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OFFICE OF ENERGY PROJECTS

Project No. 1494-438–Oklahoma
Pensacola Hydroelectric Project
Grand River Dam Authority

VIA FERC Service

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P.O. Box 70
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**Reference: Determination on Requests for Study Modifications and New Studies
for the Pensacola Hydroelectric Project**

Mr. Townsend:

Pursuant to 18 C.F.R. § 5.15 of the Commission's regulations, this letter contains the determination on requests for modifications to the approved study plan for the proposed relicensing of the Pensacola Hydroelectric Project. The project is located on the Grand (Neosho) River, in Craig, Delaware, Mayes, and Ottawa Counties, Oklahoma. The determination is based on the study criteria set forth in sections 5.9(b) and 5.15(d) and (e) of the Commission's regulations, applicable law, Commission policy and practice, and staff's review of the record of information.

Background

Pursuant to the Commission's Integrated Licensing Process (ILP), the study plan determination for the proposed relicensing of the Pensacola Project was issued on November 8, 2018. GRDA filed an initial study report (ISR) on September 30, 2021, summarizing the status of the 9 studies being conducted.¹ GRDA held meetings on October 12-14, 2021, to present the ISR results and filed a summary of the meeting on October 29, 2021.

¹ On March 30, 2021, GRDA filed the 6 Month Upstream Hydraulic Model Input Status Report. A technical conference was held on April 21, 2021 to discuss the report with stakeholders.

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Comments

Comments on the ISR and meeting summary, including requests for study modifications, were filed by: the Bureau of Indian Affairs (BIA) on November 19, 2021; the Oklahoma Department of Wildlife Conservation (Oklahoma DWC) on November 22, 2021; the City of Miami on November 29, 2021; and the United States Fish and Wildlife Service (FWS) on November 30, 2021. Oklahoma Archaeological Survey submitted comments directly to GRDA on November 29, 2021, which GRDA filed with the Commission on December 29, 2021.² The Cherokee Nation filed comments with the Commission on December 17, 2021. GRDA filed reply comments on December 7, 2021, and December 29, 2021.

A number of the comments received do not specifically request additional studies or modifications to the approved studies, and therefore, are not addressed herein. For example, some of the comments provide additional information; recommend protection, mitigation, and enhancement measures; address ongoing and future consultation; or request additional information that is contingent upon the results of incomplete studies, or that has already been requested by Commission staff. This determination only addresses comments and requests that would require study modifications or additional studies.

Study Plan Modification Determination

Pursuant to section 5.15(d) of the Commission's regulations, any proposal to modify a required 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 approved study plan, or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. As specified in section 5.15(e), requests for new information gathering or studies must include a statement explaining: (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).

Appendix A summarizes the determination on all but one of the requested modifications to the approved study plan. Specific modifications to the studies and the bases for modifying them are explained in Appendix B. Appendix C provides the determination on a new study request. Commission staff considered all study plan criteria in accordance with sections 5.9(b) and 5.15(d) and (e) of the Commission's

² See GRDA December 29, 2021 Filing at Appendix G.

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regulations.³ However, only the specific study criteria relevant to the determination are referenced in Appendices B and C.

As discussed in Appendix B, this letter provides 30 days from the issuance date of this determination for stakeholders to submit written comments on GRDA's Sedimentation Study Report and study modification proposal. GRDA is then provided 30 days from that comment due date to reply, after which a determination will be made on the Sedimentation Study.

Please note that nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies. If you have any questions, please contact Navreet Deo at (202) 502-6304, or via e-mail at navreet.deo@ferc.gov.

Sincerely,



Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A Summary of Determinations on Requests to Modify Study Plan
Appendix B Staff Recommendations on Requested Modifications to Study Plan
Appendix C Staff Recommendations on Requested New Study
Appendix D Literature Cited

³ Pursuant to section 5.29(f)(2) of the Commission's regulations, section 5.15(c)(6) is waived to provide the additional time needed to address the requested modifications to the approved study plan.

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APPENDIX A**SUMMARY OF DETERMINATIONS ON REQUESTS TO
MODIFY STUDY PLAN**

Study	Recommending Entities	Approved with Modifications	Not Approved	Determination Deferred
Requested Study Modifications				
Hydrologic and Hydraulic Modeling (<i>i.e.</i> , Flooding and Inundation Studies)	City of Miami	X		
Sedimentation Study	City of Miami, GRDA			X
Aquatic Species of Concern	FWS	X		
Terrestrial Species of Concern	GRDA		X	
Cultural Resources Study	BIA, Cherokee Nation, Osage Nation, Oklahoma SHPO, Oklahoma State Archaeologist		X	
Socioeconomics Study	City of Miami		X	
Infrastructure Study	City of Miami	X		
New Study Request				
Contaminated Sediment Transport Study	City of Miami		X	

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APPENDIX B

STAFF RECOMMENDATIONS ON REQUESTED MODIFICATIONS TO STUDY PLAN

GENERAL ISSUES

A. Schedule for Delayed Studies

The approved study plan required GRDA to file the results of the first study season for each of the nine studies as part of the Initial Study Report (ISR). GRDA filed its ISR on September 30, 2021. In its ISR, GRDA requests a schedule variance to complete the Sedimentation Study. GRDA also proposes to use the second study season to improve the Operations Model, a component of the comprehensive hydraulic model (CHM) that forms the basis for the Hydrologic and Hydraulic Modeling Study (H&H Study), and provide an updated Operations Model Report with the Updated Study Report (USR) by September 30, 2022.

Sedimentation Study

GRDA states that a schedule variance is needed to complete the Sedimentation Study Report for the first study season, and provides an Interim Sedimentation Study Report. GRDA explains that during the collection of field data, as required by the approved study plan, cohesive sediments (*e.g.*, silt, clay) were found to be the dominant sediment type within the system (*i.e.*, the impoundment and its tributaries). However, the study schedule assumed that non-cohesive sediments (*e.g.*, sand, gravel) were dominant within the system. GRDA states that cohesive sediments are more difficult to model and require the collection and analysis of core samples to inform sediment movement properties for model input. GRDA states that additional field and desktop work is needed to complete model calibration, and proposed to file a final report by December 31, 2021, which it filed on December 29, 2021. GRDA hosted a technical teleconference on the report and the proposed study modification on January 14, 2022.

In its December 29, 2021 final report, GRDA provided an analysis to show that certain sediment properties vary widely at different depths below the sediment surface where the sediments are cohesive. These properties may also vary over time as cohesive sediments begin to consolidate. GRDA notes that the HEC-RAS fluvial modeling system does not account for variations in sediment properties due to depth below the surface or time, which severely limits the ability to represent the complexity of cohesive sediment transport in the model. GRDA states that the initial results of the sediment transport model show discrepancies when compared to existing data and observed conditions and

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that the HEC-RAS model cannot accurately simulate the presence of both cohesive and non-cohesive sediments over the extent of the system for the purposes of the study.

During the second study season, GRDA proposes to: (1) update the flow roughness factors used in the sediment transport model; (2) run the sediment transport model to analyze the effects of existing and future project operation on sedimentation in the lower reaches of the tributaries to Grand Lake and the reservoir itself; and (3) describe the observed or predicted effects of sedimentation on the power pool.

In comments filed on November 29, 2021, the City of Miami, Oklahoma (the City) notes that the Sedimentation Study Report was not available for review before the deadline for comments on the ISR. In order to provide comprehensive comments on the Sedimentation Study Report, the City requests that the Commission add a comment period for the Sedimentation Study Report and adjust the Integrated Licensing Process (ILP) deadlines set forth in the Commission's regulations accordingly. Specifically, the City requests that the Commission adjust the date of the Director's Study Modification Determination to accommodate the supplemental comment period.¹

The City has also expressed technical concerns with GRDA's proposed study modification. For example, at the January 14, 2022 technical conference, representatives for the City argued that the HEC-RAS model could be modified to handle cohesive sediment, whereas GRDA said that it could not. Other commenters at the technical meeting contributed thoughts on additional sources of data or alternative model platforms that could be used in the study. The Fish and Wildlife Service proposed a site-specific method for dating the sediments to distinguish sediment affected by recent operations from other sediments.

In its partial reply comments filed December 7, 2021, GRDA states that a supplemental comment period is unwarranted, would be burdensome to relicensing participants, and would unduly delay the relicensing process. GRDA adds that the Interim Sedimentation Study Report included with the ISR provides an explanation of the work done by GRDA, as well as the initial results obtained. GRDA further adds that in accordance with the Commission's regulations, on-going study results may be submitted for review with the USR. Finally, GRDA notes that the approved study plan already requires a second study season for the Sedimentation Study. Therefore, GRDA opposes an additional comment period. However, if the request for a supplemental comment period is approved, GRDA requests a 30-day extension from any revised deadline to prepare its response. Lastly, GRDA requests that the Commission extend issuance of the Study Modification Determination until 30 days after GRDA's amended deadline for responses to the ISR comments.

¹ The City filed comments on the Sedimentation Plan on January 24, 2022.

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Discussion and Staff Recommendation

Regarding the City's request for a supplemental comment period on the Sedimentation Study, GRDA submitted the completed first season Sedimentation Study Report and its proposed modification a month after the ISR comment period ended. The study methods under discussion are technically complex and the final results of the study are important in assessing any effects of existing project operation or alternative operating scenarios on sediment erosion, transport, and deposition in the system, and characterizing the impact that sedimentation has on flooding upstream of Pensacola Dam. The City has raised technical concerns about the modifications and others have identified input they would like considered. While it appears that GRDA conducted the study as required in the approved study plan, the first season results were anomalous relative to the initial modeling assumptions (18 C.F.R. § 5.15(d)(2)).

Therefore, we recommend a 30-day period, from the date of issuance of this determination, for stakeholders to file comments on GRDA's season one Sedimentation Study Report and study modification proposal. We also recommend, as requested by GRDA in this circumstance, providing a 30-day period for GRDA to review and respond to the stakeholder comments. Upon conclusion of the comment and response periods, a determination on the Sedimentation Study modification will be issued within another 30 days.²

H&H Study – Operations Model

In its ISR, GRDA states that the Operations Model, a component of the H&H Study, used to simulate flow routing and power generation during an inflow event, has limitations in its current state and requires improvement. GRDA states that the United States Army Corps of Engineers' (Corps) RiverWare Model (RWM)³ has limitations on ramping rate restrictions, turbine shutoff compensation, and flood-routing model stage matching, which could impact the lotic and lentic mapping component of the study. Therefore, GRDA proposes to update the Operations Model and provide the results in an updated Operations Model Report with the Updated Study Report (USR) by September 30, 2022.

² Although the City filed comments on the Sedimentation Plan on January 24, 2022, we continue to recommend the supplemental comment period because of the interest expressed by other stakeholders and to ensure a complete determination process for the modification request.

³ The RiverWare Model simulates flows through the Arkansas River Basin System using a 77-year period of record.

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The City requests a supplemental comment period upon release of the Operations Model by GRDA, which the City has not yet seen, either in its original or updated form.⁴

GRDA makes similar arguments and requests regarding an additional comment period on the updated Operations Model to those it makes on the Sedimentation Study. GRDA states that it has provided extensive information in the Operations Model Report and the approved study plan already requires a second study season for continuing the modeling effort, including the modeling of operations. GRDA recommends against delaying the ILP for additional comments, and requests that if a 30-day extension is granted to other stakeholders that GRDA be granted 30 days to respond.

Discussion and Staff Recommendation

The Operations Model Report was provided with the ISR and it describes the work completed up to that point to construct and test the Operations Model. GRDA did not, however, provide the Operations Model or datasets used in its development at the time of the ISR, as anticipated in the approved study plan. Instead, GRDA proposes to improve the model during the second study season, and provide the results with the USR (due September 22, 2022). While providing the results of the Updated Operations Model with the USR is consistent with the concept of improving the model in the second study season, it does not provide access to the CHM (including the Operations Model), its inputs, and its outputs for Commission staff and other stakeholders as required in the approved study plan.

Because of the importance of a fully-functional CHM to understand the potential effects of project operation on environmental resources and flooding, and the need for Commission staff and stakeholders to understand the various models and datasets that underly the H&H Study, we recommend that GRDA make available the Operations Model, model inputs, and model outputs within 60 days of the date of this determination.

We do not recommend that GRDA expedite filing of the updated H&H Study Report, which should be filed no later than at the time of the USR. Stakeholders, including the City, will have until the deadline for filing comments on the USR to evaluate and provide comments on the Operations Model as well as the updated H&H Study Report. At that time, Commission staff will once again consider proposals for modifications to the H&H Study. Therefore, we find that the City's request for an

⁴ The City specifically requests that the supplemental comment period start when both the Sedimentation Study Report and the Operations Model have been provided by GRDA (whichever is later). However, because the report and the model differ in important ways, we have separated them to make individual determinations.

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additional 30-day comment period on the Operations Model is unnecessary and recommend against it.

B. Operations Model Access

In order for staff and other stakeholders to review and evaluate the model results developed for the H&H Study, the approved study plan requires GRDA to make the Operations Model, model inputs, and model outputs available to download on a protected cloud-based server and provide stakeholders such access.⁵

In GRDA's November 19, 2021 request for the Commission to issue a protective order between GRDA and the City, GRDA states that because the Operations Model contains confidential and commercially sensitive financial information, and contrary to the requirement of the approved study plan, it does not propose to make the Operations Model available to the public.

Discussion and Staff Recommendation

On January 27, 2022, the Commission issued an Order Denying Request for Protective Order (January 27th Order), in part because the agreement applied only to GRDA and the City, which is inconsistent with the Commission's regulations.⁶ The January 27th Order outlines two options for GRDA to file the model with the Commission that would protect GRDA's confidential information, and allow for Commission staff and stakeholders to access the model in accordance with the approved study plan. Specifically the order states that GRDA may: (1) "request confidential treatment of its Operations Model by filing the information privileged and including a proposed form of protective agreement available to any stakeholder willing to sign it, consistent with 18 C.F.R. § 388.112 (2021);" or (2) file the Operations Model without including the commercially-sensitive financial information GRDA seeks to protect.⁷

In the approved study plan, Commission staff required GRDA to use a cloud-based server in order to facilitate access to the large files associated with the H&H Study and address limitations of the Commission's eLibrary filing system for transmitting such

⁵ Commission staff November 8, 2018 Study Plan Determination, Appendix B at B-6.

⁶ *GRDA*, 178 FERC ¶ 61,056, at P 7 (2022) ("Our regulations provide that any intervenor may obtain access to privileged information by filing a written request including an executed copy of a protective agreement.").

⁷ *Id.* P 9.

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files. The purpose of this requirement was not to limit access to stakeholders; rather it was intended to facilitate information sharing. As it has done with other aspects of the CHM, GRDA must make the Operations Model, model inputs, and model outputs available for Commission staff and other stakeholders, as required by the approved study plan. As discussed above, the model and associated data must be provided within 60 days of the date of this determination. Should GRDA need assistance in transmitting the requested data, they may work with Commission staff to identify an appropriate solution.

C. Pensacola Act

GRDA asserts that the Pensacola Act⁸ places limits on the Commission that remove the connection between project operation and the extent of flooding in the project vicinity for the purposes of establishing study requirements related to relicensing the project. While the Commission may construe the Act at an appropriate point in this proceeding, any limitations on the scope of measures that may be included in a license that is issued do not eliminate the need for the Commission to obtain the information needed to fully understand the project's effects. Accordingly, GRDA is required to complete the studies required by the approved study plan, and the proposed modifications discussed in detail below, to inform the Commission's licensing decision, in accordance with Part I of the Federal Power Act.⁹

PROPOSED STUDIES AND MODIFICATIONS

Hydrologic and Hydraulic Modeling

Background

The approved study plan required the development of an H&H modeling study to determine the duration and extent of inundation under current project operation and alternative operating scenarios over a range of inflow events. Modeling and mapping were to be used to calculate flood routing specifics, including frequency, timing, amplitude, and duration of flooding during historical inflow events for which hydrographs exist.

A CHM was constructed to determine areas of inundation and flood routing specifics during several measured inflow events. To evaluate the effects of any proposed operational changes, an Operations Model was constructed to synthesize hypothetical events that inform the CHM. Information gathered from these models, including lotic

⁸ See National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92 §§ 7612(b)(3)(A), (b)(3)(B), 133 Stat. 1198, 2313 (2019) (Pensacola Act).

⁹ 16 U.S.C. §§ 791(a) – 825(r).

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and lentic mapping, will be used to inform separate analyses in several resource areas, including aquatic, terrestrial, recreation, and cultural resources.

The geographic scope of the study included the Neosho, Spring, and Elk Rivers; Tar Creek; and a downstream area that extends through Lake Hudson to just upstream of Kerr Dam. To characterize the channel bed and floodplain elevations of the upstream tributaries, the study used terrain data from historical topographic surveys and a new bathymetric survey of Grand Lake. If the model shows that flooding extends beyond the limit of available data, the plan requires additional high-resolution surveys.

The H&H Study included a flood frequency analysis of the peak inflows observed at Pensacola Dam during the flood events used in the model runs. An iterative approach was used to establish a range of high and low frequency flood events, including the 100-year recurrence interval. If the flood frequency analysis showed that the selected historical inflow events do not exceed a 100-year recurrence interval, inflow events up to and including the 100-year recurrence interval would be evaluated in the CHM.

The Corps' RWM was used both as a source of data, and to validate the model study results. The models, inputs, and outputs will be made available for stakeholders to download upon request.

The range of model runs were to include starting reservoir elevations: (1) that have been observed over the licensed history of the project; (2) at which power has, is, or could potentially be generated; and (3) that could reasonably be considered as an operational level under any new license issued. Therefore, the approved study plan required a preliminary minimum starting reservoir elevation of 734 feet Pensacola Datum (PD),¹⁰ and a preliminary maximum starting elevation of 760 feet PD. A minimum of six historical inflow events were to be modeled at these elevations. The need for additional model runs at lower or higher starting elevations will be evaluated based on the results of the ISR.

Table 14 of the ISR UHM Report indicates that GRDA modeled starting reservoir surface elevations between 740.98 feet PD and 745 feet PD for the selected inflow events, with the exception of the hypothetical 100-year inflow event, where GRDA simulated reservoir elevations between 734 feet and 757 feet PD. Though the restriction in starting elevation of all but the 100-year storm represent differences from the approved study plan for both high and low starting elevations, GRDA did not present the restriction on the low-end starting elevations as a study variance.

¹⁰ Pensacola Datum is 1.07 feet higher than National Geodetic Vertical Datum (NGVD) and 1.4 feet higher than North American Vertical Datum (NAVD).

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In its ISR, GRDA reports that it did not conduct model runs with starting elevations at Pensacola Dam at 741 feet PD or below for any storms with a return frequency below 100 years because GRDA concluded that the initial stage at Pensacola Dam has an immaterial impact on upstream water surface elevations and inundation areas. GRDA states that only the inflow volume of the storm event influences the peak flood elevation.

In the ISR, GRDA identifies two main study variances, the first of which deals with the restriction on high starting elevations in the model runs. GRDA states that a preliminary maximum starting elevation of 757 feet Pensacola Datum (PD)¹¹ was used in the model runs because reservoir elevation required by the approved study plan (760 feet PD) exceeds the height of the spillway (757 feet PD), and therefore is above the effect of project operations as a starting elevation for model runs.

The second variation reported by GRDA is that that the lentic and lotic maps required by the approved study plan will be provided with the USR. As discussed above, GRDA proposes to improve the Operations Model. Changes in model inputs may impact the mapping effort, therefore the final lotic and lentic maps will be provided with the USR.

The following components of the H&H first season of study are complete: (1) The Flood Routing Model to replicate the Corp's RWM; (2) The Upstream Hydrologic Model and flood frequency analysis; and (3) The Downstream Model.

Requested Modifications

(1) Starting Reservoir Elevations

The City requests that GRDA modify the H&H Study to consider the full range of starting reservoir elevations required by the approved study plan. The ISR analyzed starting elevations between 742 feet PD and 745 feet PD for each of the model runs, whereas the approved study plan required a preliminary minimum starting reservoir elevation of 734 feet PD, and preliminary maximum starting elevation of 760 feet PD. The City requests that GRDA model a range of starting reservoir elevations between 734 feet PD and 757 feet PD for each inflow event.

(2) Model Result Reporting

The City states that the CHM results only address the maximum lateral extent and depth of inundation. The City requests that GRDA provide model results on the impact

¹¹ Pensacola Datum is 1.07 feet higher than National Geodetic Vertical Datum (NGVD), and 1.4 feet higher than North American Vertical Datum (NAVD).

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of project operation on the frequency, timing, amplitude, and duration of flooding for each modeled flood event.

(3) Model Calibration

The City states that use of the RWM to calibrate the Operations Model does not yield accurate results for flood duration, and significantly underestimates the length of time needed for reservoir elevation to return to normal for certain modeled events. The City requests that GRDA provide a comparison to actual gage flow data, if possible. Where gage data is available, the City requests that GRDA use that data in place of, or in addition to, the RWM outputs to validate results from the Operations Model.

(4) Description of Operations

The City requests that GRDA modify their study report to describe: (1) how and why operational outputs from the Operations Model differ from actual operation, particularly with respect to modeled minimum versus actual discharges; (2) the criteria used by GRDA and the Corps to determine operation (*i.e.*, flow releases) when reservoir elevations are within the flood pool; (3) the criteria used to determine operation for each inflow event in which modeled operations diverge from GRDA's actual operation at the time; and (4) how and why the operational scenarios used in the model were selected, including the computation of boundary conditions and results, and provide detailed results of the modeled scenarios, including the water surface elevations, gate operation, dam outflows, and comparison with rule curves.

(5) 100-Year Flood Calculation

The City states that the 100-year inflow event modeled in the study overestimates the volume of flow in the Neosho River, and the City disagrees with GRDA's method of scaling up flood hydrographs from the 2007 inflow event. Instead of scaling up data from the 2007 inflow event, the City asks that GRDA develop and use more accurate hydrographs, conduct a flood-frequency analysis at each of the USGS gages,¹² and develop hydrologic models of the flood hydrographs at each inflow location using HEC-

¹² The study used USGS gage data from the Neosho River near Commerce, Oklahoma (OK) (gage no. 07185000); Neosho River at Miami, OK (gage no. 07185080); Neosho River near Langley, OK (gage no. 07190500); Tar Creek at Miami, OK (gage no. 07185095); Spring River near Quapaw, OK (gage no. 07188000); Elk River near Tiff City, MO (gage no. 07890000); and Lake O' the Cherokees at Langley, OK (gage no. 07190000).

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HMS¹³ software. Also, on the basis that outdated reservoir storage volumes may overestimate the amount of storage available, the City requests that GRDA perform a sensitivity analysis of the Operations Model by using 2019 stage-storage curves and evaluate the impact on reservoir elevation and storage. If the updated stage-storage data produces a difference in reservoir elevation, the City asks that GRDA re-run all modeling scenarios with outputs from the updated Operations Model as inputs to the CHM runs, and update results across all studies.

(6) Modeling of Railroad Bridge

The City states that the geometry used in the model for the railway bridge at river mile 134.59 does not represent actual conditions. The City states that the current geometry erroneously represents the area between the upper and lower spans of the bridge as completely blocked, preventing flow between the bridge's upper and lower trusses. Therefore, the City requests that GRDA update the CHM to reflect the existing geometry of the bridge.

(7) Trends in Flood Frequency

The City requests that GRDA explain the assumptions in flood frequency and severity, including trends due to climate change, that are used to inform the model. The City requests evidence and analysis supporting the assumptions related to such trends.

(8) Cumulative Effects to Property, from Flooding and Sedimentation, and Pre-Dam Flood Analysis

The City requests that GRDA quantify the land area in which flooding exceeds project-related property rights for each modeled scenario and, in order to inform the cumulative impacts analysis, demonstrate the extent to which that area exceeds the area that would have flooded if the dam had not been built.

(9) Assumptions Regarding Trends in Flooding Due to Climate Change

The City requests that GRDA identify trends that may indicate future conditions will diverge from historical data and refine the study to account for any such trends.

¹³ Modeling system used to simulate hydrologic processes of dendritic watershed systems.

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(10) *Using H&H Study Results in Other Models*

The City requests that GRDA revise the conclusions or model outputs derived from the CHM for the Infrastructure, Socioeconomic, and Sedimentation Studies when the modeling issues are resolved.

(11) *River Mile Numbering*

The City states that GRDA's use of USGS river miles in the study report introduces a confusing numbering system that differs by about 8 miles from the river mile numbering system used in previous studies. The City notes that the approved study plan requires a consistent datum for vertical measurements (PD), and requests that GRDA use a consistent horizontal datum as well. The City recommends use of the same numbering system as past studies for consistency, but does not specify the numbering system to which they are referring.

Comments on the Requested Modifications

GRDA proposes to modify the second study season of the H&H Study to: (1) update the title of Table 1 of the Upstream Hydraulic Modeling Report to *Summary of historical event boundary conditions used in Upstream Hydrologic Model (UHM) calibration*; and (2) include the following tables for each simulation in the appendices of the USR: a) maximum water surface elevation (feet, PD); b) maximum extent of inundation (feet); and c) duration of inundation (hours). In response to comments from the City, GRDA will update the Operations Model to include the 2019 elevation-storage data and use the updated simulation results to review and update the CHM, ISR conclusions, and other studies, as needed.

With one exception,¹⁴ GRDA disagrees with the City's requested study modifications. GRDA argues that the City has not demonstrated that the study is out of compliance with the approved study plan, or that the study was conducted under environmental conditions that have changed in a substantial way over the study period.

¹⁴ GRDA does not oppose the City's request to perform a sensitivity analysis of the Operations Model by including the 2019 storage curves and re-evaluating the model runs. GRDA agrees to use the results to update the other studies affected by changes in the H&H Study conclusions.

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Further, GRDA notes that the H&H Study was conducted using industry-standard methods and was built on the 2016 Tetra Tech Study completed for the City.¹⁵

After receipt of the City's ISR comments on model geometry of the abandoned railway bridge at river mile 134.6 of the Neosho River, GRDA performed a sensitivity analysis to determine the impact of the high chord on upstream water surface elevations. GRDA indicates that only the July 2007 event exceeded the elevation of the bridge deck and that removing the trusses from the high chord of the bridge resulted in no appreciable difference in maximum water surface elevation.¹⁶

In its response, GRDA proposes to no longer use a rule curve with seasonal target elevations. Instead, GRDA would maintain the conservation pool between 742 feet and 745 feet PD for purposes of normal hydropower operations. On this basis, GRDA justifies limiting its modeling analysis to starting elevations between 742 feet and 745 feet PD.

Finally, in response to the City's requests for study of cumulative effects or pre-project conditions, GRDA expresses its understanding that the Commission's hydropower program typically does not require study by applicants of either cumulative effects or pre-project conditions.

Discussion and Staff Recommendation

The City does not claim that the H&H Study was conducted under environmental conditions that have changed in a substantial way over the study period. However, the City's modification requests are based on the City's assertion that GRDA did not conduct all of the elements required in the approved study plan. Therefore, a discussion of, and staff recommendation for, each of the requested modifications is provided point-by-point below.

(1) Starting Reservoir Elevations

Regarding the City's requested modification to consider the full range of starting reservoir elevations, the approved study plan required GRDA to model operational scenarios that include starting elevations at which power has, is, or could potentially be generated. Specifically, the approved study plan required GRDA to use a preliminary

¹⁵ See N. Larry Bork April 14, 2016 Protest and Comments at Exhibit 8 (*Hydraulic Analysis to Evaluate the Impacts of the Rule Curve Changes at Pensacola Dam on Neosho River Flooding in the Vicinity of Miami, Oklahoma* (2016 Tetra Tech Study)).

¹⁶ GRDA used two geometries in the sensitivity analysis: (1) the original geometry used in the ISR; and (2) a flat deck with the bridge trusses completely removed from the bridge deck.

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minimum starting elevation of 734 feet PD, and a preliminary maximum starting elevation of 760 feet PD. GRDA only modeled a range of starting reservoir elevations between 742 feet PD and 745 feet PD for all inflow events other than the 100-year event, for which elevations ranged from 740.98 feet PD to 745 feet PD. We understand GRDA's point that it is not necessary to run simulations at starting elevations above the crest elevation of the dam (757 feet PD), on the grounds that reservoir elevations exceeding 757 feet PD are above the effect of project operation. However, we do not agree with GRDA's reasoning to limit the range of minimum starting elevations to 742 feet PD. GRDA justifies limiting its modeling analysis on the basis that elevations 742 feet PD to 745 feet PD are representative of both existing conditions for normal hydropower operation, and its proposal for future operation. Under any new license issued, GRDA proposes to eliminate the existing seasonal rule curve and instead maintain the conservation pool between 742 feet PD and 745 feet PD year-round.

Based on our review of existing water surface elevation data at USGS gage no. 07190000 (Lake O' the Cherokees at Langley, Oklahoma (OK) gage), reservoir water levels at the project have frequently exceeded 745 feet PD over the period of record from January 2017 to January 2022. As to using a minimum starting elevation of only 742 feet PD, the project has been operated at historic reservoir elevations as low as 734 feet PD and is currently operating under a seasonal rule curve with an elevation as low as 741 feet PD.

GRDA's conclusion that project operations do not affect upstream flooding is premature. The Operations Model is subject to substantial upgrades in the second year of study and GRDA has recently proposed technical modifications to the Sedimentation Study based on new findings from the first year of study.

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 an elevation of 757 feet PD.

(2) Model Result Reporting

As to the City's request that GRDA report the frequency, timing, amplitude, and duration of upstream flooding, GRDA proposes in its reply comments, that for model simulations with starting reservoir elevations of 742 feet to 745 feet PD, GRDA will provide the following information in the USR in tabular form: (1) maximum water

surface elevation (feet); (2) maximum extent of inundation (acres); and (3) duration of inundation (hours).

In the approved study plan,¹⁷ GRDA is required to identify areas inundated under existing and potential alternative operating scenarios, and report flood-routing specifics including the frequency, timing, amplitude (*i.e.*, elevation), and duration of inundation for each of the simulated inflow events. The differences between the City's request and GRDA's most recent proposal are (1) the range of reservoir starting elevations, and (2) the inclusion of the frequency and timing of the floods. GRDA offers no reason for eliminating the frequency and timing of inundation for the simulated inflow events. Therefore, in keeping with our recommendation for *(1) Starting Reservoir Elevations*, immediately above, we recommend that GRDA report the frequency, timing, amplitude (*i.e.*, elevation), and duration of inundation for each of the simulated inflow events with starting elevations between 734 feet and 757 feet PD.

(3) Operations Model Calibration

Regarding the City's requested modification that GRDA recalibrate its Operations Model, GRDA validated its model results against the RWM as required in the approved study plan. GRDA used standard industry practices to create an Operations Model with correlation metrics in the range of satisfactory to very good.

Nonetheless, based on a review of the Operations Model, we identified some variation in reservoir elevation between modeled output and available USGS gage data. GRDA indicates that these variations could be the result of modeling limitations (*e.g.*, lack of release gate parameters) in the RWM software, as well as real-world operating constraints of other hydroelectric facilities in the project area.¹⁸

While GRDA has committed to refining the Operations Model in the second study season, further validation would help to maximize confidence in the model. Though there is not enough gage data to completely replace output from the RWM for all of the inflow events, we have identified additional gage data that could be useful in further validating the Operations Model. We recommend that GRDA compare water surface elevations observed at USGS gage no. 07190500 (Neosho River near Langley, OK gage) to the simulated HEC-RAS stage hydrographs for the December 2015 and October 2009 inflow events on the upstream side of the dam. We further recommend that GRDA

¹⁷ GRDA September 24, 2018 Revised Study Plan.

¹⁸ GRDA notes that while the Operations Model simulates many of the rules and constraints of the RWM, it cannot account for flow restrictions at Van Buren because it is outside the study area.

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provide a graphical comparison of the simulated and observed water surface elevations over a daily time step for the duration of the flood event.

(4) Description of Operations

The City requests additional details on GRDA's operations, including operational decision making, and operational model assumptions. However, this is a request for information and not a request to modify an approved study or request for a new study. The approved study plan does not require GRDA to describe its operational decision making. With regard to operational model assumptions, this request is addressed by the approved study plan requirement that GRDA make the all models and model datasets available to stakeholders upon request.

(5) 100-Year Flood Calculation

As to the City's request that GRDA repeat its analysis of the 100-year flood using the City's recommended methods, based on a review of the UHM Report, 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. Regarding the City's concern that the analysis may overestimate the impoundment volume, GRDA has agreed to run a sensitivity analysis on the effect of switching to the most recent (*i.e.*, 2019) bathymetry data in the model. This analysis should indicate if an overestimate of reservoir volume using previous bathymetry could be a problem; therefore, we do not recommend that GRDA repeat its 100-year flood analysis or change its methodology at this time.

(6) Modeling the Railroad Bridge

Regarding the City's request that GRDA change its approach to modeling the effect of the abandoned railroad bridge over the Neosho River on upstream flood elevation, GRDA's assertion that only the July 2007 inflow event exceeded the high chord of the bridge is reasonable given that the historic starting reservoir elevation for that July 2007 storm was 745.69 feet PD at Pensacola Dam.¹⁹ In comparison, the historic reservoir elevation during the other inflow events that did not cause the high chord of the bridge to be inundated ranged from a low of 740.98 feet PD (October 2009 inflow event), to a high of 743.85 feet PD (September 1993 inflow event).

However, if GRDA were to eliminate the existing seasonal rule curve, as is proposed, starting reservoir surface elevations during future inflow events would likely be higher than what has historically been observed. For example, without the rule curve,

¹⁹ GRDA September 30, 2021 Filing, Appendix 2 at Table 14.

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the historic starting reservoir elevation for the October 2009 inflow event would have ranged between elevations 742 feet PD and 745 feet PD rather than 740.98 feet PD. As a result of such change in operation, smaller flood events combined with higher starting elevations would have the potential to exceed the bridge deck elevation. Therefore, we recommend that GRDA run the Operations Model to simulate all flow events with starting reservoir surface elevations of 734 feet PD to 757 feet PD.

(7) Trends in Flood Frequency

As to the City's request that the H&H Study be modified to require GRDA to identify trends in the factors that contribute to stream flows and flooding near the project, including changes in climate, land use, and sedimentation, the approved study plan required GRDA to use historical data to conduct a flood frequency analysis. GRDA did so using a period of record of 77-years (*i.e.*, the RWM). The City asks GRDA to repeat the flood frequency analysis in order to identify trends. However, the City does not specify a method or modeling approach to analyze trends in flood frequency. GRDA has provided a flood frequency analysis, as required by the approved study plan. Therefore, we do not recommend the City's request to include an analysis of flood frequency trends as part of the H&H Study's second season.

(8) Cumulative Effects to Property from Flooding and Sedimentation, and Pre-Dam Flood Analysis

The City requests that GRDA quantify the land area in which flooding exceeds project-related property rights for each modeled scenario. To inform a cumulative effects analysis, the City also requests that GRDA identify the extent to which the aforementioned land area exceeds the area that would have flooded if the dam had not been built.

As part of the H&H Study, GRDA was required to quantify the area inundated under existing and potential alternative operating scenarios, and report flood-routing specifics including the frequency, timing, amplitude (*i.e.*, elevation), and duration of inundation for each of the simulated inflow events. The approved study plan also required GRDA to conduct an Infrastructure Study to analyze the impact of project operation on the inundation of critical upstream infrastructure, such as bridges, roads, water systems, electric transmission, and information and communication technologies. GRDA is required to provide maps and tables identifying the frequency and depth of flooding for each infrastructure location under different inflow conditions. Finally, the approved Sedimentation Study required GRDA to analyze sediment transport and sediment deposition within the project area, and determine the extent to which any project-related sedimentation impacts upstream flooding. Therefore, GRDA's methodology complies with the Commission's approved study plan.

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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 effected resources. Rather, the Commission's no action alternative analyzed as part of the relicensing process is current conditions, which is the baseline required in the approved study plan.

Thus, no modification is needed to the study plan related to the City's request for cumulative effects or pre-project conditions analysis.

(9) Assumptions Regarding Trends in Flooding Due to Climate Change

Regarding the City's request that GRDA state the assumptions used to establish trends in flood frequency and severity, including trends due to climate change, the approved study plan did not specify that GRDA model such trends. However, the approved study plan did require GRDA to look at the frequency and severity of flooding. By definition, looking at frequency requires looking at flows and flooding over a reasonably extensive hydrologic record. Under the approved study plan, GRDA is required to provide the models, inputs, and outputs developed for the H&H Study to the City and other relicensing participants. Therefore, Commission staff and stakeholders alike will be provided with the means necessary to complete any additional return frequency analysis that may be deemed necessary following review of the USR.

Further, the approved study plan required an iterative approach to establish a range of inflow events with low and high return frequencies to inform staff's analysis and the development of license requirements (section 5.9(b)(5)). To this effect, GRDA was required to include its proposal for flood flows to be analyzed in the H&H study with the 6-month Model Input Status Report. GRDA complied with this requirement and stakeholders were given the opportunity to discuss the flood frequency analysis during the 6 Month Conference Call on Model Inputs and Calibration.

As to future trends due to climate change, we are not aware of any available climate change model or assessment that would support, with any degree of accuracy and reliability, prediction of future statistical trends at the individual project level.²⁰ However, the historic flood frequency data provided by GRDA should be sufficient for Commission staff to assess trends in flood return frequencies to inform an assessment of climate change effects.

²⁰ The City provides a reference to a source of information on the hydrological effects of climate change in Oklahoma; however, the document is limited to sensitivity analysis on the effect of runoff to predicted changes in climate to make readers aware of the uncertainty in such modeling (Oklahoma Water Resources Board, 2011).

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For the reasons stated above, we do not recommend that GRDA state and provide additional support for the assumptions used to determine trends in flood frequency and severity, beyond the requirements of the approved study plan. We also do not recommend that GRDA revise its return frequency analysis to identify potential trends due to climate change.

(10) *Using the H&H Study Results in Other Models*

Regarding the City's request that GRDA update the analysis for other studies affected by updates to the CHM Study, GRDA has committed to do so under its approved study plan, so no modification is necessary.

(11) *River Mile Numbering*

As to the City's request for a consistent horizontal datum, the approved study plan did not require a specific river mile numbering system. The USGS numbering system, used by GRDA, is a standardized horizontal numbering system with a publicly available dataset. GRDA consistently used this system across the study reports provided in the ISR, including the H&H, Infrastructure, and Sedimentation Study Reports. Therefore, we see no need for GRDA to modify its horizontal site numbering system.

Aquatic Species of Concern Study

Background

To evaluate the potential effects of project-caused water level increases on rare aquatic species (*i.e.*, Neosho mucket, rabbitsfoot mussel, winged mapleleaf mussel, Neosho madtom, and Neosho smallmouth bass), the approved study plan required GRDA to implement a phased information gathering and impact assessment that would include: (1) a review of existing information to characterize each species' physical habitat preferences, density, and spatial and temporal patterns in the project vicinity;²¹ (2) conducting targeted field surveys to develop estimates of the distribution and density of each species in relevant reaches to the extent that existing information is inadequate to

²¹ The approved study plan requires GRDA to complete the review of existing information during the first study season.

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carry out this characterization; and (3) assessing potential effects of project operation, if any, on those species that may have sensitive life-stage(s) present in the project vicinity.²²

In accordance with the approved study plan, during the first study season, GRDA conducted a review of existing information on each species' physical habitat preferences, density, and spatial and temporal patterns in the project vicinity. In the review, GRDA concluded that existing information indicates that the rabbitsfoot mussel and winged mapleleaf mussel are unlikely to occur in the project vicinity. Therefore, GRDA does not propose to conduct targeted surveys for rabbitsfoot mussel or winged mapleleaf during the second study season.

GRDA also concluded that the Neosho mucket is unlikely to occur in the Spring and Neosho River portions of the project boundary. Thus, GRDA does not propose to conduct targeted surveys for Neosho mucket in the Spring and Neosho Rivers during the second study season. However, GRDA determined that recent survey data indicate that Neosho mucket do occur in the Elk River, a few river miles upstream of the project boundary, but there are no data regarding the presence of Neosho mucket in the Elk River within the project boundary. Therefore, GRDA proposes to conduct targeted surveys in the Elk River during the second study season to determine the presence and density of Neosho mucket and other freshwater mussels.²³

GRDA concluded that Neosho madtom do not occur in the Spring and Elk Rivers; therefore, GRDA does not propose to conduct targeted surveys for Neosho madtom in those rivers during the second study season. GRDA determined that historically, Neosho madtom have been found in Neosho River drainages of the study area as recently as 2007. However, during the most recent surveys conducted in 2016, no Neosho madtom were observed. Because the most recent surveys were conducted 5 years ago, GRDA proposes to conduct a targeted survey for Neosho madtoms in a 20-mile reach of the Neosho River during the second study season.²⁴

²² The approved study plan requires GRDA to complete the targeted field surveys (if needed) and assessment of potential effects of project operation during the second study season.

²³ GRDA specifies that the targeted surveys will occur in an approximately 1-mile stretch of critical habitat that occurs within the project boundary on the Elk River.

²⁴ GRDA's proposed survey would occur in a 20-mile reach that extends from US highway 60 (near the confluence of the Neosho and Spring Rivers) to the Craig/Ottawa County line. This reach includes about 15 miles of river within the project boundary and 5 miles upstream of the project boundary.

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Requested Modification

In comments on the ISR and with respect to GRDA's conclusions that Neosho mucket are unlikely to occur in the Neosho and Spring River portions of the project boundary, FWS indicates that there are areas in the Neosho and Spring Rivers located within the project boundary they have not been surveyed. Therefore, FWS recommends that GRDA conduct freshwater mussel surveys in the Neosho River downstream of the City of Miami, Oklahoma²⁵ and in the Spring River downstream of Warren Branch.²⁶ FWS also recommends that GRDA coordinate with EcoAnalysts Inc., Tar Creek Trustee Council (TCTC), and FWS on the survey design.²⁷

Comments on Requested Modifications

In response, GRDA indicates that the Neosho mucket is the only federally listed mussel that has been observed in the Spring River upstream of the project boundary, but no federally listed mussels have been observed within the project boundary. GRDA states that in 2016, EcoAnalysts (2018) observed Neosho mucket about 6.25 miles and 1.5 miles upstream of the project boundary during qualitative surveys. GRDA states that in 2017, EcoAnalysts (2018) conducted quantitative surveys at the site located 1.5 miles upstream of the project boundary, but did not observe any Neosho mucket. Therefore, GRDA concludes that Neosho mucket likely occur only at low densities at the site located 1.5 miles upstream of the project boundary. GRDA further states that EcoAnalysts (2018) observed no federally listed mussels during surveys at four locations²⁸ within the project boundary, including one location that EcoAnalysts (2018) concluded had suitable mussel habitat (*i.e.*, riffles with gravel substrate). GRDA states

²⁵ The City of Miami is located along the Neosho River about 14 river miles upstream of the confluence with the Spring River. The reach downstream of the City of Miami is entirely within the project boundary.

²⁶ Warren Branch is a tributary of the Spring River and located about 11 river miles upstream of the confluence of the Spring River and Neosho River. The reach downstream of Warren Branch is entirely within the project boundary.

²⁷ EcoAnalysts Inc. and TCTC have both conducted recent surveys in the area and TCTC is planning some surveys in the Spring River.

²⁸ The most downstream site (Spring 24) surveyed by EcoAnalysts (2018) is about 7.6 river miles upstream of the confluence of the Spring and Neosho rivers.

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that conducting surveys in the Spring River downstream of Warren Branch,²⁹ as recommended by FWS, is unlikely to uncover any federally listed mussel species because the river slows and deepens and metal concentrations increase,³⁰ creating poor conditions for federally listed mussels.

Regarding FWS's recommendation to conduct surveys in the Neosho River, GRDA states that in 2014, FWS (2018) observed one Neosho mucket at a site just inside the project boundary (*i.e.*, Stepps Ford Bridge);³¹ however, in 2017, EcoAnalysts (2018) did not observe any Neosho mucket at the same site during a quantitative survey. EcoAnalysts (2018) also surveyed five other sites in the Neosho River, including three sites within the project boundary³² and observed no federally listed mussels. GRDA states that conducting surveys downstream of the City of Miami, as recommended by FWS, is unlikely to uncover any federally listed mussels because like the Spring River, the Neosho River slows and deepens and therefore provides poor conditions for the federally listed mussels. For these reasons, GRDA does not propose to conduct freshwater mussel surveys in the Spring and Neosho Rivers.

Staff Discussion and Recommendation

A review of existing information indicates that there is no evidence of recent occurrence of rabbitsfoot mussel in the Oklahoma portion of the Spring or Neosho rivers, including within the project boundary (EcoAnalysts, 2018; FWS, 2020). In addition, the only known population of winged mapleleaf mussel occurs in the Little River³³ and there

²⁹ Warren Branch is located about 3 river miles upstream of Spring 24, which is the most downstream site surveyed by EcoAnalysts (2018).

³⁰ GRDA states that Angelo et al., (2007) and EcoAnalysts (2018) found metal concentrations in the Spring River to be problematic for freshwater mussel richness and diversity.

³¹ Stepps Ford Bridge is located about 23 river miles upstream of the confluence of the Neosho and Spring rivers.

³² The most downstream site (Neosho 6) surveyed by EcoAnalysts (2018) is located at US highway 44, near the City of Miami.

³³ The Little River is located about 175 miles from the project area in the southeast corner of Oklahoma.

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is no evidence of recent (EcoAnalysts, 2018) or historical occurrence³⁴ in the Spring or Neosho rivers. Based on this information, we conclude that conducting targeted surveys in the Spring and Neosho rivers would provide no new information regarding the species density and spatial patterns in the project vicinity. Therefore, we do not recommend that GRDA conduct targeted surveys in the Spring and Neosho rivers for the purpose of characterizing the distribution and density of rabbitsfoot mussel and winged mapleleaf mussel in the project vicinity.

The recent presence of Neosho mucket just 1.5 miles upstream of the project boundary in the Spring River in 2017 and at the upper end of the project boundary in the Neosho River in 2014 indicates the potential for a population to occur within the project boundary, where FWS is recommending additional surveys. Although EcoAnalysts (2018) survey did not identify any Neosho mucket, the geographic scope of the survey did not include most of the habitat noted by FWS as potentially being occupied by Neosho mucket. Moreover, we are unaware of any other surveys conducted in that habitat.³⁵ Consequently, the presence/absence and density of Neosho mucket in habitat recommended by FWS (*i.e.*, most of the Spring and Neosho river portions of the project boundary) is unknown.

Neosho mucket are associated with shallow riffles and runs composed of gravel substrate and moderate to swift currents (FWS, 2018), and the slowing and deepening of the Spring and Neosho rivers is likely to result in a reduction of such habitat with increasing distance downstream, as suggested by GRDA. Nonetheless, FWS (2018) states that little is known about the habitat requirements of the Neosho mucket and that it

³⁴ In the ISR, GRDA reported that personal contact with the Sam Nobel Museum at Oklahoma State University and Oklahoma Department of Wildlife Conservation indicates that no specimens of winged mapleleaf mussel have been previously found within the Spring, Neosho, and Elk rivers or surrounding drainages.

³⁵ In the Spring River, FWS recommends a survey downstream of Warren Branch to the confluence of the Spring and Neosho rivers, which is about 11 river miles long. EcoAnalysts (2018) surveyed just one site within the Spring River reach recommended by FWS. The one site in the Spring River was located at state highway 10, which is about 3 miles downstream of Warren Branch. Thus, there are at least 8 river miles of the Spring River that have not been surveyed. In Neosho River, FWS recommends a survey downstream of the City of Miami to the confluence of the Spring and Neosho rivers, which is about 14 river miles. EcoAnalysts (2018) surveyed just one site within the Neosho River reach recommended by FWS. The one site in the Neosho River was located at US highway 44, which is about 1 mile downstream from the city boundary of Miami. Thus, there are at least 13 river miles of the Neosho River that have not been surveyed.

has been found in near-shore areas out of the main current. Thus, even if riffles and runs are limiting in the downstream areas of the Spring and Neosho rivers, Neosho mucket have the potential to occur in near-shore areas and areas out of the main current.

Further, although metals (*i.e.*, lead, zinc, cadmium)³⁶ do occur in the sediments of the Spring and Neosho rivers, as indicated by GRDA, metal concentrations may not be at levels that would negatively affect Neosho mucket throughout the downstream reaches. Garvin et al. (2017) collected metals samples from 2009 to 2010 in streambed sediment located in areas that overlap with FWS's recommended survey locations and determined that among 11 sites sampled in the Spring River, metals concentrations occurred at levels that presented a low risk, moderate risk, and high risk to reduce survival and/or biomass at 3, 4, and 4 sites, respectively.³⁷ In the Neosho River, metals concentrations occurred at levels that presented a moderate risk at one site, but were not high enough to reduce survival and/or biomass at the remaining 14 sites. Based on this study,³⁸ there is habitat in the survey area recommended by FWS that has metals concentrations that would have little to no negative impact on Neosho mucket survival and growth.

Because habitat in the survey area recommended by FWS has the potential to support Neosho mucket and very limited mussel sampling has occurred in that area, the existing information on Neosho mucket for the recommended survey area provided by GRDA is not adequate for describing the species distribution. Consequently, we

³⁶ The Grand Lakes watershed receives metals contamination from historic lead and zinc mining, ore processing, and smelting operations within the Tri-State Mining District (TSMD), located in northeastern Oklahoma near the Oklahoma-Kansas border (Garvin et al., 2017). The Spring and Neosho rivers lie downstream of the TSMD.

³⁷ The low, moderate, and high risk sediment toxicity thresholds were derived by MacDonald (2009) and are based on survival tests with the amphipod, *Hyalella azteca*. The thresholds are considered to be reliable tools for predicting the nature and magnitude of toxicity to the freshwater mussel, *Lampsilis siliquoidea*, a benthic invertebrate (Garvin et al., 2017). A low risk corresponds to a less than 10 percent reduction in survival or biomass in toxicity tests, a high risk corresponds to 20 percent or greater reduction, and a moderate risk is between a 10 and 20 percent reduction.

³⁸ GRDA indicates that Angelo et al. (2007) or EcoAnalysts (2018) found metals concentrations to be problematic for mussel richness and diversity. Commission staff do not have access to Angelo et al. (2007) or EcoAnalysts (2018), and therefore cannot comment specifically on those findings. However, Garvin et al. (2017) does indicate that that sampling conducted by Angelo et al. (2007) took place in the upper Spring River. The FWS recommends additional surveys in the lower Spring River, which is where Garvin et al. (2017) sampled metals.

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recommend 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. The targeted survey would provide the information needed to determine whether Neosho mucket are present and assess the potential effects of project operation on Neosho mucket that are present within the targeted survey locations (section 5.9(b)(5)). Results from the survey would also provide the information needed for the Commission to comply with the Endangered Species Act.³⁹

Effects of Frequency and Duration of Flooding Events on Aquatic Species of Concern

Background

As discussed above, as part of the *Aquatic Species of Concern Study*, GRDA is required to conduct an assessment of potential effects of project operation on rare aquatic species that may have sensitive life-stage(s) present in the project vicinity. The approved study plan required GRDA to complete the assessment of potential effects of project operation during the second study season.

Requested Modification

In comments on the ISR, FWS states that the information provided in the ISR focuses on potential project effects during peak flood events, but does not assess the effects of project operation on the frequency and duration of lesser flooding events.⁴⁰ FWS requests that GRDA provide information on the potential frequency and duration of lesser flooding events to determine the effects of project operation on Neosho madtom, Neosho mucket, rabbitsfoot mussel, and winged mapleleaf mussel during lesser flooding events.

Comments on Requested Modifications

In response, GRDA states that FWS did not demonstrate that the Aquatic Species of Concern Study was not conducted as provided for in the approved study plan, or that the study was conducted under anomalous environmental conditions or that

³⁹ 50 C.F.R. § 402.12(a).

⁴⁰ FWS does not define “lesser flooding events”, but we assume that “lesser flooding events” refers to historical high flow events that occur with a return rate less than the lowest return rate included in the upstream hydraulic model simulations, which was 1 year (*i.e.*, June 2004 flow data).

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environmental conditions have changed in a material way (section 5.15(d)). GRDA states that consideration of the impacts of flooding associated with the project is beyond the scope of both the Commission's and FWS's authority, because Congress has made it clear that the Corps has sole authority over flood control at the project, including issues related to the frequency and duration of flooding. GRDA also claims that with the passage of the Pensacola Act, Congress eliminated any authority of the Commission, FWS, or any other federal or state agency to regulate water surface elevations at the project.

Staff Discussion and Recommendation

As discussed in the *Hydrologic and Hydraulic Modeling* section above, we recommend that GRDA provide information on the frequency, timing, amplitude, and duration of flooding for each modeled inflow event. The modeled inflow events should include all the historic flood events required in the approved study plan, including an event with a 1-year return rate (*i.e.*, June 2004), which represents a high frequency and low magnitude event. In the same section, we also recommend that GRDA's simulations include a larger range of starting water surface elevations (*i.e.*, 734 feet PD to 757 feet PD) for all historic flood events. The information from these simulations will provide additional details regarding the effects of project operation during a low magnitude flood event, which would help to determine the potential effects of project operation on Neosho madtom, Neosho mucket, rabbitsfoot mussel, and mapleleaf mussel.

According to the approved study plan, GRDA was not required to provide information on the potential frequency and duration of flow events that have less than a 1-year return rate (*i.e.*, "lesser flooding events") or determine the effects of project operation on Neosho madtom, Neosho mucket, rabbitsfoot mussel, and winged mapleleaf mussel during these smaller flow events. Therefore, we do not recommend FWS's requested modification to the *Aquatic Species of Concern Study*.

Terrestrial Species of Concern Proposed Study Modification

Background

The federally threatened⁴¹ American burying beetle (ABB) is believed to be extirpated from all but nine states (*i.e.*, portions of Arkansas, Kansas, Oklahoma,

⁴¹ On October 15, 2020, FWS reclassified the American burying beetle from endangered to threatened, and finalized a rule under section 4(d) of the Endangered Species Act that provides measures that are necessary and advisable to provide for the conservation of the American burying beetle (85 Fed. Reg. 65241).

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Nebraska, South Dakota, Texas, Rhode Island, Massachusetts, and Missouri) in the U.S. and likely from all Canadian provinces.

The Pensacola Project is located near, and may overlap with, small portions of the FWS's Arkansas River Analysis Area, which supports the largest area of known occupied ABB habitat⁴² in the southern portion of this species' range. Potential project effects include inundating animal carcasses prior to beetles detecting them, inundating buried beetles, and/or activities that disturb or compact soil where beetles forage, breed, or overwinter (FWS, 2019).

The approved study plan required GRDA to conduct two years of surveys for the ABB. GRDA conducted the first of two surveys following the methods included in the study plan. Six traps were baited on July 18, 2021, and were checked for beetles on five nights. No ABB were trapped.

Requested Modification

Because the 2021 survey did not record any presence of ABB in the first study season, GRDA proposes to forego the second year of surveys. GRDA states that the study methods have potential to attract beetles from outside of the project area. GRDA contends that attracting beetles to the project area would not be a representative indication of whether potential habitat within the project boundary is occupied by ABB, or of project effects.

Comments on Requested Modification

FWS recommends⁴³ that GRDA complete the second year of study because flooding and land management activities could affect ABB, if drawn into the project boundary, and the initial year of study does not provide sufficient information to analyze potential project effects.

Reply Comments

In its reply comments, GRDA restates its conclusion that operations do not affect upstream flood elevations and notes that a lack of suitable soil substrate along the reservoir shoreline makes it an unlikely location for beetles.

⁴² There are over 8.6 million acres of favorable and marginal habitats for this species in this analysis area, some of which are protected (*i.e.*, managed by state or federal agencies and privately owned conservation banks) (FWS, 2019).

⁴³ FWS provided its recommendation during the ISR meeting.

Discussion and Staff Recommendation

The flight range of an adult beetle would extend within and far beyond the area of the project boundary. In addition, ABB populations are unevenly distributed throughout this species' range and even the largest and most stable populations can have marked annual fluctuations in numbers.

The fact that ABB were not trapped in the first year could be an indication that: (1) survey results were affected by land management activities adjacent to the sites (*e.g.*, use of pesticides, intensity of tillage or grazing); (2) competition with other carrion beetle species and/or other (vertebrate) carrion scavengers affected ABB success in the surveyed areas; (3) existing ABB populations do not occur at or near the six sites selected for the survey; or (4) one or more environmental conditions (*e.g.*, availability of mates, suitable carrion for foraging and reproduction, and/or suitable soil substrate) in 2021 were not favorable for ABB foraging and reproduction. A second year of sampling at different sites within potentially suitable habitat would help confirm whether the ABB and suitable habitat occur within the project boundary.

GRDA's observation that the project boundary is mostly sandy rather than organic does not mean that beetles are absent given that they occur in both sand and organic substrates (FWS, 2019). It is also not surprising that beetles were absent during the first survey year considering the annual variability in suitable habitat, carrion availability, and reproductive success. Therefore, we recommend that GRDA continue with the second year of surveys for the ABB, as required by the approved study plan.

Cultural Resources

Background

The approved study plan required GRDA to conduct cultural resources investigations within the approved Area of Potential Effect (APE), which is defined as "all lands within the FERC-approved Project Boundary" and "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."⁴⁴ As required in the approved study plan, the need for modifications to the APE would be determined after the first year of study.

The approved study plan required GRDA to formally evaluate structures, archaeological sites, and traditional cultural properties (TCPs) for listing in the National Register of Historic Places (National Register), and in consultation with the Cultural Resources Working Group (CRWG) and determine if the project may be having an ongoing adverse effect on historic properties that are eligible for listing on the National

⁴⁴ GRDA September 24, 2018 Revised Study Plan, Cultural Resources Study at 6.

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Register of Historic Places (National Register). To inform the evaluation, between 2019 and 2021, GRDA conducted a Cultural Historic Investigation of extant structures within the APE, completed two field seasons of archaeological investigations, and initiated an ethnographic study to identify and evaluate traditional cultural properties. GRDA proposes to continue additional archaeological surveys and ethnographic research during the 2021-2022 season and present the results in the USR.

Requested Modifications

Several commenters, including the Cherokee Nation, the Bureau of Indian Affairs, the Oklahoma State Historic Preservation Officer (SHPO), and the Oklahoma State Archaeologist expressed dissatisfaction that GRDA proposed no modifications to the APE for the project based on the findings of the H&H Study and requested opportunities to discuss the extent of the APE further.

Relatedly, during the October 14, 2021 CRWG meeting, a representative from the Osage Nation requested information about the potential for the project to affect several bat caves near the project and for GRDA to describe their location relative the APE.

Comments on Requested Modifications

GRDA states that the boundary of the APE may be modified as needed during the pre-filing phase of the relicensing process, but that the results of H&H Study do not necessitate a change to the current APE because the effects of project operation do not extend beyond the current project boundary.

GRDA clarified that the bat caves of concern to the Osage Nation are all located outside of the current APE. However, under Article 405 of the current license, GRDA contracts with Rogers State University on an annual basis to monitor the status of gray bats in two of the caves (DL-2 and DL-91) including providing a status update of cave conservation features and provides reimbursement for any expenses that may result.

Discussion and Staff Recommendation

As detailed above in the discussion on *Hydrologic and Hydraulic Modeling*, the H&H Study is incomplete (limitations to Operations Model inputs by the RWM), and therefore, the extent to which project operation affects lands outside of the current project boundary is unclear. The approved study plan required that GRDA finalize the APE based on the results of the H&H Study, other relicensing studies, and information gathered during the first year of the cultural resources study.

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

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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. Comments on the USR and requests for study modifications will be due in October 2022.

The need for GRDA's continued participation in monitoring of bat caves DL-2 and DL-91 is a potential measure that would be addressed in the Commission's environmental analysis. Under section 106 of the National Historic Preservation Act, an undertaking's APE is defined as the area in which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist (35 C.F.R. § 800.12(d)). In the future, should project-related activities potentially affect historic properties located outside of the project boundary, the APE may be modified to include those areas and the effects of the activity would be assessed.

Socioeconomics Study

Background

The approved study plan required GRDA to use existing information (*e.g.*, the United States Census Bureau, Oklahoma Department of Commerce, etc.) and input from stakeholders and tribes to analyze the socioeconomic effects of the Pensacola Project in the four-county (*i.e.*, Craig, Delaware, Mayes, and Ottawa Counties) project area, including baseline economic conditions, cumulative impacts of the project, and socioeconomic contributions of the project. The approved study plan also directed GRDA to provide an analysis, in the form of tabular data, of project impacts on environmental justice in the study area at the county and census tract level, where such data exists.

GRDA provided its analysis in the ISR by presenting information on land use patterns, changes in population, and employment data for the project area and the state of Oklahoma, including tabular data from the U.S. Census Bureau and copies of correspondence from stakeholders regarding existing sources of socioeconomic data.

Requested Modifications

The City states that the Socioeconomics Study Report fails to include certain components required by the study determination. Specifically, the City states that, within the study report, GRDA fails to fully describe baseline socioeconomic information or make clear the sources used in preparing the baseline; identify negative socioeconomic

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impacts; analyze environmental justice impacts; or explain how the Socioeconomics Study Report will be updated after the proposed changes to the Operations Model and overall H&H Study.

The City requests modifications to the Socioeconomics Study to address its identified deficiencies including requiring GRDA to collect additional existing economic data from stakeholders, augment the study's baseline analysis to consider the effects of the project on local government finances and social impacts, require review of FEMA Flood Insurance Studies and other publicly-available resources to analyze the impact of flooding on the availability and affordability of housing, and expand the scope of cumulative effects analysis. The City also asserts that GRDA failed to adequately engage stakeholders to collect existing information, and that the timing of the request for existing economic data in 2020 was problematic because of the COVID-19 pandemic.

The City requests that GRDA provide an appendix containing electronic copies of documents submitted by stakeholders and update the study report to clearly state the data sources used to produce the tabular data on socioeconomic conditions reported at the county and census tract level.

Comments on Requested Modifications

GRDA disagrees with the City's assertion that the Socioeconomics Study was not conducted as required in the approved study plan and that information collection was hampered by the COVID-19 pandemic. Further, GRDA states that should the conclusions of the H&H Study change during the second study season, other studies would be updated as needed and changes would be provided in the USR.

Regarding the City's request for an appendix containing electronic copies of supplemental documents, GRDA clarifies that the documents were included as Attachment B of the Socioeconomics Study Report, filed with the Commission on September 30, 2021, and posted on GRDA's relicensing webpage. GRDA also clarifies that the spreadsheets in Attachment A of the Socioeconomics Study Report were obtained from the U.S. Census Bureau.⁴⁵

⁴⁵ Specifically, GRDA provided census tract data from the 2019 American Community Survey (ACS). The ACS is conducted annually by the U.S. Census Bureau and provides a measure of the changing social and economic characteristics of the U.S. population. The ACS estimates are calibrated based on the results of the previous decennial census. ACS data collection efforts in 2020 were affected by the COVID-19 pandemic, and the 2019 ACS results presented by GRDA represent the best census tract-level data available from the U.S. Census Bureau at the time of the ISR filing.

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Discussion and Staff Recommendation

The approved study plan required GRDA to prepare a report describing baseline socioeconomic conditions in the four-county study area, including tabular data reported at both the county and census-tract level, to solicit and provide public access to socioeconomic data from stakeholders; and to provide an assessment of cumulative effects of project operation and maintenance on socioeconomic resources. Based on our review, the Socioeconomics Study Report addresses all of these components.

The City indicates that anomalous conditions caused by the COVID-19 pandemic may have prevented stakeholders from responding with existing socioeconomic data and requests that GRDA conduct additional stakeholder outreach to obtain existing data that could inform an analysis of the project's effects on socioeconomic resources. Stakeholders may, at any time, supplement the record with additional information that could inform the Commission's analysis of project effects under NEPA. Should the City or other stakeholders be aware of additional, existing resources that would help describe baseline socioeconomic characteristics of the region, project-specific effects on socioeconomic resources including local government finance, or effects of the project on environmental justice communities, those resources may be filed for consideration by the Commission.

The City requests that the study be modified to require an analysis of FEMA Flood Insurance Studies and other publicly available information regarding the effects of flooding on housing availability and affordability. Links to the publicly-available FEMA Flood Insurance studies were provided as part of GRDA's Socioeconomics Study Report. Although the Study Report does not attempt to quantify the effects of the project on housing availability or affordability, such efforts were not required by the approved study plan and the City does not provide information as to how such an analysis would meet the Commission's criteria for modification to the study plan under section 5.15(d) of the Commission's regulations.

The City raises concerns with GRDA's analysis of the effects of the project on socioeconomic resources and environmental justice, including discussion of negative effects. As part of our environmental analysis, we intend to independently evaluate, to the extent feasible, the effects of licensing the project on socioeconomic resources and environmental justice communities. Where the effects of GRDA's proposal may be reasonably quantified using existing information, including data provided in the Socioeconomics Study Report, we will do so. However, we do not typically attempt to quantify the economic value of environmental, recreation, or cultural resources or social costs associated with a licensing proposal. Rather, the impacts on or benefits will be qualitatively evaluated in the environmental document.

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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.

Infrastructure Study

Background

The approved study plan required GRDA to conduct an Infrastructure Study to analyze the impact of project operation on the inundation of critical upstream infrastructure, such as bridges, roads, water systems, electric transmission, and information and communication technologies. Flooding of critical infrastructure can degrade the structural integrity of public facilities and render them temporarily unusable, resulting in social and economic disruption to those dependent on the infrastructure. The goal of the study is to determine the range of inflow conditions at which project operation may influence the frequency or depth of flooding.

GRDA, in consultation with federal, state, local, and tribal emergency management entities, identified 228 critical infrastructure locations with potential to be affected by project operation under flood conditions. These infrastructure locations were mapped, and tabular data of inundation depth for three inflow events representing a range of flood frequency values were used for the analysis. GRDA reported that 14 infrastructure sites (6 percent of critical infrastructure locations) experience an increase in maximum inundation depth between reservoir starting elevations of 742 feet and 745 feet. GRDA stated that the inundation events occur during high-flow conditions when the Corps controls flood pool operation. GRDA concluded that only a different inflow event, and not project operation, can cause an appreciable difference in maximum water surface elevation and maximum inundation extent.

For these reasons, GRDA concluded that the study report findings eliminate the original nexus between project operation and the frequency and depth of upstream inundation, and therefore GRDA stated additional work on the Infrastructure Study is no longer needed.

Requested Modifications

The City disagrees with GRDA's conclusion that project operation has an immaterial impact on upstream water surface elevation and inundation, which is based on the results of the H&H Study. As described in its comments on the H&H Study, the City asserts that the study does not consider a realistic range of flood events or starting operating elevations. The City also states that the Infrastructure Study fails to consider

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how depth, amplitude, and duration of inundation impacts critical infrastructure. The City rebuts GRDA's assumption that if a particular piece of infrastructure is flooded under two different modeling scenarios, there is no difference in flood impacts at each structure, regardless of depth, duration, or amplitude of the modeled inflow events.

The City requests that GRDA update the Infrastructure Study Report with the revised H&H Study results once the Operations Model is finalized. The City also requests that GRDA analyze project impacts on infrastructure based on all flooding parameters, not just a binary determination of whether a flood peak reaches a particular piece of infrastructure.

Comments on Requested Modifications

GRDA states that the Infrastructure Study was conducted in accordance with the Commission's approved study plan and that the City does not demonstrate that the study was not conducted as required or that the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. Further, GRDA states that should the conclusions of the H&H Study change during the second study season, other studies, including the Infrastructure Study would be updated as needed and changes would be provided in the USR.

Discussion and Staff Recommendation

The approved study plan required GRDA to "determine the range of inflow conditions for which [H&H] model results show that project operation for hydropower and other purposes under the Federal Power Act in combination with Corps' directed flood control operations are likely to have an effect on the frequency or depth of flooding" and "to provide maps and tables identifying the frequency and depth of flooding"⁴⁶ for each infrastructure location under different inflow conditions. To address this requirement, GRDA modeled three inflow events (the September 1993, July 2007, and December 2015 events) in combination with two starting reservoir elevations (742 feet PD and 745 feet PD), for a total of six simulated events. The range of starting elevations is limited to GRDA's proposed range of operation under any new license issued, and GRDA asserts that the Pensacola Act limits the Commission's ability to require study of a broader range of operating conditions. As detailed in the *Discussion and Staff Recommendations* for the H&H Study, to inform the Commission's licensing decision, we recommend that GRDA's modeling reflect a wider range of starting operating elevations to provide a more granular view of how the project's operation influences upstream flood conditions. We recommend modifying the Infrastructure Study to require GRDA to depict, on maps and in tabular format, the change in flood

⁴⁶ Commission staff November 8, 2018 Study Plan Determination, Appendix B at B-35.

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depth and frequency for each affected infrastructure location with the same starting elevations required in the H&H Study (*i.e.*, 734 feet PD through 757 feet PD).

According to the H&H Study Report, the September 1993, July 2007, and December 2015 events represent a 21-year, 4-year, and 15-year return period for peak inflow, respectively, at Pensacola Dam. GRDA presents tables and maps showing the change in depth at the two starting elevations for each of the three modeled flood events. However, in the Infrastructure Study Report, GRDA did describe the frequency of the modeled events in the tables or on the maps, as required in the approved study plan. Rather, GRDA refers only to the date of the flood of record and not its return period. The approved study plan did not require GRDA to report on the other factors requested by the City, including duration or amplitude of flooding. However, to address the City's concerns regarding the level of detail provided in the study, we recommend that GRDA also include inundation maps and tabular data for the June 2004 (1-year flood), and October 2009 (3-year flood) in addition to the September 1993, July 2007, and December 2015 events. Further, to meet the requirements of the approved study plan, we recommend that GRDA revise the Infrastructure Study Report to present tables and maps that clearly show both the depth and frequency of flooding (*i.e.*, return period) for each modeled event.

Modifying the study to include additional maps and tabular data representing the range of operating conditions modeled as part of the H&H Study is consistent with the requirements of the approved study plan (section 5.15(d)). Therefore, we recommend that GRDA revise the Infrastructure Study Report to provide the information described in this SMD and file the revised report with the USR.

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APPENDIX C**STAFF RECOMMENDATIONS ON REQUESTED NEW STUDY****Contaminated Sediment Transport Study***City of Miami's Proposal*

The City reaffirms that the Contaminated Sediment Transport Study it first requested in response to GRDA's Proposed Study Plan remains relevant and necessary. The City requests that the Commission approve the City's Contaminated Sediment Transport Study to analyze how project operation may alter the transport and deposition of contaminated sediments on lands occupied by the City of Miami and its residents.

Comments on the Study Request

No other entities filed comments in response to the City's study request.

Reply Comments

GRDA notes that, under the approved study plan, a contaminated sediment transport study would only be necessary if the results of the H&H Study and Sedimentation Study establish a nexus between project operation and sediment transport and deposition in the overbank areas of the Grand Lake tributaries. GRDA states that no such nexus has been established and that the H&H Study results provided in the ISR demonstrate that upstream flooding is caused by natural events, not project operation.

GRDA also states that the City has failed to satisfy the Commission's regulatory criteria, in accordance with section 5.15(e), for a new study request at the ISR stage. Specifically, GRDA argues that the City has not demonstrated that significant new information material to the study has become available.

Discussion and Staff Recommendation

As discussed in the approved study plan, the results of the H&H and Sedimentation Studies are necessary to evaluate the potential for project operation to affect flooding, peak flows, and sediment transport in the project headwaters. To date, these studies are incomplete and require modification as recommended in this SMD. Until those studies, including the modifications recommended in this SMD, are completed, it remains premature to make a determination on the need for the City's requested Contaminated Sediment Transport Study. Stakeholders will have the

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opportunity to request additional studies once GRDA has filed its USR. Comments on the USR and requests for additional studies will be due in October 2022.

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