation of 730 or 734 feet PD—elevations that are, respectively, 11 and 7 feet below the minimum pool elevation used during the last 40 years of operation, and elevations that are *not* being proposed as a minimum operating elevation by GRDA—is both extreme and unreasonable.

Contrary to the City of Miami's unreasonable request, previous decisions by the Commission, most recently the 2017 Order Amending License and Dismissing Application for Temporary Variance, found that maintaining the Pensacola Reservoir at an elevation of 742 feet PD had generally positive impacts for a majority of environmental resource categories, as opposed to allowing the reservoir to drop below 742 feet PD.[132]

3. Increasing the Number of Modeling Runs Is Not Required to Meet NEPA Obligations

Finally, as explained in section 4.1.2 above, the City of Miami is incorrect in asserting that additional modeling runs are needed to meet the Commission's obligations to consider reasonable alternatives under NEPA.[133]

4.2.3 Modifications to Sedimentation Study

4.2.3.1 Model Potential Impact for Increased Sediment Deposition if Bedload Sediment is Transported

Requested Modification:

The City takes issue with GRDA's characterization that bedload sediment transport is virtually absent in the Project's tributaries. Rather, it states:

> At a minimum, the conflicting field evidence should have led GRDA to evaluate the impacts if it is incorrect in its assumption of no bedload transport. It could have developed an alternative incoming sediment load rating curve with typical amounts of sand and gravel

[132] *Grand River Dam Auth.*, 160 FERC ¶ 61,001, at P 50 (2017).

[133] City's USR Comments at 10.

> and run the STM to determine whether such material would be likely to continue building the hump (and exacerbating upstream flooding) or not. Instead, it ignored that possibility and proceeded to model only the one assumption (no incoming bedload material) least likely to show any Project operational impact on upstream flooding.[134]

GRDA Response:

The Commission should reject the City of Miami's request to develop an alternative incoming sediment load rating curve, which the City raises for the first time at this very late juncture in the ILP. Moreover, the error alleged by the City of Miami is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause and must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[135] With regard to its requested study plan modification to model the potential impact of the potential increased building of the delta feature, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. GRDA Committed no Error in Determining that there is No Appreciable Movement of Bedload Sediment in the System

In addition to not meeting the regulatory criteria, the City's requested modification is nothing more than a continuation of its groundless claims that all sediment present in the system is also mobile. Contrary to the City's allegations, GRDA is not assuming the "bedload transport is virtually absent."[136] Rather, GRDA has measured the bedload sediment transport, and the data establish that it is virtually absent. The City continues to make this assertion and characterize GRDA's findings as flawed, yet the City has failed to provide any evidence to support their claims beyond the claim that it exists on the bed and therefore must be moving.

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134 *Id.* at 12.

135 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

136 City's USR Comments at 11.

A) As stated in the USR, GRDA found coarse sand and gravel in grab samples from the system.[137] That this sediment exists in the system has never been in dispute. The question is simply whether that sediment is moving in the study area. FERC has already ruled that the field sampling efforts to collect bedload transport measurements were sufficient,[138] and the City has provided no evidence of their own that contradicts the field measurements made by GRDA. In other words, this debate is not a matter of GRDA ignoring data; this is a matter of the City's refusal to accept data collection that FERC has approved, without providing its own data in response.

B) GRDA included the sandy portion (consisting only of very fine sand, or VFS) of the sampling efforts in the sediment rating curves, so it has been accounted for in all modeled scenarios. Further, the presence of sand in those samples does not prove that bedload is moving in large quantities; it shows that very fine sand is moving in measurable quantities in the suspended portion of the sediment. The model includes this information but did not specifically add coarser, unmeasurable sediment to the rating curves because doing so would rely on conjecture rather than actual field measurements.

C) GRDA recorded several pieces of gravel and/or sand in the bedload sampling efforts. It was not even a sufficient quantity to measure, let alone enough to justify adding large quantities of gravel and sand to the modeled sediment rating curves at the STM boundaries.

D) The City's claims are misleading. While it is true that coarser sediment is occasionally mobilized, the total amount moved in the calibration run was approximately 2.19 million tons. During that same calibration run, approximately 380 million tons of sediment moved down the Neosho River. The portion of the sediment load the City continues to argue about (while providing no evidence) comprises just 0.6% of the total sediment load on the Neosho. The quantity of material coarser than the very fine sand moving into the STM throughout the *Anticipated Operations* scenario is approximately 21,130 tons. The total quantity of sediment entering the Neosho River at the upstream boundary is approximately 261 million tons. In the first year of the simulation, approximately 6,000 tons of material coarser than very fine sand wash downstream from the upstream model extent while 1.7 million tons of sediment were supplied at the boundary. To say that the coarse material is a significant portion of the overall sediment load is misleading, at best.

   The delta feature at issue in the City's comments stretches across roughly 22.1 miles of the river and the channel width in that location is approximately 650 ft. If, as the City posits, the Neosho River *were* able to carry the 2.19 million tons of coarse sediment to the delta feature and deposit it there (which the data demonstrates it does not), the total depth would be just 0.6 ft. The coarse material does not play a significant role in sedimentation within the study area.

[137] USR § 2.3.2.

[138] May 2022 SMD at B-8.

3. Additional Fieldwork Conducted by GRDA Following the USR Confirms its Conclusions that there is No Appreciable Movement of Bedload Sediment in the System

While the findings of the Sedimentation Study fieldwork (USR Section 2.3.4.2), Quantitative Analysis (USR Section 4.5.1), and STM (USR Section 7) all show limited mobilization of gravel and other coarse sediments, GRDA also completed additional fieldwork in November 2022 to evaluate whether sand and gravel were moving downstream in appreciable quantities. A more detailed account of the fieldwork and findings is available in Appendix C.

This effort involved a bathymetric survey near a low head dam at the fairgrounds in the City of Miami (approximately RM 135.25). The dam was constructed in 1923, which means it has been in place nearly 20 years longer than Pensacola Dam. During that time, the dam has acted as an obstacle to downstream transport of coarse material. If, as the City claims, a significant portion of sand and gravel is moving through the Neosho River, the upstream face of the dam would be filled in by the coarse sediment, and it would be approximately the same elevation as the dam crest.

The survey results showed that the dam crest protrudes significantly from the bed of the river. This provides yet another dataset indicating that most of the sediment transported by the Neosho River is indeed finer material which can be entrained and washed over the low head dam. This finding is not surprising, as it agrees with all the other information currently available regarding bedload transport. And, once again, this additional dataset contradicts the City's speculative claims to the contrary.

The survey team also used a 3-inch vibracore at seven locations upstream of the dam. The team was unable to recover any sediment at two of the seven locations, and the remaining five locations had a depth of refusal less than 1 foot. One core showed primarily finer material, but the rest consisted of coarser sand and gravel (sample photo of Core 4 below). Most showed signs of natural armoring, meaning surface layers are coarser material that is less mobile than those underneath. This provides a measure of resistance to sediment transport and further supports the Sedimentation Study's findings that coarse bedload is not mobile in significant quantities on the Neosho River.

The vibracore sampling actually confirms the City's statement that "sand and finer material have mostly been winnowed from the matrix due to typical surface-coarsening processes that occur in mobile gravel- and sand-bed streams."[139] Essentially, the City stated in their comment that the surface layer is naturally armored, and as such, it is less mobile than the layers beneath it, which is consistent with the findings from GRDA's own field efforts.

4. Tetra Tech's 1996 Sampling Methods Were Fundamentally Flawed and Must Be Discarded

The sampling effort by Mussetter in 1996, which the City included in its USR response comments,[140] appears to be the City's only evidence to support its claims that there is a significant volume of bedload

[139] *See* City's USR Comments, Attachment 2, at 3.

[140] *Id.*, Attachment 3, at 3-4, Fig. E & Fig. F.

sediment transport on the Neosho River. As confirmed during the USR Meeting, this sampling event was limited to grab sampling collected in 1996, including collection of material from below the surface layer. The armored surface layer is the portion of the sediment bed that will dictate sediment transport, not the protected underlayers. The data collected by the City's consultants violate appropriate data collection techniques where an armor layer exists.

As discussed in Appendix D, there are significant shortcomings with the grab sampling efforts reported by the City. Specifically, the samples were biased in two ways:

1) They came from beneath the armor layer; and
2) They were taken from a gravel bar rather than the actual streambed.

This means that the samples collected by the City's consultants would be skewed to suggest finer material than what is representative of the system. Surface armor layers are a natural feature of streambeds and consist of larger, less mobile stones that shelter underlayers from hydraulic forces and result in reduced sediment mobility. Sampling from beneath the armor layer and assigning all material the smaller grain size without accounting for the armor neglects a critical component of sediment transport. Sampling from gravel bars also tends to produce finer grain size distributions than a representative sample from the streambed. Ignoring these important facts and using only gravel bar samples in the analysis would call any resulting model outputs into question.[141]

The City's samples should not be compared to those collected by GRDA, and any conclusions reached from such comparisons are highly questionable.

Furthermore, none of the samples collected in 1996 were sediment transport measurements. The City is asking FERC to rely on (1) grab samples (which completely disregard the natural armoring) combined with (2) unsubstantiated claims as a basis to require modifications to the STM.

The biased sampling conducted by Tetra Tech has translated into biased and erroneous thinking regarding sediment transport; specifically whether or not the sediment being transported by these rivers is dominated by fine suspended sediment (as demonstrated by GRDA's suspended sediment data and lack of any significant bedload transport due to the effect of armoring), or Tetra Tech's concept that the sand and gravel sublayer below the armor layer is being transported (which is based on biased and erroneous sediment sampling and a complete lack of recognition of the existence or effectiveness of the armor layer). The data and analyses clearly show the dominance of the suspended sediment and lack of coarse material transport as controlled by the armor layer which Tetra Tech ignores (see additional explanation of these concepts in Appendix D). The fact that the delta feature has developed far downstream in the reservoir and consists predominantly of silt and clay and the lack of coarse sediment deposition in the head of the reservoir, in particular upstream of the low-head Miami Dam; further confirms the flaws in Tetra Tech's perception regarding sediment transport and confirms the correctness of GRDA's sediment data and analyses.

[141] Bunte, K. and S.R. Abt, 2001. *Sampling Surface and Subsurface Particle-Size Distributions in Wadable Gravel- and Cobble-Bed Streams for Analyses in Sediment Transport, Hydraulics, and Streambed Monitoring*. US Forest Service, Rocky Mountain Research Station General Technical Report RMRS-GTR-74.

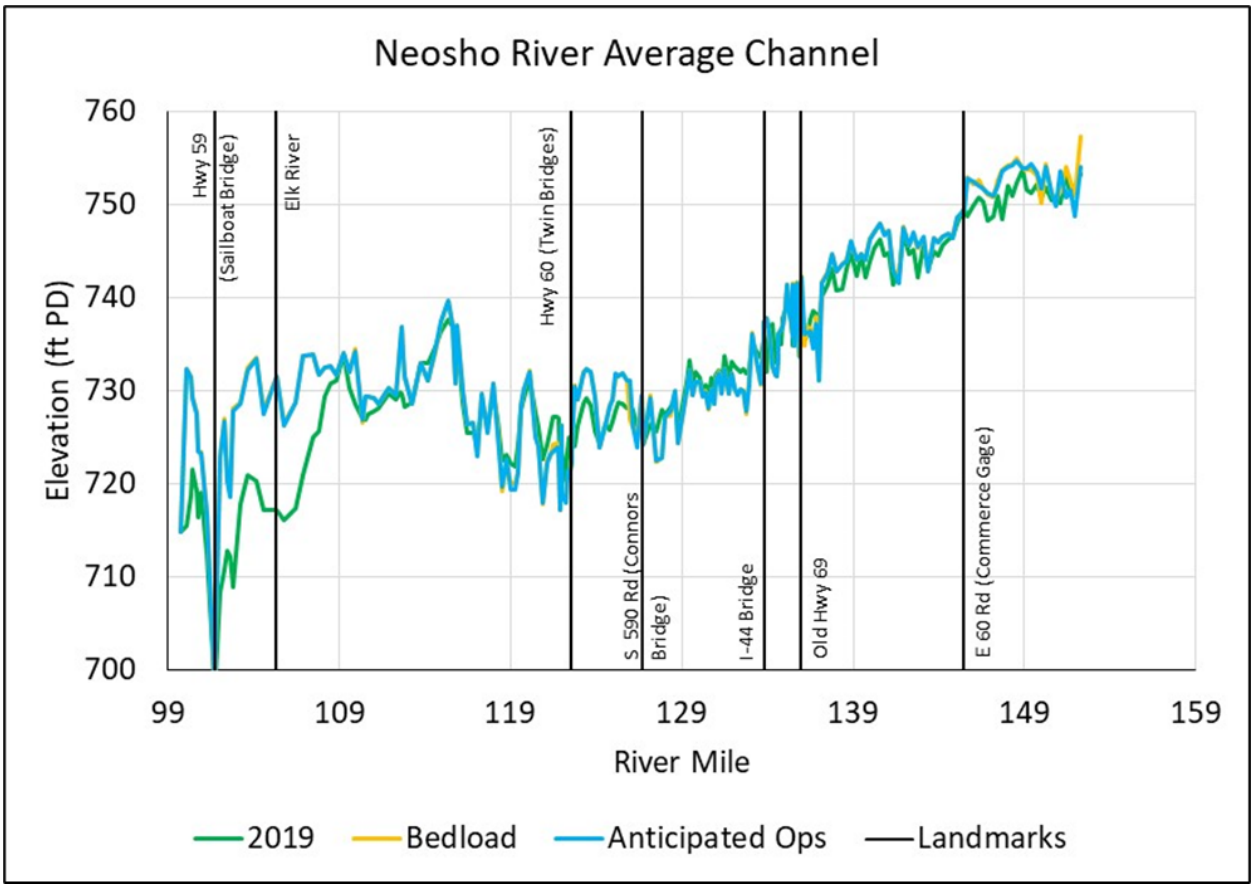
5. GRDA's Sensitivity Analysis Confirms that there is No Appreciable Movement of Bedload Sediment

Despite all evidence (both field data and simulation results) showing that there is no appreciable movement of bedload sediment in the system, GRDA developed new STM simulations that included additional coarse material loading to the upstream ends of each tributary, specifically to address the City's concern. The findings of this bedload sensitivity analysis again support the findings that the streams simply do not have the ability to transport significant quantities of coarse sediment. Details of that analysis are discussed below.

GRDA used an incipient motion analysis to determine the grain size that could be mobilized at extreme flows in the contributing streams. Based on that analysis, GRDA used the HEC-RAS Sediment Transport Capacity Tool to determine the transport capacity of the streams at high flows. The tool provides information to develop sediment rating curves with additional bedload carrying capacity. Those output sediment rating curves were then added to the existing sediment rating curves to define the *Bedload* simulation. The STM and 1D UHM were then used to model 50 years of future sedimentation using the same process described in the USR (Section 7). The *Bedload* evaluation used the same inflow hydrographs as used in the *Anticipated Operations* model described in the USR (Section 7) with Pensacola WSEs provided by OM results for anticipated operating parameters. This response focuses on the Neosho River, specifically near the City of Miami, but other data is available.

The average channel profiles of the *Bedload* simulation are largely similar to those produced under the *Anticipated Operations* simulation. This is to be expected, as most coarse material moves a small distance into the system before being deposited because the Neosho River does not carry significant quantities of sand and gravel and is not capable of doing so. The total incoming sediment load at the Neosho River was approximately 261 million tons during the simulation, with just 2 million tons of material coarser than VFS; bedload accounted for less than 0.8% of all inflowing sediment on the Neosho River. Figure 4.2.3.1-1 below shows the resulting average channel profiles of the Neosho River (see USR Section 6.2.2.1 for explanation). The main differences occur at the very upstream end of the model, where the *Bedload* simulation again shows that the stream cannot carry the coarse material, instead depositing it in the upper reaches.

Figure 4.2.3.1-1. Average Annual Profiles, Neosho River.



The resulting differences in water level near and within the City of Miami are immaterial. Differences between water levels predicted in the *Anticipated Operations* scenario and the *Bedload* scenario were compared; other data is available, but this response focuses only on the portion of the Neosho River near the City.

Figure 4.2.3.1-2 below shows the changes in WSE from RM 130 to RM 140 on the Neosho River for the July 2007 event. The mean changes in WSE near the City of Miami are 0.00 foot, meaning future geometry under *Bedload* conditions predicts similar water levels as compared to the expected *Anticipated Operations* results.

Figure 4.2.3.1-2. Changes in WSE from RM 130 to RM 140, Neosho River, July 2007 Event.

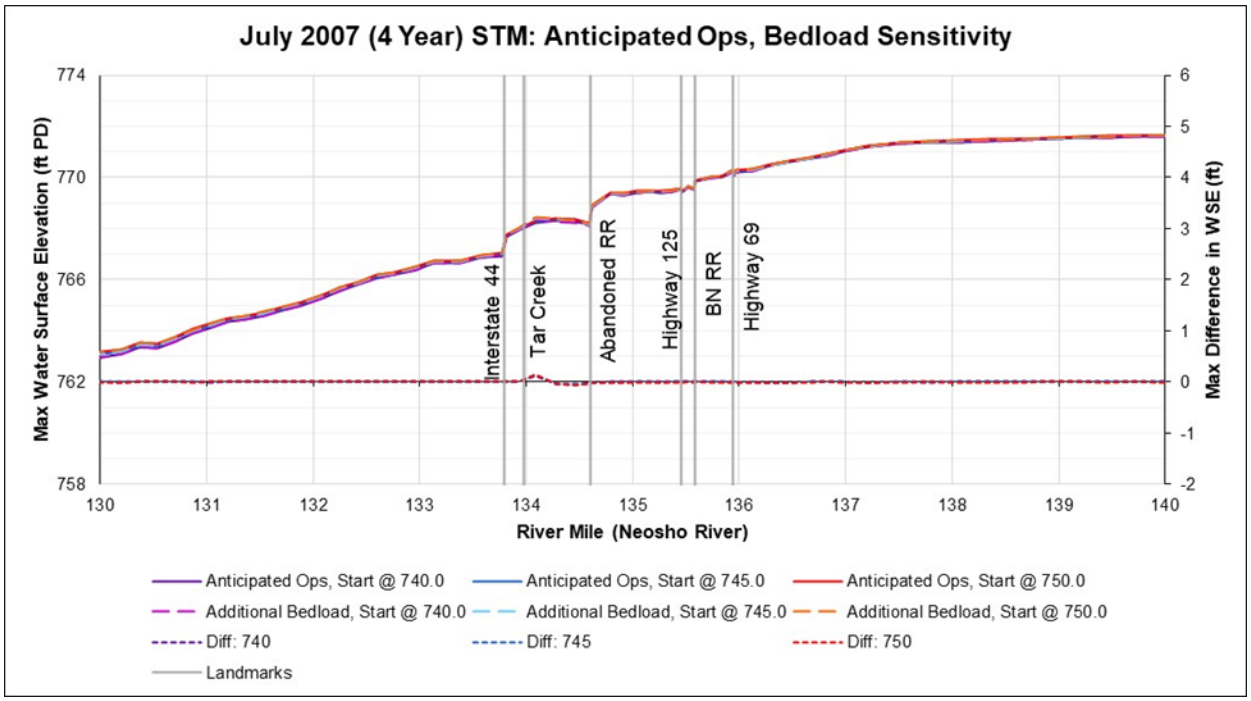
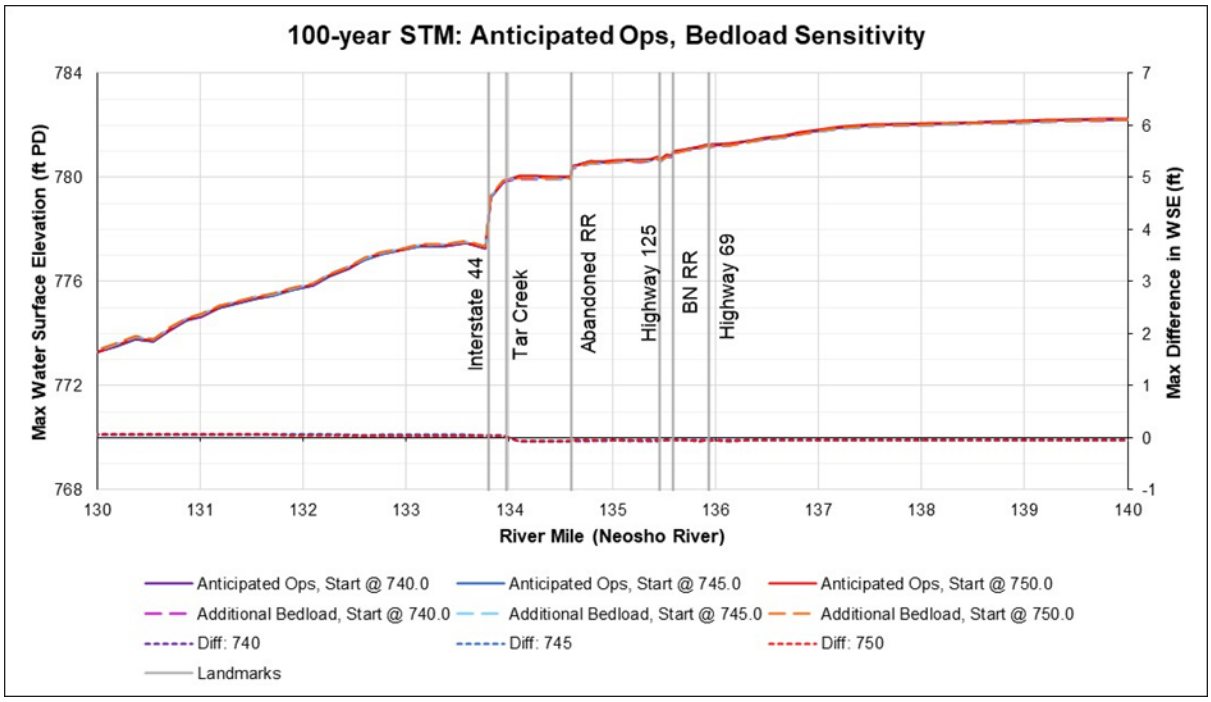


Figure 4.2.3.1-3 below shows the changes in WSE from RM 130 to RM 140 on the Neosho River for the synthetic 100-year event. The mean changes in WSE near the City of Miami are -0.03 foot, meaning future geometry under *Bedload* conditions predicts similar to slightly lower water levels as compared to the expected *Anticipated Operations* results.

Figure 4.2.3.1-3. Changes in in WSE from RM 130 to RM 140, Neosho River, Synthetic 100-Year Event.



As shown once again by field data and simulation results, all evidence suggests that bedload does not play a significant role in sediment transport within the study area. The City has not provided any evidence to support their claims that gravel and sand are moving in large quantities in this system. GRDA has shown sediment transport measurements, Quantitative Analysis results, STM outputs, bathymetric surveys, vibracore samples, and additional STM runs which all reach the exact same, mutually supportive conclusion: sand and gravel make up a negligible portion of the overall sediment load moving toward Grand Lake. To claim otherwise requires one to ignore multiple lines of evidence in favor of an unsupported narrative.

4.2.3.2 Unrealistic Deposition of Sands Overbank in Upstream Reaches

Requested Modification:

The City of Miami alleges:

> *GRDA's incorrect method of sediment distribution in the model unrealistically results in virtually all incoming sand being deposited in overbanks in the upper reaches.* As noted above, GRDA's model assumes no inflows of coarse sediment larger than very fine sand into the model reach. On top of that, GRDA's consultant constructed that model so that even that very fine sand—the coarsest incoming material—is quickly and unrealistically deposited in overbank areas in the upper reaches of the model. This means that hardly any of the very fine sand in the model ever makes it to the transition into the reservoir. In reality, such sediment would deposit farther downstream and increase upstream flooding.

> This error further demonstrates the inability of GRDA's model setup to yield reliable predictions of the Project's ongoing sedimentation impacts.[142]

GRDA Response:

The Commission should reject the City of Miami's request to require modification of the model to reduce the "unrealistic" deposition of sands overbank in the upstream reaches of the model. The City of Miami is raising this issue for the first time at this very late juncture in the ILP, after the Commission approved the methodologies for the Sedimentation Study. Moreover, the error alleged by the City of Miami is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[143] With regard to its requested study plan modification to require a reduction in the model of what the City deems to be an "unrealistic" deposition of sands overbank, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. GRDA Utilized Standard, Accepted Practices in Building the STM

In addition to its failure to meet the regulatory obligations under the ILP for justifying a study modification, the City's comment fails to recognize that GRDA used standard model setup options as suggested in the USACE HEC-RAS Modeling Guidance. The STM was developed and calibrated to match the surveyed geometry and associated erosion/deposition volumes. The argument that it is all deposited in the overbanks is illogical. The model is set up to deposit the sediment both in the channel and in the overbanks. GRDA did not build the model to deposit only in the overbank areas.

The deposition of VFS at the upstream end of the model that was pointed out by Dr. Mussetter in the USR meeting is because the quantity entering the system is larger than what is capable of being transported out of the area based on bedload transport equations. VFS was not considered in the development of many of the equations used by HEC-RAS for bedload transport, so it is an inherent limitation of sediment transport modeling. GRDA attempted to address this by including the VFS in the cohesive load during calibration efforts but selected the final parameters based on the best-fit model results.

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[142] City's USR Comments at 12.

[143] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

The City does not specify which parameters they would have preferred GRDA change, but presumably it would be related to the bed change options built into HEC-RAS. The options used for the STM were to allow in-channel erosion and deposition and overbank deposition (though not erosion), using the Veneer method. This method assumes equal depths of deposition or erosion across the entire channel and across the entire overbank area. It should be noted that "HEC-RAS can compute channel erosion and overbank deposition,"[144] so it is not a simple matter of having the same depth of deposition/erosion across the entire wetted cross section. This is the classic method of such simulations and is a common method used in modeling sediment transport with 1D HEC-RAS.

GRDA attempted calibration of the STM using the Reservoir and Distance Decay methods but was unable to successfully achieve calibration with those options. Running with Reservoir deposition in the channel allows the model to more accurately predict deposition in the lower portions of stream. As explained in the USACE guidance: "The Reservoir deposition method is available in the channel and overbank, but it is designed to fill the channel in backwater situations."[145] The Distance Decay deposition pattern is intended to add more sediment to the edges of the stream, resulting in the formation of natural levees. Running the model with these options selected resulted in the model crashing due to excessive deposition in the channel, eventually leading to a dry channel. Repeated efforts to adjust the calibration within reasonable ranges resulted in the same error message from the simulation.

3. The Circa-1940 Data Relied Upon by the City Is Unreliable, at Best

It is also important to note that the cross-sections the City highlighted use the circa-1940 data in an effort to prove that the deposition as modeled in the STM is inaccurate. As stated in the USR (Section 2.1.1.1 and Section 5.1.1), the circa-1940 dataset has considerable uncertainty associated with it. The primary dataset is low-resolution scans of topographic maps with 5-foot contour intervals that was collected with rudimentary (by today's standards) equipment and published in 1938. The contours in some places are difficult to read; in others, there are no contours at all, and those elevations were estimated based on the information available (USR Section 5.1.1). Additional information was provided in 1941 and 1942 publications with survey data taken with similar equipment. GRDA was then tasked with georeferencing these disparate data sources into a coherent STM. The data is the best available, but it is by no means perfect. The fact that cross-sections appear to show levee formation as posited by the City does not necessarily prove those changes are real. Particularly in areas of steep topography (such as those by stream banks), interpretation of the 1938 topographic map and geolocation of cross-section survey data contains significant uncertainty.

[144] U.S. Army Corps of Engineers. (2021) *HEC-RAS 1D Sediment Transport User's Manual v4*. Retrieved January 26, 2022, from https://www.hec.usace.army.mil/confluence/rasdocs/rassed1d/1d-sediment-transport-user-s-manual.

[145] *Id.*

4.2.3.3 Failure to Model Tar Creek Dynamics

Requested Modification:

The City alleges that "the STM incorrectly assumes that water levels in Tar Creek are not influenced by water levels in the Neosho River," and states that FERC "should require GRDA to fix this obvious error before performing further analysis."[146]

GRDA Response:

The Commission should reject the City of Miami's request to require GRDA to modify its model of Tar Creek dynamics. The error alleged by the City is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

1 The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[147] With regard to its requested study plan modification to require a change in the model of Tar Creek dynamics, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. *GRDA Followed USACE Best Practices when Developing STM Geometry*

The Tar Creek confluence presents a particularly complex task for HEC-RAS modeling. The confluence consists of a large river with a wide floodplain (the Neosho River) into which a significantly smaller tributary (Tar Creek) empties. Typical confluences are modeled so that contributing streams are able to flow into each other without overlapping cross-sections (see the Spring River and Neosho River confluence where the cross-sections avoid transecting each other). However, because the Neosho River floodplain extends 1.6 miles up Tar Creek, there are additional challenges to this modeling task.

When developing the STM geometry, GRDA followed USACE best practices. At the Tar Creek/Neosho River confluence, GRDA had the following options:

[146] City's USR Comments at 12.

[147] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

1. Include cross-sections along the bottom 1.6 miles of Tar Creek, which would overlap the Neosho River cross-sections.
2. Model the confluence with the cross-section alignments that are currently used in the model (or similar alignments) and model the confluence as a junction.
3. Model the confluence with the cross-section alignments that are currently used in the model (or similar alignments) and model the confluence as a lateral structure.

GRDA selected the third option for the following reasons:

Chapter 14 of the USACE HEC-RAS Reference Manual states that "cross sections should not overlap" when modeling tributaries.[148] This is because overlapping cross sections create double counted flow area, resulting in volumetric error. Therefore, the first option listed above was not selected by GRDA because it directly violates USACE guidance. Selecting an approach between the second and third options required GRDA to:

1. perform preliminary testing,
2. rely on USACE best practices, and
3. exercise sound engineering judgment.

USACE recommends placing cross-sections as close to river junctions as possible. In Chapter 6 of the HEC-RAS User's Manual, USACE states the following (bold font formatting and capitalization is included in USACE's text):

> **IMPORTANT NOTE:** When laying out cross sections around a junction (Upstream and downstream on the main stem river and tributaries connected to the junction), place the cross sections as close to the junction as possible. This is especially important for unsteady flow modeling, as the default computation option is that the model assumes the same water surface elevation at all cross sections bounding the junction. If this is a bad assumption, turn on the option labeled "**Energy Balance Method**" under the **Unsteady Flow Computation Method**. Cross sections laid out very far from the junction can lead to model instability issues if the elevation of the channel bottom for the cross sections that bound the junction are very different (Have very different invert elevations).[149]

The exact situation that USACE describes is present at the confluence of Tar Creek and the Neosho River. The floodplain of the Neosho River covers the bottom 1.6 miles of Tar Creek, so the assumption of "the same water surface elevation at all cross sections bounding the junction" would be violated. Therefore, GRDA performed preliminary testing with the Energy Balance Method, as recommended by USACE, and found that computations at the junction were unstable. This was expected as a possibility based on GRDA's consultants' previous modeling experience and because the wide Neosho floodplain meant that the Tar

[148] U.S. Army Corps of Engineers. (2022) *HEC-RAS Hydraulic Reference Manual v6.2*. Retrieved January 26, 2022, from https://www.hec.usace.army.mil/confluence/rasdocs/ras1dtechref/latest.

[149] U.S. Army Corps of Engineers. (2021) *HEC-RAS User's Manual v6.0*. Retrieved May 2021, from https://www.hec.usace.army.mil/confluence/rasdocs/rasum/latest.

Creek cross sections had to be "laid out very far from the junction." In summary, GRDA followed USACE best practices in testing the feasibility of modeling the confluence as a junction but experienced the same type of model instability that USACE documented in the HEC-RAS User's Manual. Therefore, GRDA selected the third option and modeled the Tar Creek/Neosho River confluence as a lateral structure.

There is no perfect solution to representation of the Tar Creek/Neosho River confluence in a STM. When selecting the lateral structure methodology for modeling the confluence, GRDA understood the HEC-RAS software limitations that are now presented by City's consultant. GRDA's selection process for confluence modeling methodology was based on preliminary testing, USACE best practices, and sound engineering judgment.

4.2.3.4 Run the Full STM to Represent Wider Range of Reservoir Elevations

Requested Modification:

The City of Miami states:

> The Commission should require GRDA to fix the STM as detailed below and then re-run its predictive runs. The selection of model runs likewise requires modification because GRDA ignored the Commission's direction to run the STM to reflect a wider range of potential Project operations (instead doing so only in the subsequent UHM modeling, which the Commission separately required). Tetra Tech's modeling using the 1940 and 2019 topography shows that sedimentation impacts that have accumulated since construction of the dam likely add multiple feet to upstream flooding, including in Miami. Proper execution of this study is therefore crucial to understanding the scope of future unauthorized flooding caused by the Project, including contributions from Project-driven sediment effects both past and future.[150]

Relatedly, the City of Miami states that GRDA failed to run both the STM and the subsequent 1-D UHM to reflect a 10-foot range of Project operations, as directed by FERC.[151]

GRDA Response:

The Commission should reject the City of Miami's request to require GRDA to run the full STM and 1D UHM to represent a wider range of starting reservoir elevations. The City of Miami has made this argument previously,[152] and in response, FERC staff required GRDA to "run scenarios starting at an elevation of 734 feet and extending up to and including an elevation of 757 feet PD,"[153] despite the fact that even those starting reservoir elevations are well beyond GRDA's anticipated operating parameters during the new

[150] City's USR Comments at 11.

[151] *Id.* at 14-15.

[152] City's ISR Comments at 13.

[153] Feb. 2022 SMD at B-13.

license term. Moreover, the error alleged by the City of Miami is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[154] With regard to its requested study plan modification to run the full STM and 1D UHM to represent a wider range of starting reservoir elevations, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. *GRDA Followed FERC's Guidance in its February 2022 SMD*

GRDA followed the guidance provided by FERC in their SMD. At no point in the SMD did FERC require evaluation of cumulative impacts to date. As stated in the USR:

> The primary goal of the Sedimentation Study is to determine the potential effect of the Pensacola Hydroelectric Project (Project) operations on sediment transport, erosion, and deposition in the lower reaches of tributaries to Grand Lake upstream of Pensacola Dam. Additionally, the Sedimentation Study is designed to provide an understanding of the sediment transport processes and patterns upstream of Grand Lake on the Neosho, Spring, and Elk rivers, as well as on Tar Creek.[155]

Contrary to the City's allegations, GRDA followed FERC's May 27, 2022 SMD.

FERC's goals, as stated, were:

1. "To understand operational effects on both current and potential future channel geometry."
2. "To understand the effects of project operation and predicted channel geometry on upstream water levels."[156]

[154] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

[155] GRDA's 2022 USR § 1.1.

[156] May 2022 SMD at B-7.

To that end, FERC recommended that GRDA run the STM and the 1D UHM with starting reservoir elevations of 740-, 745-, and 750-feet PD.[157]

To understand how GRDA complied with FERC's recommendations to meet FERC's stated goals, a simplified review of the modeling process is necessary:

1. The OM is run for 50 years to simulate the stage at Pensacola Dam.
2. The STM is run for 50 years, using the output stage hydrograph from the OM as the downstream boundary condition.
3. Iteration between the OM and STM occurs, so that both the OM and STM accurately reflect the changing bathymetry during the 50-year time period.
4. After OM and STM results are finalized, the 1D UHM is run for either the July 2007 (4 year) or the 100-year inflow event, using (1) the output geometry from the STM, and (2) a stage hydrograph generated by the OM.

GRDA's understanding was that FERC did not intend GRDA to run a 50-year simulation of the STM (and OM) with the three starting pool elevations (740-, 745-, and 750-feet PD), because such simulations would have little-to-no value to FERC in its decision-making process. As the stage hydrographs in Appendix C.2 of the UHM USR show, even an extreme 23-foot (734 vs 757 feet PD) variation of starting pool elevation resulted in converged stage hydrographs (1) within a month for the July 2007 (4-year) event and (2) within a few days for the 100-year event. If GRDA followed the City's interpretation of FERC's recommendation, the 50-year simulations would show some variation during the first month, followed by a second month of virtually-but-not-exactly identical results, followed by 49.8 years (49 years and 10 months) of identical results. The results of these simulations would not be useful or instructive: *nearly identical inputs lead to nearly identical outputs*.

Rather, GRDA's understanding, based on a careful reading of FERC's SMD, was that FERC desired the STM, the OM and the 1D UHM to be run *in concert* for both inflow events and all three starting pool elevations. Therefore, GRDA acted in good faith and followed the clear intent of FERC's recommendations, by performing simulations that involved the STM, OM, and 1D UHM *in concert* that show (1) the "operational effects on both current and potential future channel geometry" and (2) the "effects of project operation and predicted channel geometry on upstream water levels."[158] To that end, GRDA simulated five (5) sedimentation scenarios:

1. Existing (2019) bathymetric conditions
2. Future (2069) bathymetric conditions with expected sedimentation rates and anticipated ops
3. Future (2069) bathymetric conditions with low sedimentation rates and anticipated ops
4. Future (2069) bathymetric conditions with high sedimentation rates and anticipated ops
5. Future (2069) bathymetric conditions with expected sedimentation rates and baseline ops

[157] *Id.*

[158] *Id.*

Each of those five (5) scenarios were simulated in combination with the following six (6) hydraulic conditions:

1. The July 2007 (4 year) inflow event and a starting elevation of 740 feet PD
2. The July 2007 (4 year) inflow event and a starting elevation of 745 feet PD
3. The July 2007 (4 year) inflow event and a starting elevation of 750 feet PD
4. The 100-year inflow event and a starting elevation of 740 feet PD
5. The 100-year inflow event and a starting elevation of 745 feet PD
6. The 100-year inflow event and a starting elevation of 750 feet PD

This set of 30 simulations relied on the STM, the OM, and the 1D UHM. GRDA ran these simulations to fully investigate FERC's recommendations. Table 49 in the Sedimentation Study USR documents the 30 simulated scenarios, and Section 7.4.2 of the USR documents the simulation results and provides comparative analysis to understand operational effects on current and future geometry and on upstream water levels. The City's claim that GRDA did not comply with FERC's recommendations is refuted by the explanation above and by the thorough documentation in GRDA's Sedimentation Study USR. Additional effort and simulations will not produce any new information, as *nearly identical inputs lead to nearly identical outputs*.

3. The Circa-1940 Data Relied Upon by the City Is Unreliable, at Best

A necessary consideration when evaluating City's conclusions regarding flooding in their pre-dam simulation is that the circa-1940 terrain has significant uncertainty, and it is not clear the results presented by the City actually represent real differences in water levels from pre-dam conditions to current conditions.

The City used the STM and associated circa-1940 geometry to evaluate water levels near the City, and it bears repeating that the circa-1940 geometry, while the best available data from the time period, is still subject to significant uncertainties. As discussed in GRDA's response in section 4.2.3.2 of this Response and Sections 2.1.1.1 and 5.1.1 of the USR, this dataset is based on low-resolution scans of 5-foot contour 1938 topographic maps with many missing or illegible elevation labels combined with un-georeferenced cross-sectional survey data collected in 1941 and 1942. The 1941 and 1942 cross-sections are spaced 20,000 or even 30,000 feet (3.8 miles to 5.7 miles), while the 2009 OWRB survey transects are 250 to 500 feet apart, and the 2019 USGS bathymetry is continuous multibeam data. The differences in data density are vast, to say nothing of the improvements in survey accuracy over the intervening 67 to 77 years.

This uncertainty is particularly important in steeper areas of the geometry. This includes many of the bluffs that form the riverbanks where limited georeference information, illegible or missing contour labels, or other problems with the data may artificially narrow channels, lower overbank elevations, or otherwise result in confounding factors with this dataset. GRDA has been extremely clear about the limitations of the circa-1940 data, and it is scientifically irresponsible for the City to present it as providing a perfect basis for comparison.

Given these uncertainties and typical modeling uncertainty, a difference in water levels of just 2.8 feet is not sufficiently large to provide confidence this represents a real-world increase in conditions between pre-dam and current conditions.

It is also unclear how the City isolated the disparate contributing factors for increased upstream water levels, particularly given the uncertainty associated with the circa-1940 datasets. While they suggest that the delta feature "likely contributes to this increase as far upstream as Miami,"[159] they offer no basis for this claim, then suggest that "more subtle changes over time" are responsible for the remainder of the flooding.[160] The uncertainties with this dataset limit the conclusions that can be made from it, and it is not clear the City has factored those into its analysis.

4. The City's Other Challenges to GRDA's Modeling Results Are Without Merit

It should also be stated that GRDA has no plans to operate the Project at an elevation of 750 ft PD. This is five feet higher than any proposed operations. It would only be reached in event of high incoming flows, meaning this would only be reached during a flood event; an event dictated by nature and not Project operations.

The City also claims without basis that GRDA's conclusion that "[a]ny meaningful increase in water levels due to sedimentation is further downstream" is incorrect.[161] The model has been provided, and the results have been documented in the USR (Section 7). The numerical values of increased water levels are freely available to the City and any other interested parties, and the findings show conclusively that the larger changes in water level are further downstream and not near the City. The model results also show that the differences due to sediment loading (nature) are larger than those produced by differences in Project operations.

The changes the City is citing are not relevant to the question of whether Project operations have a meaningful impact on future sedimentation and associated upstream water levels. Both the Quantitative Analysis and STM results show that the impacts of future Project operations are immaterial on water levels within the City (USR Section 4.5, Section 7.3, and Section 7.4.2).

The City's claim that "these other, seemingly more significant dynamics could still be worsening" has no basis beyond the uncertain results discussed above. They have not presented any evidence that these dynamics are in fact worsening, and they apparently disregard all the evidence presented by GRDA indicating that the delta feature has in fact reached a state of dynamic equilibrium based on:

1) literature reviews,
2) the Quantitative Analysis documented in the USR (Section 4), and
3) The STM results themselves.

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159 City's USR Comments at 17.

160 *Id.*

161 *Id.* at 18.

The recommendations to "fix" the model come from Tetra Tech's opinion, which is based on biased advocacy, biased data, and fundamentally and fatally flawed perspective.[162]

5. Increasing the Number of Modeling Runs Is Not Required to Meet NEPA Obligations

Finally, as explained in section 4.1.2 above, the City of Miami is incorrect in asserting that additional modeling runs "to represent a wider range of reservoir elevations" are needed to meet the Commission's obligations to consider reasonable alternatives under NEPA.[163]

4.2.3.5 Randomization of Sequence of Historical Annual Hydrographs

Requested Modification:

The City of Miami states that FERC "should require GRDA to use a Monte Carlo-type simulation as proposed by Tetra Tech, to evaluate the sensitivity of the model results to variability in climatic and runoff cycles."[164]

GRDA Response:

The Commission should reject the City of Miami's request to require GRDA to use a Monte Carlo-type simulation as proposed by Tetra Tech. The City of Miami is raising this issue for the first time at this very late juncture in the ILP. Moreover, the error alleged by the City of Miami is non-existent, the City failed to meet the regulatory requirements for justifying a study modification, and the time and expense of a Monte Carlo-type simulation is not justified. The City of Miami fails to cite even a single instance in which the Commission has required this level of analysis in a hydropower licensing proceeding.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[165] With regard to its requested study plan modification to require a Monte Carlo-type simulation to evaluate the sensitivity of the model results to variability in climatic and runoff cycles, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

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[162] *See* Appendix D to this Response.

[163] City's USR Comments at 19.

[164] *Id.*at 16.

[165] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

For these reasons alone, the Commission must reject this proposed modification.

2. GRDA Followed the FERC-Approved Study Plan

GRDA followed the study plan as laid out in the USP submitted on April 27, 2022 and approved with modifications by FERC in its SMD. The USP stated:

> Following STM calibration and validation, the model will be used to evaluate reasonable future scenarios. These will use a synthetic 50-year hydrograph based on past hydrology by randomizing the historic flow recordings. Any long-term trends in magnitude will be included in the hydrograph development process by multiplication using a scaling factor.[166]

GRDA evaluated the flow data for the past 50 years of hydrology on each modeled tributary to find evidence of any trends. The findings showed that, on the Neosho River for example, there is no meaningful trend. The changes in average discharge are on the order of approximately 0.2% increase per year with an R^2 coefficient of correlation of approximately 0.002, indicating that there is virtually no relationship between discharge magnitudes and the year of their occurrence. When looking at annual peak flows, there is an increase of just 0.6% per year with an R^2 value of 0.02, which again indicates there is no trend. Similar results were found with the other modeled tributaries.

GRDA then randomized the past 50 years of hydrologic data and ran the simulations. There is no stated requirement in the USP to perform additional analyses beyond that single set of simulations, so GRDA has met the requirements of FERC's SMD.

3. The Simulation Advocated by the City of Miami Is Unlikely to Change the Analysis

However, in the interest of transparency, GRDA also ran the simulations using historical, non-randomized hydrographs. The model used the most recent 50-year period for inflows and set the downstream boundary condition using the OM outputs in the process described in the USR (Section 7.2). The model simulated Historical Hydrograph Baseline Operations and Historical Hydrograph Anticipated Operations, and the results were then used in the 1D UHM as described in the USR (Section 7.4).

The resulting differences in water level within the City boundaries are immaterial, just as was shown in the USR for the synthetic hydrographs (Section 7.3 and Section 7.4.2.3). Using the historical hydrographs and comparing between Project operational scenarios showed negligible differences like those produced under the synthetic hydrographs as shown in Table 4.2.3.5-1.

[166] *See* Response Comments on Sedimentation Study and Submission of Updated Study Plan for Approval at Attachment 3, p. 19, Project No. 1494-438 (filed Apr. 27, 2022).

Table 4.2.3.5-1. Comparison Between Project Operational Scenarios.

	WSE Differences under Synthetic Hydrographs (ft)	WSE Differences under Historical Hydrographs (ft)
July 2007 Event	-0.20	0.10
100-Year Event	0.22	0.09

*Positive values indicate that WSE under anticipated operations is higher than under baseline operations.

These results are not surprising. Any changes to the hydrology that would result in increased sedimentation under baseline operations would likely also result in increased sedimentation under anticipated operations. The comparison between the two operational scenarios requires identical inflow hydrology, and as shown in the USR,[167] changes to Project operation have an immaterial impact on sedimentation and resultant water levels near the City. Using the historical hydrology (instead of the randomized hydrology, as proposed in the approved USP) does not change this study's scientific conclusion.

4. The Simulation Advocated by the City of Miami Would Be Prohibitively Expensive and Time-Consuming

The Monte Carlo analysis requested by the City would require an unreasonable effort, particularly given the results already presented both in the USR and in this Response. Each set of simulations (Anticipated Operations, Baseline Operations, High Sedimentation, and Low Sedimentation) requires approximately 200 hours (8.3 days) of simulation time plus additional time for results processing and reporting. Additional sensitivity analyses presented here in GRDA's responses required an additional 150 hours (6.3 days) of simulation time. Monte Carlo simulations require dozens or hundreds of simulations for each scenario. Adopting the City's late-breaking request for a Monte Carlo analysis would require somewhere between 5,000 and 20,000 hours (208 to 833 days, or 0.6 to 2.3 years) of simulation time. Particularly given that results of every simulation to date have shown that Project operations have no meaningful impact on sedimentation or upstream flooding, it would be unreasonable for GRDA to perform additional simulations beyond what was approved by FERC in its SMD.

4.2.3.6 Analyze the Contribution of Historical Project-caused Sedimentation to Current and Future Upstream Flooding

Requested Modification:

The City argues that FERC should require GRDA to "analyze the contribution of historical Project-caused sedimentation to current and future upstream flooding."[168]

[167] *See* GRDA's 2022 USR §§ 7.3, 7.4.2.3.

[168] City's USR Comments at 19.

GRDA Response:

The Commission should reject the City of Miami's request to require GRDA to analyze the historical alleged "Project-caused" sedimentation to current and future upstream flooding. Because GRDA followed the requirements included in FERC's Study Modification Determination, the error alleged by the City of Miami is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[169] With regard to its requested study plan modification to require GRDA to analyze the historical "Project-caused" sedimentation to current and future upstream flooding, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. GRDA Followed FERC's Study Modification Determination

GRDA followed the guidance provided by FERC in their SMD. At no point in the SMD did FERC require evaluation of cumulative impacts to date. As stated in the USR:

> The primary goal of the Sedimentation Study is to determine the potential effect of the Pensacola Hydroelectric Project (Project) operations on sediment transport, erosion, and deposition in the lower reaches of tributaries to Grand Lake upstream of Pensacola Dam. Additionally, the Sedimentation Study is designed to provide an understanding of the sediment transport processes and patterns upstream of Grand Lake on the Neosho, Spring, and Elk rivers, as well as on Tar Creek.[170]

The goals of the study do not include evaluation of cumulative impacts of the mere existence of the Project. In fact, FERC has long held that, "in either relicensing an existing project or issuing an original license for an existing, unlicensed project, our review necessarily reflects the fact that the project works already exist, and are part of the existing environment."[171] In SD2, FERC staff stated:

[169] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

[170] GRDA's 2022 USR at § 1.1.

[171] *City of Tacoma*, 71 FERC ¶ 61,381, at p. 62,488 (1995).

> Based on information in the PAD for the Pensacola Project, preliminary staff analysis, and comments received during scoping, we have identified geology and soils, water quantity, land use, socioeconomics, and cultural resources as resources that could be cumulatively affected by the proposed continued operation and maintenance of the Pensacola Project in combination with other hydroelectric projects and other activities in the Grand River Basin.[172]

Thus, FERC did *not* commit to undertaking, or requiring GRDA to undertake, a cumulative impacts study simply for the purpose of analyzing the presence of the dam. Rather, FERC's NEPA analysis will follow its longstanding precedent, which is to consider the ongoing impacts from the continued operation of existing dams.[173]

3. The Circa-1940 Data Relied Upon by the City Is Unreliable, at Best

A necessary consideration when evaluating City's claims regarding flooding in their pre-dam simulation is that the circa-1940 terrain has significant uncertainty, and it is not clear the results presented by the City actually represent real differences in water levels from pre-dam conditions to current conditions.

The City used the STM and associated circa-1940 geometry to evaluate water levels near the City of Miami, and it bears repeating that the circa-1940 geometry, while the best available data from the time period, is still subject to significant uncertainties. As discussed in GRDA's response in section 4.2.3.2 of this Response and Sections 2.1.1.1 and 5.1.1 of the USR, this dataset is based on low-resolution scans of 5-foot contour 1938 topographic maps with many missing or illegible elevation labels combined with un-georeferenced cross-sectional survey data collected in 1941 and 1942. The 1941 and 1942 cross-sections are spaced 20,000 or even 30,000 feet (3.8 miles to 5.7 miles), while the 2009 OWRB survey transects are 250 to 500 feet apart, and the 2019 USGS bathymetry is continuous multibeam data. The differences in data density are vast, to say nothing of the improvements in survey accuracy over the intervening 67 to 77 years.

This uncertainty in the circa 1940 data is particularly important in steeper areas of the geometry. This includes many of the bluffs that form the riverbanks where limited georeference information, illegible or missing contour labels, or other problems with the data may artificially narrow channels, lower overbank elevations, or otherwise result in confounding factors with this dataset. GRDA has been extremely clear about the limitations of the circa-1940 data, and it is irresponsible to present it as providing a perfect basis for comparison.

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[172] FERC's Scoping Document 2 for the Pensacola Project § 4.1.1, Project No. 1494-438 (issued Apr. 27, 2018) [hereinafter, SD2].

[173] *See Am. Rivers v. FERC*, 895 F.3d 32, 47 (D.C. Cir. 2018).

4. The City's Analyses Supporting Its Study Modification Are Unreliable and Speculative

Furthermore, the City's consultant Tetra Tech used steady-state modeling to support the City's claim. Steady-state modeling maximizes the potential difference in WSEL between *any* two model geometries. Tetra Tech has previously criticized the use of steady-state modeling of the dynamic, complex Grand-Neosho area (Tetra Tech, 2015).[174] It is disingenuous for them to now rely on steady-state modeling simply because it creates a worst-case scenario.

Given these uncertainties in the source data, typical modeling uncertainty, and the use of steady-state modeling, the WSE increase presented by the City should not be considered an accurate quantification of cumulative sedimentation impacts to date.

It is also unclear how the City isolated the disparate contributing factors for increased upstream water levels, particularly given the uncertainty associated with the circa-1940 datasets. While they suggest that the delta feature "likely contributes to this increase as far upstream as Miami," they offer no basis for this claim, then suggest that "more subtle changes over time" are responsible for the remainder of the flooding. The uncertainties with this dataset limit the conclusions that can be made from it, and it is not clear the City has factored those into their analysis.

It should also be stated that GRDA has no plans to operate the Project at an elevation of 750 ft PD. This is five feet higher than any proposed operations. It would only be reached in event of high incoming flows, which are controlled by nature and not Project operations. Furthermore, USACE is in control when the pool exceeds 745 ft PD.

The City also claims without basis that GRDA's conclusion that "[a]ny meaningful increase in water levels due to sedimentation is further downstream" is incorrect. The model has been provided, and the results have been documented in the USR (Section 7). The numerical values of increased water levels are freely available to the City and any other interested parties, and the findings show conclusively that the larger changes in water level are further downstream and not near the City. The model results also show that the differences due to sediment loading (nature) are larger than those produced by differences in Project operations.

The changes the City cites are not relevant to the question of whether Project operations have a meaningful impact on future sedimentation and associated upstream water levels. Both the Quantitative Analysis and STM results show that the impacts of future Project operations are immaterial on water levels within the City (USR Section 4.5, Section 7.3, and Section 7.4.2).

The City's claim that "these other, seemingly more significant dynamics could still be worsening" has no basis beyond the uncertain results discussed above. The City has not presented any evidence that these dynamics are in fact worsening, and they apparently disregard all the evidence presented by GRDA

[174] Tetra Tech, *Hydraulic Analysis of the Effects of Pensacola Dam on Neosho River Flooding in the Vicinity of Miami, Oklahoma* (Dec. 9, 2015).

indicating that the delta feature has in fact reached a state of dynamic equilibrium based on literature reviews, the Quantitative Analysis documented in the USR (Section 4), and the STM results themselves.

4.2.3.7 Failure to Articulate a Basis for Conclusions of Significance

Requested Modification:

The City states that "GRDA . . . lacks any real basis for its conclusion that '[s]edimentation and associated impacts to water levels are not driven by Project operations' and argues that GRDA should either "simply admit that it has no basis and leave ultimate determinations of impact up to the Commission."[175]

GRDA Response:

The Commission should reject the City of Miami's request to require that GRDA "articulate a basis for conclusions of significance or . . . leave ultimate determinations of impact up to the Commission."[176] Nothing in the Commission-approved Study Plan prohibits GRDA from drawing reasonable, expert conclusions from the data collection and analysis required in the Study—and it would undermine the whole point of the study. If the City had any concern about GRDA's experts making any conclusions regarding the results of their work, it should have raised this concern and made appropriate recommendations during the study development process. Now that the study is complete and the results are clear, the City of Miami's request is only a transparent attempt to obfuscate and obstruct.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[177] With regard to its requested study plan modification to prohibit GRDA from drawing reasonable conclusions from its years-long effort to study sedimentation in the Grand/Neosho River, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. GRDA's Conclusions Are Reasonable and Based on Quantitative Analysis and STM Outputs

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[175] City's USR Comments at 19.

[176] *Id.*

[177] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

The basis for GRDA's conclusion is the Quantitative Analysis and STM outputs. The STM and 1D UHM are based off the most detailed, robust, and comprehensive model of the Grand-Neosho River ever built. Sediment properties, transport rates, and historical deposition measurements (USR Section 2) were then incorporated into both the Quantitative Analysis (USR Section 4) and the sediment model to create a comprehensive STM (USR Section 5). The STM was then calibrated and validated to accurately reflect sediment deposition (USR Section 6) before being used for predictive simulations (USR Section 7). The methodology follows industry standard practices and USACE guidance to create a robust, reliable model with the most accurate predictions possible. Each of these steps and associated methodology was documented in detail in the USR submitted by GRDA.

Along with the USR document, GRDA provided the models, results files, and supporting evidence relevant to the Sedimentation Study. All of this information is available to interested parties, and that includes the quantitative, scientific results. The quantitative results are the basis for materiality of water level impacts, and those have been presented alongside GRDA's assessments (USR Section 7.4). The fact that each sensitivity analysis (USR Section 7.4.2; *High Sedimentation* vs *Low Sedimentation*, *Baseline Operations* vs *Anticipated Operations*, and *Existing Conditions* vs *50-Year Future Anticipated Operations*) shows water levels within the City change just 0.12 foot (approximately 1.5 inches) or less after 50 years of sedimentation supports GRDA's conclusions that the impacts to the City are negligible.

4.2.3.8 Failure to Complete STM at Higher Water Levels

Requested Modification:

LEAD argues that GRDA should be required to complete a STM at higher water levels—at or above 755 feet PD—because LEAD asserts that Pensacola Dam's operations play a role in the frequency of these lake levels occurring.[178]

GRDA Response:

The Commission should reject LEAD's request to require GRDA to complete the STM at higher water levels. LEAD is raising this issue for the first time at this very late juncture in the ILP. Moreover, the error alleged by LEAD is non-existent, and LEAD failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous

[178] Comments of Local Environmental Action Demanded Agency, Inc., Project No. 1494-43 at 12 (Nov. 29, 2022) [hereinafter, LEAD USR Comments].

environmental conditions or that environmental conditions have changed in a material way.[179] With regard to its requested study plan modification to complete a STM at higher water levels, LEAD never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, LEAD fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. Extremely High Reservoir Elevation Levels are Well Beyond the Commission's Jurisdiction

In advancing its proposed study modification, LEAD relies on its flawed interpretation of a single statement in the 1992 Water Control Manual for the Pensacola Dam, which provides: "The Grand River Dam Authority (GRDA) is responsible for regulation above elevation 755.0. The Corps will provide technical assistance if requested."[180] Leveraging this language, LEAD makes the illogical leap that "[l]ake levels at or above 755 feet PD are within GRDA's jurisdictional control,"[181] suggesting that the Commission may exercise licensing authority over reservoir levels that exceed 755 feet PD.

LEAD's interpretation of the 1992 Water Control Manual is fatally flawed, for several reasons. To begin with, the plain language of the Manual only transfers "responsibility" to GRDA once reservoir levels reach 755 feet PD; the Manual does not—and cannot—shift jurisdictional responsibilities for flood control to GRDA. Such action is expressly prohibited by both the Flood Control Act of 1944 and NDAA 2020.

Section 7 of the Flood Control Act of 1944 provides:

> it shall be the duty of the Secretary of the Army to prescribe regulations for the use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with Federal funds provided on the basis of such purposes, and the operation of any such project shall be in accordance with such regulations.[182]

Nothing in section 7 authorizes the Corps to terminate its flood control jurisdiction above a certain reservoir level, as such action would be antithetical to the whole purpose of maintaining federal jurisdiction over flood control. Contrary to LEAD's argument, therefore, the language in the 1992 Water Control Manual is properly understood as the Corps' directive that GRDA take measures to save Pensacola Dam in the event reservoir levels reach 755 feet PD. The Corps still maintains flood control jurisdiction under section 7 in these circumstances; its Manual is a manifestation of it exercising its exclusive jurisdictional responsibilities by directing GRDA to take actions to save the dam from catastrophic failure, as the top elevation of the gates in Pensacola Dam is 755 ft PD.

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[179] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

[180] USACE, Pensacola Reservoir Grand (Neosho) River, Oklahoma Water Control Manual at 7-4 (1992) [hereinafter, 1992 Water Control Manual].

[181] LEAD USR Comments at 6.

[182] 33 U.S.C. § 309.

And if there were any doubt regarding the Corps' jurisdiction, Congress settled that matter in NDAA 2020, which provides: "The Secretary [of the Army] shall have exclusive jurisdiction and responsibility for management of the flood pool for flood control operations at Grand Lake O' the Cherokees."[183]

For these reasons, the Commission should not require additional STM runs on areas that are outside its jurisdiction by at least 10 vertical feet. For additional analysis on this issue, please see section 4.1.1.

3. The Commission Is Not Required Under NEPA to Conduct an Analysis of Unreasonable Alternatives

As detailed in section 4.1.2, an analysis of extreme, hypothetical Project operations is unnecessary to meet the Commission's obligations under NEPA to evaluate reasonable alternatives.

4.2.3.9 Sediment Depositions Should be Measured to Verify the Model Projections and Tested for Metals to Determine if they are Safe and Appropriate for Wildlife Management

Requested Modification:

USFWS requests that GRDA be required to measure sediment depositions to verify the model projections and tested for metals to determine if they are safe and appropriate for wildlife management.[184]

GRDA Response:

The Commission should reject USFWS' request to require GRDA to measure sediment depositions to verify the model predictions and test for metals to determine if they are safe and appropriate for wildlife management. USFWS is raising this issue for the first time at this very late juncture in the ILP. Moreover, GRDA is not responsible for the existence of contaminants from the Tar Creek Superfund Site in Oklahoma which is a part of the larger Tri-State Mining District (TSMD), which extends into Kansas and Missouri, and EPA has responsibilities for this site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); thus, the information requested by USFWS would not provide any information of how it "would inform the development of license requirements," as required by the ILP regulations.[185]

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause *and* must include a demonstration that: (1) the approved study was not conducted as provided

[183] Pub. L. No. 116-92, § 7612(c), 133 Stat. 1198, 2313 (2019).

[184] USFWS Comments on Updated Study Report, Project No. 1494-438, at 2 (Dec. 1, 2022) [hereinafter, USFWS USR Comments].

[185] 18 C.F.R. § 5.9(b)(5).

for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[186] With regard to its requested study plan modification to require GRDA to measure sediment depositions to verify the model projections and tested for metals to determine if they are safe and appropriate for wildlife management, USFWS never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, USFWS fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. GRDA is not Responsible for Tar Creek Superfund Site

Moreover, the Commission must reject USFWS' proposed study modification on the basis that the information it seeks will not "inform the development of license requirements," as required by Study Criterion 5.[187] GRDA is not responsible for the presence of contaminated soils in the Project area. Rather, the source of these metals has been thoroughly documented as the Tar Creek Superfund Site and other Superfund Sites. Further, EPA has already identified potentially responsible parties (PRP) under CERCLA and is actively managing the cleanup project. GRDA is not a PRP.

3. USFWS' Request Is Already Addressed by Model Results

The STM allows and predicts sedimentation within the channel as well as in overbank areas. All deposition (both above and below "typical" water levels) is included in model predictions. If stream conditions are such that sediment is likely to deposit in the overbank areas, including in forested areas, the model predicts deposition in that area. The model will allow sediment deposition in any area that is wet; this means it will allow (and did, in fact, predict) deposition in overbank areas during large flow events. It is not designed to allow deposition only in stream channels while neglecting potential for overbank deposition. The STM simulates 50 years of hydrologic record, including such significant events as September 1993, July 2007, December 2015, and May 2019. These events include overbank flow and overbank sediment deposition. So to clarify, USFWS' comment is directly addressed by model results presented at the USR.

4. Additional Fieldwork Would Not Produce Useful Information on Future Deposition Rates

The surveys used in the model development are based on both in-channel and overbank datasets where such information is available. The calculations regarding sediment deposition that were used in the model calibration and validation have been documented (USR Section 6).

Field measurements of sediment deposition in overbank areas will not provide significant benefit or useful information for the study, and it is unclear how this would be accomplished. The modern geometry was

[186] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

[187] *Id.* § 5.9(b)(5).

based on a number of data sources (see USR Section 5.1.2) and calibration/validation was achieved based on comparisons to measurements made circa-1940. Going to the site now would allow evaluation of current ground elevations but would not likely produce meaningful information about deposition thicknesses or rates.

4.2.4 Modifications to Aquatic Species of Concern Study

4.2.4.1 Modify to Reflect Proposed Changes to UHM Study

Requested Modification:

The City of Miami requests that, as a result of its requested modifications to the UHM and the Sedimentation Study, FERC should require additional modifications to GRDA's other studies that depend upon the results of those studies, including the Aquatic Species of Concern Study.[188]

GRDA Response:

The Commission should reject the City of Miami's request to modify the Aquatic Species of Concern Study, which the City raises for the first time at this very late juncture in the ILP. The City fails to allege with any specificity the modifications that should be made to the Aquatic Species of Concern Study, and rather, simply states that this study and others "all depend on supporting analysis from the UHM study."[189] Moreover, the error alleged by the City of Miami is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause and must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[190] With regard to its requested study plan modification to require changes to the Aquatic Species of Concern Study based on the City's alleged errors in the H&H Study, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

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188 City's USR Comments at 19-20.

189 *Id.*at 19.

190 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

2. The City's Premise for Requiring Changes to the Aquatic Species of Concern Study Is Flawed

The City's only basis for requesting a modification to the Aquatic Species of Concern Study is its allegation that the H&H Study modeling work and Sedimentation Study are flawed[191]—a premise that is fully addressed and debunked in sections 4.2.2 and 4.2.3, above. Because these studies do not contain the errors alleged by the City, there is no reason to revisit the Aquatic Species of Concern Study.

3. The City's Concerns Modeling Outputs Are Not Relevant to the Aquatic Species of Concern Study

The Aquatic Species of Concern Study did not use simulation outputs from the Sedimentation Study. Therefore, modification to the Sedimentation Study would not necessitate modification to the Aquatic Species of Concern Study.

While the Aquatic Species of Concern Study used simulation outputs from the H&H Study UHM, none of the City's allegations are relevant to the specific UHM outputs used in the Aquatic Study. Therefore, even if the City's disproven premise had merit, there would still be no reason to revisit the Aquatic Species of Concern Study.

First, the calibrated UHM has not changed since the ISR. The City's requested modifications focus on (1) USACE flood control operations during inflow events, (2) the 100-year inflow hydrograph, (3) "materiality" threshold, and (4) physically feasible Project Operations. The City has not requested any modification to UHM calibration, and any such request at this point in the ILP would be untimely. Therefore, there is no reason why the calibrated UHM cannot be used "as is" to analyze hydraulics in regard to Aquatic Species of Concern.

Second, the expanded suite of inflow event simulations, on which the City's criticisms rest, has nothing to do with the Aquatic Species of Concern Study. FERC Staff's February 2022 SMD required GRDA to "run scenarios starting at an elevation of 734 feet and extending up to and including 757 feet PD."[192] The expanded suite of simulations analyzing a combined matrix of inflow events and starting stages at Pensacola Dam has no impact on the separate, period-of-record critical season simulations used in the Aquatic Species of Concern Study.

Third, the conclusions of the Hydrologic and Hydraulic Modeling Study have not changed since the ISR. GRDA implemented the Commission's recommendations following the ISR, including the recommendation to run all simulated inflow event scenarios with starting elevations of 734 feet up to and including 757 feet PD. GRDA presented the results of these additional model runs in the USR. The expanded suite of simulations did not change the study conclusions.

[191] City's USR Comments at 19.

[192] Feb. 2022 SMD at B-13.

Fourth and finally, GRDA has demonstrated in this Response how the use of inflated WSEL differences, reported by the City's consultant Tetra Tech and based on methodologically flawed model input, would still not change the study conclusion[193]

For these reasons, even if the City's disproven premise had merit, there is no reasonable basis for the Commission to adopt the City's request to modify the Aquatic Species of Concern Study.

4.2.4.2 Additional Surveys of Mussels in Neosho and Spring Rivers

Comment:

USFWS states that "additional surveying of mussels in the Neosho and Spring rivers could be beneficial," however, "such surveying should be designed in consideration of survey work that has been completed recently as well as survey work planned in the area that is fairly certain to occur."[194]

GRDA Response:

The Commission should reject USFWS' request to modify the Aquatic Species of Concern Study. USFWS fails to allege with any kind of specificity the modifications that should be made to the Aquatic Species of Concern Study, and rather, simply states that "additional surveying of mussels in the Neosho and Spring rivers could be beneficial."[195] USFWS has previously made this same request in its comments on the ISR, and in response, FERC required that "GRDA conduct a targeted freshwater mussel survey in the FWS-recommended survey area (i.e., the Spring River between Warren Branch and the confluence with the Neosho River and in the Neosho River between the City of Miami and the confluence with the Spring River) after consultation with FWS, EcoAnalysts, and TCTC on the survey design."[196] Thereafter, GRDA completed those additional surveys as required by FERC and provided the results in the USR.[197] Moreover, USFWS failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause and must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[198] With regard to its requested study plan modification to require even more surveying in the Spring and Neosho rivers,

193 *See supra* § 4.2.2.2.

194 USFWS USR Comments at 2.

195 *Id.* at 5.

196 Feb. 2022 SMD at B-23 to B-24.

197 GRDA's 2022 USR § 4.3.1.

198 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

the USFWS never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission—including the additional surveys approved by the Commission following USFWS recommendations following the ISR. Moreover, USFWS fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. GRDA Completed Additional Freshwater Mussel Surveys in Accordance with FERC's February 2022 SMD

USFWS previously made this same request that FERC require GRDA to conduct additional surveys on the Spring and Neosho Rivers.[199] In its February 2022 SMD, Commission accepted this request, and required GRDA to complete "a targeted freshwater mussel survey in the FWS-recommended survey area (*i.e.,* the Spring River between Warren Branch and the confluence with the Neosho River and in the Neosho River between the City of Miami and the confluence with the Spring River), after consultation with FWS, EcoAnalysts, and TCTC on the survey design."[200]

GRDA explained in the USR that these surveys were completed the week of July 18, 2022, following consultation with USFWS in the development of study methods. Overall, 188 mussels represented by 12 species were collected from 13 sites during 57 person-hours of total survey effort. Bluefer (*Potamilus purpuratus*) was the most abundant species, with 108 individuals collected. The next most abundant species was Fragile Papershell (*Leptodea fragilis*), with 23 individuals collected. Threehorn Wartyback (*Obliquaria reflexa*) and Pink Papershell (*Potamilus ohiensis*) were the next most abundant species overall, with 19 and 17 individuals collected, respectively. No Neosho Muckets were collected during this study.[201]

Thus, USFWS' request for additional freshwater mussel surveys at this stage is unwarranted.

4.2.5 Modifications to Terrestrial Species of Concern Study

4.2.5.1 Modify to Reflect Proposed Changes to UHM Study

Requested Modification:

The City of Miami requests that, as a result of its requested modifications to the UHM and the Sedimentation Study, FERC should require additional modifications to GRDA's other studies that depend upon the results of those studies, including the Terrestrial Species of Concern Study.[202]

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199 *See* USFWS Comment on Initial Study Report at 2, Project No. 1494-438 (filed Nov. 30, 2021).

200 Feb. 2022 SMD at B-24.

201 *See* GRDA's 2022 USR at § 4.3.1.

202 City's USR Comments at 19-20.

GRDA Response:

The Commission should reject the City of Miami's request to modify the Terrestrial Species of Concern Study, which the City raises for the first time at this very late juncture in the ILP. The City fails to allege with any specificity the modifications that should be made to the Terrestrial Species of Concern Study, and rather, simply states that this study and others "all depend on supporting analysis from the UHM study."[203] Moreover, the error alleged by the City of Miami is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause and must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[204] With regard to its requested study plan modification to require changes to the Terrestrial Species of Concern Study based on the City's alleged errors in the H&H Study, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. The City's Premise for Requiring Changes to the Terrestrial Species of Concern Study is Flawed

The City's only basis for requesting a modification to the Terrestrial Species of Concern Study is its allegation that the H&H Study modeling work and Sedimentation Study are flawed[205]—a premise that is fully addressed and debunked in sections 4.2.2 and 4.2.3, above. Because these studies do not contain the errors alleged by the City, there is no reason to revisit the Terrestrial Species of Concern Study.

3. The City's Concerns Modeling Outputs Are Not Relevant to the Terrestrial Species of Concern Study

The Terrestrial Species of Concern Study did not use simulation outputs from the Sedimentation Study. Therefore, modification to the Sedimentation Study would not necessitate modification to the Terrestrial Species of Concern Study.

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[203] *Id.* at 19.

[204] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

[205] City's USR Comments at 19.

While the Terrestrial Species of Concern Study used simulation outputs from the H&H Study UHM, none of the City's allegations are relevant to the specific UHM outputs used in the Terrestrial Study. Therefore, even if the City's disproven premise had merit, there would still be no reason to revisit the Terrestrial Species of Concern Study.

The UHM modeling performed in support of the Terrestrial Species of Concern Study followed similar methodology as the Aquatic Species of Concern Study (i.e., a critical season was defined by the Terrestrial Species of Concern Study Team and period-of-record simulation outputs were requested from the Hydrologic and Hydraulic Modeling Study Team). Therefore, the four (4) reasons presented in Section 4.2.4.1 apply here as well:

1. The calibrated UHM has not changed since the ISR.
2. The expanded suite of inflow event simulations, on which the City's criticisms rest, has nothing to do with the Terrestrial Species of Concern Study.
3. The conclusions of the Hydrologic and Hydraulic Modeling Study have not changed since the ISR.
4. GRDA has demonstrated in this Response to Comments how the use of inflated WSEL differences, reported by the City's consultant Tetra Tech and based on methodologically flawed model input, would still not change the Hydrologic and Hydraulic Modeling Study conclusion.

For these reasons, even if the City's disproven premise had merit, there is no reasonable basis for the Commission to adopt the City's request to modify the Terrestrial Species of Concern Study.

4.2.6 Modifications to Wetlands and Riparian Habitat Study

4.2.6.1 Modify to Reflect Proposed Changes to UHM Study

Requested Modification:

The City of Miami requests that, as a result of its requested modifications to the UHM and the Sedimentation Study, FERC should require additional modifications to GRDA's other studies that depend upon the results of those studies, including the Wetlands and Riparian Habitat Study.[206]

GRDA Response:

The Commission should reject the City of Miami's request to modify the Wetlands and Riparian Habitat Study, which the City raises for the first time at this very late juncture in the ILP. The City fails to allege with any specificity the modifications that should be made to the Wetlands and Riparian Habitat Study, and rather, simply states that this study and others "all depend on supporting analysis from the UHM study."[207] Moreover, the error alleged by the City of Miami is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

[206] City's USR Comments at 19-20.

[207] *Id.* at 19.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause and must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[208] With regard to its requested study plan modification to require changes to the Wetlands and Riparian Habitat Study based on the City's alleged errors in the H&H Study, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. The City's Premise for Requiring Changes to the Wetlands and Riparian Habitat Study Is Flawed

The City's only basis for requesting a modification to the Wetlands and Riparian Habitat Study is its allegation that the H&H Study modeling work and Sedimentation Study are flawed[209]—a premise that is fully addressed and debunked in sections 4.2.2 and 4.2.3, above. Because these studies do not contain the errors alleged by the City, there is no reason to revisit the Wetlands and Riparian Habitat Study.

3. The City's Concerns Modeling Outputs Are Not Relevant to the Wetlands and Riparian Habitat Study

The Wetlands and Riparian Habitat Study did not use simulation outputs from the Sedimentation Study. Therefore, modification to the Sedimentation Study would not necessitate modification to the Wetlands and Riparian Habitat Study.

While the Wetlands and Riparian Habitat Study used simulation outputs from the H&H Study UHM, none of the City's allegations are relevant to the specific UHM outputs used in the Wetlands and Riparian Habitat Study. Therefore, even if the City's disproven premise had merit, there would still be no reason to revisit the Wetlands and Riparian Habitat Study.

The UHM modeling performed in support of the Wetlands and Riparian Habitat Study followed similar methodology as the Aquatic Species of Concern Study (i.e., a critical season was defined by the Wetlands and Riparian Habitat Study Team and period-of-record simulation outputs were requested from the Hydrologic and Hydraulic Modeling Study Team). Therefore, the four (4) reasons presented in Section 4.2.4.1 apply here as well:

1. The calibrated UHM has not changed since the ISR.

[208] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

[209] City's USR Comments at 19.

2. The expanded suite of inflow event simulations, on which the City's criticisms rest, has nothing to do with the Wetlands and Riparian Habitat Study.
3. The conclusions of the Hydrologic and Hydraulic Modeling Study have not changed since the ISR.
4. GRDA has demonstrated in this Response to Comments how the use of inflated WSEL differences, reported by the City's consultant Tetra Tech and based on methodologically flawed model input, would still not change the Hydrologic and Hydraulic Modeling Study conclusion.

For these reasons, even if the City's disproven premise had merit, there is no reasonable basis for the Commission to adopt the City's request to modify the Wetlands and Riparian Habitat Study.

4.2.7 Modifications to Infrastructure Study

4.2.7.1 Modify to Reflect Proposed Changes to UHM Study

Requested Modification:

The City of Miami requests that, as a result of its requested modifications to the UHM and the Sedimentation Study, FERC should require additional modifications to GRDA's other studies that depend upon the results of those studies, including the Infrastructure Study.[210]

GRDA Response:

The Commission should reject the City of Miami's request to modify the Infrastructure Study, which the City raises for the first time at this very late juncture in the ILP. The City fails to allege with any specificity the modifications that should be made to the Infrastructure Study, and rather, simply states that this study and others "all depend on supporting analysis from the UHM study."[211] Moreover, the error alleged by the City of Miami is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause and must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[212] With regard to its requested study plan modification to require changes to the Infrastructure Study based on the City's alleged errors in the H&H Study, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails

[210] *Id.*

[211] *Id.*

[212] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

2. The City's Premise for Requiring Changes to the Infrastructure Study Is Flawed

The City's only basis for requesting a modification to the Infrastructure Study is its allegation that the H&H Study modeling work and Sedimentation Study are flawed[213]—a premise that is fully addressed and debunked in sections 4.2.2 and 4.2.3, above. Because these studies do not contain the errors alleged by the City, there is no reason to revisit the Infrastructure Study.

3. The City's Concerns Modeling Outputs Are Not Relevant to the Infrastructure Study

The Infrastructure Study did not use simulation outputs from the Sedimentation Study. Therefore, modification to the Sedimentation Study would not necessitate modification to the Infrastructure Study.

The Infrastructure Study used simulation outputs from the H&H's Study UHM to analyze whether Project operations were likely to have an effect of frequency and depth of flooding. Between the ISR and the USR, the Infrastructure Study was expanded to include additional inflow events and extreme, hypothetical starting pool elevations. Yet even this study expansion did not result in a different study conclusion.

In the ISR, GRDA studied three inflow events combined with starting pool elevations within GRDA's anticipated operational range: 742 to 745 feet PD. GRDA concluded that "no additional adverse impacts exist due to Project operations."[214] In its February 2022 SMD, FERC recommended that GRDA expand its analysis to include five inflow events, combined with starting pool elevations from 734 feet up to an including 757 feet PD. After GRDA conducted this significantly expanded infrastructure analysis, the study conclusion did not change: "infrastructure locations are not adversely affected by GRDA's anticipated Project operations."[215]

If a significant expansion of starting pool elevations and inflow events did not change the study conclusion, it is unlikely that any further modification of the H&H Study, within the reasonable bounds of the ILP process, would change the Infrastructure Study conclusion. For this reason, even if the City's debunked premise had merit, there is no reasonable basis for the Commission to adopt the City's request to modify the Infrastructure Study.

[213] City's USR Comments at 19.

[214] ISR, Appendix 11, § 7.

[215] USR, Appendix 11, § 7.

4.2.8 Modifications to Socioeconomics Study

4.2.8.1 Modify to Reflect Proposed Changes to UHM Study

Requested Modification:

The City of Miami requests that, as a result of its requested modifications to the UHM and the Sedimentation Study, FERC should require additional modifications to GRDA's other studies that depend upon the results of those studies, including the Socioeconomic Study.[216]

GRDA Response:

The Commission should reject the City of Miami's request to modify the Socioeconomics Study, which the City raises for the first time at this very late juncture in the ILP. Indeed, the Socioeconomics Study has been complete since the ISR, as the Commission imposed no additional requirements in its February SMD.

The City fails to allege with any specificity the modifications that should be made to the Socioeconomics Study, and rather, simply states that this study and others "all depend on supporting analysis from the UHM study."[217] Moreover, the error alleged by the City of Miami is non-existent, and the City failed to meet the regulatory requirements for justifying a study modification.

1. The Study Plan Modification Fails to Meet the ILP Regulatory Standard

As explained in section 4.2 above, any request for a modified study must be accompanied by a showing of good cause and must include a demonstration that: (1) the approved study was not conducted as provided for in the Commission-approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.[218] With regard to its requested study plan modification to require changes to the Socioeconomic Study based on the City's alleged errors in the H&H Study, the City of Miami never alleges good cause, and it makes no showing that GRDA failed to conduct the Study Plan as required by the Commission. Moreover, the City of Miami fails even to allege that the Commission-approved study was conducted under anomalous conditions, or that environmental conditions have changed in a material way.

For these reasons alone, the Commission must reject this proposed modification.

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[216] City's USR Comments at 19-20.

[217] *Id.* at 19.

[218] 18 C.F.R. § 5.15(f) (requiring a request for modified study to meet the requirements of 18 C.F.R. § 5.15(d)).

2. The City's Premise for Requiring Changes to the Socioeconomics Study Is Flawed

The City's only basis for requesting a modification to the Socioeconomics Study is its allegation that the H&H Study modeling work and Sedimentation Study are flawed[219]—a premise that is fully addressed and debunked in sections 4.2.2 and 4.2.3, above. Because these studies do not contain the errors alleged by the City, there is no reason to revisit the Socioeconomics Study.

3. The Socioeconomics Study Does Not Rely on Modeling Outputs.

In GRDA's ISR, additional work on the Socioeconomics Study was not proposed. In its February 2022 SMD, the Commission affirmed that:

> The Socioeconomics Study Report filed by GRDA conforms to the requirements of the Commission's study plan determination and there is no evidence that the study was conducted under anomalous environmental conditions or that conditions changed in a material way since approval of the study plan (section 5.15(d)). Therefore, no modification to the study is warranted.[220]

The City has not identified, in either its comments on GRDA's ISR or in its comments on GRDA's USR, how the Socioeconomics Study relies on the results of the H&H Study or the Sedimentation Study, and thus how any modification to these studies would necessitate modification to the Socioeconomic Study. For this reason, even if the City's debunked premise had merit, there is no reasonable basis for the Commission to adopt the City's request to modify the Socioeconomics Study.

4.3 Response to Requests for New Studies

For a requested new study at the USR stage, section 5.15(f) of the ILP regulations imposes a heavy burden, requiring the requestor not only to demonstrate "extraordinary circumstances warranting approval" of the new study,[221] but also to include an explanation of: (1) any material change in law or regulations applicable to the information request, (2) why the goals and objectives of the approved study could not be met with the approved study methodology, (3) why the request was not made earlier, (4) significant changes in the Project proposal or that significant new information material to the study objectives has become available, and (5) why the new study request satisfies the study criteria in Section 5.9(b).[222]

When commenting on the USR, several relicensing participants requested new studies. First, both the City of Miami and LEAD revive their prior study request—which the Commission has deferred twice in this proceeding—for GRDA to conduct a study of Contaminated Sediment, including heavy metals related to the TSMD. In addition, USFWS seeks a new study related to tree-roosting bats.

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219 City's USR Comments at 19.

220 Feb. 2022 SMD at B-32.

221 18 C.F.R. § 5.15(f).

222 *Id.* (requiring a new study request to meet the standards of 18 C.F.R. § 5.15(e)).

As demonstrated below, neither of these study requests meets the regulatory standard under section 5.15(f) and should be denied.

4.3.1 Contaminated Sediment, Including Heavy Metals, Related to TSMD

The City of Miami requested that FERC require GRDA to undertake a new study to consider whether contaminated sediment from the upstream Tar Creek Superfund site might be deposited downstream as a result of flooding. Similarly, LEAD requests that FERC "conduct a heavy metal study in the Grand Lake watershed to ensure the safety of human health due to runoff from the Tar Creek Superfund Site and the Tri-State Mining District."[223]

1. The Study Requests Fail to Meet the ILP Regulatory Standard.

GRDA recognizes that relicensing participants have sought the Contaminated Sediment Study since the beginning of the relicensing process, which the Commission has repeatedly deferred pending results of the H&H Study and Sedimentation Study. While the "extraordinary circumstances" standard under section 5.15(f) may not apply to the Commission's determination of this study, it nonetheless must be denied for failure to meet the study criteria under section 5.9(b) of the Commission's regulations.

There are numerous reasons why the Commission should not approve this requested new study under the required elements of section 5.9(b):

First, the requested study lacks "any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied" (Criterion 5).[224] In this case, after four years of extensive study and modeling, the Commission-approved Study Plan has demonstrated that Project operations do not materially affect flows moving through the Project area from upstream locations, nor does the Project affect sedimentation. The now-completed study reports in the USR firmly support these conclusions.[225] The Project unquestionably did not cause the release of contaminants these sediments, and GRDA's studies demonstrate that the Project does not cause the transport or deposition of these contaminants. Independent studies conducted by third parties also recognize that contamination of sediments is caused by parties other than GRDA.[226]

Second, the requested study will not "inform the development of license requirements" (Criterion 5).[227] Again, because the Project did not cause the release of contaminants from TSMD or materially contribute to their movement into and within the Project area, there is no basis for the Commission to fashion any license requirements to address this issue. As the Commission has recognized in other relicensing

[223] LEAD USR Comments at 3.

[224] 18 C.F.R. § 5.9(b)(5).

[225] *See* USR at Appendices 2 (H&H Study Reports) and 4 (Sedimentation Study Report).

[226] *See Andrews et al.* 2009; *Ingersoll et al.* 2009, and *Juracek and Becker* 2009.

[227] 18 C.F.R. § 5.9(b)(5).

proceedings, because GRDA is not responsible for the presence of heavy metals and has no ability to mitigate effects of these substances, this type of study does not meet Criterion 5.[228] Moreover, the Tar Creek and other Superfund sites within the TSMD fall under EPA's control. EPA has an existing program in place to address it. Under EPA's Operable Unit 2,[229] EPA has developed a remedial action plan for the residential areas[230] of the Superfund Site. The action plan requires EPA to sample soils to determine whether contaminants in the soils are at levels above those protective of human health. If contaminants are found above established threshold levels, EPA would excavate contaminated soils, which are transported off-site. The excavated areas are then back-filled with clean soil.[231] Through 2015, EPA has remediated 2,940 residential areas.[232] Current soil sampling assessments and remediation are being addressed by the Oklahoma Department of Environmental Quality through a cooperative agreement with EPA Region 6.[233]

In summary, the TSMD contains the Tar Creek Superfund site located upstream of the Pensacola Project and is the source of sediment-bound metals in Grand Lake. GRDA is not responsible for the presence of heavy metals in Tar Creek. Heavy metal contamination in sediment in Grand Lake is a cumulative effect in the area due to natural flooding upstream and is not directly related to Project operations. As demonstrated by the now-completed UHM and Sedimentation Study, Project operations do not materially affect natural flooding in the Project area, and, in any event, studies conducted as part of EPA's ongoing oversight as well as numerous others, have concluded that there is no evidence of acute or chronic toxicity as a result of metals contamination within Grand Lake.

Moreover, EPA has identified the PRPs and has a program in place to address the remediation of the Tar Creek Superfund site and TSMD. For these reasons, this study request does not meet the Commission's study plan criteria, lacks any "nexus" to the Project, and must be denied.

2. The Commission Can Ascertain Cumulative Effects Without Requiring a New Study.

GRDA recognizes that the Commission has indicated that it will analyze "the effects of project operations on the transport and subsequent deposition of potentially contaminated sediment, without restricting the geographic scope of analysis to the existing project Boundary, and to reflect our intention to analyze the resource for cumulative effects."[234] It is well-settled, however, that the Commission need not require new

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228 *See*, *e.g.*, *First Light Hydro Generating Co.*, 162 FERC ¶ 61,235, at P 39 (2018); *Ga. Power Co.*, 111 FERC ¶ 61,433, at PP 36-46 (2005); Study Plan Determination for the Toledo Bend Project at 17, Project No. P-2305 (issued Aug. 6, 2009) (rejecting the risk assessment study for the accumulation of Mercury and Sediment into the Toledo Bend Reservoir "[d]ue to the lack of a nexus between project operation and the resource to be studied").

229 EPA, Record of Decision, Residential Areas Operable Unit 2 (August 1997).

230 "Residential areas" includes single-family residences, apartments, condominiums, and high access areas (places frequented by children such as daycares, playgrounds and schoolyards).

231 *Id.*

232 https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0601269#Done.

233 *Id.*

234 SD2 at 8-9.

studies to support its analysis of cumulative effects.[235] And there is literally a mountain of information regarding the Tar Creek Superfund site and the TSMD in general for the Commission to support its cumulative effects analysis.[236]

3. LEAD Misapprehends the Purpose of the Cs-137 Analysis

In its comment, LEAD incorrectly asserts that "FERC previously suggested that GRDA satisfied the requirement to conduct a heavy metal assessment on the Grand Lake watershed by conducting Cs-137 tests."[237] This statement misapprehends the purpose of the Cs-137 tests. In its SMD, FERC stated that "[t]he primary purpose for comparing metal at different depths would be to estimate the age of the sediment. This goal has been accomplished with the Cs-137 analysis."[238] Contrary to LEAD's comment, FERC has never imposed any requirement for GRDA to perform heavy metal testing—because, as demonstrated above, there has never been any justification to impose such a requirement.

4.3.2 Additional Studies for Tree Roosting Bats

USFWS requested that "studies be done for tree roosting bats such as northern long-eared bats (NLEB) (*M. septentrionalis),* Indiana bats (*Myotis sodalis*), and tricolored bat (*Perimyotis subflavus*).[239] USFWS alleges that GRDA "has made a quick assessment that northern long-eared bat is 'unlikely to be affected' without further explanation".[240] USFWS indicates that it "need[s] to have a better understanding of how flooding could affect summer roosting areas, which would ultimately require a combination of acoustic surveys, mist-netting, and radio-telemetry."[241]

For a requested new study at the USR stage, section 5.15(f) of the ILP regulations imposes a heavy burden, requiring the requestor to not only demonstrate "extraordinary circumstances warranting approval" of the new study,[242] but also include an explanation of: (1) any material change in law or regulations applicable to the information request, (2) why the goals and objectives of the approved study could not be met with the approved study methodology, (3) why the request was not made earlier, (4) significant changes in the Project proposal or that significant new information material to the study objectives has become available, and (5) why the new study request satisfies the study criteria in Section 5.9(b).[243]

In its USR comments, USFWS makes none of these showings:

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235 *See, e.g., Natural Res. Defense Council v. Callaway*, 524 F.2d 79, 90 (2d Cir. 1975); *Eagle Crest Energy Co.*, 153 FERC ¶ 61,058 (2015).

236 *See, e.g.,* https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0601269.

237 LEAD USR Comments at 10-11.

238 May 2022 SMD at B-8.

239 USFWS USR Comments at 3.

240 *Id.*

241 *Id.*

242 18 C.F.R. § 5.15(f).

243 *Id.* (requiring a new study request to meet the standards of 18 C.F.R. § 5.15(e)).

- Although required by section 5.15(f) of the ILP regulations, USFWS makes no attempt to demonstrate extraordinary circumstances warranting approval of its new study request.
- Although required by section 5.15(e)(1) of the ILP regulations, USFWS does not cite any material change in the law or regulations that applies to its request.
- Although required by section 5.15(e)(2), USFWS' request for this new study does not indicate why the goals and objectives of any approved study could not be met with the approved study methodology.
- Although required by section 5.15(e)(3), USFWS makes no attempt to explain why its new study request was not made earlier.
- Although required by section 5.15(e)(4), USFWS does not identify any significant changes to the Project proposal or significant new information material to the study objectives has become available.
- Although required by section 5.15(e)(4), USFWS makes no attempt to demonstrate that its new study request satisfies the study criteria in § 5.9(b).

For these reasons alone, the Commission must request these new studies advanced by USFWS.

2. Any Effects to Bat Species Caused by Overland Flooding Are Not Associated with the Proposed Action in this Relicensing (ILP Study Criterion 5)

This proposed new study request seeks to have GRDA investigate effects of an action (i.e., flood control) that is outside the purview of the Commission's authority in this relicensing proceeding. As GRDA has explained throughout this process, including in section 4.1.1 above, USACE has exclusive jurisdiction over flood control at this Project, and no agency has any authority to dictate reservoir levels of the Project's conservation pool. Thus, to the extent that flooding within the flood pool may cause adverse effects to any species listed under the ESA, such effects are caused by USACE's actions, not any discretionary action of the Commission. Accordingly, these studies are not needed to meet any obligations of the Commission under ESA section 7 in this proceeding.[244] Moreover, this study request lacks any nexus to the Project under Study Criterion 5 of the ILP regulations.[245]

During the recent USR meeting, USFWS staff seemed to acknowledge this limitation, indicating that USFWS is already in consultation with the Corps on the issue of endangered northern long-eared bats (recently up-listed) and other tree roosting candidate bat species in Corps flood pools.

[244] 16 U.S.C. § 1536.

[245] 18 C.F.R. § 5.9(b)(5).

3. Existing Information Amply Demonstrates No Adverse Effect of the Project on ESA-Listed Bats (ILP Study Criterion 4)

GRDA does not dispute the presence of NLEB and tri-colored bat (Perimyotis subflavus) in the Project area. These bats and their presence in the area is well known to USFWS and GRDA. GRDA has previous research demonstrating their presence, as well as observations from caves in the area.[246] A study on tree roosting bats would be of little value to this process, as the Commission already has all the information it needs to make its decisions under NEPA and ESA section 7 in this process based on a wealth of existing data (Study Criterion 4).[247]

Indeed, NLEB has been documented to day roost in floodplains and bottomland hardwood communities.[248] But that does not mean that NLEB and tri-colored bats are harmed by flooding events, as alleged by USFWS. Contrary to USFWS' statements, floodplain forest is prone to large scale and seasonal flooding events that can create large numbers of standing dead trees and snags. It has been demonstrated that frequently flooded habitats support greater bat activity and species richness than adjoining upland and agricultural environments.[249] Studies on tree roosting bats have also found no evidence that bats get trapped within roost trees as water levels rise or change seasonally, with little effect on roost switching behavior.[250] Roost switching is also a common occurrence for this species and can occur daily in populations.[251] Finally, NLEB in Arkansas and Missouri have been noted to roost at heights of 15-30 feet above the forest floor.[252]

Given the life history of this species and documented propensity for floodplains, known day roost switching behavior, and roosting heights, USFWS' unsupported claims lack merit. The existing scientific record demonstrates that flooding and flood control within the flood control pool likely have a positive impact on the NLEB. Especially since several hundred miles of unregulated river exist upstream; which GRDA has conclusively demonstrated, nature (not operations) is the determining factor in frequency, magnitude, and flood height.

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[246] Grand River Dam Authority. 2017. Annual Report for Article 405: Gray Bat Compliance Monitoring for the Pensacola Project (P-1494). FERC Accession No. 20170623-0538. June 23, 2017.

[247] 18 C.F.R. § 5.9(b)(4).

[248] Carter TC and GA Feldmamer. 2005. Roost tree use by maternity colonies of Indiana bats and northern long-eared bats in southern Illinois. Forest Ecology and Management. 219. 259-268; Burrell GE and SM Bergeson. 2022. Roosting behavior of northern long eared bats (Myotis septentrionalis) in an uban-adjacent forest fragment. Forests. 13. 12.

[249] Blakey RV, RT Kingsford, BS Law, and J Stoklosa. 2017. Floodplain habitat is disproportionately important for bats in large river basin. Biological Conservation. 215. 1-10.

[250] Scherman SJ, TS Rish, and V Rolland. 2022. Fall and winter activity of two bat species in response to winter flooding and decreasing temperature. Global Ecology and Conservation. 38. E02276.

[251] Silvis A, RW Perry, and WM Ford. 2016. Relationships of three species of white-nose syndrome-impacted bats to forest condition and management. US Forest Service Southern Research Station General Technical Report SRS−214, Ashville, NC.

[252] *Id.*

On an operational level (not flood control), GRDA models do forecast a slightly higher median water level during the growing season under GRDA's anticipated Project operations during the new license term. This may, in turn, influence some forested wetland area and tree species less adept to more hydric conditions, converting forested wetlands to other wetland types. However, this conversion would create habitat (perhaps temporarily) for the NLEB as demonstrated in the previously cited works. In the DLA and revised Shoreline Management Plan, GRDA has proposed operational measures for protection of NLEB.[253]

4. The Proposed Studies Would Impose Significant Cost Burdens and Expansive Levels of Effort (ILP Study Criterion 7)

USFWS' proposed acoustic survey and tracking survey would only be interesting at an academic level. It would require a massive undertaking to conduct such a study for a 46,000-acre lake and would be impossible to demonstrate any operational effect. Thus, it fails to meet ILP study Criterion 7.[254]

5. ESA Section 7 Consultation Cannot Involve Any New Studies

Finally, ESA section 7 demands only that analyses and decisions be made "based on the best scientific and commercial data *available*.[255] The D.C. Circuit has consistently held that, pursuant to this standard, the Secretary of the Interior "has no obligation to conduct independent studies," but is prohibited "from disregarding *available* scientific evidence that is in some way better than the evidence he relies on."[256] Importantly, the courts have held that the "best available data" requirement "requires not only that data be attainable, but that researchers in fact have conducted the tests."[257] Thus, USFWS' new study request cannot be granted simply because of a need for ESA section 7 consultation in this relicensing.

4.4 Response to Other Technical Comments and Requests for Clarification

4.4.1 Comments on Hydrologic and Hydraulic Modeling Study

4.4.1.1 Adverse Effects of Power Generation at Fort Gibson

Comment:

Commission Staff requested a clarification on "whether, and if so, to what extent (i.e., on-peak and off-peak megawatt hours per year), hydropower optimization at the Pensacola and Kerr Dams would adversely affect power generation at Fort Gibson."[258]

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253 *See* DLA §§ 3.7.2.2.4 and Appendix E-21 at § 5.6.3.

254 18 C.F.R. § 5.9(b)(7).

255 16 U.S.C. § 1536 (emphasis added).

256 *Sw. Ctr. for Biological Diversity v. Babbit*, 215 F.3d 58, 60 (D.C. Cir. 2000).

257 *Am. Wildlands v. Kempthorne*, 530 F.3d 991, 998 (D.C. Cir. 2008).

258 Staff Comments on the Updated Study Report for the Pensacola Hydroelectric Project, Project No. 1494-438 at A-1 (Nov. 29, 2022) [hereinafter FERC Staff USR Comments].

GRDA Response:

Hydropower optimization at Pensacola and Kerr Dams is not expected to adversely impact power generation at Fort Gibson. This is because Fort Gibson has a large conservation pool volume that can be, and is, used to manage short-term inflow fluctuations.

The anticipated operations at Pensacola would not affect the total volume of inflow at Fort Gibson aside from *de minimis* differences in evaporation. This is because, regardless of daily differences in Grand Lake elevation, all the water eventually flows downstream, and over time the total inflow volumes equilibrate.

Furthermore, the timing of inflows resulting from the anticipated operations at Pensacola should be favorable for power generation at Fort Gibson, due to the proximity of the two supply points in the regional electrical grid. Because of this proximity, the fluctuations of electricity prices at both facilities will tend to correlate well. Under the anticipated operations, GRDA would tend to limit releases for longer periods of time before generating power for longer periods of time to take advantage of multi-day electricity price fluctuations. Compared to the baseline operations, which were essentially a run-of-river operation, the anticipated operations will tend to result in releases which are better timed to the demands of the electrical grid. This tendency would be an advantage for power production at Fort Gibson as well, because USACE will be able to generate power more intensively during times of peak demand as the outflow volume at Fort Gibson is replaced with the inflow from Pensacola hydropower generation.

Importantly, SPA agrees with this analysis. In commenting on the USR, SPA stated:

> As stated in previous comments, Southwestern's primary concern with the Pensacola relicensing is the operation and timing of Pensacola releases. Southwestern believes that the operations presented in the October 12th and 13th, 2022, USR meetings will not have a significant negative impact on downstream hydropower. In fact, an operational change that allows GRDA flexible use of water storage between elevations 742 and 745 feet is likely to result in increased water releases during times of higher energy demand and reduced releases during times of lower energy demand, resulting in a positive impact to Southwestern's downstream hydropower resources. Added operational flexibility may also promote regional grid reliability by giving GRDA the ability to better respond to normal grid fluctuations as well as unusual events.[259]

[259] Letter from Ashley Corker, SPA, to Kimberly D. Bose, FERC, at 1 (Dec. 16, 2022). SPA's full comment letter on the USR appears in Appendix A.

4.4.1.2 Clarification of FRM and Use of RWM

Comment:

With respect to the FRM and the RWM, Commission staff requested clarification on two points. First, whether or not historic flow restrictions placed on the modeled reservoirs (Pensacola, Kerr, and Fort Gibson) are implicitly included in the RWM discharges that the FRM is intended to match for the modeled calibration events; and second, how modeling of historic inflow events in the FRM reflects the reservoir operating restrictions (*e.g.,* reservoir elevation and discharge requirements) that were actually placed on the reservoirs at the time the events actually occurred.[260]

GRDA Response:

To clarify, the OM could have been developed to match either the RWM output or historical gage records, but not both. This is because USACE makes real-time flood routing decisions based on actual conditions during inflow events. These real-time decisions often conflict with the flood routing results produced by RiverWare. The historical gage data does not match the RWM output. If the OM had been developed to validate against historical data, rather than against the RWM output, it would likely include very different rule sets which would not resemble the operating balance level and other rule sets in RiverWare. At the outset of this study, there was a choice to either develop the OM to match historical data or develop the OM to match RWM output.

In its 2018 SPD, FERC instructed GRDA to "validate its model results against the RiverWare output."[261] Therefore, GRDA developed the FRM and OM in a way that would best match the RWM output, and the FRM and OM results were successfully validated against the RWM output, as documented in both the ISR and USR. However, this means the model results will not compare well against the historically observed data for events when the actual USACE flood routing decisions did not agree with the RWM output. With this background understanding established, the requested clarifications are as follows:

First, GRDA's understanding is that any historical flow restrictions placed on the modeled reservoirs that differ from the flow restrictions represented by the RWM input data and results as delivered to GRDA by USACE would not be represented in the RWM. Flow restrictions (more broadly termed *system balancing and reservoir operating rules)* believed to be contemporary to the operation of Pensacola Dam prior to the 2015 license amendment, are implicitly included in the RWM discharge results for the entire simulated period of the RWM.

Additionally, the system balancing and reservoir operating rules in the RWM, and therefore also the FRM, do not necessarily reflect the exact same discharge requirements that were actually placed on the reservoirs by USACE at the time the events actually occurred. Rather, the FRM is a tool that can be used to comparatively assess the potential effects of different sets of reservoir operating rules or initial system

[260] *Id.*

[261] 2018 SPD at B-5.

conditions. This is presumably why FERC determined in 2018 that GRDA should validate its model results against the RWM output, and not against historical data which would not reflect adherence to any specific set of operating rules. System balancing and reservoir operating rules which are included in the RWM and FRM, and which reflect the real-world considerations presumably accounted for by USACE when making real-time flood routing decisions, include the following:

- Allowable rising release change and allowable falling release change limit how quickly the controlled releases are increased or decreased, subject to other limitations such as minimum surcharge.
- Operating level balancing seeks to maintain similar balance levels in each reservoir and return each reservoir to its target elevation following an inflow event.
- Regulating discharges of 100,000 cfs established in the water control manual are considered for Pensacola Dam, Kerr Dam, and Fort Gibson Dam.

4.4.1.3 Clarification of Use of Historical Spillway Gate Opening Records to Simulate Operations

Comment:

With respect to validation against USGS gage data, Commission staff referenced GRDA's use of the historical records of spillway gate openings to simulate operations for two historical validation simulations. Commission staff stated:

> It appears that this method could pre-determine validation by: (a) back-calculating inflow based on historic outflow and change in storage (elevation); (b) calculating outflow and change in storage based on the inflow; and (c) comparing the resulting water surface elevation to historic gage data. Please confirm or clarify this interpretation of the methodology, using sample calculations. Also, please explain why the reservoir elevations from normal simulations of the inflow events used for other aspects of the study could not be (or were not) compared directly to the historic gage data.[262]

GRDA Response:

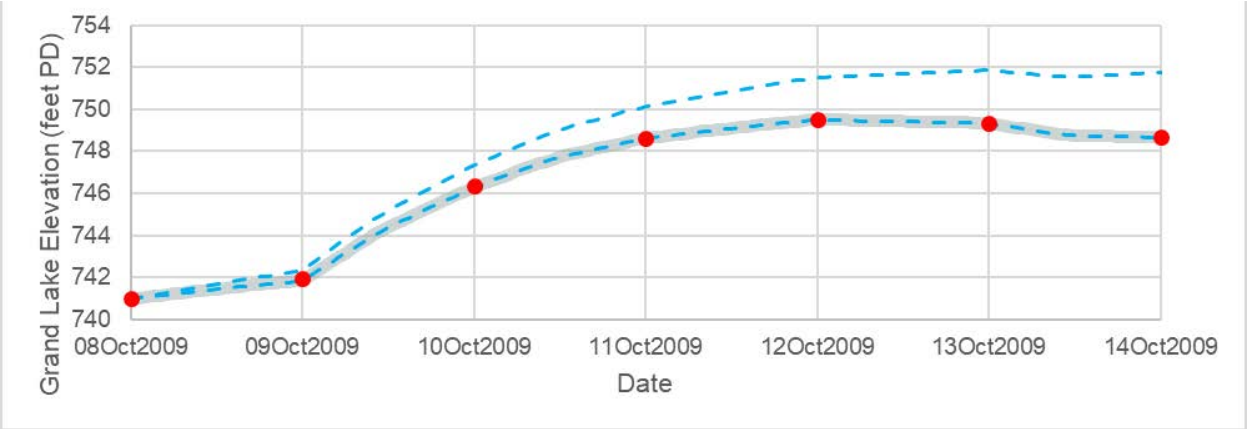
GRDA clarifies that its method did not pre-determine validation. While the reservoir inflow and spillway gate openings were calculated from the historical record, the hydropower discharge was modeled according to the same operating rules as other simulations. Therefore, validation was not pre-determined. Rather, the modeled hydropower operations, an important component of the OM, were validated. Secondarily, the validation results simply (though indirectly) demonstrate the volume conservation of the calculations.

An example of the model's sensitivity to the modeled hydropower discharge is shown in Figure 4.4.1.3-1 below for the October 2009 event. Sample calculations were requested, and although the full chain of calculations cannot be reasonably included outside of a spreadsheet, some sample elevations and volume

[262] FERC Staff USR Comments at A-2.

calculations are provided below the graph for this example. The dashed lines indicate the reservoir levels that would result from either maximum or minimum available turbine discharge during the event. These sensitivity results indicate a range of predicted elevations of 2.02 feet at the recorded peak of the event. By contrast, the validation results demonstrated a match to the observed peak stage within 0.02 feet. Obviously, it is not typical to cease turbine flows during such an event, as assumed for the upper sensitivity bound. To the contrary, it is typical to produce at the maximum available capacity during such an event, which is why the OM solution approximately follows the lower sensitivity bound. However, this example shows that validation of the Ops Model was not pre-determined, but rather demonstrated the validity of the hydropower optimization calculations, albeit for a simple case.

Figure 4.4.1.3-1. October 2009 Event.



Beginning storage (October 8, 2009)	= 1,266,191 AF
Net Inflow (October 8 – 12, 2009)	= 749,344 AF
Turbine capacity (October 8 – 12, 2009)	= 104,030 AF
Spillway discharge (October 8 – 12, 2009)	= 259,841 AF
Ending storage, min turbine discharge	= 1,755,694 AF (=1,266,191+749,344-259,841)
Ending storage, max turbine discharge	= 1,651,664 AF (=1,266,191+749,344-259,841-104,030)
Observed elevation (October 12, 2009)	= 749.50 ft PD
Ops Model predicted elevation	= 749.52 ft PD (based on USGS 2019 bathymetry)
Ending elevation, min turbine discharge	= 751.52 ft PD
Ending elevation, max turbine discharge	= 749.50 ft PD

Additionally, and as addressed in response to Commission staff's comment in section 4.4.1.2 above, model results based on the RWM system balancing and reservoir operating rules will not necessarily reflect historical flood routing decisions made by USACE. Therefore, direct comparison of those results to historical gage data cannot determine model validation. However, both the historical gage data and the reservoir elevations from normal simulations of the inflow events used for other aspects of the study were included in the data submitted with the USR for the December 2015 and October 2009 inflow events, as requested by FERC in its February 2022 SMD.[263] Relicensing participants can make any additional comparison they find constructive using the data provided.

[263] *See* Feb. 2022 SMD at B-14.

4.4.1.4 Use of Constant Target Elevation of 743.1 feet PD

Comment:

Commission staff requested clarification on the statement in GRDA's USR that "the average (mean) reservoir level below 745 PD was used as the guide curve elevation in the FRM. For the hourly period of record from April 1, 2004 through December 31, 2019, this average elevation was 743.1 feet PD."[264] Specifically, staff stated that "it appears this modeling approach would be equivalent to using a constant target elevation of 743.1 feet PD with short-term fluctuations driven by the incentive table. Please confirm or clarify this interpretation by December 29, 2022."[265]

GRDA Response:

Commission staff's interpretation is correct, with a few additional clarifications. First, FRM total discharge and stage-matching rules in the OM can override the discharge selected based on the incentive table, to greater or lesser extent, as detailed in the USR.[266] Additionally, the fluctuations driven by the OM incentive table remain within the range of 742-745 feet PD when the inflows are within the hydropower capacity and the reservoir elevation remains below 745 feet PD. Also, in the OM, the elevation does not actually remain at elevation 743.1 feet PD for extended periods, but regularly fluctuates between 742 and 745 feet PD.

4.4.1.5 Clarification of Approach Used to Determine Quantity of Inflows

Comment:

With respect to the DHM, Commission staff stated:

> Adjustment of Manning's n-values is a standard practice to calibrate the magnitude and timing of peaks for a given quantity of water. However, the approach used to initially determine the quantity of inflow appears to simply set a portion of the inflow equal to the amount needed to match the modeled elevations to the observed elevations on a storm-by-storm basis. This approach essentially pre-determines the calibration results presented in figures 5 through 12. Please clarify why this methodology was used rather than deriving a mathematical relationship between the non-gaged inflows and other historic or calculated inflows.[267]

[264] FERC Staff USR Comments at A-2.

[265] *Id.*

[266] *See* USR at Appendix 2, Operations Model Report § 5.4.3.

[267] FERC Staff USR Comments at A-3.

GRDA Response:

The calibration approach used for the DHM did not pre-determine the calibration results. The USACE recommends accounting for ungaged inflows when calibrating an unsteady HEC-RAS model.[268] The lateral inflow hydrograph applied during calibration was used to represent ungaged inflows to Lake Hudson and was computed on an event-by-event basis to account for the variability in lateral inflows for each unique event. Total lateral inflows to Lake Hudson are most often independent of outflows from Pensacola Dam. This is discussed briefly in Section 3.3 of the DHM USR, which references the poor correlation between peak inflows to Pensacola Dam and lateral inflows to Lake Hudson. Also, there is variability from event to event in how the rainfall is distributed over the local Lake Hudson watershed, which results in a unique pattern of inflow to Lake Hudson for each event. For both of these reasons, it would be very difficult, if not impossible, to derive a mathematical relationship between non-gaged inflows and other historic/observed or calculated inflows.

A rigorous approach was required to closely match both historical observed discharge and elevation for the entire model. GRDA recognizes that the rigorous calibration method used for the DHM is different from what is often used for a simpler system, e.g., a free-flowing river in which a downstream boundary condition is applied as a WSEL constraint (time-series, fixed, or normal depth). Had this typical approach been taken for the DHM calibration, a quasi-calibration could have been achieved with respect to upstream WSELs at the Langley streamgage with much less effort, but the discharges at Kerr Dam would not match the historical observed discharges due to the important volume-storage effect of the reservoir. This would be problematic for a model intended to represent actual historical flow routing through Lake Hudson and operation of Kerr Dam, especially given the influence that Lake Hudson levels have on WSELs throughout the entire length of the DHM. Therefore, this more rigorous approach, which followed USACE guidelines for calibrating an unsteady HEC-RAS model, was adopted to most closely match both historical observed discharge and elevation for the entire model domain.

For these reasons, the approach was taken to compute the lateral inflow hydrographs individually for each of the calibration events to properly match the volumetric inflows to Kerr Dam. Refinements were then made to the Manning's n-values to provide a good match to the observed stages at the Langley streamgage for all the calibration events while using a single model geometry.

4.4.1.6 Clarification of Whether Hydrographs are Converging Toward Reservoir Rule Curve in Place at Time of Event and Whether Convergence is Related to Stage Matching

Comment:

In its comments on the UHM, Commission staff requested clarification on:

[268] HEC-RAS User's Manual, Chapter 8: *Performing an Unsteady Flow Analysis.*

whether the hydrographs (figures C.7-C.12) are converging toward the reservoir rule curve that was in place at the time of the event, and, if so, whether this convergence is related to the stage matching discussed in section 5.4.3, *Flood Routing Model Stage Matching*. Further, please clarify whether this constraint also applies for the 100-year inflow event, which has no specified date from which to derive a rule curve elevation. Finally, please explain whether the start of the simulations could be adjusted so that the prescribed starting elevation for a given inflow event is still in effect when the storm flows arrive.[269]

GRDA Response:

GRDA clarifies that the hydrographs are converging toward the reservoir rule curve that was in place at the time of the event. This constraint applies to the historical inflow events and the synthetic 100-year inflow event. Because the 100-year event was based on the July 2007 event, the starting time of the 100-year event is analogous to 00:00 hours (midnight) on 6/28/2007, which is also the starting time of the July 2007 inflow event. The convergence of hydrographs toward the reservoir rule curve is accomplished by the stage matching discussed in the OM USR, Section 5.4.3, *Flood Routing Model Stage Matching* when the discharge and/or elevation are high. When the elevation is low and converging to a higher elevation, as in the 734 feet PD starting elevation, the convergence is based on the lack of available volume for generation above the normal minimum elevation (741 feet PD for Baseline, 742 feet PD for Anticipated).

GRDA also clarifies that the start of the simulations cannot be adjusted so that the prescribed starting elevation for a given inflow event is still in effect when the storm flows arrive. To understand why, additional clarification is required:

1. The stage hydrographs at Pensacola Dam represent decision making by USACE as a flood approaches Pensacola Dam from an upstream flooding source. It is appropriate that the hydrographs converge toward the target elevation because they represent USACE's decisions in balancing reservoir levels as a flood event moves through the system.
2. GRDA's simulations start when the flood hydrograph enters the UHM domain. The UHM domain covers 75 miles of Grand/Neosho River. It takes time for inflow hydrographs to move through the UHM domain and reach Pensacola Dam. During this time, USACE would perform flood control operations as part of its balancing of flood storage in the Arkansas River system as it sees the flood passing through upstream USGS gages and coming toward Pensacola Dam.
3. The only remaining option that could possibly have allowed the stage at Pensacola Dam to be *closer* to the prescribed starting elevation when the flood arrives at Pensacola Dam—after traveling the 75 miles of model domain—would have required that the simulation start mid-flood, meaning that a portion of the rising limb of the flood hydrograph be cut off and not simulated. As shown in Appendix B of this Response, this would have resulted in loss of flood volume, and would not have reflected USACE's flood control decisions in light of upstream federal dams and the balancing of flood storage in other reservoirs in the Arkansas River system. Even this inadvisable option would not have resulted in the prescribed starting elevation to still be in effect when the incoming flood

[269] FERC Staff USR Comments at A-3.

> wave arrived at Pensacola Dam, because floods take longer than 24 hours to move through the UHM domain. The approximate travel time from the USGS Commerce gage to Pensacola Dam is 50 hours, or slightly more than 2 days.

GRDA elaborates on these clarifications below.

In preparation for the ISR, GRDA set simulation starting dates based on when inflow began to increase at the upstream USGS gages on the Neosho River, Tar Creek, Spring River, and Elk River. Data at these USGS gages were used to define the inflow hydrographs, as discussed in Section 7 of both the ISR and USR. Simulations must start at midnight to allow computational alignment with the FRM. GRDA set the starting pool elevations in accordance with FERC's SPD and set the simulation start time in accordance with USACE best practices. USACE recommends starting the simulation prior to flood wave arrival at the upstream model boundary.[270] USACE recommends that the minimum flow be between 1% and 10% of the peak flow. For all inflow events except the June 2004 (1-year) event, the ratio of starting low flow to peak flow ranged from 1.1% to 5.6%. These values are within the USACE-recommended range. The exception is the June 2004 (1-year) inflow event, for which the ratio was 16.1%. This is because the peak flow during the 1-year event is inherently not much greater than normal river flows.

To aid in understanding the care that GRDA took when selecting simulation start dates, Appendix B of this Response displays the inflow hydrographs that GRDA used for both the ISR and the USR. These are the same inflow hydrographs presented in Appendix C.1 of the UHM ISR and USR, with additional inflow data added prior to the simulation start time and clarifying annotations added. The simulation starting dates are displayed on the hydrographs, along with alternate starting dates one day before and one day after the selected starting date. As mentioned above, to allow computational alignment with the FRM, simulations must begin at midnight. With that stipulation, the figures show that GRDA selected the most appropriate starting date for the simulations.

To clarify, the starting stages are not rendered immaterial. The issue at hand is the fact that the UHM covers approximately 75 miles of Grand Lake/Neosho River, 4 miles of Tar Creek, 21 miles of the Spring River, and 20 miles of the Elk River. The simulation starts when the flood hydrograph enters the model domain. At the same time, the OM starts calculating operations at the dam. The stage hydrographs generally converge toward each other during the simulation because high initial stages (e.g., 757 feet PD) result in the FRM and OM evacuating the flood pool to balance the storage at all three reservoirs, while low initial stages (e.g., 734 feet PD) result in the FRM and OM holding back water to fill the conservation pool and thus increase pool elevation during the simulation. There is no way to decouple the OM computations from the UHM without sacrificing the very purpose of the validated-against-RiverWare OM, which consistently computes operations at Pensacola Dam during inflow events according to its constraints, which are similar to the Water Control Manual. For example, if a simulation starts with the pool at 757 feet PD (at the very crest elevation of the dam, truly an emergency situation), USACE would direct GRDA to draw down the pool, regardless of whether any inflow hydrograph was moving down the Neosho River, the Spring River, or the Elk River.

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[270] HEC-RAS User's Manual, Chapter 8: *Performing an Unsteady Flow Analysis*.

The OM is the best available consistent mathematical representation of USACE's decision-making process and has been validated using USACE's RiverWare model as required by the Commission-approved Study Plan. To reiterate, the starting stages are not rendered immaterial by the fact that the UHM covers 75 miles of Grand Lake/Neosho River. Not only are the stage hydrographs in UHM Appendix C.2 unsurprising, but the results are also completely expected, because they represent decision making by USACE as a flood approaches Pensacola Dam from an upstream flooding source.

Regarding FERC's question of "whether the start of the simulations could be adjusted so that the prescribed starting elevation for a given inflow event is still in effect when the storm flows arrive," such a modification would require that a portion of the rising limb of the flood hydrograph be cut off and not simulated. As shown in Appendix B of this Response, this would have resulted in a loss of flood volume. When GRDA set the simulation start dates in 2021, special care was taken to specifically avoid the loss of flood volume. Adopting such a methodology and purposefully ignoring a portion of the incoming flood volume would not reflect the reality of USACE's flood control decisions in light of upstream federal dams, as well as balancing flood storage in other reservoirs in the Arkansas River system.

In summary, GRDA followed the Commission-approved Study Plan exactly. GRDA simulated a wide range of inflow events, with return periods ranging from 1-year to 100-years and combined those inflow events with a wide range of starting pool elevations. The mathematical results of those simulations quantifiably prove that GRDA's anticipated operations have an immaterial impact on upstream flooding. This conclusion applies to a wide range of starting pool elevations, and accounts for the reality that USACE directs storage and releases at Pensacola Dam during flooding events. If GRDA modified the dozens of simulations to keep the pool artificially higher during the initial portion of the simulation, the upstream WSELs might change slightly, but such an approach would ignore the reality of the effects of USACE flood control operations. Moreover, all the WSELs *in a given simulation set* would change *by a similar value*, and thus the only change would be from a relative standpoint, while the study conclusion would remain the same: natural inflows determine the extent and severity of flooding in Miami and nature's impacts are orders of magnitude greater than any impact GRDA or USACE can possibly have on upstream flooding.

4.4.2 Comments on Sedimentation Study

4.4.2.1 Elk River REAS Data for Calibration

Comment:

Commission staff requested that GRDA clarify "whether the Elk River REAS data would be useful for model calibration if a logical datum correction were applied and, if so, describe the level of effort that would be required to incorporate these data into the STM. Please provide this information by December 29, 2022."[271]

[271] FERC Staff USR Comments at A-3.

GRDA Response:

While it is true that the datum shift may have been applied incorrectly, there is no definitive documentation showing that was the case. As a result, it is impossible to determine what the correct shift would be or whether the mismatch was due to an incorrect application of the conversion from NGVD29 to or from PD. In this situation, it is better to have no validation dataset than to use incorrect data.

GRDA has already contacted David Williams, PhD, PE, CFPM, D.WRE of the Tulsa District of USACE regarding this issue, and he has confirmed that this dataset is unreliable and there is no documentation to determine the source of this error (USR Section 2.1.1.4.4). Dr. Williams specifically stated that "[He] did speak with an engineer who previously worked for the Tulsa District, and he pointed out that the survey wasn't subjected to a rigorous QA/QC process." GRDA also found issues with datum labels in USACE figures (USR Figure 7). Given the lack of proper QA/QC for this dataset, it is not possible for GRDA to ascertain the correct elevations of any surveys of the Elk River from the REAS.

4.4.2.2 Availability and Use of One-Ninth Arc-Second Data from USGS NED

Comment:

In its comments on section 2.1.1.8, *Topographic Surveys*, Commission staff stated that "one-third arc-second corresponds to a resolution of about 10 meters (33 feet). The USGS National Elevation Dataset website indicates that there is one-ninth arc-second (about 3.4-meter, or 11-foot, resolution) and 1 meter (3.2 feet) data available for some of the study area. Please describe the level of effort required to incorporate this data (in place of the one-third arc-second data) into the model, where available."[272]

GRDA Response:

The rasters used in the developing the STM were the best available at the time of study planning. The higher resolution dataset was not published until after the study began and was therefore not included in the study plan.

To incorporate the finer NED raster dataset into the model would require a significant effort from GRDA. After rebuilding the terrain files for the model geometry, GRDA would then need to re-model each simulation. This process involves approximately 200 hours of simulation time (50 hours each for the *Anticipated Operations*, *Baseline Operations*, *High Sedimentation*, and *Low Sedimentation* scenarios), plus additional time for data processing and reporting.

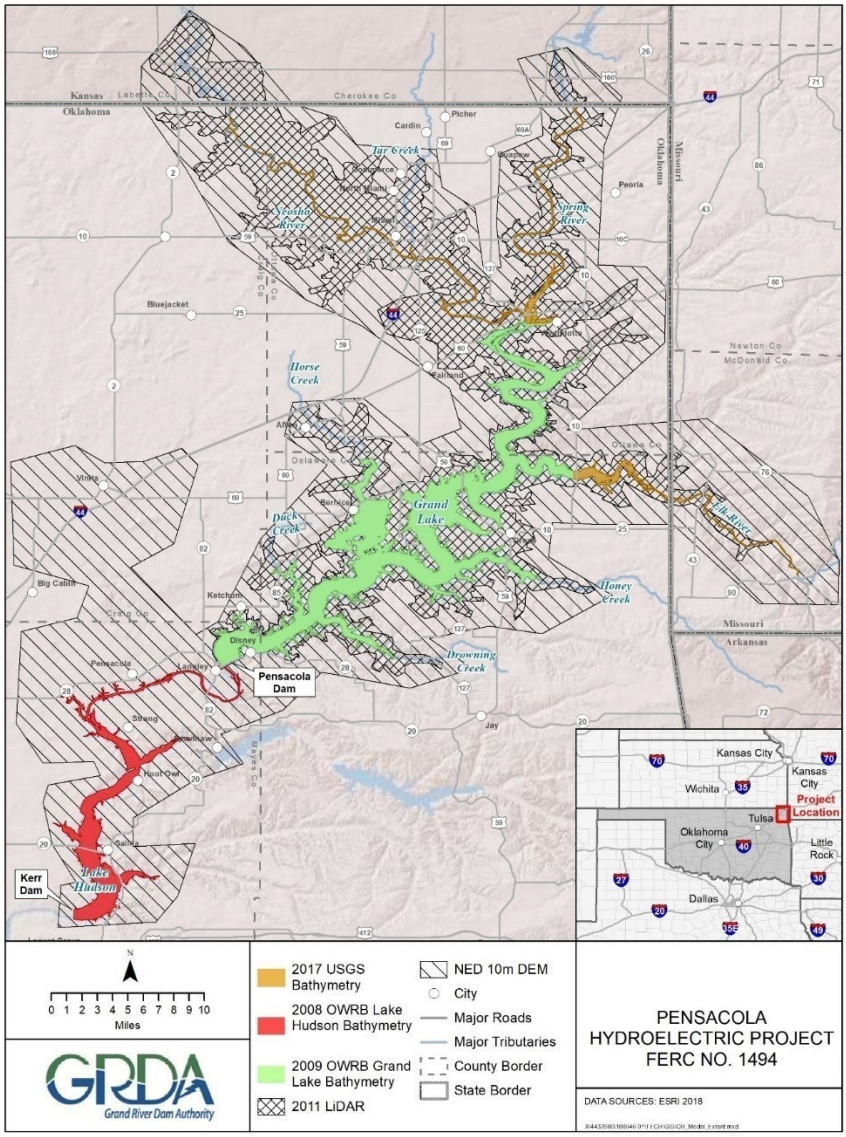
Changes to the raster geometry are also not expected to produce significant changes to the study results. The one-third arc-second data resolution is significantly higher than the resolution of the STM by nature of

[272] *Id.* at A-4.

1D modeling. Cross-sections in the model are spaced at intervals measured in hundreds of feet, so any increase in resolution of the underlying NED dataset would be lost in the transition to the model geometry.

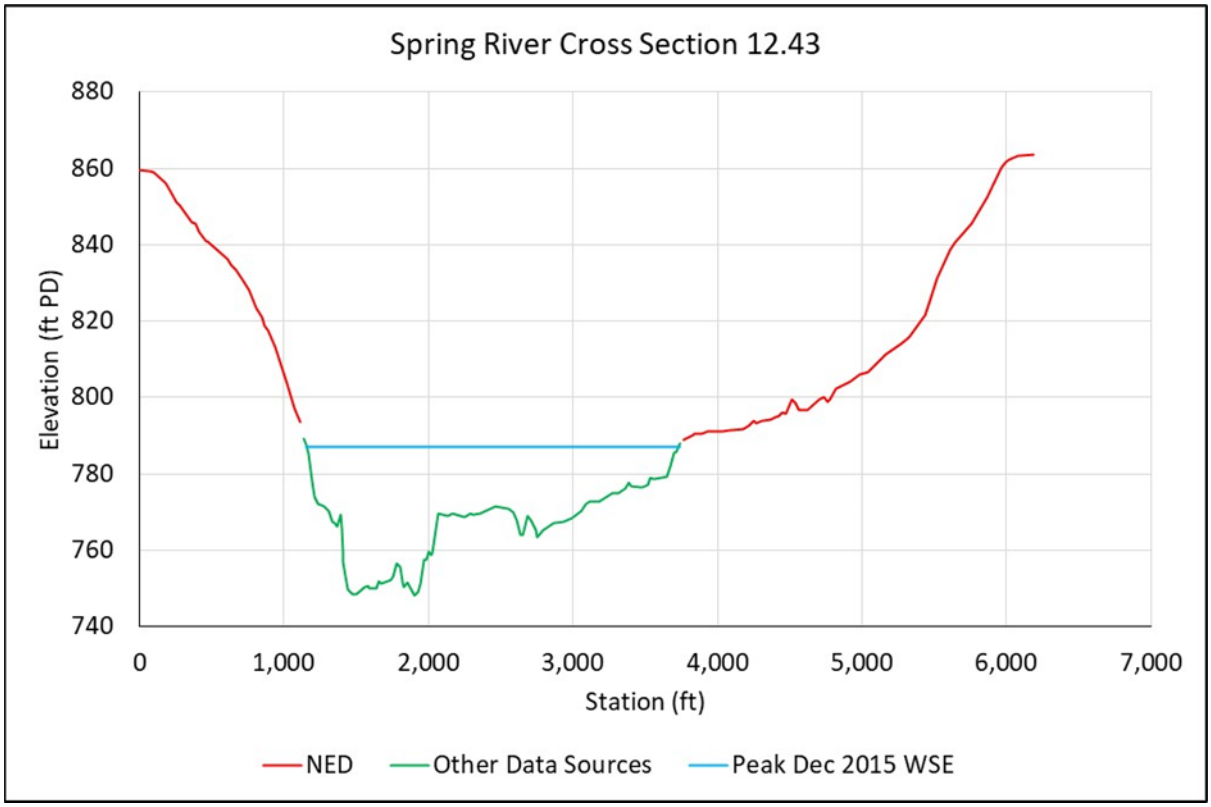
In addition, it should be noted that the dataset in question is used only in the upland areas, typically far from the channel, where the geometry is dry for most or all simulation time steps (see Figure 4.4.2.2-1 below).

Figure 4.4.2.2-1. NED Dataset Availability.



Many of the cross sections do not extend into areas using the NED data, but an example of one that does is shown in Figure 4.4.2.2-2 below. The blue line shown in the figure represents the highest water level recorded during the December 2015 event (the largest of the calibration events on the Spring River), and the water is contained entirely within the non-NED data sources. Increasing resolution in the far overbank areas will have no impact on model results.

Figure 4.4.2.2-2. Cross-Sectional View of NED Data Availability.



4.4.2.3 Define Variables A, B, and C in the Calibration Evaluation

Comment:

Commission staff states that "Section 6.2.2, *Calibration Evaluation,* of the Sedimentation Study Report, does not define variables 'A,' 'B,' and 'C,' which are used in equation 7. Please provide this information by December 29, 2022."[273]

[273] *Id* at A-4.

GRDA Response:

GRDA appreciates staff's comment. This was a typographical error that was not caught before submission of the report. There are no variables "A," "B," or "C" related to that equation. A corrected Equation 7 appears in Figure 4.4.2.3-1 below.

Figure 4.4.2.3-1. Corrected Equation 7.

Equation 7

$$RSR = \frac{RMSE}{STDEV_{obs}} = \frac{\left[\sqrt{\sum_{i=1}^{n}\left(Y_i^{obs} - Y_i^{sim}\right)^2}\right]}{\left[\sqrt{\sum_{i=1}^{n}\left(Y_i^{obs} - Y^{mean}\right)^2}\right]}$$

where:

RMSE = root mean square error

$STDEV_{obs}$ = standard deviation of the observed values

~~C = the sum of A and B~~

4.4.2.4 Clarify Why the Rating Curve Equation in Table 32 for the Spring River Differs from the Pre-2009 Unbiased Sediment Curve Equation in Figure 87 and Table 17

Comment:

Commission staff commented:

> "In section 6.2.1.2.2, *Sediment Inflows*, of the Sedimentation Study Report, the selected rating curve equations provided in table 32 for the Neosho River, Elk River, and Tar Creek match the pre-2009 (pre-1964 for Neosho River) unbiased sediment curve equations in figures 85, 89, and 91, respectively, and the corresponding equations in summary table 17 (section 4.3, *Suspended Sediment Regression Analyses*). Please clarify why the rating curve equation in table 32 for the Spring River differs from the pre-2009 unbiased sediment curve equation in figure 87 and the corresponding equation in table 17. Please provide this information by December 29, 2022.[274]

[274] *Id.* at A-4.

GRDA Response:

The Quantitative Analysis and STM were intended to serve as checks on each other. They were therefore developed largely independently of one another. The STM curves were selected from outputs of the HEC-RAS Sediment Rating Curve Analysis Tool, much like those used in the Quantitative Analysis. The curves used differed slightly due to the method used by HEC-RAS when removing bias, and the STM selection was based on what produced the best calibration results.

4.4.2.5 Consideration of Climate Change in H&H Study

Comment:

LEAD comments that GRDA's H&H Study failed to account for potential impacts from climate change.[275] Specifically, LEAD argues that "GRDA's H&H Model did not consider climate change in projecting and analyzing the impacts of future flooding events."[276] Additionally, it argues that "FERC should analyze the Dam's effects in conjunction with climate change to accurately assess whether the Dam's operations will have significant environmental impacts on the area, as required by the FPA and NEPA."[277]

LEAD argues that "[t]his omission plainly violates federal policy and will frustrate FERC's ability to conduct an environmental review of the Dam's relicensing in compliance with the FPA and NEPA."[278]

GRDA Response:

Commission precedent uniformly maintains that climate change studies are not warranted or appropriate in hydropower licensing proceedings. The Commission has acknowledged that climate change is a complex issue, but under NEPA regulations, it is afforded discretion based on its expertise and experience, to determine the scope of an environmental analysis based on available information.[279]

FERC has explained that climate change models would not allow it "to predict matters such as water supply or flow within a given basin during the 30 to 50-year term of a typical hydropower license in such a manner to assist the Commission in analyzing alternatives and determining appropriate mitigation for environmental impacts."[280] In addition, FERC in *Alaska Energy Authority* determined that climate change studies are not likely to yield reliable data that can be used to develop license requirements.[281] FERC has found that

[275] LEAD USR Comments at 6-9.

[276] *Id.* at 6.

[277] *Id.* at 7.

[278] *Id.*

[279] *See Eagle Crest Energy Co.*, 153 FERC ¶ 61,058, at P 39 (2015).

[280] *See id.; see also Ala. Power Co.*, 155 FERC ¶ 61,080, at P 29 (2016) ("attempting to predict future flow scenarios that may occur due to climate change or other conditions would be too speculative given the state of the science at this time.").

[281] *See Alaska Energy Auth.*, 144 FERC ¶ 61,040, at P 8 (2013).

conventional hydrological studies, monitoring techniques, and predictive models can be used to effectively study and evaluate the effects of projects on environmental resources.[282]

While this issue of climate change studies was raised and addressed by Commissions staff earlier in this relicensing process,[283] LEAD continues to raise it in its comments at this very late USR stage. Such comments overlook that the Commission's approach to climate change investigations has remained unchanged since its November 2018 SPD.[284]

In another recent proceeding, the Commission explained:

> [T]he baseline for our analysis is current environmental conditions, not a projected or modeled future condition. Therefore, the requested climate change study to predict uncertain, future climate and associated hydrologic conditions would not inform the development of license requirements [18 C.F.R. § 5.9(b)(5)] and staff does not recommend that [the license applicant] be required to conduct the requested climate change study.[285]

These same principles apply in the present case. Although LEAD has requested that GRDA consider the effects of climate change through additional modeling and study, Commission policy and precedent maintain that all such requests should be denied. Because climate impact studies would not "assist the Commission in analyzing alternatives and determining appropriate mitigation for environmental impacts,"[286] FERC should not accept LEAD's comments by requiring further changes to the FERC-approved Study Plan.

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[282] *Id.* at P 9.

[283] *See, e.g.,* Comments of the City of Miami, Oklahoma on GRDA's Proposed Study Plan at 9-10, Project No. 1494-438 (filed July 26, 2018); City of Miami's Request for Socioeconomic Information at 9, Project No. 1494-438 (filed Aug. 28, 2020).

[284] *See, e.g.,* Response to Additional Study Request at A-3 to A-5, Project Nos. 2179-043 *et al.* (issued Nov. 3, 2021) (denying a requested study to assess the potential effects of climate change on project operation and anadromous fish habitat in project-affected waters).

[285] Determination on Requests for Study Modifications and New Studies for the Cutler Hydroelectric Project, Project No. 2420-054 at B-6 (issued June 11, 2021) (denying a study request because "our environmental effects analysis will address how the proposed relicensing action could affect, among other things, water resources").

[286] *Eagle Crest Energy Co.*, 153 FERC ¶ 61,058, at P 81 (2015).

4.4.3 Comments on Aquatic Species of Concern Study

4.4.3.1 Provide Maps Delineating Riverine Reaches that Would Be Converted to Lentic Habitat During Paddlefish Spawning Season, and Provide an Estimate of the Acres of Habitat in the Spring and Neosho Rivers that Would Be Converted to Lentic Habitat

Comment:

Commission Staff stated that "GRDA did not provide maps delineating the riverine reaches that would be converted to lentic habitat during the paddlefish spawning season (March-April), as a result of increases in reservoir water levels associated with anticipated project operations . The lentic and lotic maps are needed to conduct our analysis of project effects."[287]

GRDA Response:

GRDA appreciates this comment from FERC staff and has added these maps as Appendix E in the updated Aquatic Species of Concern Study Report, which appears in the DLA as Appendix E-12.

4.4.3.2 Provide Additional Information in the DLA Regarding Neosho Madtom and Neosho Mucket

Comment:

Commission staff requested additional information on the Neosho madtom and Neosho mucket. Specifically, staff stated:

> To help us understand the effects of anticipated project operation on Neosho madtom and Neosho mucket please:
>
> (1) include a table in the draft license application that reports the numerical difference in water level in feet between baseline and anticipated operation at each survey site in the Spring and Neosho Rivers where GRDA conducted Neosho madtom surveys during July and August 2022 and at any other sites where Neosho madtom have been observed within the project boundary. The estimated differences in water level between baseline and anticipated operations should be based on the data used to generate the aquatic habitat maps in Appendix I of the Hydrologic and Hydraulic Modeling: Upstream Hydraulic Model Updated Study Report;
>
> (2) use the upstream hydraulic model to estimate the water level under baseline operations and anticipated operations using the median reservoir elevations and

[287] FERC Staff USR Comments at A-5.

inflows during the Neosho mucket spawning period (April through May) and separately during the brooding period (May through August); and

(3) use the model output from item (b) above, to estimate the numerical difference in water level in feet between baseline and anticipated operations at each of the locations in the Spring, Neosho, and Elk Rivers where suitable Neosho mucket habitat was identified during the July 2022 freshwater mussel surveys. Please report the above requested water level differences in two tables (one for the spawning season and one for the brooding season) and include the tables in the draft license application.[288]

GRDA Response:

GRDA appreciates this comment from FERC staff and has added the requested information in table format as Appendix D in the updated Aquatic Species of Concern Study Report, which appears in the DLA as Appendix E-12.

4.4.3.3 Insufficient Disclosure of Studies of TSMD

Comment:

USFWS, in its comments on Table 2 of the USR, states that GRDA does not "sufficiently disclose data from studies of the Tri-State Mining District (EcoAnalysts 2018), which were provided to the GRDA by the U.S. Fish and Wildlife Service."[289]

GRDA Response:

GRDA appreciates this comment from USFWS and has added the exact location and results, vs the description of the location to Table 2 of the updated Aquatic Species of Concern Study Report which appears in the DLA as Appendix E-12. The location in question is 1.5 miles upstream of the Project Boundary. Upon receipt of the document in December of 2021, and after trying for some time to get it, the study was used to help guide the survey required by FERC. The information displayed is accurate in Table 2 and both GRDA and EcoAnalysts surveyed similar locations within the Project Boundary. No Neosho Mucket were located at coincident sites.

[288] *Id.* at A-6.

[289] USFWS USR Comments at 4.

4.4.3.4 Clarification of Mussel Names

Comment:

USFWS stated:

> Table 3 (page 15) summarizes data from the GRDA's Phase II mussel study, data that are further detailed in Tables 4-6. Table 3 is misleading in separately listing two mussel names (*Anodonta suborbiculata* and *Utterbackiana suborbiculata)* that are synonyms of each other (i.e., denote a single species). Different numbers of individuals are reported for each binomial. Depending on the nature of the originating error, this creates inaccurate information regarding the species found, the number of species found, and/or the number of individuals found. The table also incorrectly lists *Leptodea fragilis* as *Potamilus fragilis* and lists one species by genus only (*Quadrula).* From Table 5, the *Quadrula* species can be interpreted as being *Q, quadrula;* however, the other errors are not corrected. Only Table 4 includes mussel common names, complicating relation of the report text (that uses common names) to the tables (that mostly use scientific names).[290]

GRDA Response:

GRDA appreciates this comment from USFWS and has added a clarification to these mussel names in the updated Aquatic Species of Concern Study Report which appears in the DLA as Appendix E-12. Errors in Table 3 have been corrected. Common names have been added to mussel tables to reduce confusion. Common and scientific names in this report follow the Freshwater Mollusk Conservation Society's 2021 checklist of freshwater mussels of the United States and Canada.[291] Within this up-to-date standardized taxonomic list Fragile Papershell has been reassigned from *Leptodea fragilis* to *Potamilus fragilis*.

4.4.3.5 Failure to Rely on Additional Reporting Beyond OWRB Records

USFWS states: "We do not understand why the report authors would rely solely on records of the OWRB, rather than including extensive literature and report records, in discussing host fish for the rabbitsfoot. Three rabbitsfoot host species were collected in the Phase II fish surveys (Table 9)."[292]

GRDA Response:

GRDA appreciates this comment from USFWS and has added additional information and recommended reference to clarify documented fish hosts in section 4.2.1 of the updated Aquatic Species of Concern Study Report which appears in the DLA as Appendix E-12.

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290 *Id.* at 3.

291 https://molluskconservation.org/MServices_Names-Bivalves.html.

292 USFWS USR Comments at 5.

4.4.3.6 Insufficient Discussion of Historical Range of Rabbitsfoot

Comment:

USFWS states:

> The section on rabbitsfoot distribution and occurrence (4.2.2) describes the species' former range in and near Oklahoma as involving several rivers, but then limits recent records to a handful of sites in the Spring and Neosho rivers. This contradicts the second sentence of the paragraph stating that populations remain in the Verdigris, Illinois, and Little rivers. Recent occurrence in these latter rivers is well documented as reported in the rabbitsfoot Species Status Assessment (USFWS 2021) and recovery plan (USFWS 2022). The final sentence of this section indicates the species' status as endangered when it actually is threatened.[293]

GRDA Response:

GRDA appreciates this comment from USFWS and has added additional information in section 4.2.2 and clarification of various geographic bounds of the report of the updated Aquatic Species of Concern Study Report, which appears in the DLA as Appendix E-12.

The study team focused on records within the Elk, Spring and Neosho Rivers, as the other rivers are not in the Project vicinity or in the Project Boundary. However, to add context to the species current distribution within the Grand Lake watershed, GRDA needed to review a wider geographic area than just the few miles of river and potential habitat influenced by Project operation and model extent. The text has been modified to clarify this in the report to distinguish the Project vicinity vs. Project Boundary. The listing status of this species has been corrected.

It should be also noted that the draft USFWS recovery plan published in October of 2022 further indicates that the rabbitsfoot is extirpated in Oklahoma in both the Spring and Neosho Rivers, which are the areas most germane to this relicensing proceeding.[294]

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[293] *Id.* at 4.

[294] *See* U.S. Fish and Wildlife Service, Draft Recovery Plan for The Rabbitsfoot (*Quadrula cylindrica cylindrica*, Say 1817, https://ecos.fws.gov/docs/recovery_plan/Rabbitsfoot%20draft%20Recovery%20Plan_20221005.pdf.

4.4.3.7 Failure to List Species Determined to be Suitable Hosts for Winged Mapleleaf Larvae

Comment:

USFWS stated that "the wingled mapleleaf discussion (4.3) does not list fish species determined to be suitable hosts for that species' larvae."[295]

GRDA Response:

GRDA appreciates this comment from USFWS and has added additional information in sections 4.3.1 and 4.3.2 of the updated Aquatic Species of Concern Study Report, which appears in the DLA as Appendix E-12.

4.4.3.8 Quality of Freshwater Mussel Images in Appendix A Insufficient to Identify Species Reported with High Confidence

Comment:

USFWS states that the quality of the images included in Appendix A (photo log) "are not all of sufficient quality to identify with high confidence the species reported."[296]

GRDA Response:

GRDA appreciates this comment from USFWS and has added additional voucher images to the photo log contained in Appendix A of the updated Aquatic Species of Concern Study Report, which appears in the DLA as Appendix E-12.

4.4.3.9 Inclusion of Lentic and Lotic Maps Generated from CHM

Comment:

USFWS states:

> The Neosho mucket summary discussion (4.1.3, page 24) states that lentic/lotic maps were generated from the CHM to evaluate changes to inundation relative to Project operations," but that "the maps indicated are not included in the subject report, a significant omission given the considerable reliance placed on them in reaching the report's conclusions. The

[295] USFWS USR Comments at 5.

[296] *Id.*

Service requests that they be added to the final version of the report so that they are accessible to any reader.[297]

GRDA Response:

GRDA appreciates this comment from USFWS and has added these maps as Appendix C in the updated Aquatic Species of Concern Study Report, which appears in the DLA as Appendix E-12.

4.4.4 Comments on Terrestrial Species of Concern Study

4.4.4.1 Clarify How GRDA Determined that Gray Bats Don't Vacate Beaver Dam Cave Until Water Level Reaches 751 ft. and How GRDA Knows Whether All Bats Leave

Comment:

USFWS states "The [study] report states that the gray bats (*Myotis grisescens*) don't vacate Beaver Dam cave until the water level reaches 751 feet, but how was that determined and how would we know if they all leave?"[298]

GRDA Response:

GRDA appreciates the opportunity to refamiliarize USFWS with the foundational work that has guided the current Gray Bat mitigation at this Project for the past 30 years. GRDA also appreciates the partnerships and relationships developed between the Nature Conservancy and USFWS over the decades with respect to protecting this unique resource. However, reevaluating these elevations was not requested in PSP, RSP, ISR, or USR periods of this relicensing effort. GRDA is utilizing previous work and data in the record that was established many years ago. These lake elevations were taken from data established in previous relicensing proceedings and endangered species study in the 1980s and 1990s.[299] Over GRDA's many years of observation, annual reporting, and protection at this site, GRDA has no reason to believe the thresholds previously established are inaccurate or in need of further study. And USFWS has not provided any information indicating the previous thresholds are incorrect.

In support of GRDA's conclusion that "the impact to gray bats is negligible," the entire body of work must be considered. Pre 1970s, Beaver Dam Cave (DL-2) was not a maternity site for gray bats as the maternity colony was located at Twin Cave (DL-92). Conservation efforts (cave gating) in the early 1970s at Twin Cave (DL-92) caused abandonment and scattering of the maternity colony. Part of colony shifted their

[297] *Id.* at 6.

[298] *Id.* at 2.

[299] Benham-Holoway Power Group. 1986. Assessment of the impact on the gray bat and Ozark cavefish. Pensacola Hydroelectric Project, FERC Project No. 1494. Tulsa, Oklahoma July 1986. 13pp and appendices. FERC Accession No. 19860711-0188.

maternity cycle to Beaver Dam Cave (DL-2), which is prone to flooding by Grand Lake (when USACE has exclusive authority over Grand Lake for flood control). Prior to the Project mitigation and enhancement efforts, the biggest and most obvious cause for concern at Beaver Dam Cave was the entire maternity colony being trapped for an extended period during flood control operations (see table 4 in the USR) and destroying an entire colony (hence the incidental take permit referenced by USFWS).

Through the previous Beaver Dam Cave mitigation and enhancement measures, GRDA has successfully demonstrated the efficacy of the conservation measures put in place when the lake enters the flood pool (alternative exits at Beaver Dam Cave (DL-2) and monitoring and protection of the colony alternate location at Twin Cave (DL-91)). Efficacy has been determined through observation of the colony during exit surveys and inspection of the cave by trained experts as requested by USFWS through annual reporting.

GRDA's observations indicate that the bats exit somewhere around 750-751 feet PD. While GRDA cannot state with certainty that no "take" exists, as that term is defined by regulation, GRDA has not observed any evidence of take. Moreover, the potential for the loss of the entire colony has been eliminated, and the population as the site has remained stable. Therefore, GRDA is confident that our anticipated operations have a negligible impact on the gray bat for reasons as a direct result of mitigation.

4.4.4.2 Clarify How Assessment of Bat Mortality Could be Made Without Movement of Flood Waters and Potential Removal of any Bat Remains Therein

Comment:

USFWS states:

> Depending on the rate at which water levels are rising, an assumption is being made that the entire gray bat colony is making it out of Beaver Dam Cave when 1) they have 1 ft. of space, and 2) they have a secondary exit. The following line states on page 7 ("...post-inundation monitoring visit to the cave on 27 June 2022 failed to give any indication that take had occurred as a result of inundation in early May 2022"). We don't understand how any assessment of bat mortality could be made with the movement of flood waters and potential removal of any bat remains therein.[300]

GRDA Response:

GRDA has been evaluating and reporting on flooding in this cave and mitigation efficacy for many years with annual reports to the USFWS Tulsa Office. Not once has this issue been raised in the comments from USFWS in GRDA's annual reports. As far as GRDA knows, USFWS has long been satisfied with the results of our work. If more detailed information was requested by USFWS, GRDA would have worked with our conservation partners in this mitigation endeavor to further investigate. Or, if requested during the PSP and

[300] USFWS USER Comments at 3.

RSP phases of this relicensing effort, or even after the ISR, GRDA could have made attempts to further address this. We do not believe further study is warranted or will yield significant findings based off the extended body of existing work demonstrating stable populations as well as efficacy of current mitigation and enhancement measures.

Once the lake reaches flood stage, GRDA works with an independent consultant to inspect Beaver Dam Cave to examine the alternative exit for signs of usage (guano) as well as check the alternative cave (DL-92; Twin Cave) for usage. Upon return to normal pool elevations, GRDA inspects the cave entrance, initial room, and area around the cave for dead bats. Over the past license term, no decaying carcasses have been noted. Inspection of the far interior where the colony congregates would be unwise as the colony often rapidly shifts between Twin Cave and Beaver Cave. The risk of disturbance to a maternity colony and its unintended consequences would be unwise; therefore, exit counts are conducted. Also, USFWS' comment seems to naïvely suggest that water is flowing out of the cave when it is not, therefore bats, as well as other dead things, would tend to accumulate.

GRDA is proud to have partnered with USFWS, the Nature Conservancy, and others bat experts in the area to find a solution that has significantly benefited the endangered gray bat colony and overall population in the Project vicinity. GRDA is also proud to have aided USFWS' understanding about the unique linkage between DL-91 (Twin Cave) and DL-2 (Beaver Dam Cave) and how these habitats function together as swarming and breeding habitats while also providing excellent, long-term population data on the species.

Finally, it bears noting that GRDA does not cause incoming flood events nor has jurisdictional authority over flood control, as discussed in Sections 9 and 12 of the H&H Study UHM Report, included in Appendix 2 of GRDA's USR, and documented in the Pensacola Reservoir Water Control Manual.[301] Natural inflows from the 10,345 square mile watershed generate floods of such magnitude that the maximum impact of nature typically ranges from over 10 times to over 100 or even over 1,000 times the maximum simulated impact of GRDA's anticipated operational range.[302] During these inflow events, USACE exercises its exclusive jurisdiction over flood control at Pensacola Dam as a component of flood storage balancing in the series of reservoirs and federal dams in the Arkansas River system.

[301] 1992 Water Control Manual.

[302] *See* USGS, Lake O' the Cherokees at Langley, OK, https://waterdata.usgs.gov/monitoring-location/07190000/%23parameterCode=00065&period=P7D.

4.4.5 Comments on Wetlands and Riparian Habitat Study

4.4.5.1 Provide Additional Information in the DLA Regarding Existing Wetland Acreage, Daily Average Low Water Elevations, and Inundation

Comment:

Commission staff stated:

> to allow for further analysis of the effects of proposed project operations on wetlands and riparian areas, please include the following with the draft license application: (a) existing wetland acreage by habitat type within elevation bands 741 feet to 742 feet PD, 742 feet to 743 feet PD, 743 feet to 744 feet PD, and 744 feet to 745 feet PD; (b) daily average low water elevation during the growing season for baseline (*i.e.,* pre-2015 operating rules), and proposed conditions; and (c) average total days of inundation, during the growing season by the elevation bands identified for baseline and proposed conditions.[303]

GRDA Response:

GRDA appreciates staff's comment and has included the requested information in section 2.1 (including tables 4 and 5) of the updated Wetland and Riparian Habitat Study Report, which appears in the DLA as Appendix E-11.

4.4.6 Comments on Cultural Resources Study

4.4.6.1 Consult with the SHPO and TPOs regarding the Area of Potential Effects

Comment:

Commission staff stated that "[a]s a reminder, GRDA must consult with, and seek the concurrence of, the Oklahoma SHPO and relevant Tribal Historic Preservation Officers (THPOs, where tribal lands are involved) on the APE. Please consult with the SHPO and THPOs, and file documentation of consultation and concurrence with the draft license application."[304]

GRDA Response:

GRDA appreciates staff's comment. Following the USR meetings in October 2022, FERC staff requested GRDA to seek concurrence from CRWG participants regarding the establishment of the APE as defined in the USR. GRDA sought this concurrence by letter to CRWG participants dated December 23, 2022. GRDA

[303] FERC Staff USR Comments at A-7.

[304] *Id.*

will file documentation of this concurrence with the Commission once consulting entities have a meaningful opportunity to comment.

4.4.6.2 Provide documentation of Oklahoma SHPO concurrence with National Register recommendations for the evaluated, eligible and ineligible sites with the DLA and address any concurrences in an updated HPMP

Comment:

Commission staff stated:

> Table 3.2 of the draft Historic Properties Management Plan (HPMP) indicates that there are 64 known archaeological sites within, or partially within, the project APE, as defined by GRDA and approved by the SHPO in the letter filed June 14, 2019. Of these 64 sites, 31 resources are entirely submerged. Of the remaining 33 sites, 2 sites were previously determined to be eligible for listing on the National Register, 4 sites were recently evaluated and are recommended to be eligible, and 10 sites were evaluated and are recommended to be ineligible for listing (One of these ineligible sites contains an unevaluated but submerged component). Eleven sites were not evaluated but are recommended to be potentially eligible, and 6 sites were not evaluated because their condition appears to be stable. Please provide documentation of Oklahoma SHPO concurrence with your National Register recommendations for the evaluated, eligible, and ineligible sites with the draft license application and address any concurrences in an updated HPMP.[305]

Response:

GRDA appreciates staff's comment. GRDA will be seeking this concurrence from CRWG participants following its submittal of this Response and filing of the DLA, and expects to further address this issue in the updated HPMP that will be filed as part of the FLA.

4.4.6.3 Update the draft HPMP to Indicate that Unevaluated Sites that Are Inundated Remain Potentially Eligible for National Register Listing and Include a Requirement to Evaluate them Should they Become Exposed over the Term of Any New License

Comment:

With respect to archaeological sites within the Project APE that are either entirely or partially submerged, Commission staff stated that "[w]hile it is understood that they are not currently accessible for evaluation, please update the draft HPMP to indicate that they remain potentially eligible for listing and include a

[305] *Id.*

requirement to evaluate them should they become exposed over the term of any new license. Please file the revised HPMP with the draft license application."[306]

GRDA Response:

GRDA appreciates staff's comment and has revised Table 3.2 of the HPMP to reflect that these sites remain potentially eligible for listing and will be evaluated if they become exposed during the new license term. The updated HPMP is included as Appendix E-26 to the DLA.

4.4.6.4 Update the HPMP to Include a Brief Summary of the Results of the TCPs Inventory

Comment:

Commission staff states that "the draft HPMP does not discuss the results of the subsequent TCPs inventory (Battaglia and Hawkins, 2022)," and requests that GRDA include a summary of non-confidential results in the HPMP, "including but not limited to a discussion of: (1) Tribes that participated in the study and how the study was conducted; (2) the number of TCPs that were identified relative to the APE; (3) the kinds of TCPs that were identified (without disclosing specific information); and (4) as recommended in the TCP inventory report, requirements for the completion of any additional consultation, documentation, and National Register evaluation of TCPs that may experience project-related effects."[307]

GRDA Response:

GRDA appreciates staff's comment and has amended Section 5.1.1 of the HPMP added a new Appendix D to the HPMP to discuss this information. The updated HPMP is included as Appendix E-26 to the DLA.

4.4.6.5 Update the HPMP to Include a Discussion of the Effects that May Occur to TCPs and Requirements to Consult with Tribes and the SHPO to Resolve Effects to TCPs

Comment:

Commission staff states:

> The draft HPMP does not discuss the type of project-related effects occurring at identified TCPs. The nature of effects to TCPs could warrant the implementation of treatment measures other than monitoring and could hinge on the specific issues that the Tribes may have identified related to a location. Therefore, please update the HPMP to include: (1) a discussion of the kinds of project-related effects that may occur at documented TCPs within

[306] *Id.* at A-8.

[307] *Id.*

> the APE; and (2) requirements to consult with the appropriate Tribes and the Oklahoma SHPO to resolve effects to TCPs that are determined to be eligible for listing in the National Register. Please provide this information with the draft license application.[308]

GRDA Response:

GRDA appreciates staff's comment and has provided this information in Appendix D of the updated HPMP. The updated HPMP is included as Appendix E-26 to the DLA.

4.4.6.6 Monitoring to be Conducted by Archaeologist that Meets Secretary of Interior's Standards for Archaeology and Historic Preservation, as well as by GRDA Staff

Comment:

FERC staff states:

> [I]t is advantageous for GRDA personnel and GRDA Police to be trained in cultural resources identification and preservation. Such training will enable staff to identify potential impacts during their day-to-day activities and will aid in timely reporting. However, formal annual monitoring, including conduct of the seven standards and procedures identified in section 5.1.1, should also be conducted by both an archaeologist that meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation, and a representative of GRDA staff.[309]

GRDA Response:

GRDA appreciates staff's comment and commits to formal annual monitoring, including conduct of the seven standards and procedures identified in section 5.1.1 of the HPMP, and ensures that such monitoring will be conducted by an archaeologist that meets the Secretary of the Interior's Standards for Archaeology and Preservation, as well as a representative of GRDA staff. For additional reference, please see Appendix H of the updated HPMP. The updated HPMP is included as Appendix E-26 to the DLA.

4.4.6.7 Provide a Plan in the HPMP for Monitoring Rock Shelters

Comment:

Commission staff states:

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[308] *Id* at A-8 to A-9.

[309] *Id.* at A-9.

> During the October 13, 2022 Cultural Resources Working Group meeting, a representative of the Osage Nation expressed concern about public access to these potential sites and the need for more explicit information about them. While the first paragraph of section 5.1.1, *Monitoring Program*, of the draft HPMP states that monitoring is used by GRDA to assess the condition of archaeological resources and other significant properties (e.g., TCPs, caves, and potential rock or bluff shelters), the monitoring program only applies to recorded archaeological sites, and not to the potential rock or bluff shelters that have not been recorded as sites. GRDA's plan for monitoring and documenting (as needed) these potential cultural resources is not clear. Please provide a detailed plan for monitoring these potential shelters in the final HPMP.[310]

GRDA Response:

Based on the Commission's comment, GDA has updated the HPMP to include a plan for monitoring bluff-shelter sites, which appears in section 5.1.1.2 of the updated HPMP. The updated HPMP is included as Appendix E-26 to the DLA.

4.4.6.8 Provide a Summary of Any Existing Legal Rights that Participating Tribes May Have to Resources within the Project Boundary

Comment:

FERC staff states that "By December 29, 2022, please provide a summary of any existing legal rights that the participating Tribes may have to resources within the project boundary."[311]

GRDA Response:

Congress disestablished any treaty rights and associated reservations with respect to the Pensacola Hydroelectric Project. In 1940, during the time in which GRDA was acquiring lands to construct the newly licensed Project, Congress passed Public Law 76-597, 54 Stat. 303, "To transfer certain Indian lands to the GRDA." Public Law 76-597 expressly grants to GRDA "all the right, title, and interest held by the U.S. and by individual Indians and tribes of Indians in Indian lands located in Ottawa, Delaware, Craig, and Mayes counties . . . lying below an elevation of seven hundred and fifty feet above mean sea level." GRDA is not aware of any "legal Tribal rights to lands, waters, or other resources within the project boundary," as requested by Commission staff. During the extensive consultation that has transpired in this relicensing process—which has been ongoing for nearly 5 years—no Native American Tribe has ever asserted any treaty right to any natural resources in the Project Boundary.

[310] *Id.*

[311] *Id.* at A-10.

4.4.6.9 The APE Should Extend Farther Upstream

Comment:

In its comments on the USR, the Quapaw Nation expressed concern that "the APE did not extend far enough upstream."[312]

GRDA Response:

GRDA appreciates the participation of the Quapaw Nation and other members of the CRWG in this relicensing proceeding. As noted in section 4.4.6.1 above, following the USR meetings in October 2022, FERC staff requested GRDA to seek concurrence from CRWG participants regarding the establishment of the APE as defined in the USR. GRDA sought this concurrence from the Quapaw Nation and other participants in the CRWG by letter dated December 23, 2022.

As explained in GRDA's December 23 letter, GRDA has concluded that the APE should not extend beyond the FERC Project Boundary. GRDA welcomes further input from the Quapaw Nation and other participants in the CRWG on this issue, as requested in the December 23 letter. As explained in that letter, the delineation of the APE has evolved throughout this relicensing process. In its SPD, FERC approved the following APE for its relicensing undertaking for the Project:

> All lands within the FERC-approved project boundary (encompassing GRDA-owned lands and approximately elevation of 750 feet PD). The APE also includes lands or properties outside the project boundary where project operations or project-related recreation activities or other enhancements may cause changes in the character or use of historic properties, if any such properties exist.[313]

Although FERC determined that this definition "is consistent with the requirements of section 106 and the definition of a project's APE provided at 36 CFR 800.16(d), which would encompass project-related effects both within and outside the Project boundary,"[314] FERC recommended that GRDA should consult with the CRWG following the first year of environmental studies.[315]

Following the first year of studies, GRDA as part of the ISR consulted with participants of the CRWG on the placement of the APE . In the ISR GRDA explained that the results of the first year of studies did not warrant a change to the APE:

> The APE for studies needs to encompass project-related effects. The H&H Study has found change in inundation that occurs at higher inflow events under changing starting WSELs

312 Quapaw Nation's Comments on USR at 2, Project No. 1494-438 (filed Nov. 30, 2022).

313 2018 SPD at B-23.

314 *Id.* at B-24.

315 *Id.*

> or anticipated future operations is immaterial to the inundation differences caused by the magnitude of the inflow event.
>
> The only changes in inundation or impounded water caused by the anticipated future operations are restricted to the approximate elevation of the reservoir at the dam. Since the APE already encompasses land up to an approximate elevation of 750 feet PD and any anticipated future operations will not exceed 745 feet PD, the APE already encompasses all the areas where project operations have an effect.[316]

At that time, several commenters, including the Oklahoma Archeological Survey concurred with FERC's original definition of the APE, but expressed concern about using the H&H Study results as a basis for excluding areas outside the Project Boundary from the APE. Accordingly, FERC in its February 2022 SMD instructed GRDA:

> To finalize the APE, the approved study plan required GRDA to consult with and request concurrence on the final APE from the Oklahoma SHPO and Tribal Historic Preservation Officers (THPOs) for tribes with lands within the Project Boundary. All correspondence with the Oklahoma SHPO and THPOs should be filed with the Commission. As required in the approved study plan, the proposed final APE should clearly identify: (1) the Project Boundary; (2) lands outside the Project Boundary that are included in the final APE, and (3) the specific locations of any tribal trust lands that GRDA and BIA determine are within the Project Boundary. This information should be filed with the Commission no later than the USR, at which point, Tribes and stakeholders may again provide comments or requests for modifications.[317]

In response to this directive, GRDA completed additional work on the H&H Study as required by FERC and updated its analysis regarding the proper placement of the APE. As a result of this work, GRDA in the USR concluded that the APE should not extend beyond the Project Boundary, because the H&H Study demonstrates that the Project does not affect lands outside the Project Boundary. As GRDA explained in the USR:

> Since the initial establishment of the APE, the H&H Study determined that starting pool elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream WSELs, inundation, and duration for a range of inflow events. Compared to starting elevations within GRDA's anticipated operational range, only a different inflow event caused an appreciable difference in maximum WSEL, maximum inundation extent, or duration. The differences in WSEL, inundation extent, and duration due to the size of the inflow event were orders of magnitude greater than the differences in WSEL, inundation extent, and duration due to the initial stage at Pensacola Dam. The maximum impact of nature typically ranged from over 10 times to over 100 or even over

316 ISR at 29.

317 Feb. 2022 SMD at B-28 to B-29.

> 1,000 times the maximum simulated impact of GRDA's anticipated operational range.
>
> Comparing anticipated operations to baseline operations for a suite of simulations that spanned the FERC-requested range of starting pool elevations and inflow event magnitudes, the results of the H&H Study demonstrate that anticipated operations have an immaterial impact on upstream WSELs and inundation compared to baseline operations.
>
> Since the APE already encompasses land up to an approximate elevation of 750 feet and any anticipated Project operations authorized by FERC under the license will not exceed 745 feet PD (due to the USACE's exclusive jurisdiction and responsibility for management of the flood pool beginning at 745 feet PD or even less for flood control operations at Grand Lake), the APE does not require modification. It already encompasses all the areas where Project operations under the FERC license potentially have an effect. Therefore, there is no basis for conducting additional cultural resources investigations beyond the APE that has been established for several years, and the current suite of studies fulfills GRDA's obligations under Section 106 of the NHPA.[318]

Based on this extensive modeling analysis, which is now supported by 4 years of technical work and reporting in both the ISR and USR, GRDA has concluded that the APE should encompass only those areas within the Project Boundary. No areas outside the Project Boundary should be included in the APE, as these studies have demonstrated that the Project does not materially affect water surface levels in areas outside the Project Boundary.

GRDA looks forward to receiving comments from the Quapaw Nation and other CRWG participants on this matter as we work together to finalize the APE definition for FERC's relicensing of the Project.

4.4.6.10 Area of Potential Effects

Comment:

In its comments on the USR, BIA states that "GRDA's assertion that the APE does not require modification, *see* USR at 46, is premised on its interpretation of the NDAA 2020, which, as explained above, has not yet been interpreted by the Commission. To the extent the Commission offers an alternative interpretation of the NDAA 2020, the BIA reserves the right to request modification of the APE."[319]

GRDA Response:

GRDA appreciates BIA's comment. GRDA clarifies, however, that GRDA's proposed establishment of the APE is not premised on its interpretation of NDAA 2020. Rather, GRDA's proposal is supported by years of technical studies under the H&H Study, which confirm that the Project does not materially affect WSELs in the Grand/Neosho watershed upstream of Pensacola Dam; rather, flooding is caused by natural events.

[318] GRDA's 2022 USR § 4.7.1.

[319] BIA USR Comments at 2.

As discussed in sections 4.4.6.1 and 4.4.6.9 above, GRDA is in the process of consulting with BIA and other CRWG members regarding the establishment of the APE, and GRDA looks forward to receiving any further comments BIA may have on this issue.[320]

[320] *See also supra* § 4.4.6.9.

Appendix A
USR Comments of the Southwest Power Administration

Department of Energy
Southwestern Power Administration
One West Third Street
Tulsa, Oklahoma 74103-3502

December 16, 2022

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
c/o Grand River Dam Authority
888 First Street, NE
Washington, D.C. 20426

RE: Updated Study Report for the Pensacola Hydroelectric Project (P-1494-483)

Dear Ms. Bose,

Southwestern Power Administration (Southwestern) appreciates the opportunity to comment on the Updated Study Report (USR) filed by Grand River Dam Authority (GRDA) for the Pensacola Hydroelectric Project (Pensacola) relicensing.

Southwestern is an agency within the U.S. Department of Energy that markets hydroelectric power from 24 multi-purpose Federal water resources projects constructed and operated by the U.S. Army Corps of Engineers (Corps), in the states of Arkansas, Missouri, Oklahoma, and Texas. Those projects include Fort Gibson, which is located immediately downstream of the GRDA Pensacola (at Grand Lake) and Markham Ferry (at Lake Hudson) hydroelectric projects, and four additional lock and dam run-of-river projects on the Arkansas River downstream of the Grand River confluence. By statute, Federal hydropower serves not-for-profit customers, largely rural electric cooperatives and municipalities, in the four previously mentioned states as well as Kansas and Louisiana. Additionally, Southwestern is obligated to repay the Federal investment, with interest, and all expenses allocated to the hydropower purpose in the water resource projects with revenues received from the sale of power. Therefore, Southwestern has a clear and direct interest in any activities which may impact the operation of these projects, which directly influence Southwestern's ability to fulfill Federal contractual obligations and repayment to the Federal Treasury. Southwestern's specific comments on the USR are detailed below.

As stated in previous comments, Southwestern's primary concern with the Pensacola relicensing is the operation and timing of Pensacola releases. Southwestern believes that the operations presented in the October 12th and 13th, 2022, USR meetings will not have a significant negative impact on downstream hydropower. In fact, an operational change that allows GRDA flexible use of water storage between elevations 742 and 745 feet is likely to result in increased water releases during times of higher energy demand and reduced releases during times of lower energy demand, resulting in a positive impact to Southwestern's downstream hydropower resources. Added operational flexibility may also promote regional grid reliability by giving GRDA the ability to better respond to normal grid fluctuations as well as unusual events.

Additionally, there were continued discussions concerning flood releases and flood control operations at Pensacola during the USR meetings. Southwestern appreciates the

acknowledgement from GRDA representatives that the National Defense Authorization Act for Fiscal Year 2020 gives sole authority "for management of the flood pool for flood control operations at Grand Lake O' the Cherokees" to the United States Army Corps of Engineers (Corps). Any action involving the management of the flood pool or flood control operations will be the responsibility of the Corps.

Please contact Tyler Gipson at 918-595-6685 or Tyler.Gipson@swpa.gov if you have any questions regarding our comments. Thank you again for the opportunity to comment on the Pensacola USR.

Sincerely,

Ashley Corker
Director
Division of Resources and Rates

Appendix B
Inflow Hydrographs Used in the ISR and USR, with Preceding Periods of Low Flow

APPENDIX B:
INFLOW HYDROGRAPHS USED IN THE ISR AND USR, WITH PRECEDING PERIODS OF LOW FLOW

The following figures show inflow hydrographs that GRDA used for both the ISR and the USR. The simulation starting dates are displayed on the hydrographs, along with alternate starting dates one day before and one day after the selected starting date.

To allow computational alignment with the FRM, simulations must begin at midnight. With that stipulation, the figures show that GRDA selected the most appropriate starting date for the simulations.

Note that the simulations themselves extend past the last date displayed in the figures. The purpose of the figures is to show the start date of the simulation, the inflow event hydrographs, and how GRDA selected the most appropriate starting date.

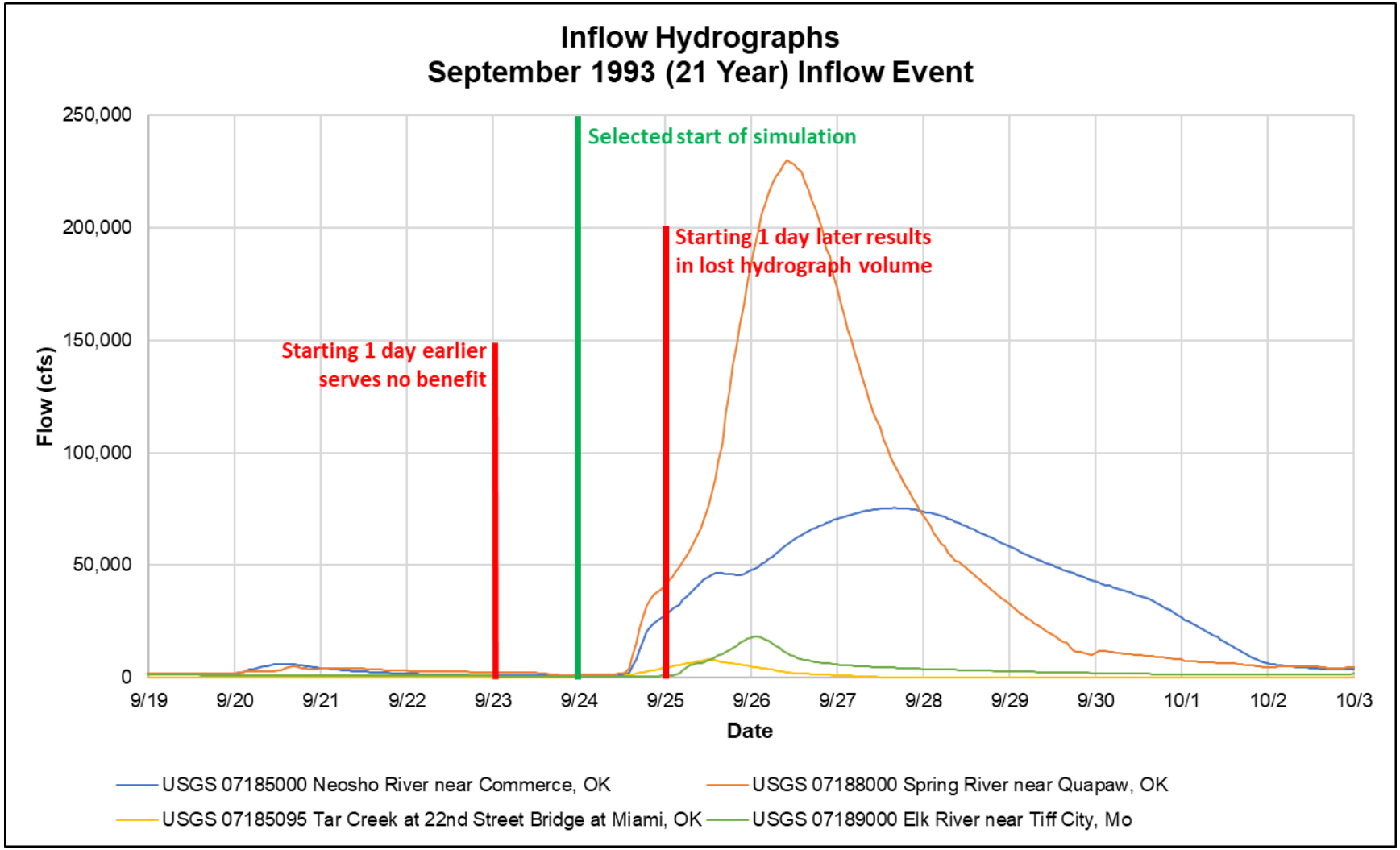


Figure 1. Inflow hydrographs for the September 1993 (21 year) inflow event.

Notes: The ISR and USR simulations started at midnight on 9/24/1993, immediately prior to the flood wave arrival, with the stipulation that the simulation must begin at midnight to allow alignment with the FRM. Note that GRDA selected a starting day as close to the increase in flow as possible without losing significant hydrograph volume.

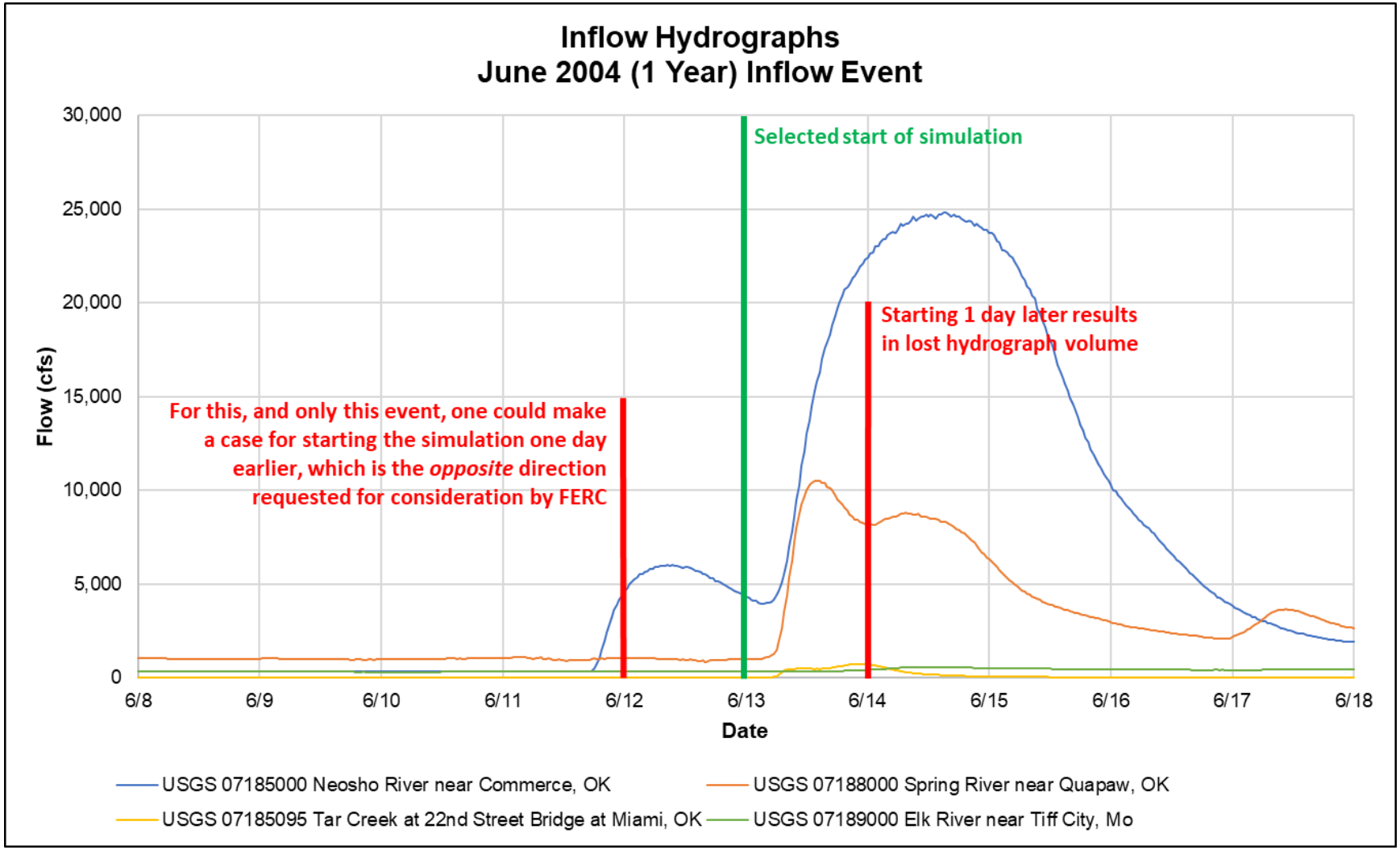


Figure 2. Inflow hydrographs for the June 2004 (1 year) inflow event.

Notes: The ISR and USR simulations started at midnight on 6/13/2004, immediately prior to the flood wave arrival, with the stipulation that the simulation must begin at midnight to allow alignment with the FRM. Note that GRDA selected a starting day as close to the increase in flow as possible without losing significant hydrograph volume.

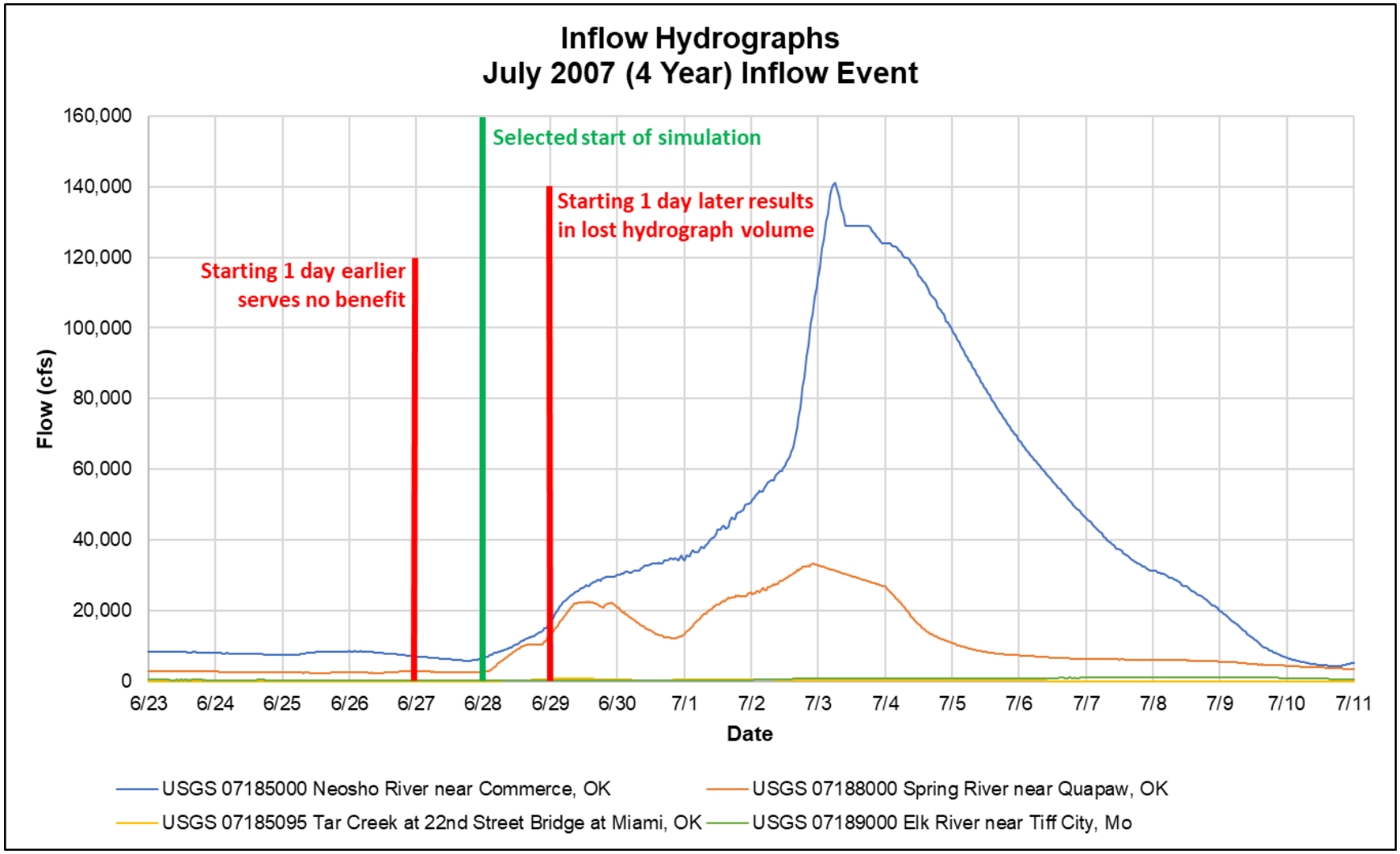


Figure 3. Inflow hydrographs for the July 2007 (4 year) inflow event.

Notes: The ISR and USR simulations started at midnight on 6/28/2007, immediately prior to the flood wave arrival, with the stipulation that the simulation must begin at midnight to allow alignment with the FRM. Note that GRDA selected a starting day as close to the increase in flow as possible without losing significant hydrograph volume.

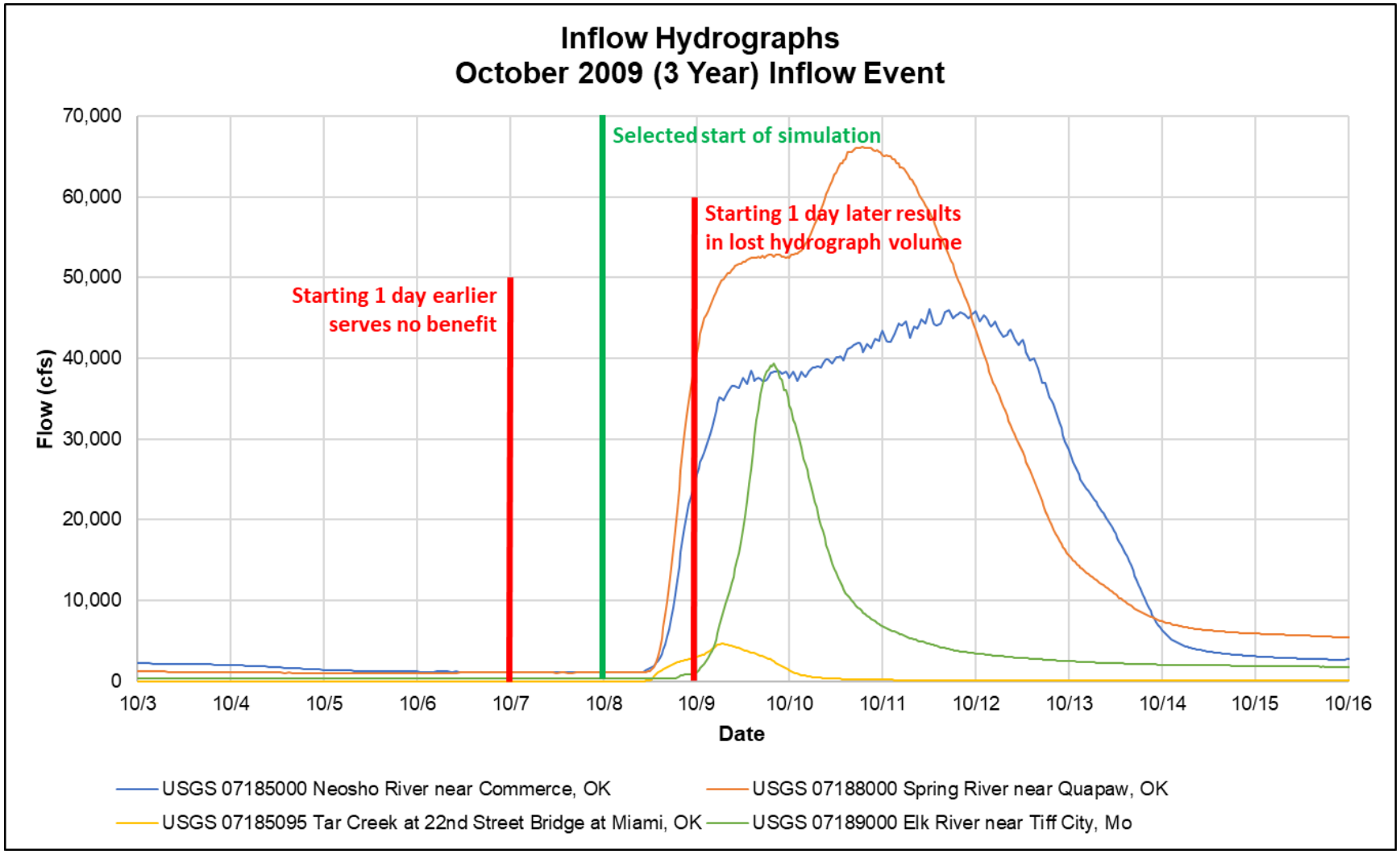


Figure 4. Inflow hydrographs for the October 2009 (3 year) inflow event.

Notes: The ISR and USR simulations started at midnight on 10/8/2009, immediately prior to the flood wave arrival, with the stipulation that the simulation must begin at midnight to allow alignment with the FRM. Note that GRDA selected a starting day as close to the increase in flow as possible without losing significant hydrograph volume.

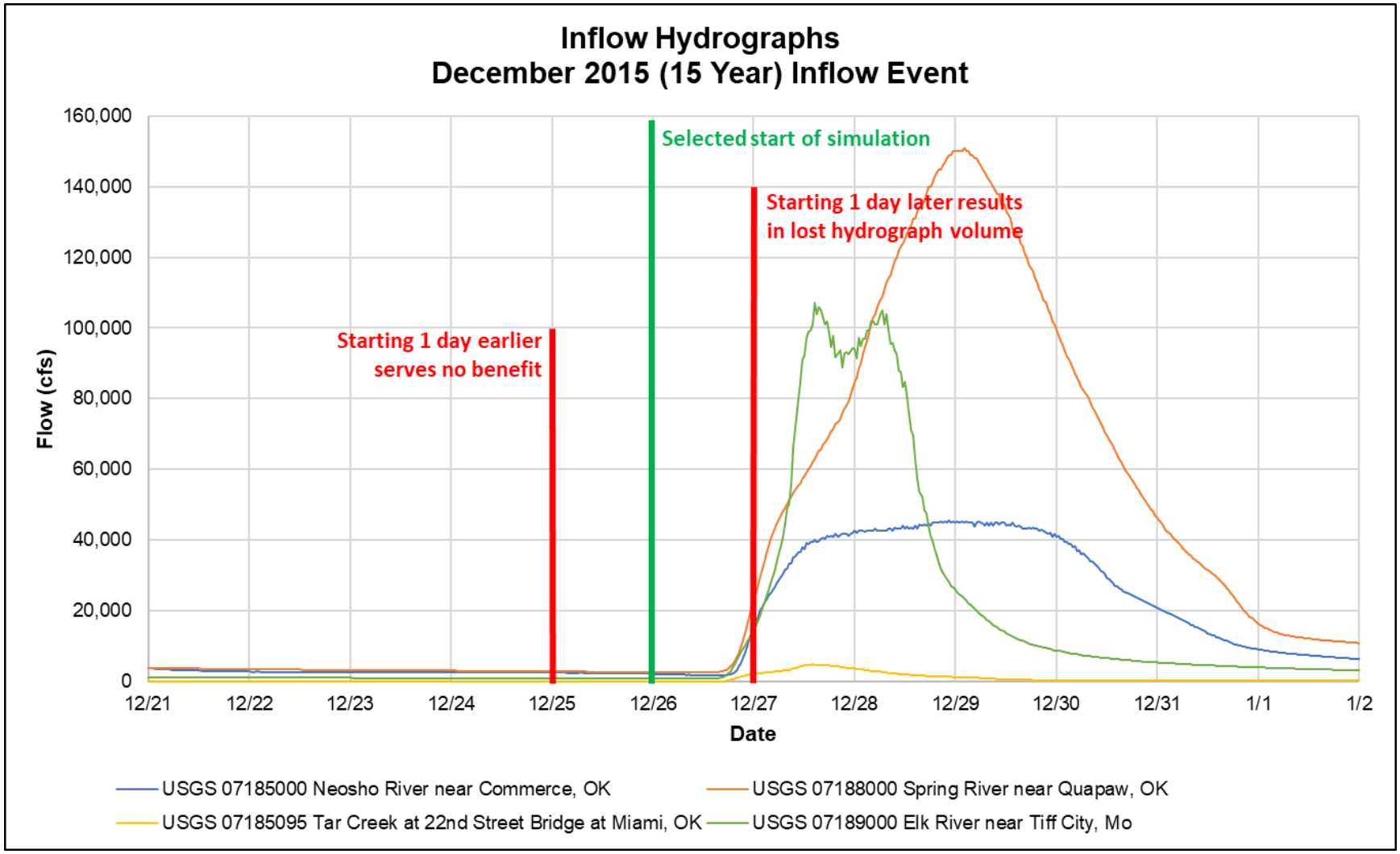


Figure 5. Inflow hydrographs for the 2015 December (15 year) inflow event.

Notes: The ISR and USR simulations started at midnight on 12/26/2015, immediately prior to the flood wave arrival, with the stipulation that the simulation must begin at midnight to allow alignment with the FRM. Note that GRDA selected a starting day as close to the increase in flow as possible without losing significant hydrograph volume.

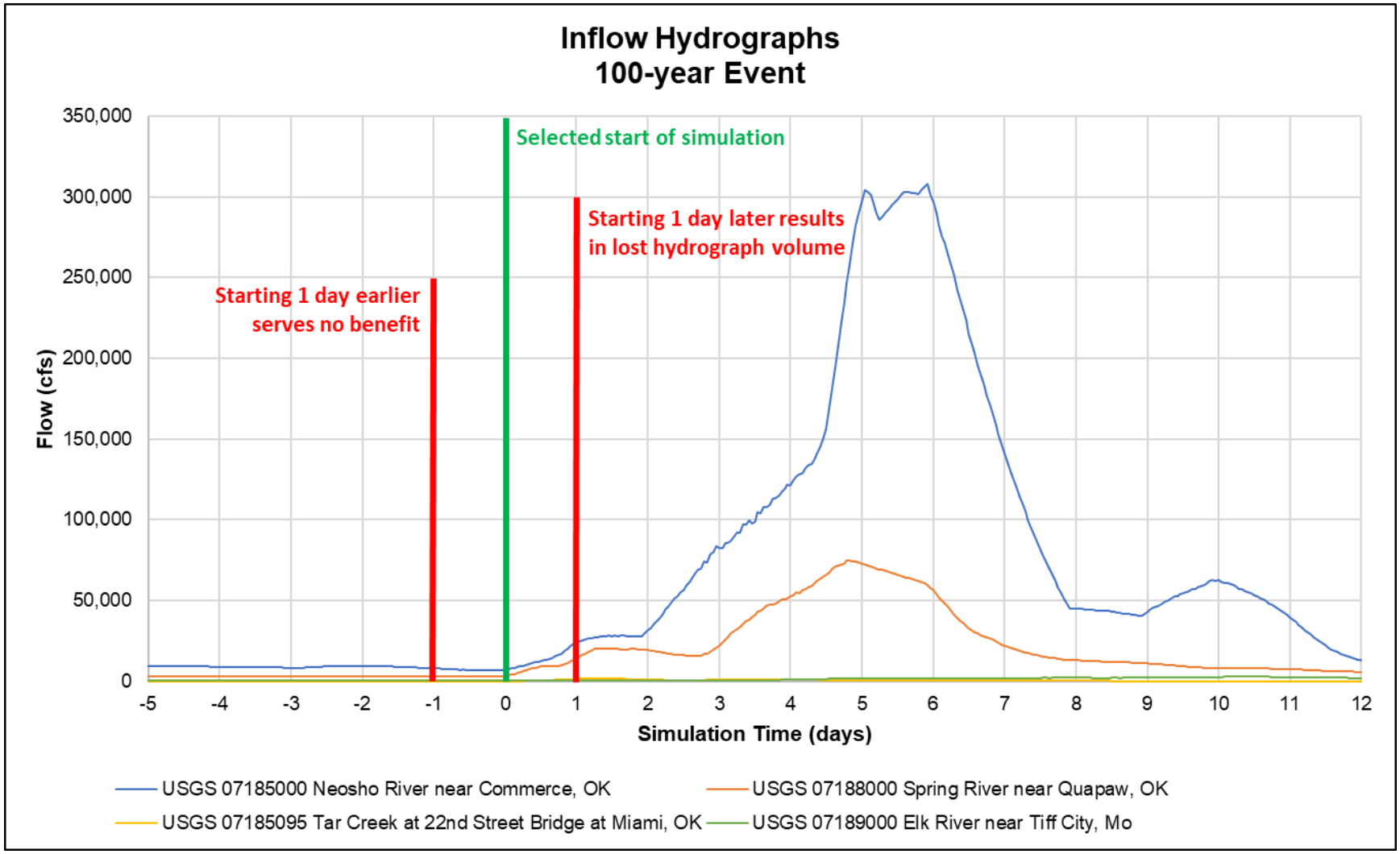
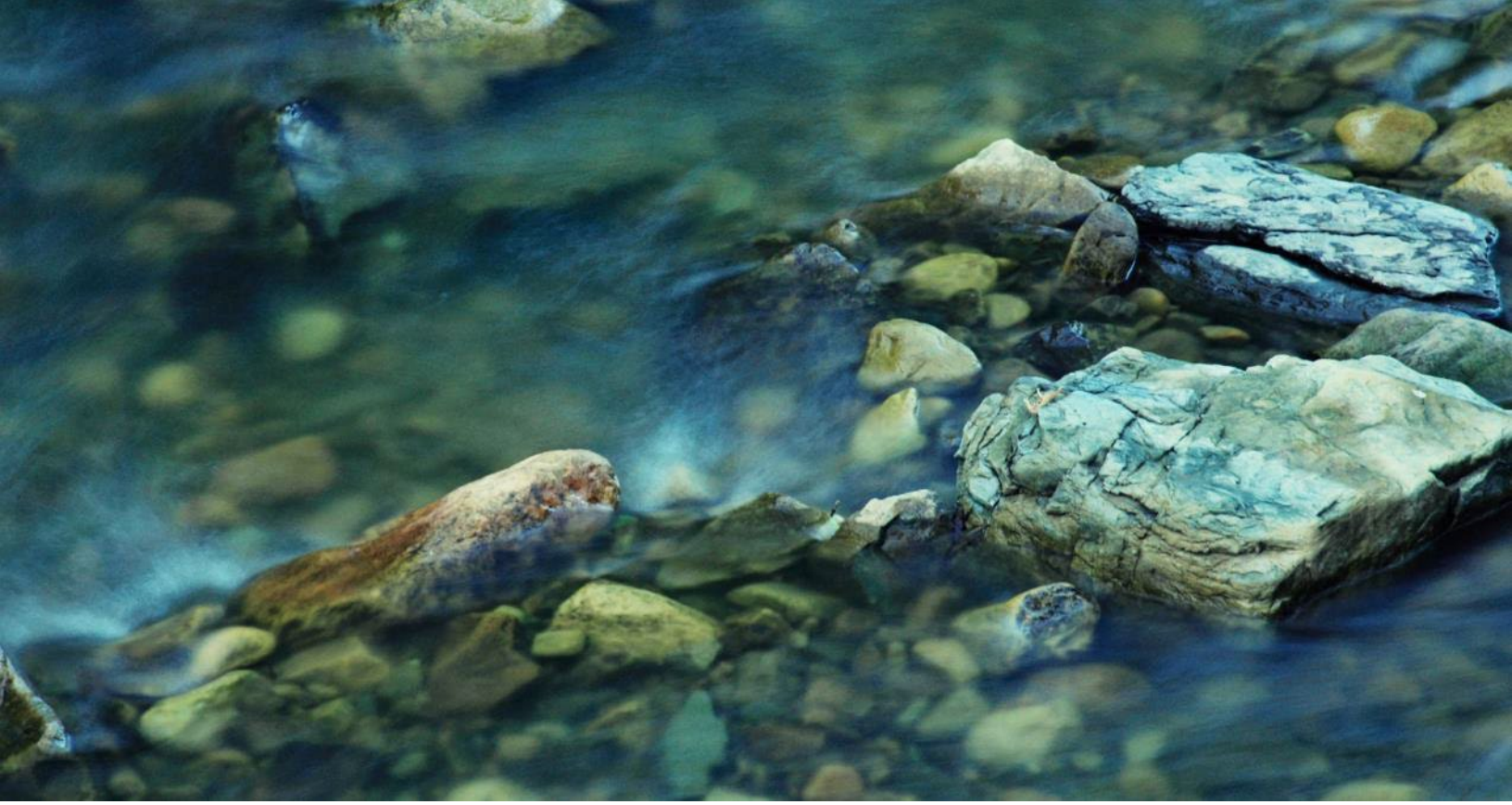


Figure 6. Inflow hydrographs for the 100-year inflow event.

Notes: The ISR and USR simulations started at midnight on a day equivalent to date 6/28/2007, immediately prior to the flood wave arrival, with the stipulation that the simulation must begin at midnight to allow alignment with the FRM. Note that GRDA selected a starting day as close to the increase in flow as possible without losing significant hydrograph volume.

Appendix C
Technical Memo: Neosho River Field Investigation



December 2022
Response to Comments on Updated Study Report

ANCHOR QEA

Appendix C:
Neosho River Field Investigation

Prepared for

GRDA
Grand River Dam Authority

December 2022
Response to Comments on Updated Study Report

Appendix C:
Neosho River Field Investigation

Prepared for
Grand River Dam Authority
P.O. Box 409
Vinita, Oklahoma 74301

Prepared by
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Madison, Wisconsin 53715
Simons & Associates
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Midway, Utah 84049

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TABLES

FIGURES

APPENDICES

1 Neosho River Field Investigation

Anchor QEA performed a field investigation in November 2022 to provide a bathymetric survey and sediment coring. The purpose of the investigation was to gather additional information about coarse sediment conditions within the Neosho River, specifically near a low head dam in Miami, Oklahoma.

1.1 Bathymetric Survey

The survey was completed using a SonTek RiverSurveyor M9 pseudo-multibeam echosounder (pMBES). The M9 allows accurate, detailed hydrographic surveying by sending sound pulses into the water column toward the bed. The time it takes for the pulses to reflect off the bottom and return to the M9 is used to determine water depth. Reported attributes of the M9 are shown in Table 1.

Table 1. SonTek RiverSurveyor M9 Reported Specifications

Transducer Configuration	
Dual 4-Beam 3.0 MHz/1.0MHz Janus at 25° Slant Angle	
0.5 MHz Vertical Beam Echosounder	
Depth Measurements	
Range	0.20 m to 80 m
Accuracy	1%
Resolution	0.001 m

Source: SonTek

The M9 features multiple sonar heads, which map a swath of the riverbed, providing more coverage than a single beam echosounder. Anchor QEA mounted the sonar unit on a powered floating platform and used the M9 as a remote operated vehicle to collect a closely-spaced grid of bathymetry data points. Location information was provided by differential GPS equipment and water surface elevation (WSE) information was measured with real-time kinematic GPS (RTK-GPS) equipment.

Data was collected and post-processed using HYPACK to remove outlier datapoints and interference errors. The revised point files were then exported and used to create a three-dimensional (3D) surface. The bed elevation was determined by subtracting depths measured by the M9 from the WSE measured by RTK-GPS. Bed elevations ranged from 734 and 742 feet above the North American Vertical Datum of 1988 (NAVD88) as shown in Figure 1.

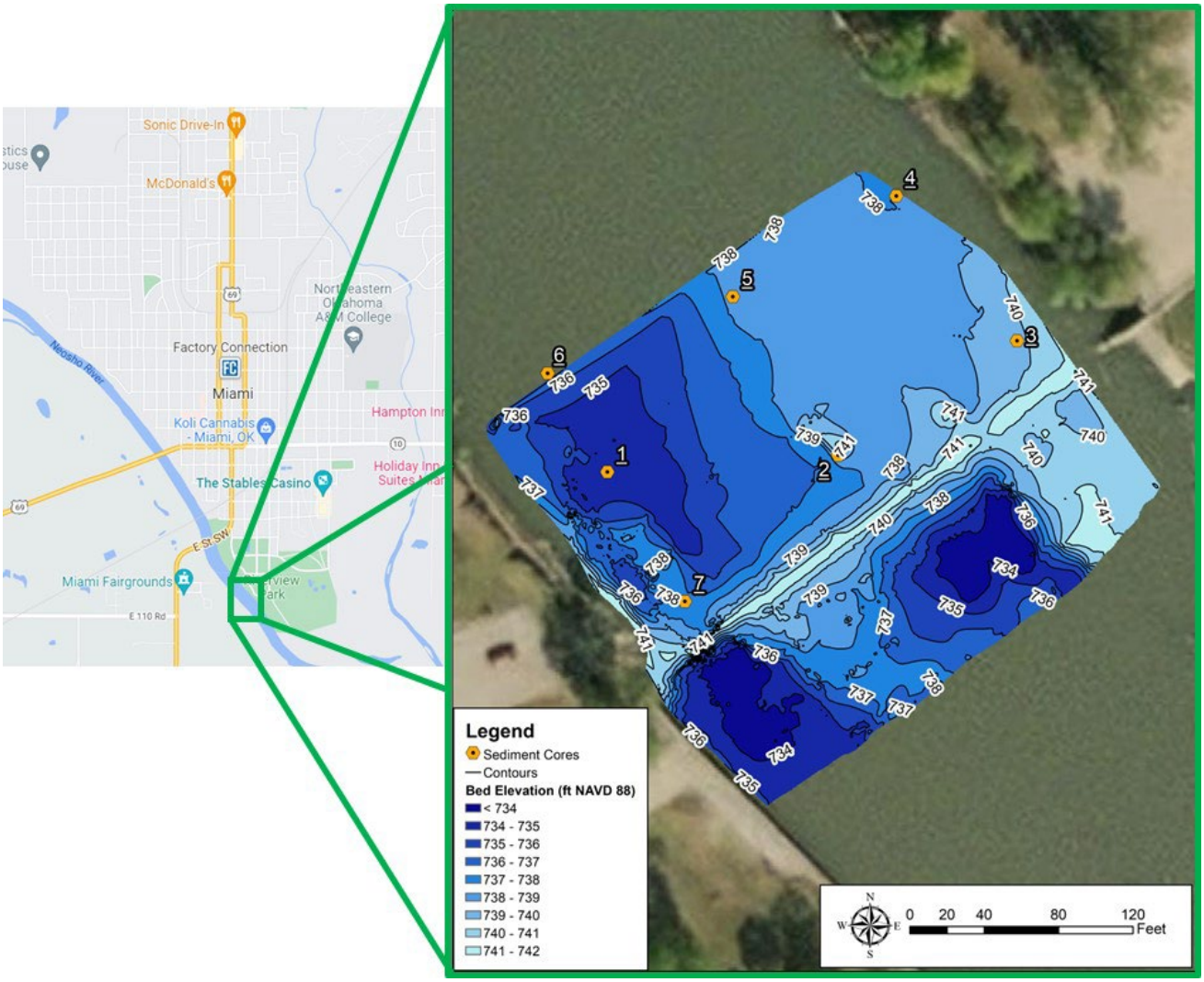


Figure 1. Bed Elevation Map from Bathymetric Survey Results; Low Head Dam is Located at Approximately RM 135.25 on the Neosho River

The low head dam protrudes approximately 6 feet out of the neighboring bed sediments. There are several deeper locations within the surveyed reach; one is located upstream of the dam, and the other two are located downstream.

1.2 Sediment Vibracoring

Seven locations were selected for sediment vibracore sampling. The locations, date, and time of sediment coring are provided in Table 2.

Table 2. Locations of Sediment Vibracore Samples

Core ID	Northing (US ft, OK State Plane N)	Easting (US ft, OK State Plane N)	Date	Time
Core 1	692448.306	2881571.069	11/19/2022	15:11:51
Core 2	692457.22	2881695.279	11/20/2022	10:44:44
Core 3	692518.869	2881791.416	11/20/2022	11:12:04
Core 4	692596.812	2881726.468	11/20/2022	11:32:05
Core 5	692542.601	2881638.603	11/20/2022	12:02:57
Core 6	692501.402	2881539.034	11/20/2022	12:20:24
Core 7	692378.619	2881612.767	11/20/2022	12:31:29

During vibracoring, the water depth was measured by sonar depth sounder or lead line. Location and WSE measurements were collected using RTK-GPS to determine bed elevations. Once all equipment was positioned above the intended sampling site, the vibracore was started and lowered to refusal.

Seven locations were sampled with the vibracoring equipment, though two produced no sediment (i.e., depth to refusal was 0 feet) as shown in Table 3. Core 7 consisted primarily of finer material. The rest of the core samples contained primarily coarser sand and gravel material with evidence of surface armoring.

Table 3. Sediment core descriptions

Core ID	Depth (ft)	Water Level (ft NAVD88)	Mudline Elevation (ft NAVD88)	Core Length (ft)
Core 1	7.6	743.339	735.739	0.00
Core 2	5.7	743.583	737.883	0.62
Core 3	4.5	744.965	740.465	0.37
Core 4	5.67	744.509	738.839	0.56
Core 5	6.25	744.522	738.272	0.50
Core 6	10.25	744.743	734.493	0.00
Core 7	7.33	744.497	737.167	0.67

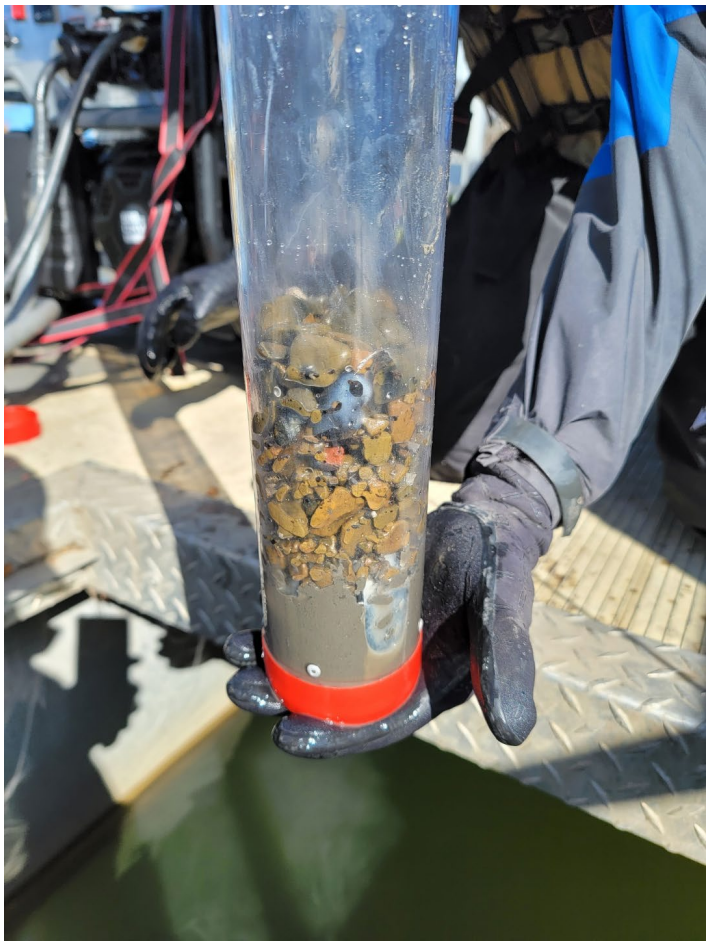


Figure 2. Sample Photo of Core Sample from Near Miami Low Head Dam Showing the Natural Armoring of the Bed at This Location

The armoring is expected as part of a natural process in streams as finer materials are washed from the top layers of the bed, leaving only coarse-grained sediment on the surface (see, for example, Bunte and Abt 2001). This armoring prevents motion of underlying finer material and decreases likelihood of bedload sediment transport.

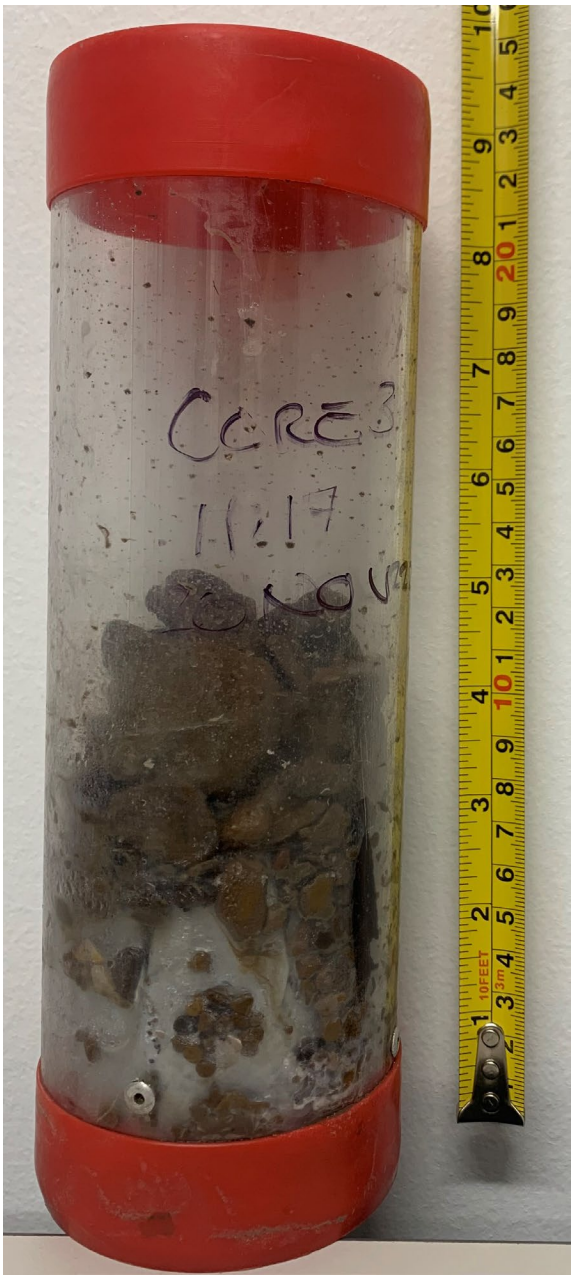
2 References

Bunte, K. and S.R. Abt, 2001. *Sampling Surface and Subsurface Particle-Size Distributions in Wadable Gravel- and Cobble-Bed Streams for Analyses in Sediment Transport, Hydraulics, and Streambed Monitoring*. US Forest Service, Rocky Mountain Research Station General Technical Report RMRS-GTR-74.

Appendix A
Photographs of Core Samples

Core 2

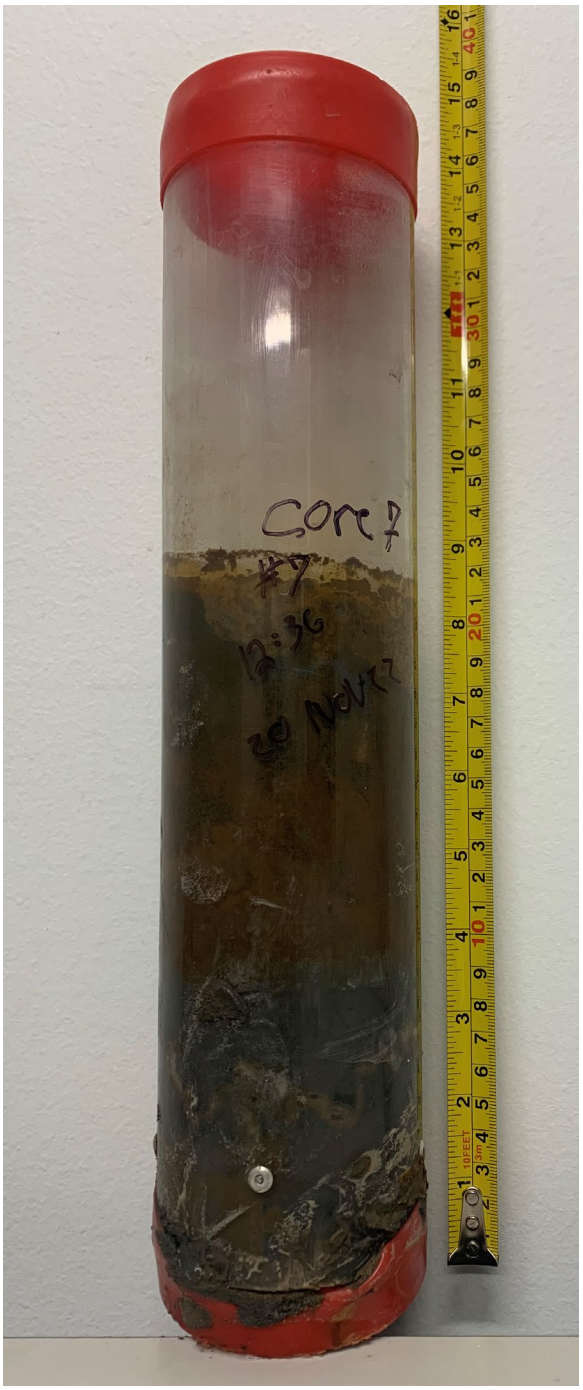
Core 3



Core 4

Core 5

Core 7



No sediment was recovered with Core 1 or Core 6

Appendix D
Technical Memo: Neosho River Sediment Transport

Appendix D:
Technical Memo – Neosho River Sediment Transport

December 29, 2022

Discussion of Sediment Transport in the Neosho River above Pensacola Dam

The City of Miami, Oklahoma (City) continually mischaracterizes the lack of bedload sediment in the model as an "assumption" by the Grand River Dam Authority (GRDA). It is not an assumption, and it is based on measurements from numerous sampling efforts as documented in the USR (Section 2.2.4.2 and Section 2.3.4.2). The City has not measured bedload transport and instead relies on biased judgment to form the opinion that because gravel is present on the bed, it must also be moving, despite all evidence suggesting otherwise.

It is notable, however, that when evaluating GRDA's surface grab samples, the City argues they are excessively coarse. They state that this is the case because "sand and finer material have mostly been winnowed from the matrix due to typical surface-coarsening processes that occur in mobile gravel- and sand-bed streams." Essentially, they are stating that the surface layer is naturally armored, and as such, it is less mobile than the layers beneath it, which is consistent with the findings from GRDA's own field efforts.

The City's idea that "coarse sediment is **clearly** carried into the reach" *[emphasis added]* is simply not supported by the data. GRDA has repeatedly provided original field measurements and comprehensive modeling documentation to support their assertions, and the City has not.

The City also states that approximately 2.2 million tons of coarser material moves through the Neosho River during the calibration simulation. It should be noted that in total, approximately **380 million tons of sediment** entered in that timeframe. The coarse material they are describing comprises just 0.6% of the total sediment load to this system, and it is misleading to suggest it is a significant portion.

Regardless of the City's unsupported arguments, GRDA has tested the sensitivity of the results to the City's claims by performing an additional sensitivity analysis following the USR. GRDA performed an incipient motion analysis of sediment on the streambeds, added coarse bedload material to the

simulation, and evaluated future geometry. See section 4.2.3.1 of GRDA's Response to Comments filed in December 2022.

The City present its self-described "opinion" that the sediment gradations developed by the GRDA team for upstream portions of the river reaches are "unrealistically coarse." They state that "the coarse GRDA samples appear to have been collected from the bed surface in areas where the sand and finer material have mostly been winnowed from the matrix due to typical surface-coarsening processes that occur in mobile gravel- and sand-bed streams (Parker 2008, Parker et al. 1983); whereas, Dr. Mussetter's samples were collected from below the coarser surface layer in areas that are more representative of the material being transported when the bar material was deposited." Dr. Mussetter's samples are deliberately biased in two ways and do not provide an accurate representation of the bed material characteristics of these upper rivers:

- They neglect the importance of a surface armor layer
- They were collected on bars rather than from the stream beds

Appropriate methodologies for collecting bed material are described in *"Sampling Surface and Subsurface Particle-Size Distributions in Wadable Gravel- and Cobble-Bed Streams for Analyses in Sediment Transport, Hydraulics, and Streambed Monitoring,"* May 2001 by Kristin Bunte (fluvial geomorphologist and research associate at Colorado State University) and Steven R. Abt (professor and associate dean for research, Colorado State University), for the Forest Service Rocky Mountain Research Station, General Technical Report RMRS-GTR-74 (Bunte and Abt 2001). This document discusses the concept of a coarse armor layer at the bed surface and how to conduct appropriate sampling: *"Several mechanisms have been proposed to explain the cause of surface coarsening and the development of an armor layer (Fig. 4.1). These include winnowing of surface fines."*

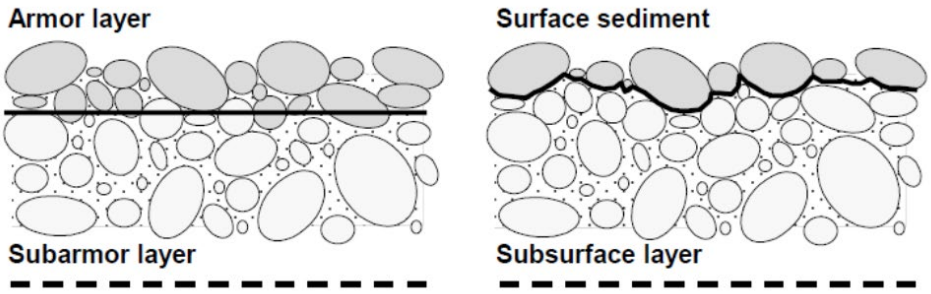


Fig. 4.1: Stratigraphy of an armored bed distinguishing between armor layer, subarmor layer, surface sediment, and subsurface layer. (After Bunte and Abt 2001)

This figure shows the armor layer that frequently develops at the surface of the bed of a river. Photographs of the beds of the Neosho, Spring and Elk Rivers as well as Tar Creek, which have been

previously presented in the ISR, clearly show the presence of a relatively coarse armor layer on the surface of the bed in the upstream reaches of these streams (see photographs below).

Spring River sediments

Elk River sediments

Tar Creek sediments

Neosho River sediments

In bed material sampling, as discussed in Bunte and Abt (2001), the following statements are made:

> *A sample of the armor layer should extend over the entire thickness of the armor layer. If the sample is not sufficiently deep, it misses the fine particles under the coarse surface particles and produces a size distribution that is too coarse. An armor-layer sample that extends too deeply into the bed includes subsurface sediment which is finer than the armor layer and thus produces a sample that is too fine.*

Mussetter's samples completely disregard the presence of the armor layer that exists on the beds of these streams as anyone can clearly see by observation. Again, the Tetra Tech comments state: *"Dr. Mussetter's samples were collected from below the coarser surface layer in areas that are more representative of the material being transported when the bar-material was deposited."* Removing the armor layer and sampling "below the coarser surface layer" produces a sample that, according to the Bunte and Abt sampling guidelines *"includes subsurface sediment which is finer than the armor layer and thus produces a sample that is too fine."* Thus, to account for the armor layer which clearly exists is necessary and appropriate. It is not the samples collected by GRDA that are too coarse, but it is the Mussetter samples which are too fine.

In addition to the extreme bias in sampling by eliminating the armor layer, Mussetter's samples are also biased in that they were all collected on bars on the side of the river. Referring back to the Bunte and Abt sampling guidelines, they state*: "In coarse gravel-bed streams with low sediment supply, bar surface sediment tends to be finer than the reach-average bed-material size,"* and that: *"a generally coarse thalweg occur (sic) in alluvial streams."* This means that samples collected by Mussetter are finer because they were collected on bars and not from the thalweg. While some samples collected by GRDA were collected on bars, others were collected from the thalweg area of the stream thereby reducing the bias from the bar samples.

From a sampling perspective, Mussetter's samples are biased to the fine side by total elimination of the armor layer, sampling from a hole dug down into the finer sub-surface layer and only collecting samples from bars which are generally finer than the thalweg portion of the stream.

Beyond the very biased sampling, there are significant implications on how these biased samples influenced Tetra Tech's perspective and understanding of these rivers. Tetra Tech believes that the sub-surface bar samples represent the sand and gravel material that is being regularly transported by these rivers and that this coarse component of sediment needs to be added into the upstream sediment inflow

for sediment transport modeling. As stated by Tetra Tech this is their "opinion." It is based on extremely biased sediment sampling, and it is not based on any facts or technical analysis.

Developing an adequate understanding of these rivers, and particularly the Neosho River which is the greatest contributor of sediment to Grand Lake, requires an understanding of the upstream coarse sediment supply.

Upstream coarse sediment supply

In a document entitled "Chert Gravel Sources, Hydrology, Transportation, and Deposition Within the Lower Neosho River, Southeastern Kansas," (Byerly 1995), he presents the source of coarse sediment supply to the Neosho River and discusses how this source has been completely eliminated by John Redmond Reservoir:

> *The headwaters of the Neosho River originate in the Flint Hills region providing a rich source of chert gravel to replenish gravel bars, but a barrier exists to the gravel ever reaching the lower Neosho River channel. Since John Redmond Reservoir was impounded in 1964, it has provided a man-made obstacle to the transportation and deposition of chert gravel into and within the lower Neosho River channel. Chert gravel is pebble and cobble sediment that becomes trapped at the reservoir and settles to the bottom of it. Only fine sediment, such as the size of soil colloids, flow into the lower Neosho River channel from the base of John Redmond Reservoir.*
>
> *The transportation of chert gravel sediment is restricted downstream by numerous low-water dams and the John Redmond Reservoir. These man-made controls on the flow of the river have prevented the natural transportation and deposition of chert gravel downstream*

These gravel bars are stationary landforms as evidenced by topographic maps dating back to the 1970's.

One of the earliest studies attributed the chert grave! deposition of southeastern Kansas to glacial action or drift. The geologist, Mudge, who was quoted in a study written by Parker (Mudge in Parker 1884), called the chert gravel "modified drift" in context with its proposed glacial origin. In an earlier study by Mudge (1875). he hypothesized that the chert gravels and the presence of erratic quartz and quartzite pebbles within them in eastern Kansas were due to glacial meltwaters that had transported the gravels and pebbles into the region. Wooster (1934) also attributed the presence of this combination of chert gravels and erratic quartz and quartzite pebbles to glacial meltwaters that transported the sediment into eastern Kansas via the McPherson valley.

He also mentioned other geologic studies that present the possibility of old river systems which have flowed through the area which may have transported and deposited the coarse gravel material in what has become the Neosho River valley.

Byerly also discusses the armoring process and the reduction in peak flows downstream of John Redmond:

> *Channel bed build-up or armoring occurs upstream within proximity of the reservoir dam due to a leveling of the slope within that reach (Leopold et al. 1964). The reduction in peak flows negate the regulated river's ability to transport larger and coarser sediment such as pebble and cobble gravels downstream. Instead, the roughness of the upstream channel bed creates an armoring effect in which the larger and coarser sediment becomes trapped and accumulates while the finer and smaller sediment is transported downstream.*

His figures show the most significant flood of record in 1951 and the reduced peak flows downstream after the construction of John Redmond Reservoir.

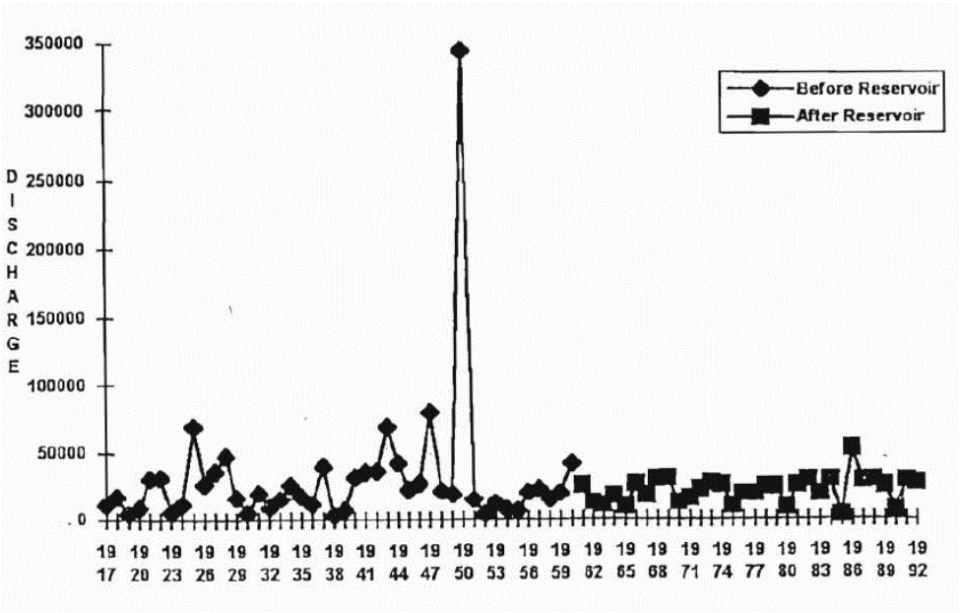
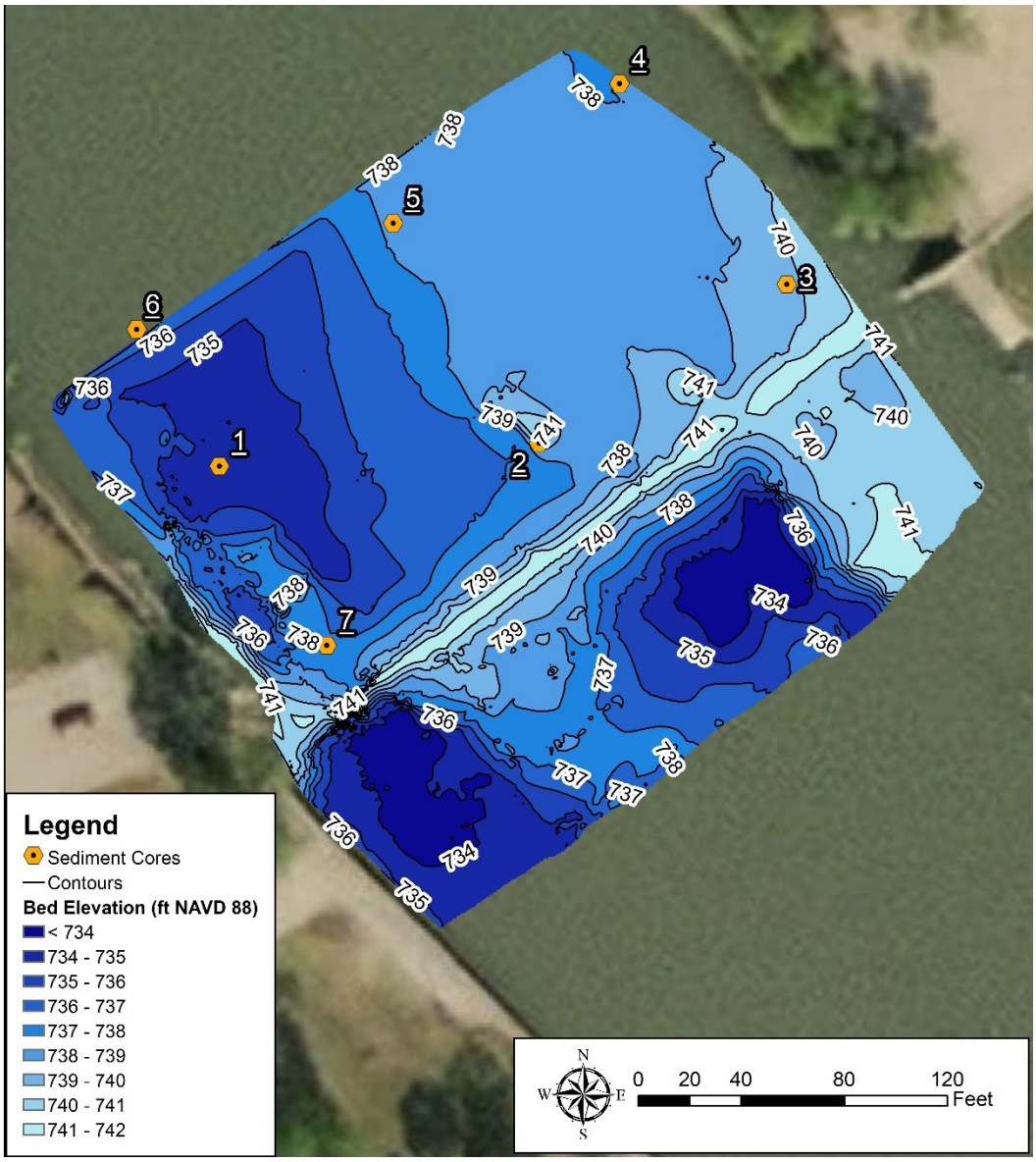


Figure 9. Peak annual discharges for water-budget years 1917 -1992 inclusive, before and after the impoundment of John Redmond Reservoir. Data from stream-gage records taken at lola gaging station.

Low head dam

The City and Tetra Tech are also aware of the low-head Miami Dam that was constructed in 1923. GRDA performed additional fieldwork to investigate this structure and the surrounding area. This consisted of a bathymetric survey and a series of vibracore samples (see Appendix B).

The recent bathymetric survey conducted in late 2022 shows that nearly 100 years later this dam extends about 6 feet above the bed since the riverbed is about 6 feet lower than the crest of the dam. This survey demonstrates that no significant sediment deposition has occurred in this area for the nearly 100 years of its existence. If, as suggested by Tetra Tech, there was a significant and ongoing supply of coarse sediment being transported down the Neosho River from upstream, it would have deposited in and filled the pool upstream of the Miami Dam with sediment. The fact that the Miami Dam continues to protrude about 6 feet above the bed confirms the bedload data collected by GRDA which shows virtually no bedload is being transported down the Neosho River (or other rivers in the system).

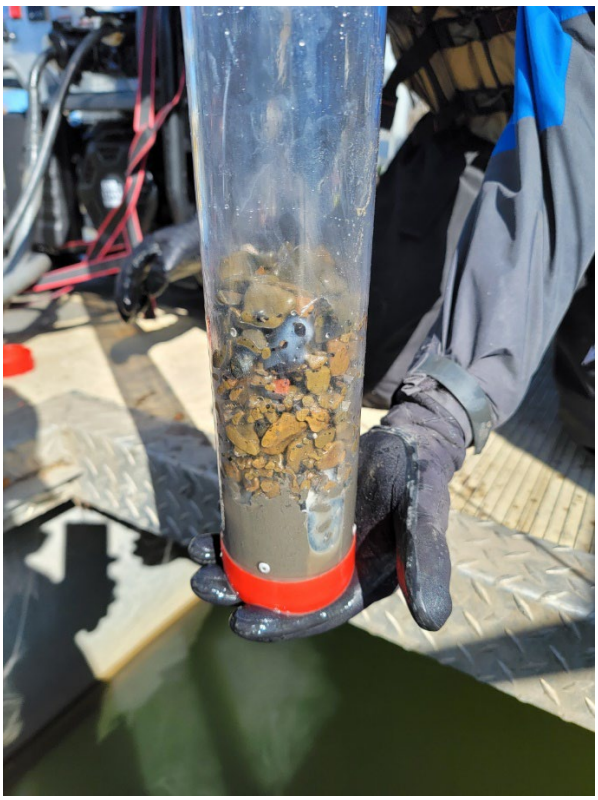


Bathymetric map of the Miami Dam and surrounding area

Since the construction of the Miami Dam, the river has experienced the most significant flood of 1951 which had a peak daily flow of 251,000 cfs on July 15, 1951, which likely produced the greatest incoming sediment load of the historic record. The Miami Dam has experienced the pre-John Redmond sediment regime for about 41 years (from 1923 to 1964) and the post-John Redmond sediment regime for about 58 years and during all these years the dam remains about 6 feet higher than the bed level with no apparent deposition of sediment.

It should be noted that in conjunction with the recent bathymetric survey of the Miami Dam reach, vibra-core samples were taken upstream of the dam. These samples show again the generally armored nature

of the river, which is an important aspect of the streambed and significantly affects sediment transport in the Neosho River.



Example photograph of vibracore sample showing armor layer above finer material

Armoring analysis

An armoring analysis has been conducted based on the bed material samples collected and the hydraulic model. Detailed research was conducted on bedload transport and the effectiveness of an armor layer to protect against erosion in a dissertation entitled, "Sediment Transport in a Gravel-Bottomed Stream,1973, Robert T. Milhouse (Ph.D. dissertation Oregon State University). In this study he conducted bedload transport and bed material analyses for a range of flow events. One of the key findings of his research deals with what sizes of material in an armor layer is a threshold condition when an armor layer begins to mobilize and expose the underlying bed material.

> *It was found that the armour layer controls the bed load transport system by preventing sand and finer material from the bed from being entrained in the flow unless the armouring particles are first moved.*
>
> *The critical discharge for disturbing the armour layer is related to a size equal to 69% of the D65 size. The critical shear stress of the armouring material is at a minimum for a particle*

equal to the 0.69 D65 size. Smaller particles are hidden in the armour layer and larger particles are heavier than the critical particle.

The bed material sample collected at RM 145.5 had a maximum diameter of 38mm and a D65 of 24mm resulting in a 69% value of 16.6mm. Based on Shield's analysis of critical velocity required to move this size of sediment (using a dimensionless shear value of 0.047) results in a critical velocity of 4.66 feet per second. The hydraulic model (using the 2019 geometry and 2009-2019 historic flow and operations) found that the critical velocity required to begin to disrupt the armor layer was exceeded 1.9%, 7.9% and 0.3% of the time at cross-sections RM 145.69, 145.5 and 145.3.

Just upstream of the Miami Dam at RM 135.267, the maximum sediment size was 50mm with a D65 of 34mm and a 69% of D65 of 23.5mm. This results in a critical velocity of 5.55 ft/sec. This value was exceeded 1.6% 0.6%, 0.02%, 0.34% and 0.1% of the time for cross-sections upstream and downstream of the Miami Dam at RM 135.47, 135.44, 135.37, 135.267, and 135.15. This analysis shows the stability of the armor layer under the vast majority of flow conditions.

Relict channel

Bunte and Abt (2001) in their sampling protocol, discuss the concept of self-formed and relict/non-fluvial streams:

1.3.4 Sediment source: self-formed versus relict/non-fluvial streams

The distinction between self-formed and relict/non-fluvial gravel-bed rivers is not explicitly part of current classification systems, but this distinction is important because it affects all aspects of bed-material sampling in gravel-bed rivers.

Self-formed streams

Self-formed streams receive their sediment supply almost entirely from upstream (fluvial) sources, the local bed, and erosion of banks composed of sediment transported under the current transport regime. Stream morphology and sediment sizes are exclusively controlled by the interaction between flow and sediment. Consequently, the streambed contains no particles larger than those that can be moved during the highest floods. Because sediment in self-formed streams is not coupled to hillslopes and other non-fluvial sources, such stream systems are also referred to as uncoupled streams.

Relict/non-fluvial streams

Relict/non-fluvial streams can receive much of their sediment from non-fluvial sources such as:

• mass movements (debris flows, landslides, avalanches, etc.),

• rock-fall from canyon walls,
• intensive slope wasting, bank undercutting and slumping,
• downcutting into glacial deposits from which the stream unearths large boulders that may be of commonly untransportable size, and
• erosion of bank material deposited under a different regime of flow or sediment supply.

Bunte and Abt (2001) also state that, "Self-formed and relict-non-fluvial streams can be difficult to distinguish in the field, if off-stream sediment supply is low or occurs only sporadically." As demonstrated by the armoring analysis and the Byerly analysis documenting that the coarse sediment supply has been cut off due to John Redmond Reservoir, the lower Neosho River rarely experiences any movement of coarse sediment because of the lack of supply of these sizes and armoring.

Byerly (1995) discusses the origins of the coarse sediment supply for the Neosho River as being the result of post-glacial ice melt and/or the significant geomorphic changes associated with other large river systems flowing through the area after glaciation.

The Neosho River can be considered a relict/non-fluvial river, or at least exhibiting relict/non-fluvial tendencies because the upper riverbed is armored and the riverbed consists of material which was deposited in the post-glacial era, the riverbed material rarely is transported and there is no longer any supply of gravel that previously existed prior to the construction of John Redmond Reservoir.

Based on the biased data collected by scraping away the armor layer and excavating down into the finer sub-surface material in gravel bars, Tetra Tech has developed the concept that these finer sediment sizes represent the sizes of material being transported. This concept has guided their comments and view that these coarse sediments are deposited on the riverbed and adversely affect flooding. This approach of developing a theory or hypothesis has been discussed in Vision of the Anointed (Sowell, 1995). Sowell also observed that analysis may too often be guided by the vision or objective of the scientist rather than the facts: *"Those with the vision of the anointed almost invariably choose . . . the particular direction of causation depending on which is more consistent with that vision-not which is more consistent with the empirical facts."* He goes on to suggest that such problems can be avoided by application of the scientific method. His interpretation of the scientific method includes the determination of empirical observations that would be anticipated if one theory were correct compared to what would occur if an alternative theory were correct. The need to apply the scientific method specifically to geomorphic issues such as channel change is echoed by Schumm (1991) in his interesting and thought-provoking book entitled, To Interpret the Earth, Ten ways to be wrong. He suggests a critical approach whereby the scientists would attempt to disprove rather than to attempt to justify or verify their own hypotheses.

If Tetra Tech's hypothesis that the finer component of the bed material was being transported on a relatively regular basis leading to sediment deposition in the head of the reservoir, the following empirical facts would be true:

- The bedload transport data would have collected samples of these sizes of sediment being transported over a significant part of the flow regime.
- The Miami Dam, which is located in the head area of the reservoir would have filled with sediment over its nearly 100-year existence.
- There would be no armor layer present on the surface of the riverbed that is effective in limiting erosion and transport of the finer sub-surface material.

Instead, the following empirical facts are true:

- although collecting bedload transport data which covered approximately 99% of the flow regime, the bedload data show that virtually no bedload is being transported.
- The Miami Dam has not filled with sediment and remains about 6 feet above the riverbed as it was in 1923 when it was constructed.
- Collection of bed material data using appropriate protocols, coupled with simple visual observation, show the existence of a relatively coarser armor layer on the surface of the riverbeds in the upper reaches of the Neosho, Spring and Elk Rivers and Tar Creek.
- Armoring analysis using the bed material size distribution of the armor layer, hydraulic analysis and data-based criteria developed in the scientific literature regarding the size of sediment required for armoring shows that the armor layer is effective in preventing erosion and transport of finer sub-surface sediment for the vast majority of flow conditions.
- The scientific literature shows that the coarse sediment supply on the Neosho River (which is the dominant sediment supply into Grand Lake) has been completely cutoff by John Redmond Reservoir, the Neosho riverbed is armored, and the reduced flows due to flood storage in John Redmond has reduced peak flows and the potential for coarse sediment being transported down the Neosho River.
- There is no significant deposition of coarse sediment in the Miami Dam reach. The sediment load, which consists almost exclusively of suspended sediment (primarily fine silt and clay) is deposited about 15 or more miles downstream in the delta feature area. Core samples collected in the delta feature confirm that the delta consists of about 89% silt and clay.
- Evaluation of the relict/non-fluvial characteristics and tendencies of the Neosho River provides a reasonable and scientifically supportable perspective of the true geomorphic nature of these upper river systems.

Application of the scientific method clearly demonstrates that Tetra Tech's key hypothesis that is the basis for their overall perspective and comments and must be rejected. In Schumm (1991) he quotes Medawar (1979): *"I cannot give any scientist of any age better advice than this: the intensity of the conviction that a hypothesis is true has no bearing on whether it is true or not."* Sowell (1995) states: *"For every expert, there*

is an equal and opposite expert, but for every fact there is not necessarily an equal and opposite fact." Tetra Tech has provided yet another example of Schumm's: To Interpret the Earth Ten ways to be wrong. Their analysis and perspective are fundamentally and fatally flawed.

The analysis and perspective developed by GRDA is based on appropriate data collection following accepted protocols for bed material and bedload transport. It considers the fact that no significant sediment deposition has occurred at the Miami Dam since it extends vertically above the bed about the same distance as it did in 1923. It has included analysis of armoring using appropriate bed material sizes representing the armor layer. It considers the geomorphic and geologic history of coarse sediment supply and the fact that John Redmond has cut off the river from this supply of coarse sediment. It considers the relict/non-fluvial nature and tendencies of the Neosho River. The GRDA analysis follows the three-level approach including qualitative geomorphic analysis, quantitative analysis and computer modeling which provides mutually supportive and consistent results.

In contrast, the Tetra Tech analysis relies on biased data and a perspective based on the biased data without appropriate consideration of the key concepts of armoring, coarse sediment supply cut off, and the true nature of this river system. They neglect the implications or even existence of the Miami Dam which shows no significant change over a period of 100 years. As they themselves state, it is their opinion - with nothing backing up that opinion. Their analysis and perspective are fundamentally and fatally flawed.

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