PREPARED BY

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Supplementary Analysis No. 1

Hydrologic and Hydraulic Modeling: Fictional Scenarios in which the U.S. Army Corps of Engineers Fails to Adhere to its Water Control Manual Until the Peak Inflow Reaches Pensacola Dam

Pensacola Hydroelectric Project
Project No. 1494

July 24, 2023

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Executive Summary

Mead & Hunt is assisting Grand River Dam Authority (GRDA) with the relicensing of the Pensacola Hydroelectric Project (Project), which is regulated by the Federal Energy Regulatory Commission (FERC). Pursuant to federal law, including the Flood Control Act of 1944 and section 7612 of the National Defense Authorization Act for 2020, flood control operations at the Project are regulated exclusively by the United States Army Corps of Engineers (USACE).

This Supplementary Analysis No. 1 (SA1) for the Hydrologic and Hydraulic (H&H) Modeling fulfills the requirements of FERC's March 14, 2023 Determination on Requests for Study Modifications and New Studies. Revisions to the one-dimensional (1D) Upstream Hydraulic Model (UHM) are discussed, but the primary matter is FERC's recommendation that GRDA accommodate the City of Miami's (City) request to simulate fictional scenarios—i.e., operations that would never be implemented in the real world—in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

In their comments on GRDA's Updated Study Report (USR), the City claimed that GRDA, in performing the modeling runs required by the FERC-approved study plan, simulated "inappropriate pre-releases" that the City alleged minimized the simulated flooding impacts within and in the vicinity of the City. The City requested that FERC require GRDA to simulate scenarios where USACE would hold the elevation at Pensacola Dam steady at flood stage while the incoming flood passed the USACE-monitored upstream United States Geological Survey (USGS) gages near Commerce and Miami (which are 68 and 58 miles upstream of the dam, respectively) and continue to hold the elevation at Pensacola Dam steady at flood stage until the incoming flood reached Pensacola Dam. In this fictional scenario, USACE would fail to adhere to its Water Control Manual, because what the City mischaracterized as a "pre-release" is, in reality, the simulation of USACE flood control directives under USACE's congressionally-mandated authority. In GRDA's USR models, the Operations Model (OM), which was validated using USACE's RiverWare model as required by the FERC-approved study plan, performed flood releases in accordance with the reservoir management rules defined in the RiverWare model.

FERC staff, of course, determined that GRDA's USR simulations were "consistent with the Corps' standard procedure for flood control as specified in the Corp's Water Control Manual for Pensacola Dam and Reservoir." Staff recommended, however, that GRDA perform new simulations to accommodate the City's requests. GRDA has fulfilled FERC's recommendation by simulating fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam. For simulation of an initial elevation of 757 feet PD, limitations of physical reality at Pensacola Dam prevented the starting elevation from remaining steady until the arrival of flood flows.

Even in these extreme, fictional scenarios in which USACE fails to adhere to its Water Control Manual, the impact of nature far surpasses any impacts of Project operations by orders of magnitude, as floods accumulate in the 10,345 square mile watershed upstream of Pensacola Dam. This new, quantified analysis resulted in the same conclusion presented in GRDA's USR: starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream water surface elevations (WSELs), inundation, and duration for a range of inflow events. In these extreme, fictional scenarios most recently recommended by FERC staff, the impact of nature within the City of Miami ranged from 5 or 20 to over 7,000 times the maximum simulated impact of GRDA's anticipated operations.

Thus, the extreme, fictional scenario in which USACE would fail to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam could not overcome the outsized and overwhelming impact of nature. This fact further solidifies the conclusion of GRDA's USR. GRDA has now simulated scenarios specifically requested by the City after years of study and multiple rounds of intense scrutiny, peer review, and public comment. Even in these extreme and fictional scenarios—which obviously were handpicked by the City to lend support to its position regarding flooding causation, and which were intended to test the limits of GRDA's modeling conclusions—the quantified results show that only natural inflows, and not Project operations, cause an appreciable difference in maximum WSEL, maximum inundation extent, or duration of inundation in the study area.

Finally, the quantified results presented in (1) GRDA's USR and (2) the additional scenarios reported in this SA1 that were designed as extreme events to test the limits of the model are fully consistent with the documented history of flooding in the watershed: flooding is a natural phenomenon that will continue to occur in Miami regardless of dam operations. After years of study and analysis, we can confidently conclude that GRDA's Project operations are not the cause of flooding within and in the vicinity of the City of Miami.

List of Abbreviations and Terms

1D	One-Dimensional
CFS	Cubic Feet Per Second
Corps or USACE	United States Army Corps of Engineers
FERC	Federal Energy Regulatory Commission
GRDA	Grand River Dam Authority
H&H	Hydrologic and Hydraulic
ILP	Integrated Licensing Process
ISR	Initial Study Report
HEC	Hydrologic Engineering Center
MISR	Model Input Status Report
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
OM	Operations Model
PD	Pensacola Datum
Project	Pensacola Hydroelectric Project
PSP	Proposed Study Plan
RAS	River Analysis System
RM	River Mile
RSP	Revised Study Plan
SA1	Supplementary Analysis No. 1
SPD	Study Plan Determination
STM	Sediment Transport Model
UHM	Upstream Hydraulic Model
USGS	United States Geological Survey
USR	Updated Study Report
WSEL	Water Surface Elevation

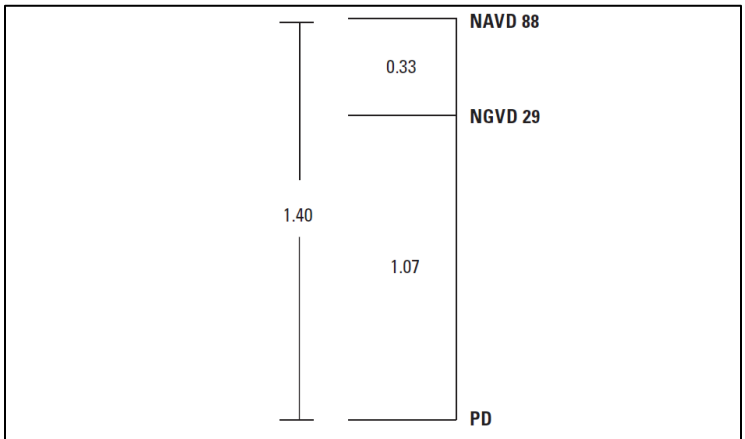
1. Introduction and Background

1.1 Project Description

The Project is owned and operated by GRDA and regulated by FERC. The Pensacola Dam is in Mayes County, Oklahoma on the Grand-Neosho River. Pensacola Dam impounds Grand Lake. Construction of Pensacola Dam was completed in 1940. Downstream of Pensacola Dam, GRDA also owns and operates the Robert S. Kerr Dam as the Markham Ferry Hydroelectric Project. Kerr Dam is also in Mayes County and impounds Lake Hudson, also known as Markham Ferry Reservoir. Flood control operations at both Pensacola Dam and Kerr Dam are regulated exclusively by USACE.

1.2 Vertical Datums

Data sources for this study use a variety of vertical datums. Unless otherwise noted, data are presented in the Pensacola Datum (PD). To convert from PD to the National Geodetic Vertical Datum of 1929 (NGVD29), add 1.07 feet. To convert from NGVD29 to the North American Vertical Datum of 1988 (NAVD88), add 0.33 feet. **Figure 1** displays datum transformations and conversions (Hunter, Trevisan, Villa, & Smith, 2020). The Hydrologic Engineer Center's (HEC) River Analysis System (RAS) model discussed in this report was developed in NGVD29.



	Elevations, in feet		
	NAVD 88	NGVD 29	PD
Conservation pool	743.40	743.07	742.00
Top of the dam	758.40	758.07	757.00

Figure 1. Datum transformations and conversions.
Source: (Hunter, Trevisan, Villa, & Smith, 2020).

1.3 Study Plan Proposals and Determination

The timeline of the Integrated Licensing Process (ILP) is as follows:

1. On April 27, 2018, GRDA filed its Proposed Study Plan (PSP) to address H&H Modeling in support of its intent to relicense the Project.
2. On September 24, 2018, GRDA filed its Revised Study Plan (RSP).
3. On November 8, 2018, FERC issued its Study Plan Determination (SPD) for the Project.
4. On January 23, 2020, FERC issued an Order on the Request for Clarification and Rehearing,

which clarified the timeline for certain milestones applicable to the relicensing study plan.

5. On March 30, 2021, GRDA filed its Model Input Status Report (MISR).
6. On September 30, 2021, GRDA filed its Initial Study Report (ISR).
7. On February 24, 2022, FERC issued a Determination for the Project, in regard to GRDA's ISR.
8. On September 30, 2022, GRDA filed its USR.
9. On December 30, 2022, GRDA filed its Draft License Application.
10. On March 14, 2023, FERC issued a Determination for the Project, in regard to GRDA's USR.
11. On May 30, 2023, GRDA filed its Final License Application.
12. On July 24, 2023, GRDA filed this document, SA1.

1.4 GRDA's Updated Study Report

As discussed in **Section 1.3**, GRDA filed its USR on September 30, 2022. The H&H Study Reports, including the UHM Report, are included in Appendix 2 of GRDA's USR. **Figure 2** displays the UHM study area.

The UHM USR included:

1. A chronology of ILP filings as they relate to the H&H Modeling.
2. Documentation of UHM development, which adhered to the RSP and followed best practices and USACE guidance (see Section 2 of the UHM USR).
3. A comprehensive fulfilment of FERC's SPD (see Section 1.3 of the UHM USR).

The quantified, analytical results of the UHM USR demonstrated that GRDA's anticipated operations have an immaterial impact on upstream WSELs, inundation, and duration for the FERC-specified range of inflow events. Only natural inflows—and not Project operation—caused an appreciable difference in maximum WSEL, maximum inundation extent, or duration. The maximum impact of nature typically ranged from over 10 times to over 100 or even over 1,000 times the maximum simulated impact of GRDA's anticipated operations. Additionally, the results of the UHM USR demonstrated that, as compared to baseline operations, anticipated operations have an immaterial impact on upstream WSELs, inundation, and duration.

As part of the SPD, FERC requested that GRDA simulate extreme, hypothetical starting elevations at Pensacola Dam outside GRDA's anticipated operational range. The analytical results of the UHM USR showed that the impact of nature typically ranged from 2 times to 10 or even 100 times the impact of the extreme, hypothetical starting stage range.

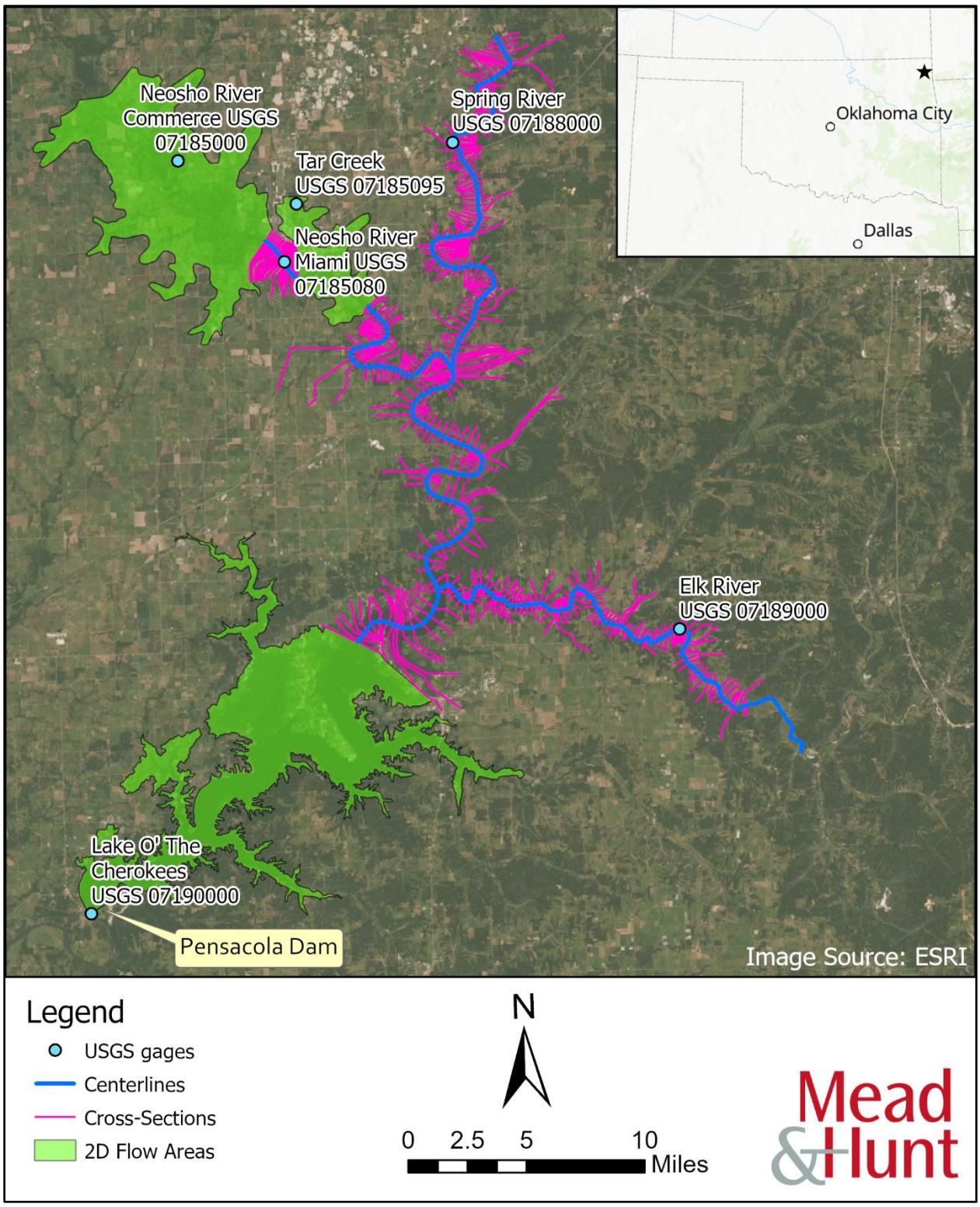


Figure 2. UHM study area.

1.5 FERC's Determination and GRDA's Fulfillment

As discussed in **Section 1.3**, FERC issued a Determination for the Project with regard to GRDA's USR on March 14, 2023. FERC's recommendations are discussed below.

1.5.1 Finding of GRDA's Consistency with USACE Standard Procedures and Request for Simulations

FERC staff's March 14, 2023 Determination found that GRDA's model runs were:

> *Consistent with the Corps' standard procedure for flood control as specified in the Corp's Water Control Manual for Pensacola Dam and Reservoir.*

FERC staff also found that:

> *GRDA's procedure for setting simulation start times "was based on the Corps' recommendation, per the HEC-RAS User's Manual, to start unsteady flow simulations prior to flood wave arrival at the upper boundary of the model. GRDA's model is consistent with this approach.*

After this recognition that GRDA followed USACE's Water Control Manual and that GRDA followed USACE's standard procedures, FERC staff characterized GRDA's USR simulations as "one extreme." FERC staff recommended that GRDA "capture the other extreme" by conducting "additional model runs for each operation alternative assuming that the initial starting elevation remains steady until the arrival of flood flows."

GRDA strongly disagrees with FERC staff's characterization of the USACE's regulation of flood control operations at the Project as "one extreme," because executing flood management operations in accordance with the USACE Water Control Manual is standard and proven practice, developed in accordance with standard USACE protocols. Such operations are not extreme. Nonetheless, GRDA has fulfilled the requirements of FERC staff's March 14, 2023 Determination by developing new simulations that hold the initial elevation at Pensacola Dam "steady until the arrival of flood flows"—simulations that unquestionably are the "other extreme" as noted by FERC staff. As discussed in **Section 2**, limitations of physical reality at Pensacola Dam prevented the initial elevation from remaining steady until the arrival of flood flows for an initial elevation of 757 feet PD.

1.5.2 Recommendation for 1D UHM

FERC staff's Determination also recommended modification to the downstream boundary condition for Tar Creek at the Neosho River confluence in GRDA's 1D UHM. As stated in its March 14, 2023 Determination, FERC staff recommended:

> *That GRDA revise the downstream boundary condition for Tar Creek at the Neosho River confluence to reflect a flatter friction slope (if normal depth is used) or use a different downstream boundary condition, as appropriate.*

Additionally, FERC staff recommended that GRDA:

Re-run the Sediment Transport Model and revise the portions of the sedimentation study where the results differ significantly from those reported in September 2022.

GRDA has fulfilled the requirements of FERC's March 14, 2023 Determination by modifying the downstream boundary condition of Tar Creek at the Neosho River confluence, as discussed in **Section 4**. Revisions to the Sediment Transport Model (STM) are discussed in the updated Sedimentation Study report.

2. FRM and OM Updates

To fulfill the requirements of FERC staff's March 14, 2023 Determination, GRDA modified the Flood Routing Model (FRM) and OM to hold the initial elevation at Pensacola Dam "steady until the arrival of flood flows," meaning that USACE would not take any action to address flood control (in violation of its statutory obligations) until the peak inflow reaches Pensacola Dam. **Appendix A** presents the stage hydrographs for these fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

The FRM attempts to hold the Pensacola Dam stage constant until the beginning of the day during which the peak inflow reaches Pensacola Dam. To accomplish this, the target WSEL was set equal to the initial elevation at Pensacola Dam until the flood wave arrives. For starting elevations of 734 feet PD up to and including 753 feet PD, the FRM can maintain the initial elevation until the flood wave arrives. However, for the starting elevation of 757 feet PD, limitations of physical reality at Pensacola Dam prevented the FRM from maintaining the target WSEL, as discussed below in detail.

As part of FERC staff's SPD, a starting elevation at Pensacola Dam of 757 feet PD was simulated. An elevation of 757 feet PD is equal to the crest of the dam. The crest elevation of the spillway tainter gates is 755 feet PD (GRDA, 2021). Therefore, 2 feet of weir flow over the tainter gates immediately begins at the start of the simulation. As **Figure 3** displays, the FRM attempts to restore the elevation at Pensacola Dam to 757 feet PD, but that elevation cannot be physically maintained, unlike other starting elevations. Because of the immense weir flow over the top of the spillway gates, approximately 600,000 cubic feet per second (cfs) would need to be constantly arriving at the dam to maintain an elevation of 757 feet PD. For context, the instantaneous peak discharge of the 100-year event is 300,000 cfs at the dam. *A constant, unceasing flow twice the value of the 100-year peak discharge would be required to hold the elevation at Pensacola Dam at 757 feet PD*.

In summary, GRDA has followed FERC staff's March 14, 2023 Determination within the limitations of physical reality: for simulations with a starting elevation of 757 feet PD, until the flood arrives, the FRM makes every mathematical attempt to maintain the initial elevation at Pensacola Dam.

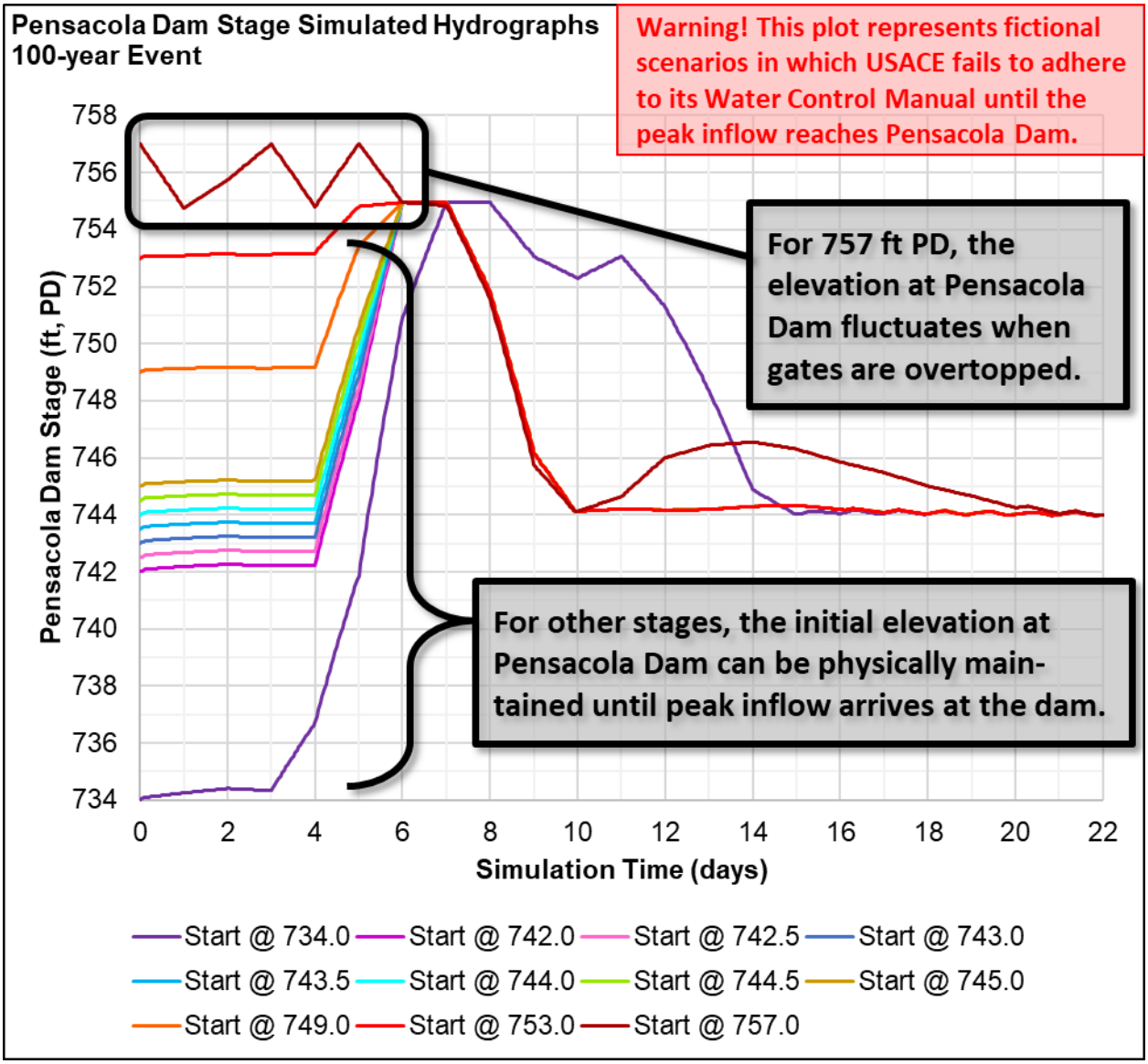


Figure 3. Simulated stage hydrographs resulting from limitations of physical reality at Pensacola Dam.

3. UHM Results

The results from the FRM and OM represent fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam. Using these results, GRDA fulfilled the requirements of FERC's March 14, 2023 Determination by simulating inflow events in the UHM.

Maximum WSELs, maximum inundation extents, and durations of inundation were extracted from HEC-RAS for each simulation. Maximum WSELs are presented in **Appendix B** (tabular format) and **Appendix C** (graphical format). Durations of inundation are presented in **Appendix D**. New maps were not created because the minimal differences in inundation extent between (1) the fictional simulations discussed herein, in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam and (2) the USR simulations cannot be effectively displayed on an inundation map. Because the two scenarios produce almost identical results, the inundation maps for the fictional scenarios discussed herein would be virtually identical to the maps presented in the USR.

3.1 Analysis of Water Surface Elevations

Maximum WSELs were analyzed to determine the upstream impacts, if any, of various initial stages at Pensacola Dam during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

3.1.1 WSELs for Starting Elevations within GRDA's Anticipated Operational Range

For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Table 1** presents a summary of maximum WSEL differences along the modeled inflow reaches for simulated starting elevations at Pensacola Dam within GRDA's anticipated operational range. The first six rows in the table characterize the theoretical, potential impact of starting elevations at Pensacola Dam within GRDA's anticipated operational range and the last two rows characterize the impact of nature.

During fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the maximum simulated WSEL differences due to a change in starting elevation within GRDA's anticipated operational range are orders of magnitude smaller than the maximum WSEL differences that can be caused by nature. More specifically:

1. Along the Neosho River, the maximum impact of nature ranges from 8 to 641 times greater than the maximum simulated impact of GRDA's anticipated operational range.
2. Along the Spring River, the maximum impact of nature ranges from 22 to 409 times greater than the maximum simulated impact of GRDA's anticipated operational range.
3. Along the Elk River, the maximum impact of nature ranges from 10 to 382 times greater than the maximum simulated impact of GRDA's anticipated operational range.
4. Along Tar Creek, the maximum impact of nature ranges from 26 to 2,694 times greater than the maximum simulated impact of GRDA's anticipated operational range.

The orders of magnitude presented above are similar to those presented in GRDA's USR. Even during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the impact of nature is orders of magnitude greater than any simulated impact of GRDA's anticipated operational range.

Table 1. Summary of maximum WSEL differences for starting elevations within GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum WSEL Differences (ft) for Starting Elevations Within GRDA's Anticipated Operational Range			
	Neosho River[1]	Spring River	Elk River	Tar Creek
Sept. 1993 (21 year)	0.49	0.18	0.07	0.22
June 2004 (1 year)	2.11	1.67	0.68	0.80
July 2007 (4 year)	2.39	1.11	2.39	0.04
Oct. 2009 (3 year)	2.64	0.58	2.63	0.21
Dec. 2015 (15 year)	0.94	0.90	0.19	0.44
100-year	0.05	0.09	0.08	0.01
Impact of inflow events (historical events only)	21.05	36.78	26.75	20.57
Impact of all inflow events (inc. 100-year event)	32.03	36.78	26.75	32.32

[1] Along the Neosho River, the maximum WSEL differences for the anticipated operations simulations occur at various locations between RM 77 (Pensacola Dam) and RM 129.1, which is downstream of Miami, OK. For the impact of inflow (impact of nature) simulations, the maximum WSEL difference occurs at RM 135.9, which is located in Miami, OK.

3.1.2 WSELs for Extreme, Hypothetical Starting Elevations

For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Table 2** presents a summary of maximum WSEL differences along the modeled inflow reaches for simulated starting elevations at Pensacola Dam outside GRDA's anticipated operational range. Even using these extreme, hypothetical starting stages, which range from 734 to 757 feet PD, the impact of nature is much greater than that of a 23-foot change in starting elevation at Pensacola Dam. More specifically:

1. Along the Neosho River, the maximum impact of nature ranges from 1.5 to 16 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.
2. Along the Spring River, the maximum impact of nature ranges from 2.9 to 50 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.
3. Along the Elk River, the maximum impact of nature ranges from 1.9 to 13 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.
4. Along Tar Creek, the maximum impact of nature ranges from 3.0 to 314 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.

The orders of magnitude presented above are similar to those presented in GRDA's USR. Even during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the impact of nature is much greater than any simulated impact of extreme, hypothetical starting stages outside of GRDA's anticipated operational range.

Table 2. Summary of maximum WSEL differences for all starting elevations, including extreme, hypothetical values outside GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum WSEL Differences (ft) for All Starting Elevations, Including Extreme, Hypothetical Values Outside GRDA's Anticipated Operational Range			
	Neosho River[1]	Spring River	Elk River	Tar Creek
Sept. 1993 (21 year)	5.97	1.47	5.01	0.95
June 2004 (1 year)	12.93	12.66	12.92	6.79
July 2007 (4 year)	9.19	6.64	9.19	0.68
Oct. 2009 (3 year)	14.08	7.63	14.10	2.70
Dec. 2015 (15 year)	4.96	4.54	3.56	2.63
100-year	2.05	0.73	1.99	0.10
Impact of inflow events (historical events only)	21.05	36.78	26.75	20.57
Impact of all inflow events (inc. 100-year event)	32.03	36.78	26.75	32.32

[1] Along the Neosho River, the maximum WSEL differences for the extreme, hypothetical simulations occur at various locations between RM 77 (Pensacola Dam) and RM 122.0, which is downstream of Miami, OK. For the impact of inflow (impact of nature) simulations, the maximum WSEL difference occurs at RM 135.9, which is located in Miami, OK.

3.1.3 WSELs through the City of Miami

For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Table 3** presents maximum WSEL differences through the City of Miami, OK in more detail for simulated starting elevations at Pensacola Dam within GRDA's anticipated operational range. **Table 4** presents the same information for extreme, hypothetical starting elevations outside GRDA's anticipated operational range. In both tables, the columns on the right present maximum simulated differences in WSEL for four individual River Mile (RM) segments that cover the City of Miami. The results show that any simulated impact of starting stage—whether within GRDA's anticipated operational range or for extreme, hypothetical stages—has little impact on WSELs when compared to nature's impact. More specifically:

1. The maximum impact of nature ranges from 19 to 2,652 times greater than the maximum simulated impact of GRDA's anticipated operational range.
2. The maximum impact of nature ranges from 2.3 to 292 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.

The orders of magnitude presented above are similar to those presented in GRDA's USR. Even during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the impact of nature is much greater than any simulated impact of starting stage—whether within GRDA's anticipated operational range or for extreme, hypothetical stages.

Table 3. Summary of maximum WSEL differences through Miami, OK for starting elevations within GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum WSEL Differences (ft) through Miami for Starting Elevations Within GRDA's Anticipated Operational Range			
	RM 133-134	RM 134-135	RM 135-136	RM 136-137
Sept. 1993 (21 year)	0.27	0.22	0.18	0.16
June 2004 (1 year)	1.07	0.79	0.67	0.58
July 2007 (4 year)	0.04	0.04	0.03	0.03
Oct. 2009 (3 year)	0.28	0.20	0.17	0.16
Dec. 2015 (15 year)	0.53	0.43	0.38	0.36
100-year	0.01	0.02	0.02	0.02
Impact of inflow events (historical events only)	20.81	20.53	20.93	20.91
Impact of all inflow events (inc. 100-year event)	31.83	31.84	32.03	31.95

Table 4. Summary of maximum WSEL differences through Miami, OK for all starting elevations, including extreme, hypothetical values outside GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum WSEL Differences (ft) through Miami for All Starting Elevations, Including Extreme, Hypothetical Values Outside GRDA's Anticipated Operational Range			
	RM 133-134	RM 134-135	RM 135-136	RM 136-137
Sept. 1993 (21 year)	1.10	0.93	0.84	0.79
June 2004 (1 year)	8.92	6.70	5.66	4.98
July 2007 (4 year)	0.77	0.66	0.55	0.51
Oct. 2009 (3 year)	3.57	2.65	2.25	2.12
Dec. 2015 (15 year)	3.07	2.60	2.34	2.26
100-year	0.11	0.11	0.11	0.11
Impact of inflow events (historical events only)	20.81	20.53	20.93	20.91
Impact of all inflow events (inc. 100-year event)	31.83	31.84	32.03	31.95

3.1.4 Summary of WSEL Analysis

In summary, for fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream WSEL, especially in the City of Miami. Compared to starting elevations within GRDA's anticipated operational range, only natural inflows—and not Project operation—caused an appreciable difference in maximum WSEL. In Miami, the impact of nature ranged from nearly 20 to over 2,500 times the maximum simulated impact of GRDA's anticipated operations.

Even the combination of (1) USACE failing to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam and (2) extreme, hypothetical starting elevations at Pensacola Dam outside GRDA's anticipated operational range cannot exceed the outsized impact of nature. Rather, in Miami, the impact of nature ranged from 2 to nearly 300 times the impact of the most extreme conditions conceivable.

3.2 Analysis of Inundation Areas

Maximum inundation areas were analyzed to determine the upstream impacts, if any, of various initial stages at Pensacola Dam during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

3.2.1 Inundation Areas for Starting Elevations within GRDA's Anticipated Operational Range

For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Table 5** presents a summary of smallest and largest inundation areas for simulated starting elevations within GRDA's anticipated operational range. The first six rows in the table characterize the theoretical, potential impact of GRDA's anticipated operations and the last two rows characterize the impact of nature.

During fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the simulated inundation area differences due to a change in starting elevation at Pensacola Dam within GRDA's anticipated operational range are orders of magnitude smaller than the inundation differences that can be caused by nature. More specifically:

1. If only historical inflow events are considered, the maximum impact of nature ranges from 11 to 5,590 times greater than the maximum simulated impact of GRDA's anticipated operational range.
2. If all inflow events are considered, the maximum impact of nature ranges from 14 to 6,885 times greater than the maximum simulated impact of GRDA's anticipated operational range.

The orders of magnitude presented above are similar to those presented in GRDA's USR. Even during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the impact of nature is orders of magnitude greater than any simulated impact of GRDA's anticipated operational range.

Table 5. Summary of smallest and largest inundation areas for starting elevations within GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.			
Event(s)	Area of Inundation (acres) for Starting Elevations Within GRDA's Anticipated Operational Range		Difference (%)
	Smallest	Largest	
Sept. 1993 (21 year)	81,921	82,049	0.2%
June 2004 (1 year)	48,812	51,028	4.4%
July 2007 (4 year)	75,758	77,716	2.6%
Oct. 2009 (3 year)	67,412	69,078	2.4%
Dec. 2015 (15 year)	77,890	78,178	0.4%
100-year	92,624	92,632	0.0%
Impact of inflow events (historical events only)	49,846	81,986	48.8%
Impact of all inflow events (inc. 100-year event)	49,846	92,624	60.1%

3.2.2 Inundation Areas for Extreme, Hypothetical Starting Elevations

For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Table 6** presents a summary of smallest and largest inundation areas for simulated starting elevations at Pensacola Dam outside GRDA's anticipated operational range. Even using these extreme, hypothetical starting stages, which range from 734 to 757 feet PD, the impact of nature is much greater than that of a 23-foot change in starting elevation at Pensacola Dam. More specifically:

1. If only historical inflow events are considered, the maximum impact of nature ranges from 1.7 to 26 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.
2. If all inflow events are considered, the maximum impact of nature ranges from 2.1 to 31 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.

The orders of magnitude presented above are similar to those presented in GRDA's USR. Even during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the impact of nature is much greater than any simulated impact of extreme, hypothetical starting stages outside of GRDA's anticipated operational range.

Table 6. Summary of smallest and largest inundation areas for all starting elevations, including extreme, hypothetical values outside GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.			
Event(s)	Area of Inundation (acres) for All Starting Elevations, Including Extreme, Hypothetical Values Outside GRDA's Anticipated Operational Range		Difference (%)
	Smallest	Largest	
Sept. 1993 (21 year)	79,864	84,372	5.5%
June 2004 (1 year)	48,812	65,221	28.8%
July 2007 (4 year)	75,001	83,472	10.7%
Oct. 2009 (3 year)	66,238	77,551	15.7%
Dec. 2015 (15 year)	77,108	81,165	5.1%
100-year	92,489	94,272	1.9%
Impact of inflow events (historical events only)	49,846	81,986	48.8%
Impact of all inflow events (inc. 100-year event)	49,846	92,624	60.1%

3.2.3 Inundation Areas through the City of Miami

For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Table 7** presents results of maximum inundation area differences through the City of Miami, OK in more detail for simulated starting elevations at Pensacola Dam within GRDA's anticipated operational range. **Table 8** presents the same information for extreme, hypothetical starting elevations outside GRDA's anticipated operational range. The results show that any simulated impact of starting stage—whether within GRDA's anticipated operational range or for extreme, hypothetical stages—has little impact on maximum inundation area within the City of Miami when compared to nature's impact. More specifically:

1. The maximum impact of nature ranges from 5 to 7,847 times greater than the maximum simulated impact of GRDA's anticipated operational range.
2. The maximum impact of nature ranges from 1.3 to 908 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.

The orders of magnitude presented above are similar to those presented in GRDA's USR. Even during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the impact of nature is much greater than any simulated impact of starting stage—whether within GRDA's anticipated operational range or for extreme, hypothetical stages.

Table 7. Summary of maximum inundation area differences through Miami, OK for starting elevations within GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum Inundation Area Differences Through Miami, OK for Starting Elevations Within GRDA's Anticipated Operational Range			
	RM 133-134	RM 134-135	RM 135-136	RM 136-137
Sept. 1993 (21 year)	1.4%	1.1%	1.4%	1.2%
June 2004 (1 year)	26.7%	12.0%	13.6%	20.8%
July 2007 (4 year)	0.2%	0.2%	0.1%	0.1%
Oct. 2009 (3 year)	1.6%	0.8%	1.4%	5.4%
Dec. 2015 (15 year)	5.1%	2.1%	3.3%	3.3%
100-year	0.0%	0.1%	0.0%	0.0%
Impact of inflow events (historical events only)	146%	142%	135%	144%
Impact of all inflow events (inc. 100-year event)	164%	165%	148%	153%

Table 8. Summary of maximum inundation area differences through Miami, OK for all starting elevations, including extreme, hypothetical values outside GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum Inundation Area Differences Through Miami, OK for All Starting Elevations, Including Extreme, Hypothetical Values Outside GRDA's Anticipated Operational Range			
	RM 133-134	RM 134-135	RM 135-136	RM 136-137
Sept. 1993 (21 year)	6%	5%	6%	7%
June 2004 (1 year)	117%	84%	70%	88%
July 2007 (4 year)	3%	4%	3%	1%
Oct. 2009 (3 year)	22%	11%	20%	20%
Dec. 2015 (15 year)	21%	13%	18%	26%
100-year	0.4%	0.4%	0.2%	0.2%
Impact of inflow events (historical events only)	146%	142%	135%	144%
Impact of all inflow events (inc. 100-year event)	164%	165%	148%	153%

3.2.4 Summary of Inundation Area Analysis

In summary, for fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream inundation, especially in the City of Miami. Compared to starting elevations within GRDA's anticipated operational range, only natural inflows—and not Project operation—caused an appreciable difference in inundation extent. In Miami, the impact of nature ranged from 5 to over 7,000 times the maximum simulated impact of GRDA's anticipated operations.

Even the combination of (1) USACE failing to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam and (2) extreme, hypothetical starting elevations at Pensacola outside GRDA's anticipated operational range cannot exceed the outsized impact of nature. Rather, in Miami, the impact of nature ranged from 1.3 to over 900 times the impact of the most extreme conditions conceivable.

3.3 Analysis of Inundation Duration

Durations of inundation were analyzed to determine the upstream impacts, if any, of various initial stages at Pensacola Dam during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

3.3.1 Durations for Starting Elevations within GRDA's Anticipated Operational Range

For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Table 9** presents a summary of maximum duration differences for simulated starting elevations within GRDA's anticipated operational range. The first six rows in the table characterize the theoretical, potential impact of starting elevations at Pensacola Dam within GRDA's anticipated operational range and the last two rows characterize the impact of nature. As **Table 9** presents, some of the maximum duration differences for a given inflow event on a given reach were zero. In such instances, a value of one hour was used instead of zero to calculate the ratios listed above, which would otherwise be undefined.

During fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the simulated maximum duration differences due to a change in starting elevation at Pensacola Dam within GRDA's anticipated operational range are orders of magnitude smaller than the maximum duration differences that can be caused by nature. More specifically:

1. Along the Neosho River, the maximum impact of nature ranges from 9 to 132 times greater than the maximum simulated impact of GRDA's anticipated operational range.
2. Along the Spring River, the maximum impact of nature ranges from 6 to 126 times greater than the maximum simulated impact of GRDA's anticipated operational range.
3. Along the Elk River, the maximum impact of nature is 118 times greater than the maximum simulated impact of GRDA's anticipated operational range.
4. Along Tar Creek, the maximum impact of nature ranges from 40 to 213 times greater than the maximum simulated impact of GRDA's anticipated operational range.

The orders of magnitude presented above are similar to those presented in GRDA's USR. Even during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the impact of nature is orders of magnitude greater than any simulated impact of GRDA's anticipated operational range.

Table 9. Summary of inundation duration differences for starting elevations within GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum Duration Difference (hours) for Starting Elevations Within GRDA's Anticipated Operational Range			
	Neosho River	Spring River	Elk River	Tar Creek
Sept. 1993 (21 year)	28	7	0	2
June 2004 (1 year)	2	0	0	0
July 2007 (4 year)	9	0	0	2
Oct. 2009 (3 year)	7	2	0	1
Dec. 2015 (15 year)	18	20	0	4
100-year	2	3	0	1
Impact of inflow events (historical events only)	238	113	118	158
Impact of all inflow events (inc. 100-year event)	264	126	118	213

The largest differences in duration for simulated starting elevations within GRDA's anticipated operational range occur in rural, sparsely populated areas. For the September 1993 (21 year) inflow event, the 28-hour maximum simulated difference in duration listed in **Table 9** is isolated to RM 124 to 125 on the Neosho River. This location is between the Highway 60 Bridge at Twin Bridges State Park (RM 122.57) and the S 590 Road Bridge (RM 126.70). The simulated difference in duration is isolated to this location and does not extend either upstream or downstream. For the September 1993 (21 year) inflow event, there are no other locations along the Neosho River with differences in duration greater than 8 hours. For the December 2015 (15 year) inflow event, the 18-hour simulated difference in **Table 9** is isolated to RM 131 to 132 on the Neosho River. This location is between the S 590 Road Bridge (RM 126.70) and the Interstate 44 Bridge (RM 133.80). The simulated difference in duration is isolated to this location and does not extend either upstream or downstream. For the December 2015 (15 year) inflow event, there are no other locations along the Neosho River with differences in duration greater than 8 hours.

3.3.2 Durations for Extreme, Hypothetical Starting Elevations

For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Table 10** presents a summary of duration differences for simulated starting elevations at Pensacola Dam outside GRDA's anticipated operational range. As **Table 10** presents, some of the maximum duration differences for a given inflow event on a given reach were zero. In such instances, a value of one hour was used instead of zero to calculate the ratios listed above, which would otherwise be undefined.

Even using these extreme, hypothetical stages, which range from 734 to 757 feet PD, the impact of nature is much greater than that of a 23-foot change in starting elevation at Pensacola Dam. More specifically:

1. Along the Neosho River, the maximum impact of nature ranges from 3.3 to 7 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.
2. Along the Spring River, the maximum impact of nature ranges from 1.3 to 126 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.
3. Along the Elk River, the maximum impact of nature ranges from 30 to 118 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.
4. Along Tar Creek, the maximum impact of nature ranges from 1.8 to 213 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.

The orders of magnitude presented above are similar to those presented in GRDA's USR. Even during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the impact of nature is much greater than any simulated impact of extreme, hypothetical starting stages outside of GRDA's anticipated operational range.

Table 10. Summary of inundation duration differences for all starting elevations, including extreme, hypothetical values outside GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum Duration Difference (hours) for All Starting Elevations, Including Extreme, Hypothetical Values Outside GRDA's Anticipated Operational Range			
	Neosho River	Spring River	Elk River	Tar Creek
Sept. 1993 (21 year)	40	32	3	62
June 2004 (1 year)	43	0	0	0
July 2007 (4 year)	53	86	0	37
Oct. 2009 (3 year)	73	39	3	90
Dec. 2015 (15 year)	58	45	4	63
100-year	42	23	0	17
Impact of inflow events (historical events only)	238	113	118	158
Impact of all inflow events (inc. 100-year event)	264	126	118	213

3.3.3 Durations through the City of Miami

For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Table 11** presents results of maximum duration differences through the City of Miami, OK in more detail for simulated starting elevations at Pensacola Dam within GRDA's anticipated operational range. **Table 12** presents the same information for extreme, hypothetical starting elevations outside GRDA's anticipated operational range. The results show that any simulated impact of starting stage—whether within GRDA's anticipated operational range or for extreme, hypothetical stages—has little impact on duration when compared to nature's impact. More specifically:

1. The maximum impact of nature ranges from 23 to 226 times greater than the maximum simulated impact of GRDA's anticipated operational range.
2. The maximum impact of nature ranges from 2.1 to 226 times greater than the maximum simulated impact of an extreme, hypothetical starting stage range of 23 feet.

The orders of magnitude presented above are similar to the orders of magnitude presented in GRDA's USR. Even during fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the impact of nature is much greater than any simulated impact of starting stage—whether within GRDA's anticipated operational range or for extreme, hypothetical stages.

Table 11. Summary of maximum duration differences through Miami, OK for starting elevations within GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum Duration Differences (hours) Through Miami, OK for Starting Elevations Within GRDA's Anticipated Operational Range			
	RM 133-134	RM 134-135	RM 135-136	RM 136-137
Sept. 1993 (21 year)	1	1	1	1
June 2004 (1 year)	0	0	0	0
July 2007 (4 year)	2	3	3	2
Oct. 2009 (3 year)	0	7	5	2
Dec. 2015 (15 year)	6	4	3	3
100-year	1	1	1	1
Impact of inflow events (historical events only)	150	162	164	171
Impact of all inflow events (inc. 100-year event)	213	221	223	226

Table 12. Summary of maximum duration differences through Miami, OK for all starting elevations, including extreme, hypothetical values outside GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.				
Event(s)	Maximum Duration Differences (hours) Through Miami, OK for All Starting Elevations, Including Extreme, Hypothetical Values Outside GRDA's Anticipated Operational Range			
	RM 133-134	RM 134-135	RM 135-136	RM 136-137
Sept. 1993 (21 year)	10	11	11	10
June 2004 (1 year)	0	0	0	0
July 2007 (4 year)	36	36	35	34
Oct. 2009 (3 year)	73	73	49	37
Dec. 2015 (15 year)	43	29	22	18
100-year	16	16	17	18
Impact of inflow events (historical events only)	150	162	164	171
Impact of all inflow events (inc. 100-year event)	213	221	223	226

3.3.4 Summary of Duration Analysis

In summary, for fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on duration of inundation, especially in the City of Miami. Compared to starting elevations within GRDA's anticipated operational range, only natural inflows—and not Project operation—caused an appreciable difference in duration of inundation. In Miami, the impact of nature ranged from over 20 to over 200 times the maximum simulated impact of GRDA's anticipated operations.

Even the combination of (1) USACE failing to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam and (2) extreme, hypothetical starting elevations at Pensacola Dam outside GRDA's anticipated operational range cannot exceed the maximum impact of nature. Rather, in Miami, the impact of nature ranged from 2 to over 200 times the impact of the most extreme conditions conceivable.

3.4 Summary of Quantified Impacts in Miami

To compile and summarize the quantified results presented in **Sections 3.1.3**, **3.2.3**, and **3.3.3**, two tables are presented. For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam:

1. **Table 13** presents the impact of nature as a range of multiples of the simulated impact of GRDA's anticipated operational range.
2. **Table 14** presents the impact of nature as a range of multiples of the simulated impact of an extreme, hypothetical starting stage range of 23 feet.

The compiled and summarized quantifications support the conclusions presented in **Sections 3.1.4**, **3.2.4**, and **3.3.4**. For fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream WSELs, inundation, and duration for a range of flow events, especially in the City of Miami. Even the combination of (1) USACE failing to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam and (2) extreme, hypothetical starting elevations at Pensacola Dam outside GRDA's anticipated operational range cannot exceed the maximum impact of nature.

Table 13. Summary of quantified impacts in Miami, OK for starting elevations within GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.	
Parameter	Impact of Nature, as a Multiple of the Simulated Impact of GRDA's Anticipated Operational Range
Maximum Water Surface Elevation	19 to 2,652 times greater
Maximum Inundation Area	5 to 7,847 times greater
Duration of Inundation	23 to 226 times greater

Table 14. Summary of quantified impacts in Miami, OK for all starting elevations, including extreme, hypothetical values outside GRDA's anticipated operational range.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.	
Parameter	Impact of Nature, as a Multiple of the Simulated Impact of All Starting Elevations, Including Extreme, Hypothetical Values Outside GRDA's Anticipated Operational Range
Maximum Water Surface Elevation	2.3 to 292 times greater
Maximum Inundation Area	1.3 to 908 times greater
Duration of Inundation	2.1 to 226 times greater

3.5 Graphical Results

To visualize the simulated results of fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, **Figure 4** through **Figure 17** display maximum WSEL profiles[1] and maximum inundation extents[2] in the City of Miami, OK.

The figures show how, even for fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the magnitude of the incoming flow event is far and away the primary determining factor of maximum WSEL and maximum inundation extent upstream of Pensacola Dam. For the various inflow events, modifying the starting elevation at Pensacola Dam within GRDA's anticipated operational range (742 to 745 feet PD, a range of 3 feet) resulted in little difference in maximum WSEL and little difference in maximum inundation extent. The maximum WSEL differences due to a change in starting elevation at Pensacola Dam within GRDA's anticipated operational range are orders of magnitude smaller than the maximum WSEL differences that can be caused by nature. Even if the operational range were expanded to the extreme, hypothetical stages analyzed in accordance with FERC staff's February 24, 2022 Determination, nature is the outsized and controlling factor. For an extreme 23-foot range in starting elevation at Pensacola Dam (734 to 757 feet PD, with a maximum starting elevation equal to the top of the dam), the differences are still far less than the differences caused by nature. The differences in maximum WSEL and maximum inundation extent caused by nature are twice or more than simulated differences for a 23-foot change in starting elevation at Pensacola Dam.

To show this more explicitly, **Figure 18** through **Figure 25** display maximum WSEL profiles and maximum inundation extents for simulations that used various natural inflow events and a single starting elevation at Pensacola Dam. The figures display results for the following starting elevations:

1. 734 feet PD, the lowest extreme, hypothetical starting stage FERC recommended simulating,
2. 742 feet PD, the lowest elevation of GRDA's anticipated operational range,
3. 745 feet PD, the highest elevation of GRDA's anticipated operational range, and
4. 757 feet PD, the highest extreme, hypothetical starting stage FERC recommended simulating and the elevation of the top of the dam.

These figures show that for the same starting elevation at Pensacola Dam, there are large differences in maximum WSEL and maximum inundation extent due to the magnitude of the incoming natural inflow event. Even for fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the magnitude of the natural inflow event is the primary determining factor of maximum WSEL and maximum inundation extent.

[1] A full set of maximum WSEL profiles is presented in Appendix C.

[2] As discussed in the introduction of **Section 3**, new maps that cover the entire study area were not created because the minimal differences in inundation extent between (1) the fictional simulations discussed herein, in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam and (2) the USR simulations cannot be effectively displayed on an inundation map. Therefore, a new set of maps would show virtually the same inundation extents as the maps included in GRDA's USR. The maps presented in this section show that, even for fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream inundation.

A final comparison is presented to show how the magnitude of the natural inflow event is the primary determining factor of maximum WSEL, as opposed to the starting elevation at Pensacola Dam. **Figure 26** displays four plots of maximum difference in peak WSEL:

1. Maximum difference due to changes in starting elevation at Pensacola Dam within GRDA's anticipated operational range (742 to 745 feet PD).
2. Maximum difference due to changes in starting elevation at Pensacola Dam for extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.
3. Maximum difference in WSEL due to the magnitude of the historical inflow events (does not include synthetic, 100-year event).
4. Maximum difference in WSEL due to the magnitude of the inflow event (1-year to 100-year).

Figure 26 shows the following, for fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam:

1. The magnitude of the natural inflow event is the primary determining factor of maximum WSEL.
2. Starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream WSELs.
3. Even if extreme, hypothetical values of starting elevations at Pensacola Dam outside GRDA's anticipated operational range are used, the impact of nature is much greater than that of a 23-foot change in starting elevation.

The figure is a stark representation of the results previously presented in this section. In summary, for fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam, the quantified analysis resulted in the same conclusion presented in GRDA's USR: starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream WSELs, inundation, and duration, especially in the City of Miami. Compared to starting elevations within GRDA's anticipated operational range, only natural inflows—and not Project operation—caused an appreciable difference in maximum WSEL, maximum inundation extent, or duration. In the City of Miami, the impact of nature ranged from 5 or 20 to over 7,000 times the maximum simulated impact of GRDA's anticipated operations.

Even the combination of (1) USACE failing to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam and (2) extreme, hypothetical starting elevations at Pensacola Dam outside GRDA's anticipated operational range cannot exceed the maximum impact of nature. Rather, in Miami, the impact of nature ranged from 1.3 to over 900 times the impact of the most extreme conditions conceivable.

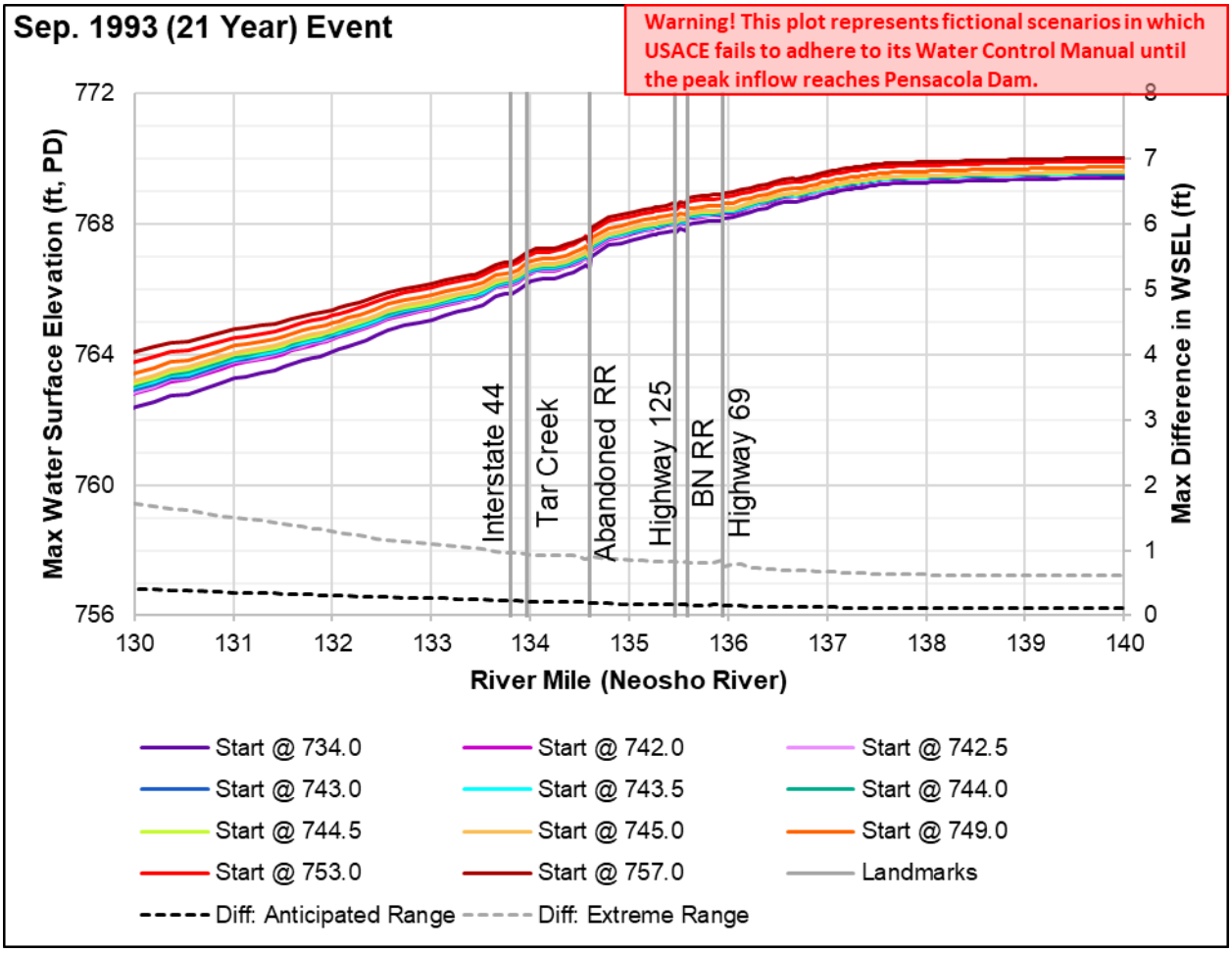


Figure 4. Maximum WSELs near Miami, OK for the September 1993 (21 year) event.

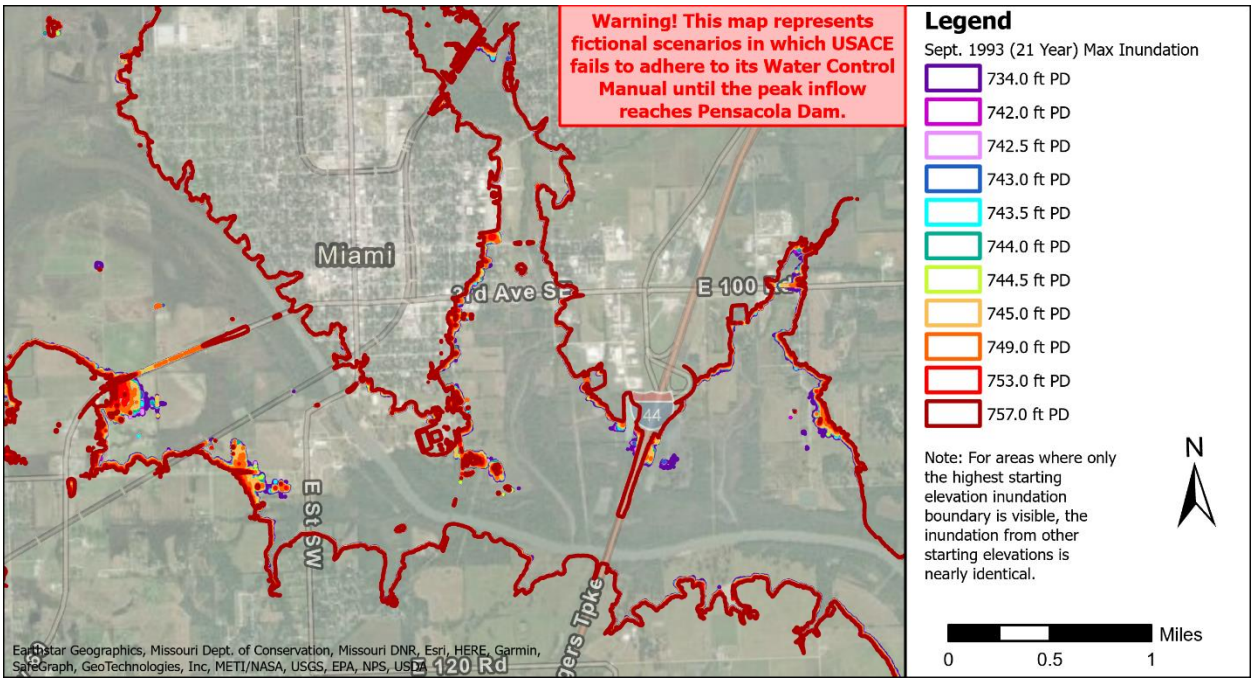


Figure 5. Maximum inundation extents near Miami, OK for the September 1993 (21 year) event.

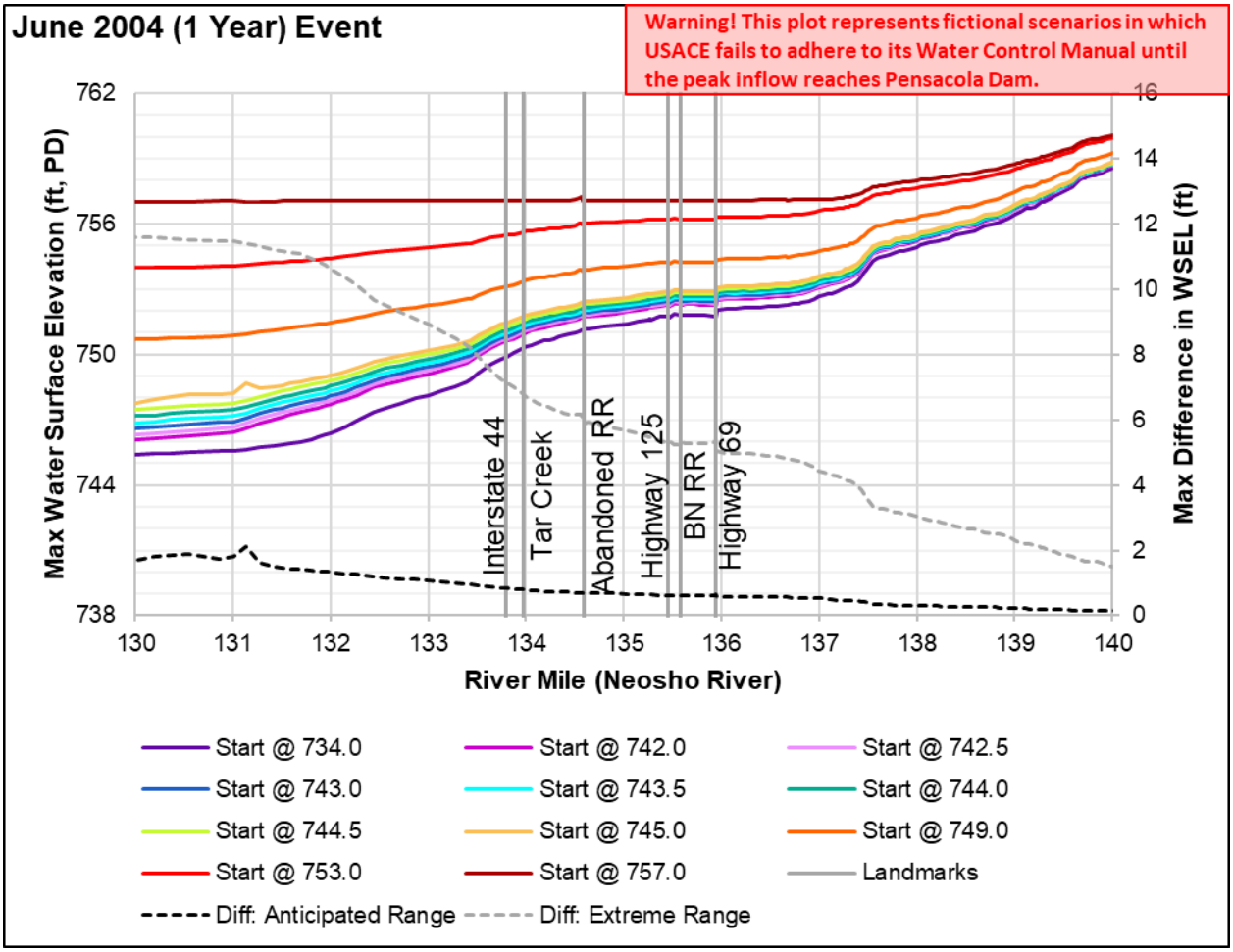


Figure 6. Maximum WSELs near Miami, OK for the June 2004 (1 year) event.

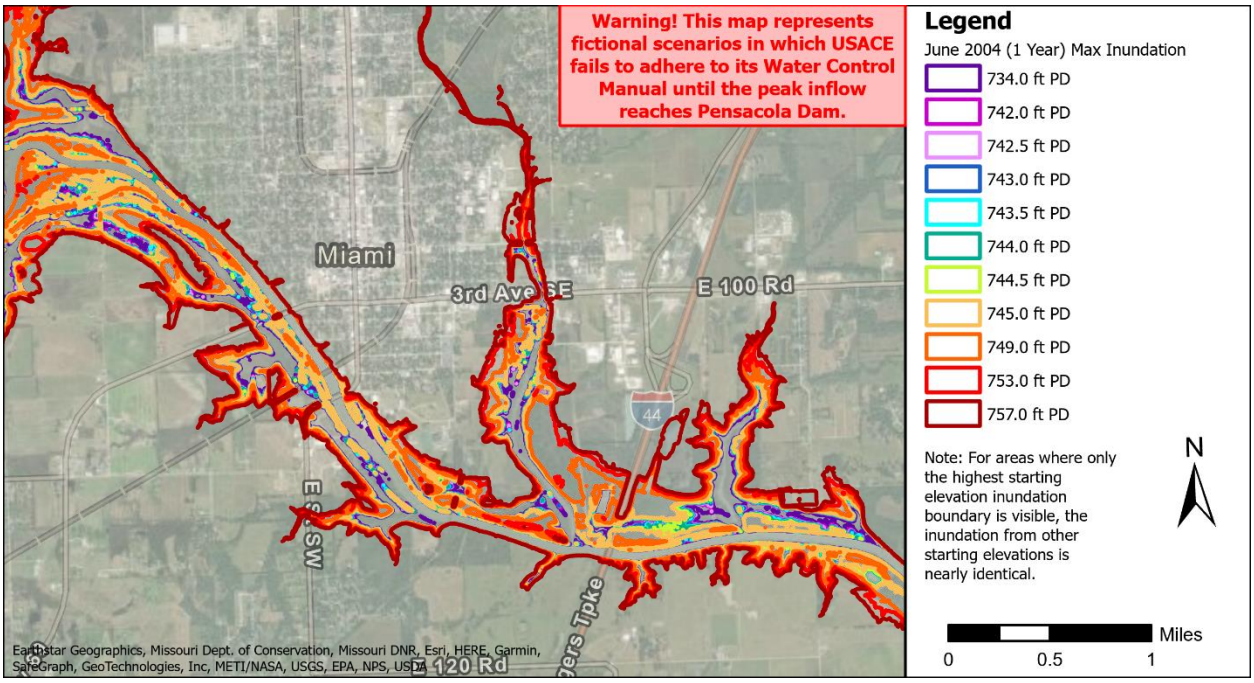


Figure 7. Maximum inundation extents near Miami, OK for the June 2004 (1 year) event.

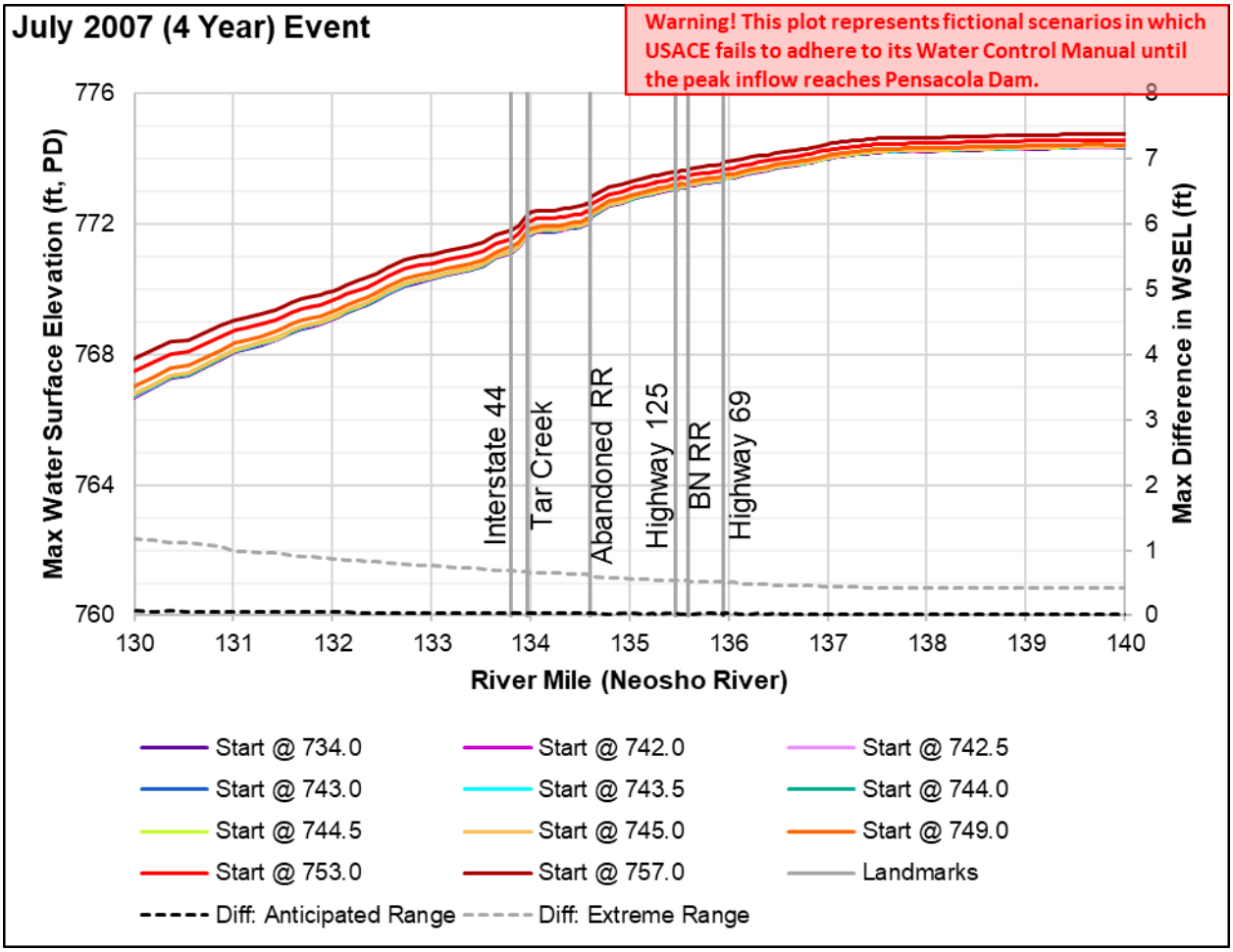


Figure 8. Maximum WSELs near Miami, OK for the July 2007 (4 year) event.

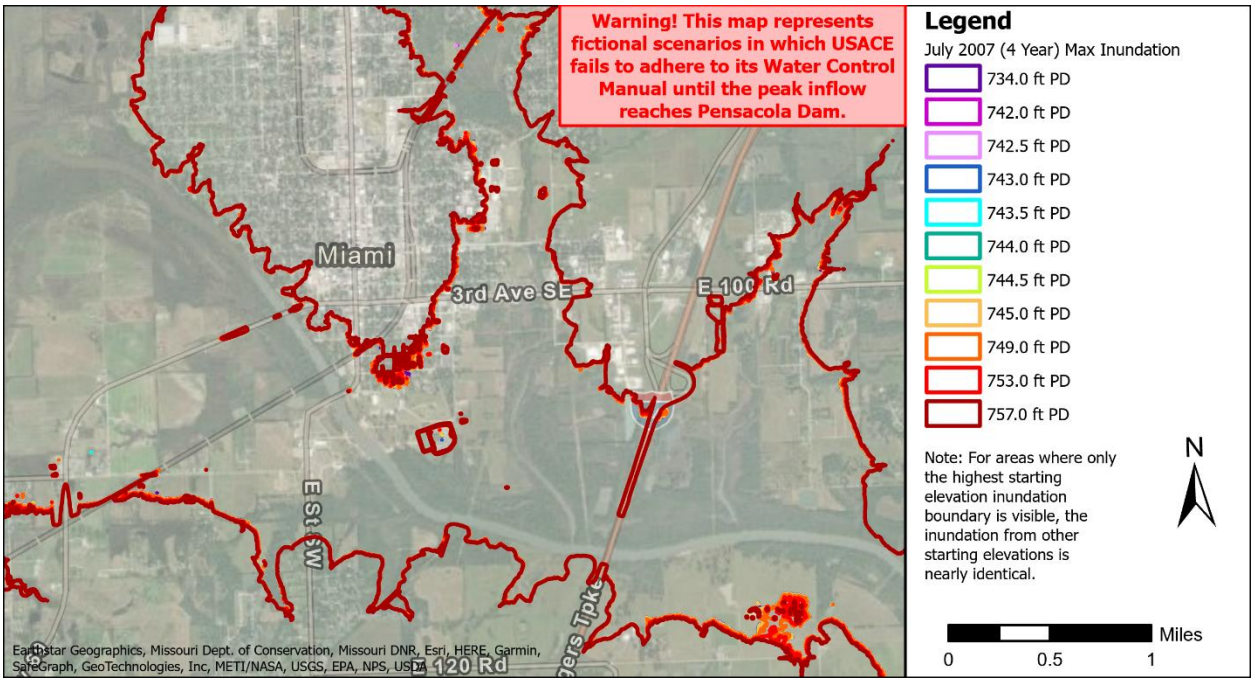


Figure 9. Maximum inundation extents near Miami, OK for the July 2007 (4 year) event.

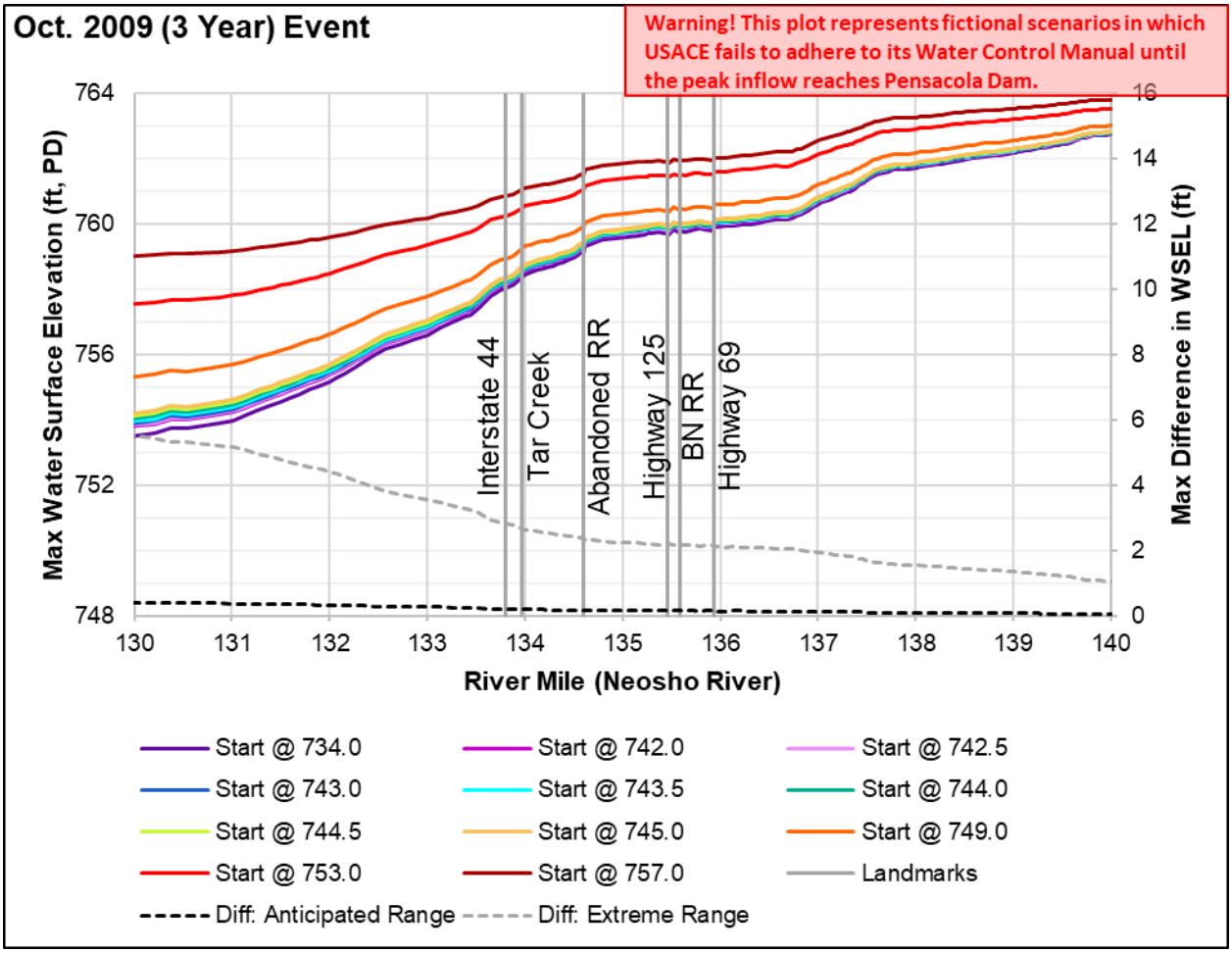


Figure 10. Maximum WSELs near Miami, OK for the October 2009 (3 year) event.

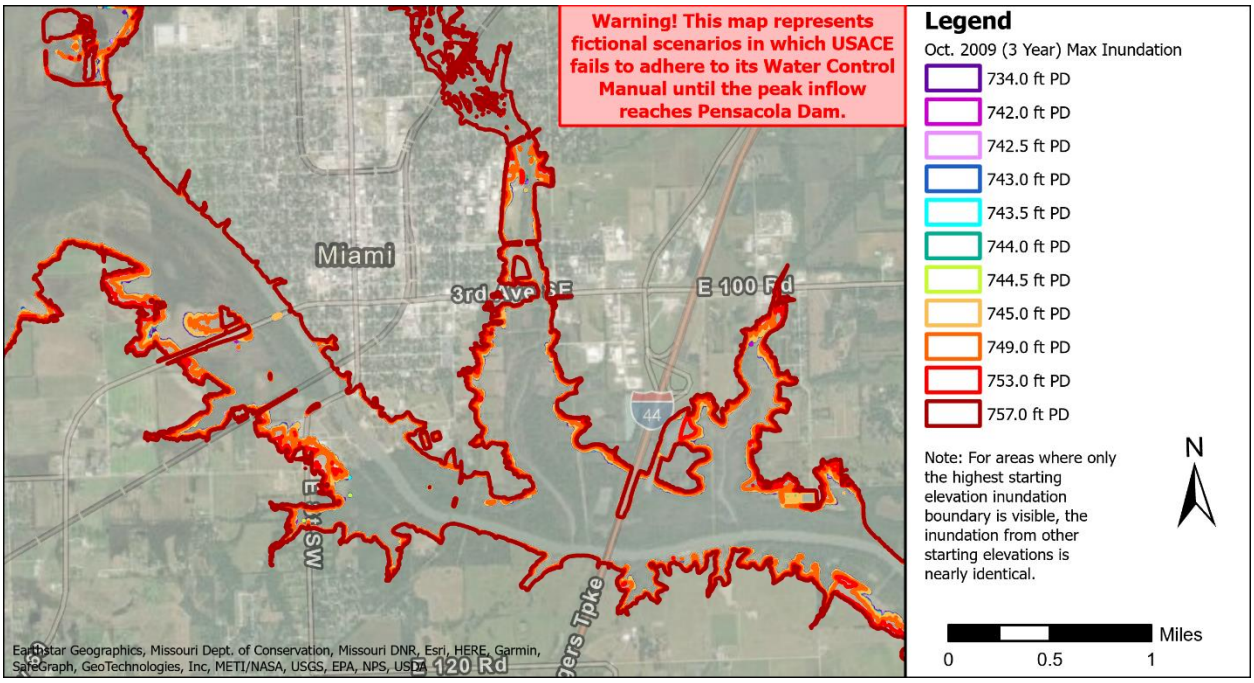


Figure 11. Maximum inundation extents near Miami, OK for the October 2009 (3 year) event.

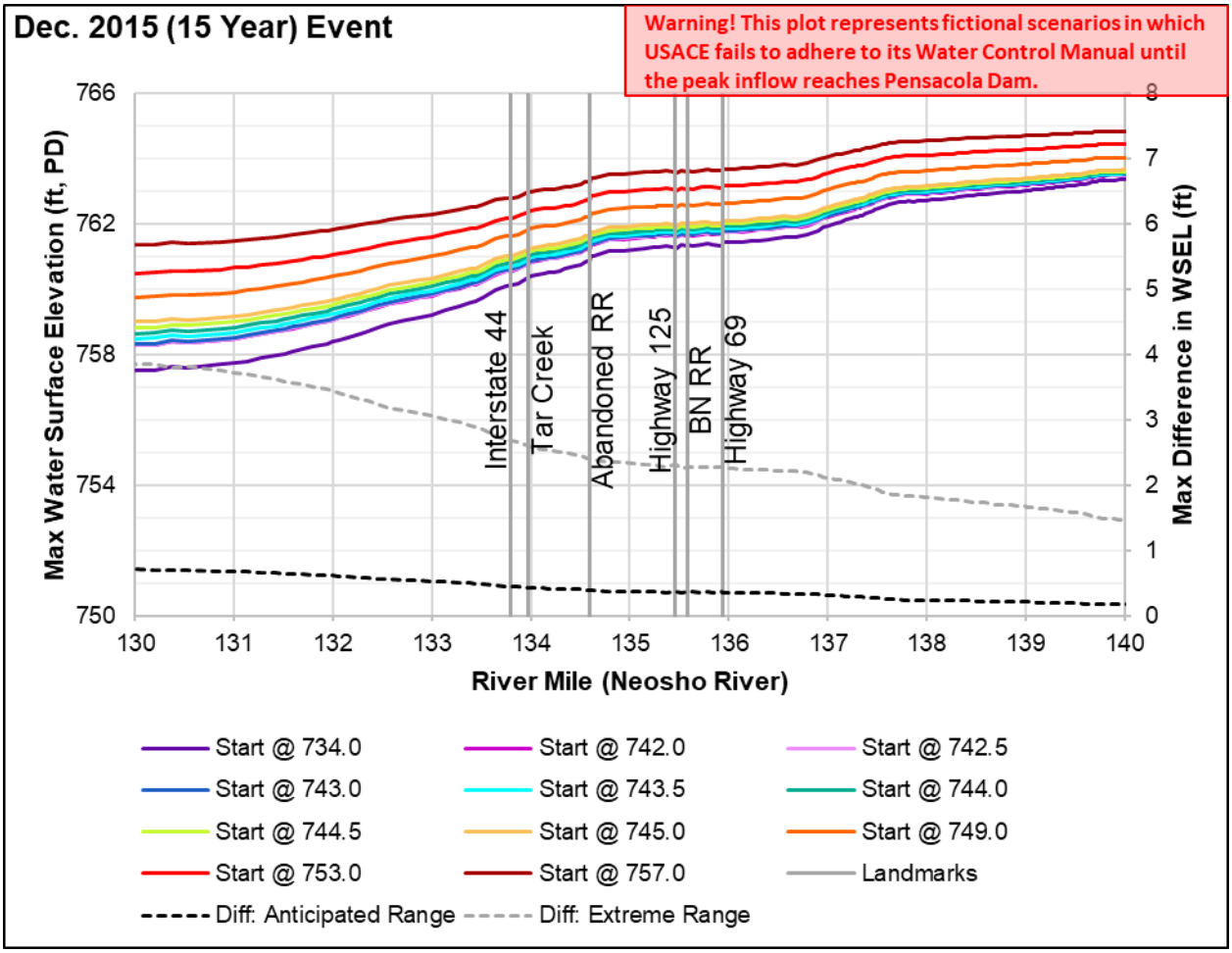


Figure 12. Maximum WSELs near Miami, OK for the December 2015 (15 year) event.

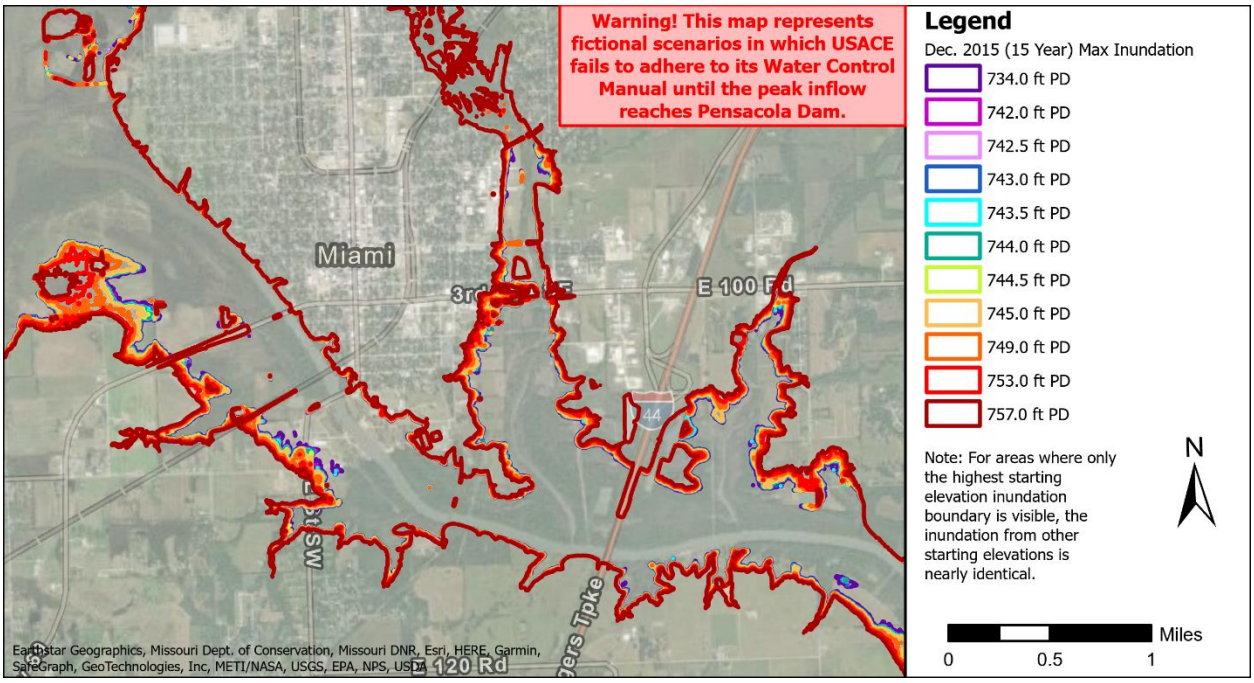


Figure 13. Maximum inundation extents near Miami, OK for the December 2015 (15 year) event.

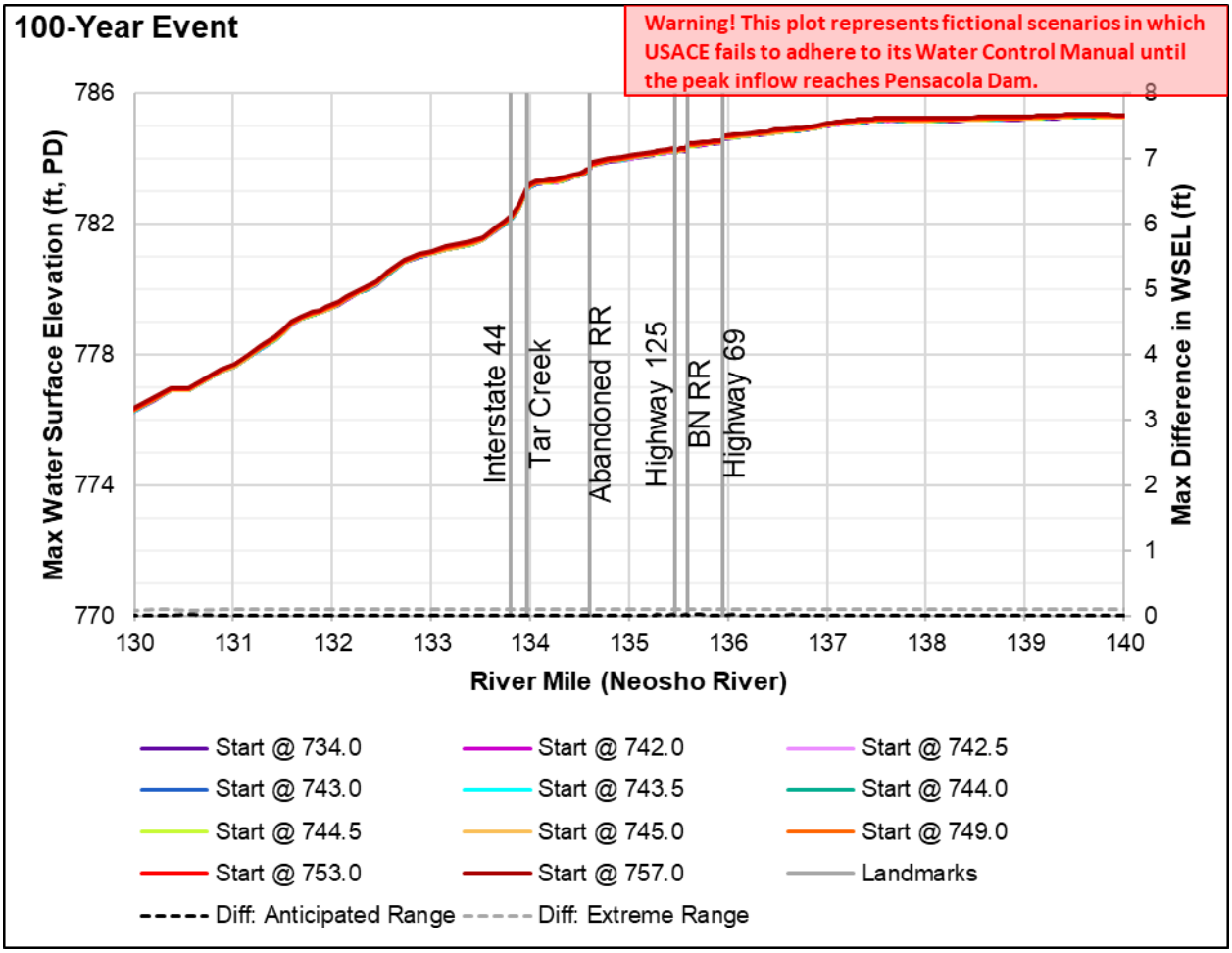


Figure 14. Maximum WSELs near Miami, OK for the 100-year event.

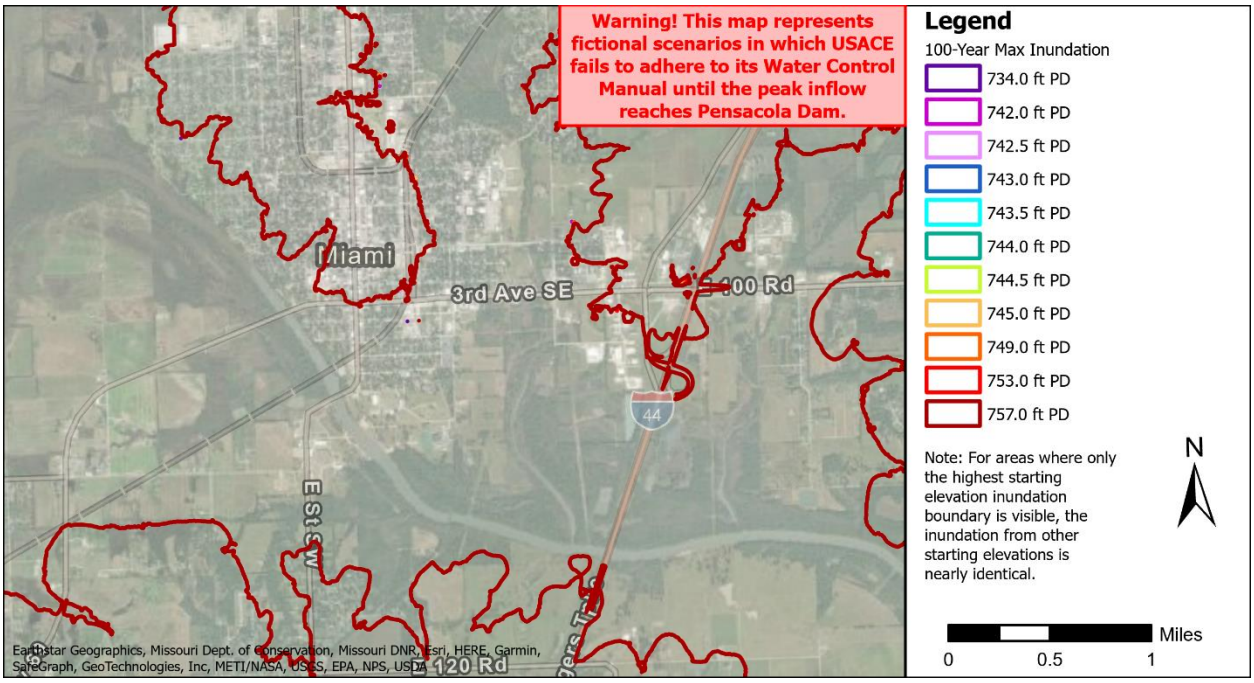


Figure 15. Maximum inundation extents near Miami, OK for the 100-year event.

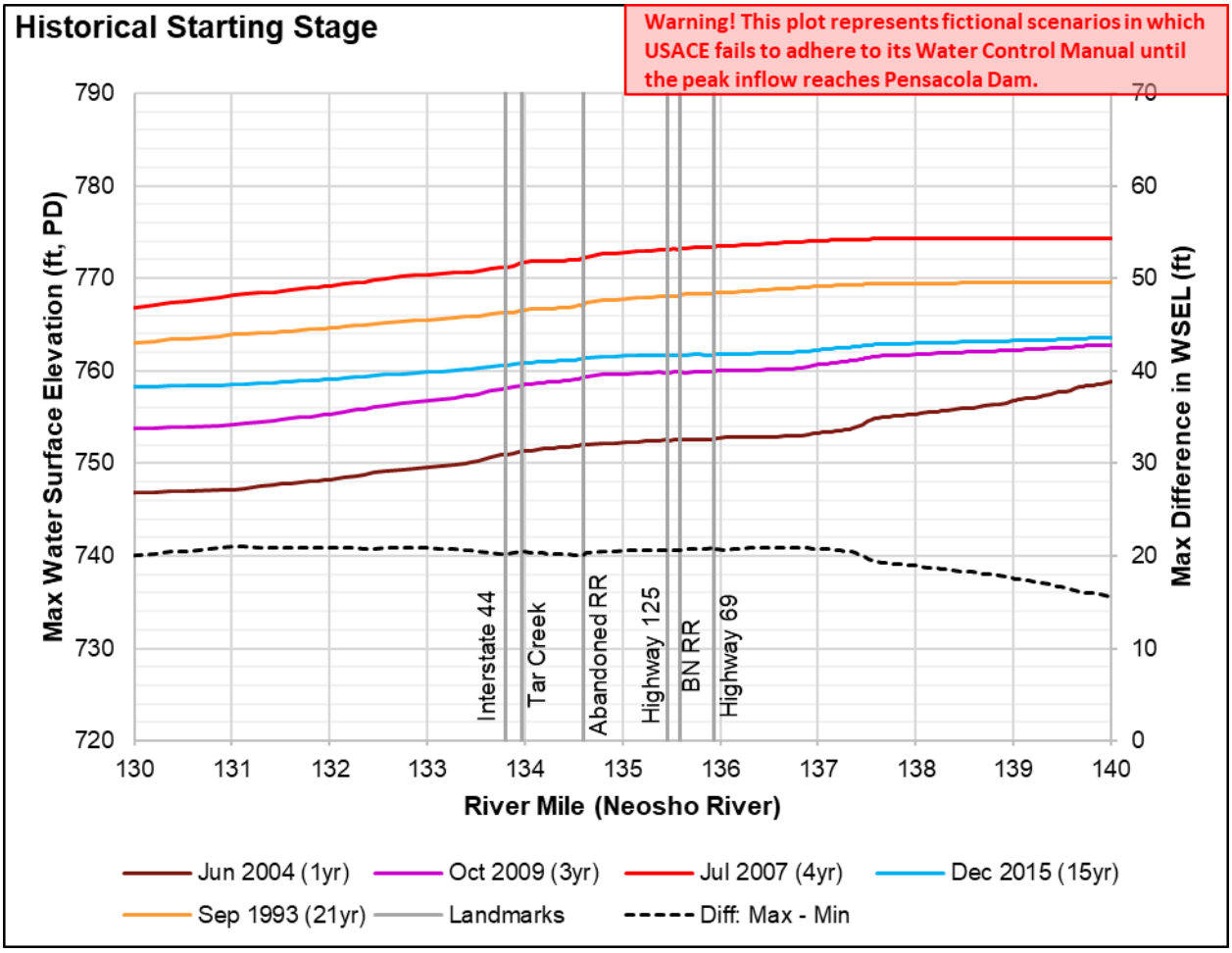


Figure 16. Maximum WSELs near Miami, OK for simulations with historical starting stages.

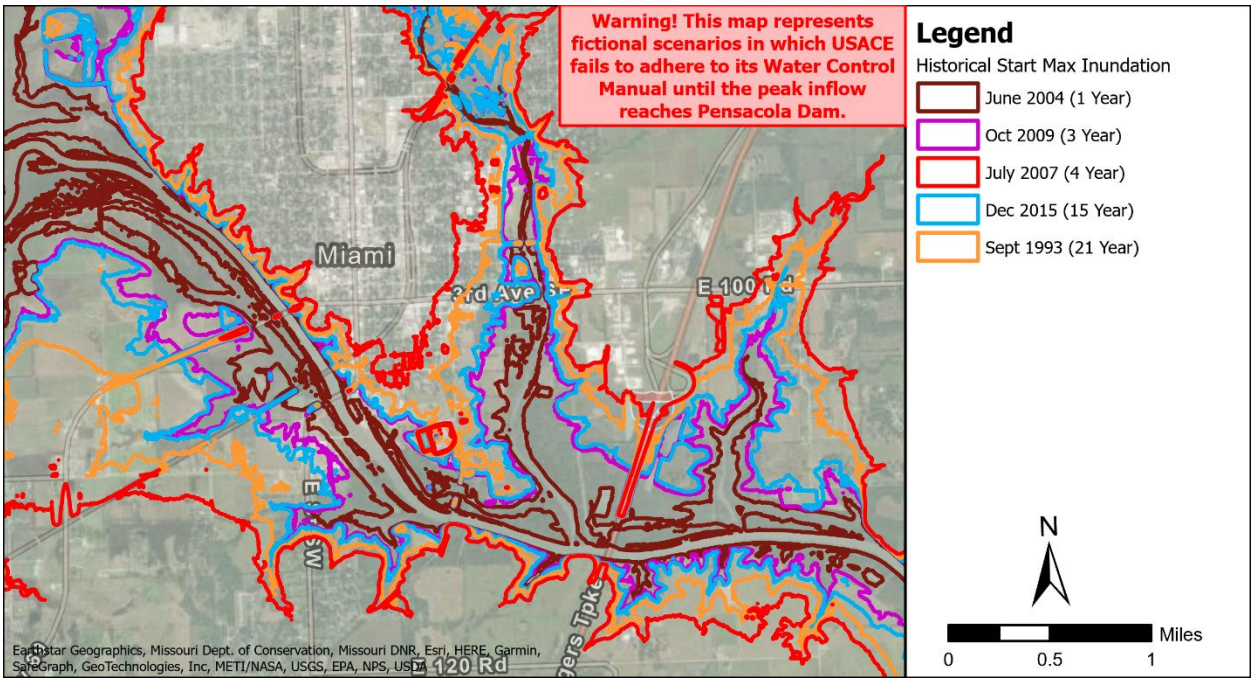


Figure 17. Maximum inundation extents near Miami, OK for simulations with historical starting stages.

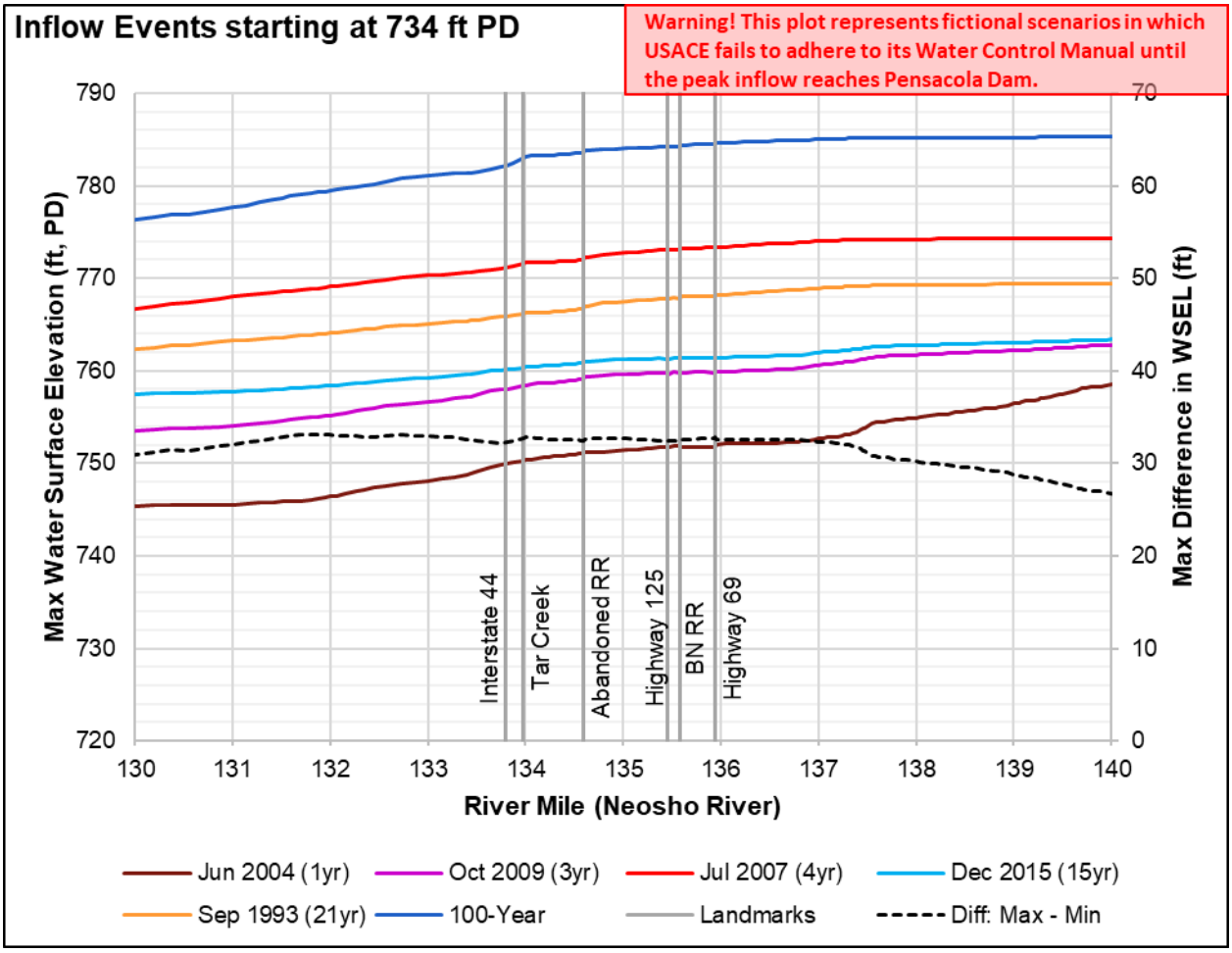


Figure 18. Maximum WSELs near Miami, OK for various natural inflow events, using a starting elevation of 734 feet.

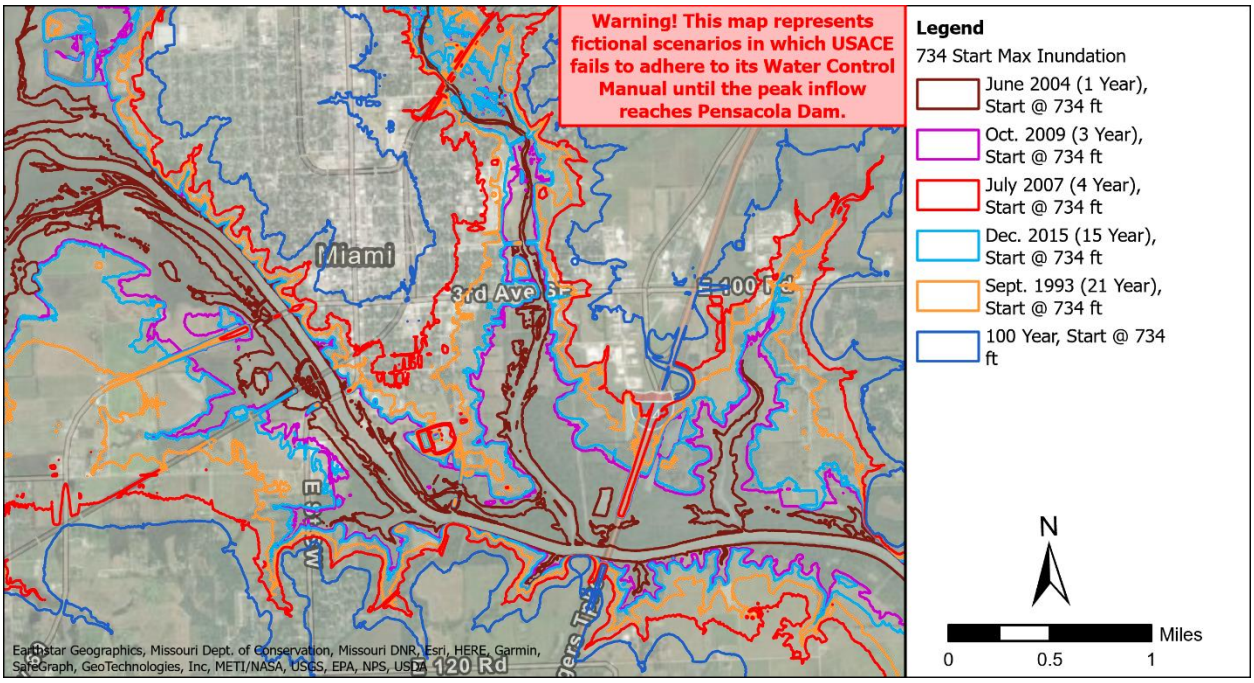


Figure 19. Maximum inundation extents near Miami, OK for various natural inflow events, using a starting elevation of 734 feet.

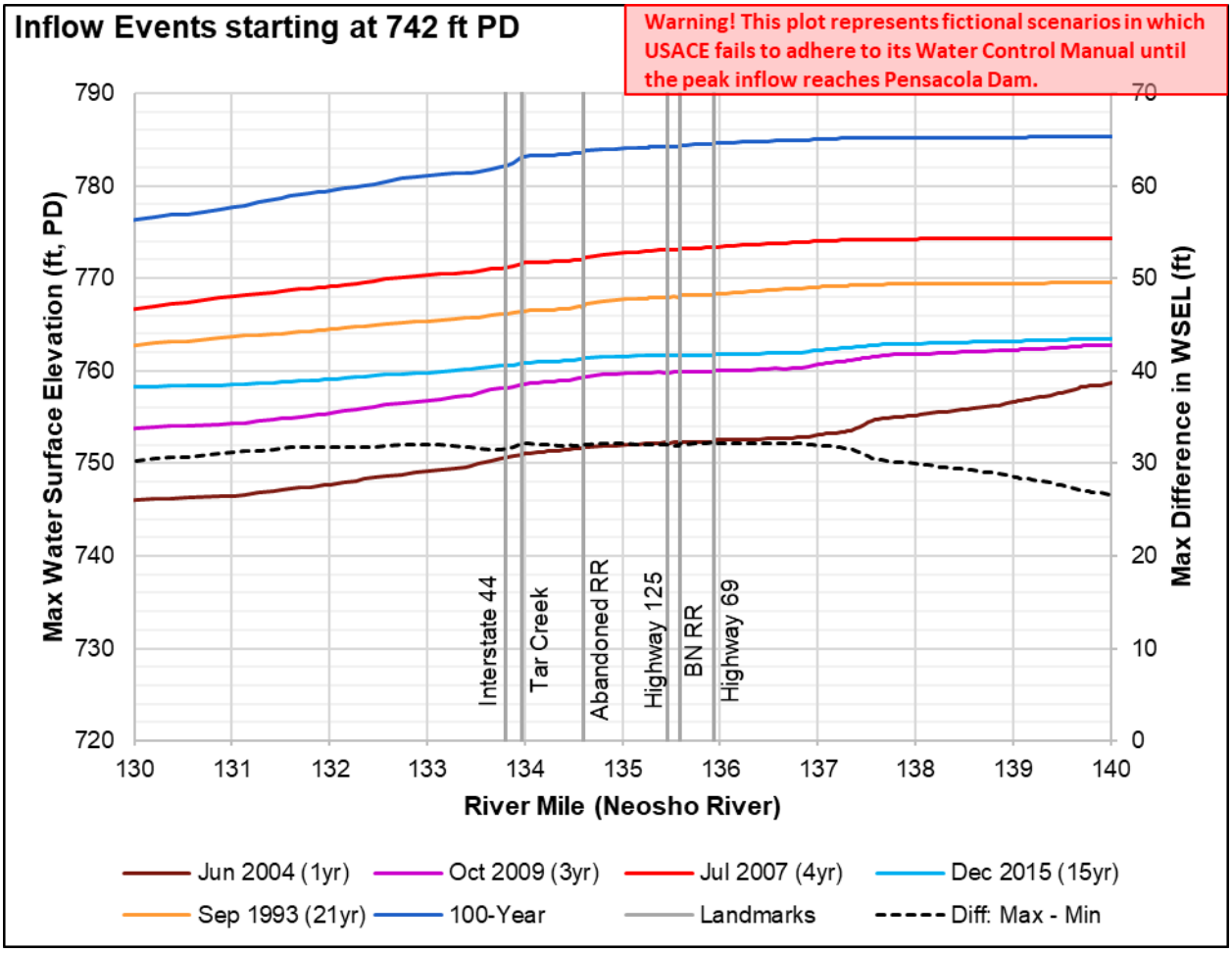


Figure 20. Maximum WSELs near Miami, OK for various natural inflow events, using a starting elevation of 742 feet.

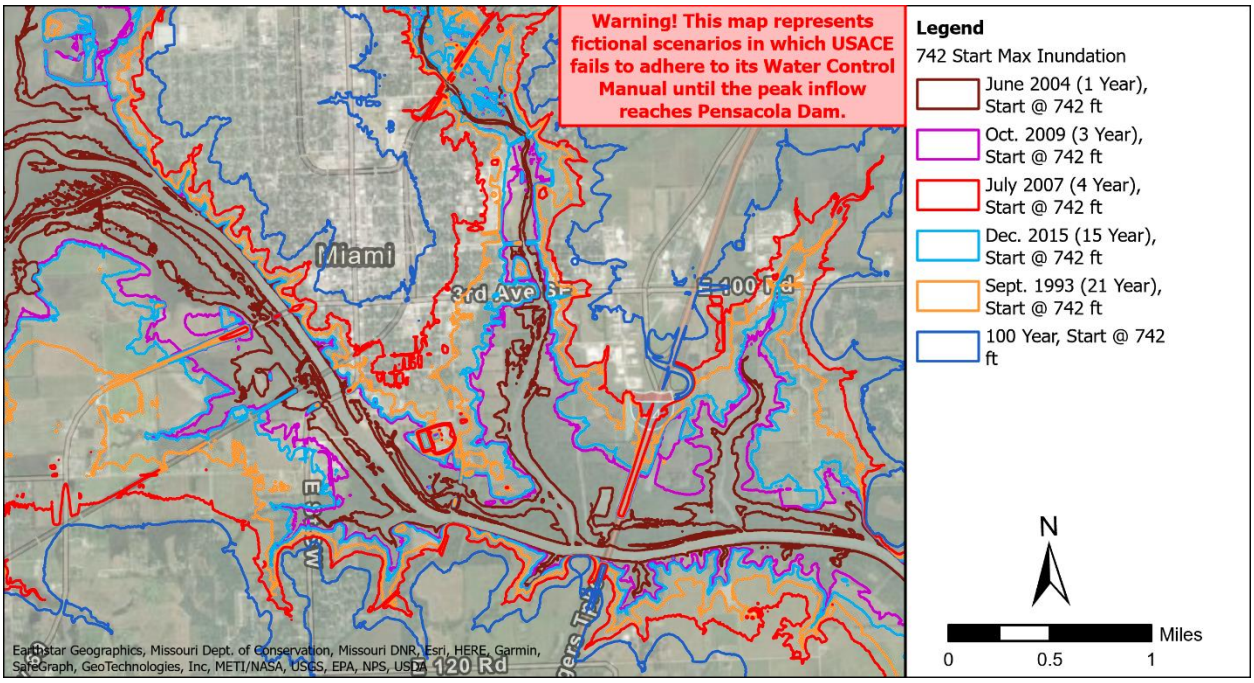


Figure 21. Maximum inundation extents near Miami, OK for various natural inflow events, using a starting elevation of 742 feet.

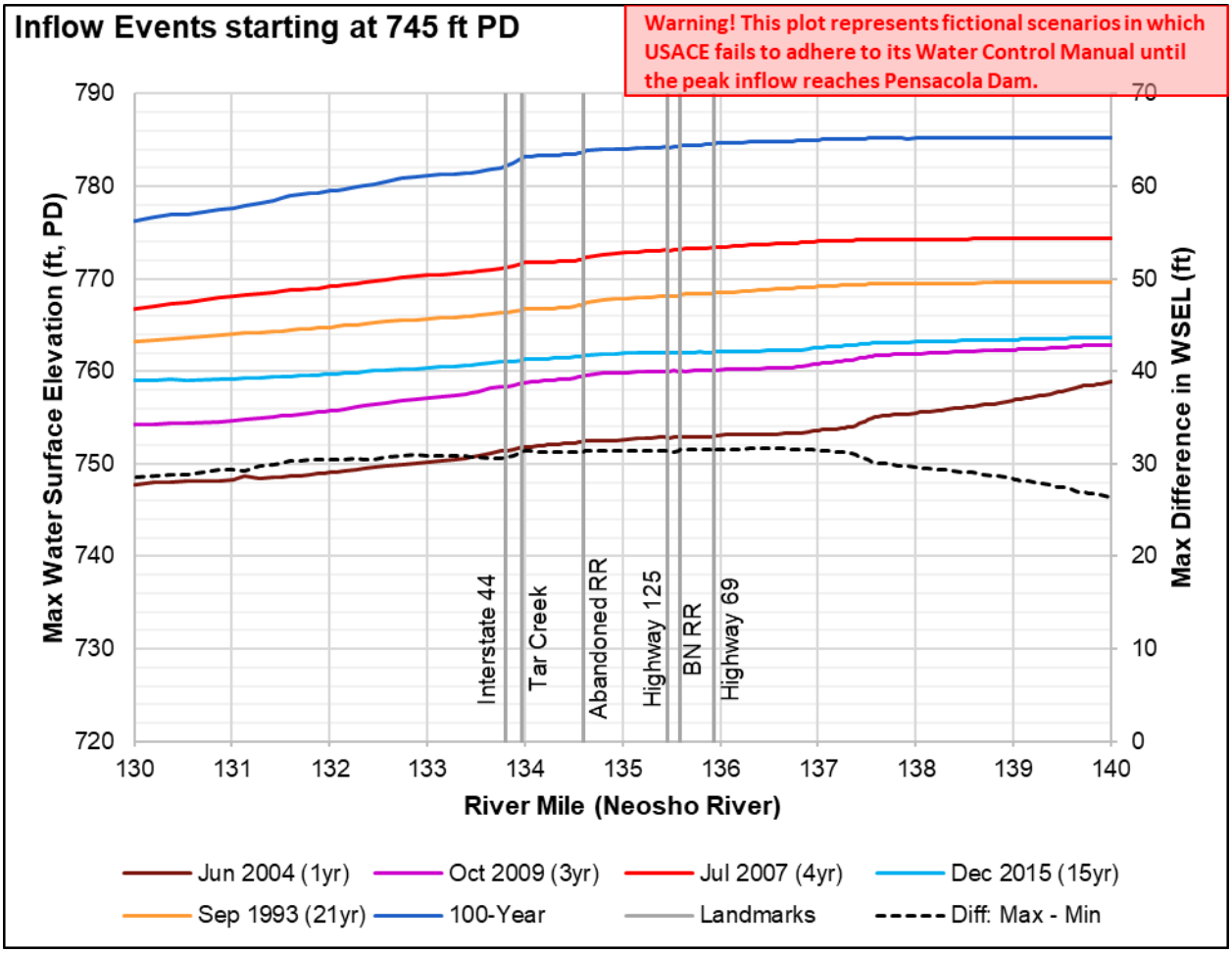


Figure 22. Maximum WSELs near Miami, OK for various natural inflow events, using a starting elevation of 745 feet.

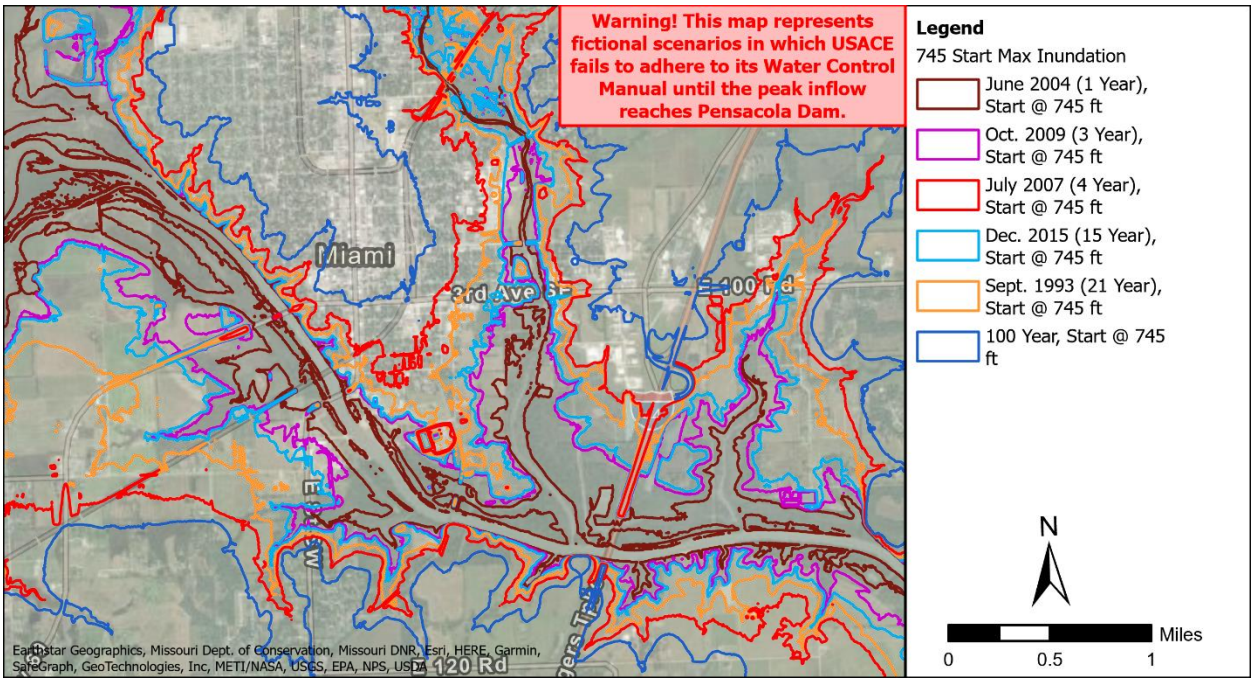


Figure 23. Maximum inundation extents near Miami, OK for various natural inflow events, using a starting elevation of 745 feet.

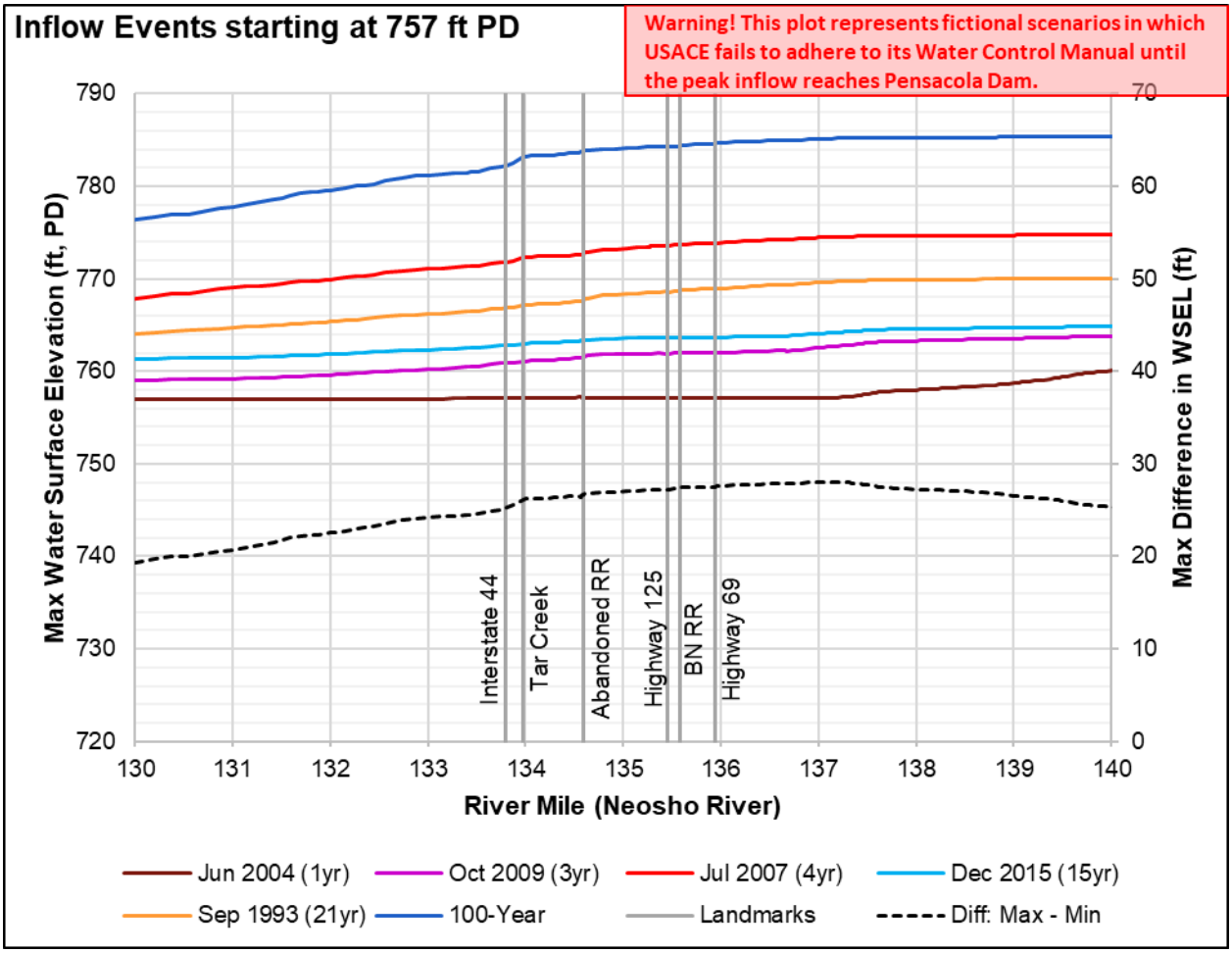


Figure 24. Maximum WSELs near Miami, OK for various natural inflow events, using a starting elevation of 757 feet.

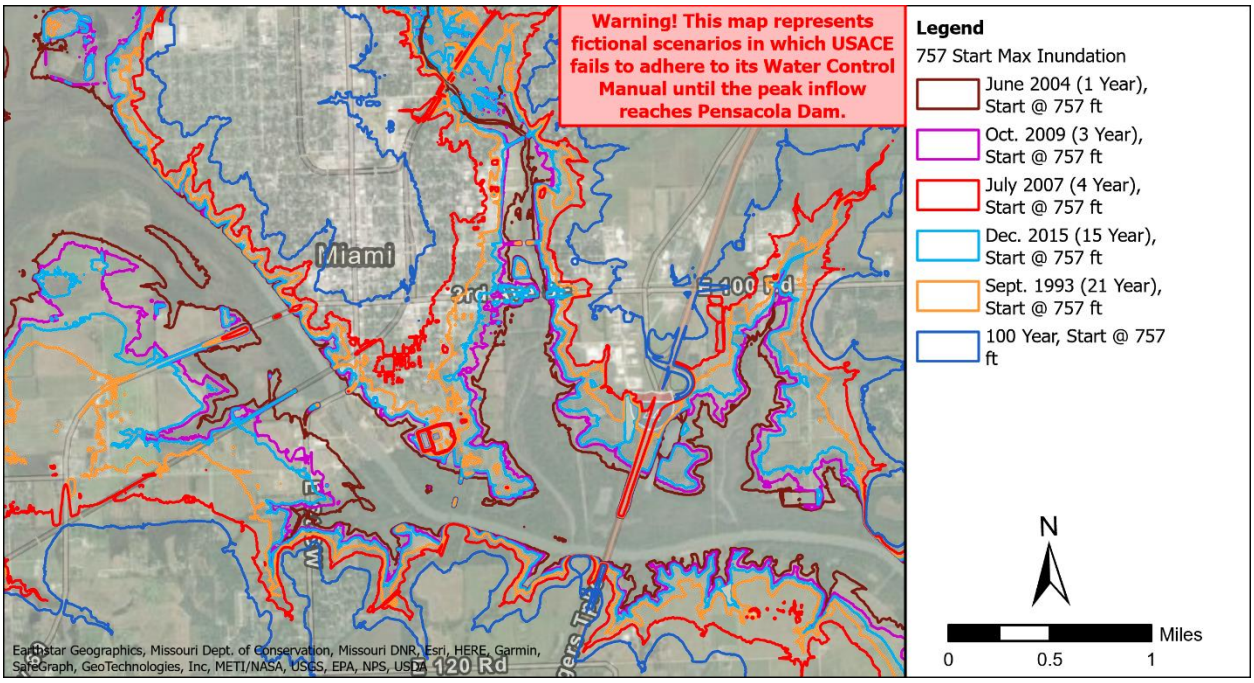


Figure 25. Maximum inundation extents near Miami, OK for natural various inflow events, using a starting elevation of 757 feet.

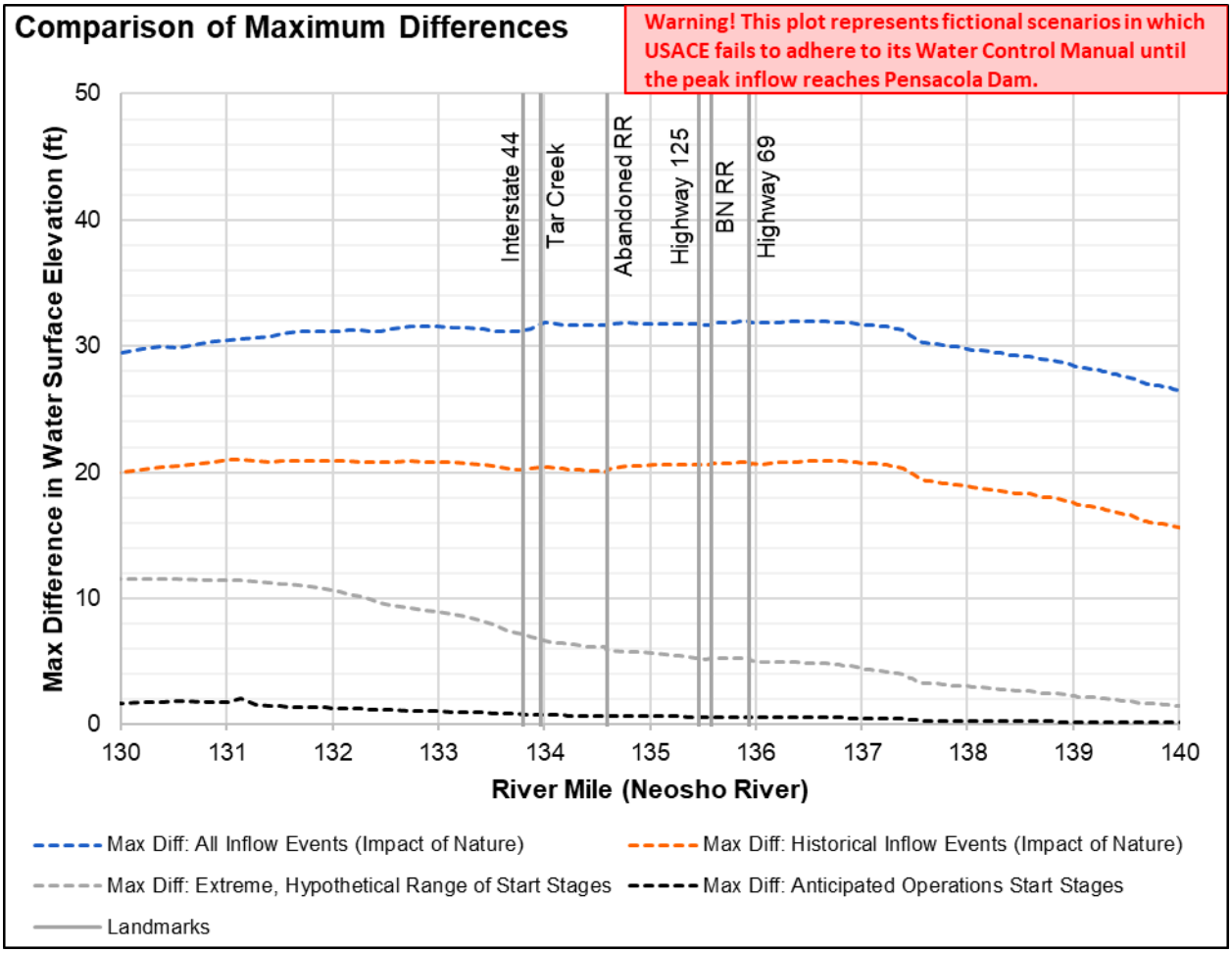


Figure 26. Comparison of maximum WSEL differences near Miami, OK.

4. Tar Creek Confluence in 1D UHM

As discussed in **Section 1.5.2**, FERC's March 14, 2023 Determination recommended modification to the downstream boundary condition for Tar Creek at the Neosho River confluence in GRDA's 1D UHM. Specifically, FERC recommended:

> *That GRDA revise the downstream boundary condition for Tar Creek at the Neosho River confluence to reflect a flatter friction slope (if normal depth is used) or use a different downstream boundary condition, as appropriate.*

GRDA fulfilled the requirements of FERC's March 14, 2023 Determination by modifying the downstream boundary condition of Tar Creek at the Neosho River confluence. After testing various friction slopes ranging from 0.00001 ft/ft to 0.003 ft/ft, the downstream boundary condition of Tar Creek was set to a friction slope of 0.000067 ft/ft. This boundary condition resulted in virtually identical peak WSELs on Tar Creek and the Neosho River at the confluence. An example of the hydrographs at the confluence is displayed in **Figure 27**. As the figure shows, the revised Tar Creek stage hydrograph is virtually identical to the Neosho River stage hydrograph for a majority of the simulation. The stage hydrographs do not match each other at the start of the simulation because both Tar Creek and the Neosho River are within their banks during the initial portion of the simulation. The stage hydrographs should not and do not match each other for this initial portion of the simulation. The Tar Creek stage hydrograph from the USR simulation is

also displayed in the figure to show how the confluence has been improved, fulfilling the requirements of FERC's March 14, 2023 Determination.

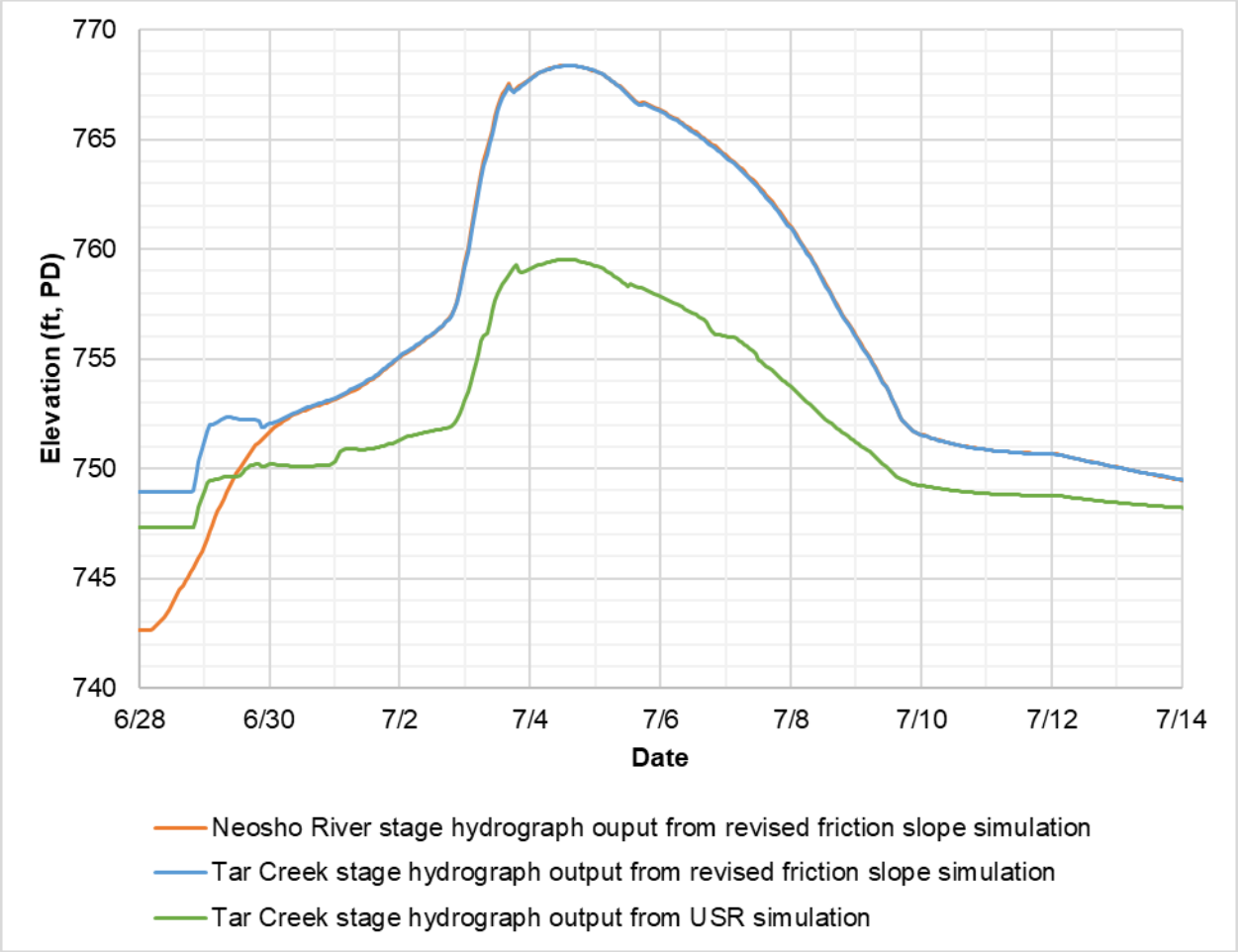


Figure 27. Comparison of revised Tar Creek stage hydrographs to the Tar Creek stage hydrograph from USR.

As discussed in the updated Sedimentation Study report, filed concurrently with this report, the downstream boundary condition for Tar Creek was set to a stage hydrograph in the STM. For consistency between the STM and the 1D UHM, the downstream boundary condition for Tar Creek was also set to a stage hydrograph in the 1D UHM. The boundary stage hydrograph was calculated by selecting the maximum of (1) the Tar Creek stage hydrograph and (2) the Neosho River stage hydrograph, both of which were output from the revised friction slope simulation. As discussed above, when the revised friction slope was used in the 1D UHM, the stage hydrographs for Tar Creek and the Neosho River were already virtually identical for out of bank flow. The Tar Creek stage hydrograph was higher than the Neosho River stage hydrograph when flows were within the banks during the initial portion of the simulation. Therefore, this modification to the type of downstream boundary condition used did not result in any change to simulation results in the 1D UHM. To reiterate, the change was made for consistency between the STM and the 1D UHM. **Figure 28** shows how the output stage hydrograph from the friction slope simulation is identical to the output stage hydrograph used in the final 1D UHM simulation, where a stage hydrograph boundary condition is used.

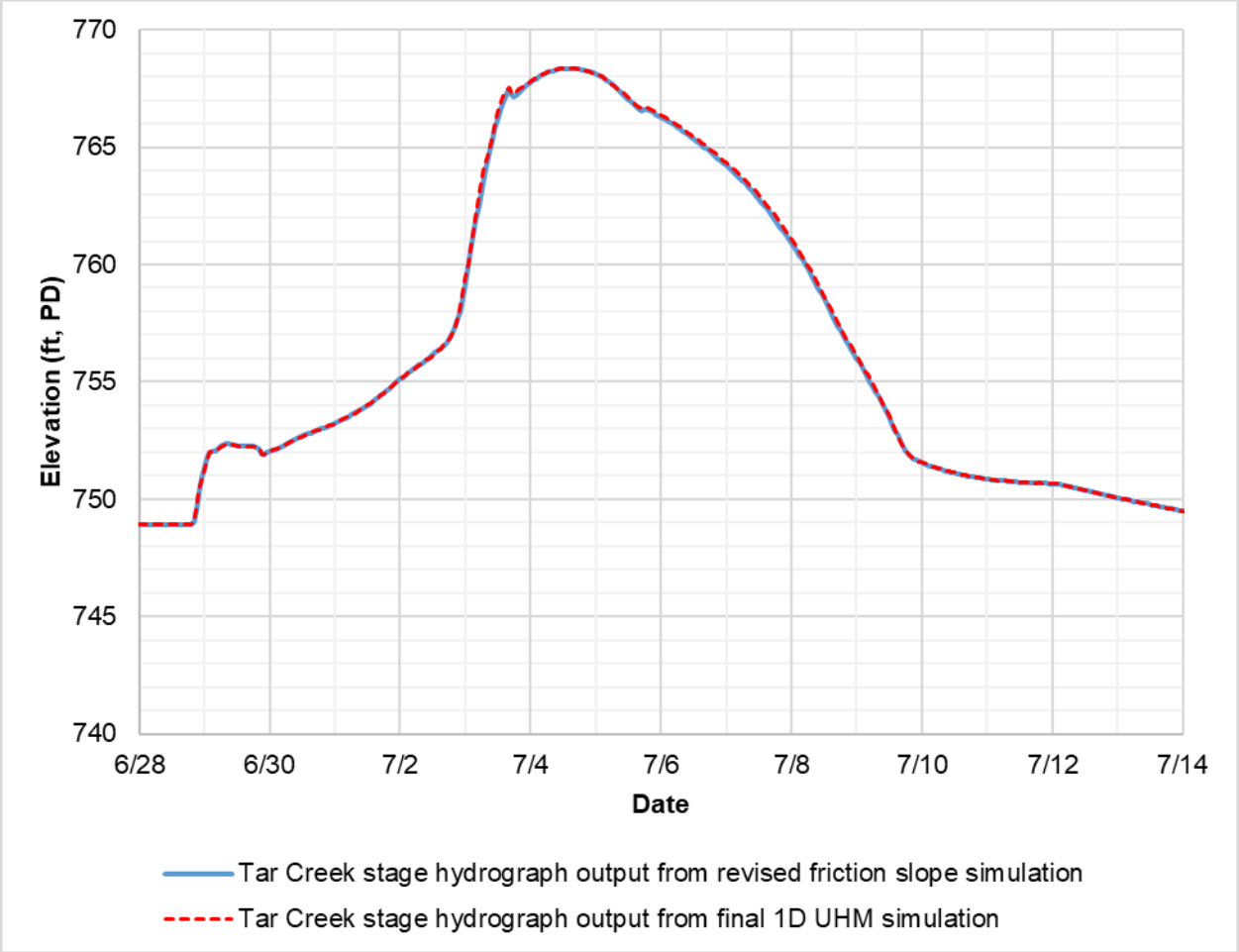


Figure 28. Comparison of Tar Creek WSEL using friction slope and using stage hydrograph.

As discussed in **Section 1.5.2**, FERC's March 14, 2023 Determination also recommended that GRDA:

> *Re-run the Sediment Transport Model and revise the portions of the sedimentation study where the results differ significantly from those reported in September 2022.*

Revisions to the STM are discussed in the updated Sedimentation Study report, filed concurrently with this report.

5. Summary and Conclusions

On March 14, 2023, FERC staff issued a Determination for the Project in regard to GRDA's USR. FERC staff recommended the following:

1. Develop new simulations that hold the initial elevation at Pensacola Dam "steady until the arrival of flood flows."
2. Revise the downstream boundary condition for Tar Creek in GRDA's 1D UHM, re-run the STM, and "revise the portions of the sedimentation study where the results differ significantly from those reported in September 2022."

GRDA has fulfilled the requirements of FERC's Determination. As **Section 4** describes, GRDA updated the 1D UHM. Revisions to the STM are discussed in the updated Sedimentation Study report, filed

concurrently with this report. GRDA also developed new simulations that hold the initial elevation at Pensacola Dam "steady until the arrival of flood flows." The conclusions regarding those simulations are discussed below.

The quantified results presented in GRDA's USR demonstrated that starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream WSELs, inundation, and duration for a range of inflow events. As stated in GRDA's USR:

> *Compared to starting elevations within GRDA's anticipated operational range, only natural inflows—and not Project operation—caused an appreciable difference in maximum WSEL, maximum inundation extent, or duration. The differences in WSEL, inundation extent, and duration due to the size of the natural inflow event were orders of magnitude greater than the differences in WSEL, inundation extent, and duration due to the initial stage at Pensacola Dam. The maximum impact of nature typically ranged from over 10 times to over 100 or even over 1,000 times the maximum simulated impact of GRDA's anticipated operations.*

The City of Miami disagreed with GRDA's conclusion and claimed that the OM simulated "inappropriate pre-releases." The City's consultant, Tetra Tech, went so far as to badly mischaracterize USACE flood operations—drawing the stage at Pensacola Dam down from a crisis elevation of 757 feet PD—as a "pre-release." The City requested that FERC require GRDA to simulate scenarios where USACE would hold the elevation at Pensacola Dam steady at flood stage while the incoming flood passed the USACE-monitored upstream USGS gages near Commerce and Miami (which are 68 and 58 miles upstream of the dam, respectively) and continue to hold the elevation steady at flood stage until the incoming flood reached Pensacola Dam.

FERC staff found that GRDA's USR simulations were:

> *Consistent with the Corps' standard procedure for flood control as specified in the Corp's Water Control Manual for Pensacola Dam and Reservoir.*

FERC staff also determined that:

> *GRDA's procedure for setting simulation start times "was based on the Corps' recommendation, per the HEC-RAS User's Manual, to start unsteady flow simulations prior to flood wave arrival at the upper boundary of the model. GRDA's model is consistent with this approach.*

Despite these determinations, FERC staff recommended that GRDA conduct "additional model runs for each operation alternative" to accommodate the City's concern, "assuming that the initial starting elevation remains steady until the arrival of flood flows."

GRDA has fulfilled FERC staff's recommendation by simulating fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam. For simulation of an initial elevation at Pensacola Dam of 757 feet PD, limitations of physical reality at Pensacola Dam prevented the starting elevation from remaining steady until the arrival of flood flows.

Even in these fictional scenarios, USACE failing to adhere to its Water Control Manual could not overcome the impact of nature as floods accumulate in the 10,345 square mile watershed upstream of Pensacola Dam (USGS, 2023). This new, quantified analysis resulted in the same conclusion presented in GRDA's USR: starting elevations at Pensacola Dam within GRDA's anticipated operational range have an immaterial impact on upstream WSELs, inundation, and duration of inundation for a range of inflow events. In the City of Miami, the impact of nature ranged from 5 or 20 to over 7,000 times the maximum simulated impact of GRDA's anticipated operations.

Even the combination of (1) USACE failing to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam and (2) extreme, hypothetical starting elevations at Pensacola Dam outside GRDA's anticipated operational range cannot exceed the maximum impact of nature. Rather, in Miami, the impact of nature ranged from 1.3 to over 900 times the impact of the most extreme conditions conceivable.

The fact that USACE failing to adhere to its Water Control Manual could not overcome the impact of nature further solidifies the conclusion of GRDA's USR. GRDA has now simulated scenarios specifically requested by the City of Miami after years of intense scrutiny, peer review, and multiple rounds of public comment. Even in these handpicked scenarios intended to test the limits of GRDA's modeling conclusions, the quantified results show that only natural inflows—and not Project operation—cause an appreciable difference in maximum WSEL, maximum inundation extent, or duration of inundation in the study area.

To put the quantified results in context, photographs of flooding in Miami on June 26, 1928 are presented in **Figure 29**. These photographs were included in Historical Research Associates' *A History of Flooding, Flood Control, and Hydropower on the Neosho (Grand) River*, which was included in Appendix E-10 of GRDA's Final License Application. The bridge in the upper right photograph is the railroad bridge in Miami at RM 134.599. The deck of the railroad bridge is elevated above the flood waters and the span of the bridge exceeds the width of the devastating flood, which "covered large portions of Miami" (Historical Research Associates, 2023). Clearly, the bridge was designed to withstand massive overbank flooding of Miami. The engineers who designed the bridge—decades before the construction of Pensacola Dam—understood the flood risk posed by nature in Miami. The quantified results presented in (1) GRDA's USR and (2) the additional scenarios reported in this SA1—which were designed as extreme events to test the limits of GRDA's model—are consistent with the documented history of flooding in the watershed: flooding is a natural phenomenon that will continue to occur in Miami regardless of dam operations.

Thus, after years of study and analysis of flooding impacts in the ongoing relicensing, we can confidently conclude what history has always demonstrated: that GRDA's Project operations are not the cause of flooding within and in the vicinity of the City of Miami. Significant, natural flooding in and around Miami has been occurring for centuries, well before the development of the Project, and continue today. This flooding is a function of nature, and not Project operations.

Published Every Evening (Except Saturday) and Sunday Morning, by Miami News-Record Publishing Co. (Inc.)

MIAMI, OKLA., TUESDAY, JUNE 26, 1928

AIRPLANE VIEWS OF NEOSHO RIVER FLOOD IN VICINITY OF MIAMI

Figure 29. Airplane views of Neosho River flood in vicinity of Miami, OK on June 26, 1928.
Source: Miami News-Record, June 26, 1928, on file at Dobson Museum, Ottawa County Historical Society, Miami, OK.

6. References

116th Congress. (2019). *S. 1790 National Defense Authorization Act for Fiscal Year 2020.* Public Law No. 116-92.

GRDA. (2021). *Supporting Technical Information Document for the Pensacola Project No. 1494 (Revision 3).* Compiled by Burns & McDonnell Engineering Company, Inc.

Historical Research Associates. (2023). *A History of Flooding, Flood Control, and Hydropower on the Neosho (Grand) River.* Seattle.

Hunter, S. L., Trevisan, A. R., Villa, J., & Smith, K. A. (2020). *Bathymetric Map, Surface Area, and Capacity of Grand Lake O' the Cherokees, Northeastern Oklahoma, 2019.* Denver: USGS.

Mead & Hunt. (2022). *Hydrologic & Hydraulic Modeling: Updated Study Report.*

USACE. (1980). *Arkansas River Basin Water Control Master Manual.* Tulsa and Little Rock Districts.

USACE. (1992). *Pensacola Reservoir Water Control Manual.* Tulsa District.

USGS. (2023, March 9). *Lake O' the Cherokees at Langley, OK*. Retrieved from Water for the Nation: https://waterdata.usgs.gov/monitoring-location/07190000

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX A
STAGE HYDROGRAPHS

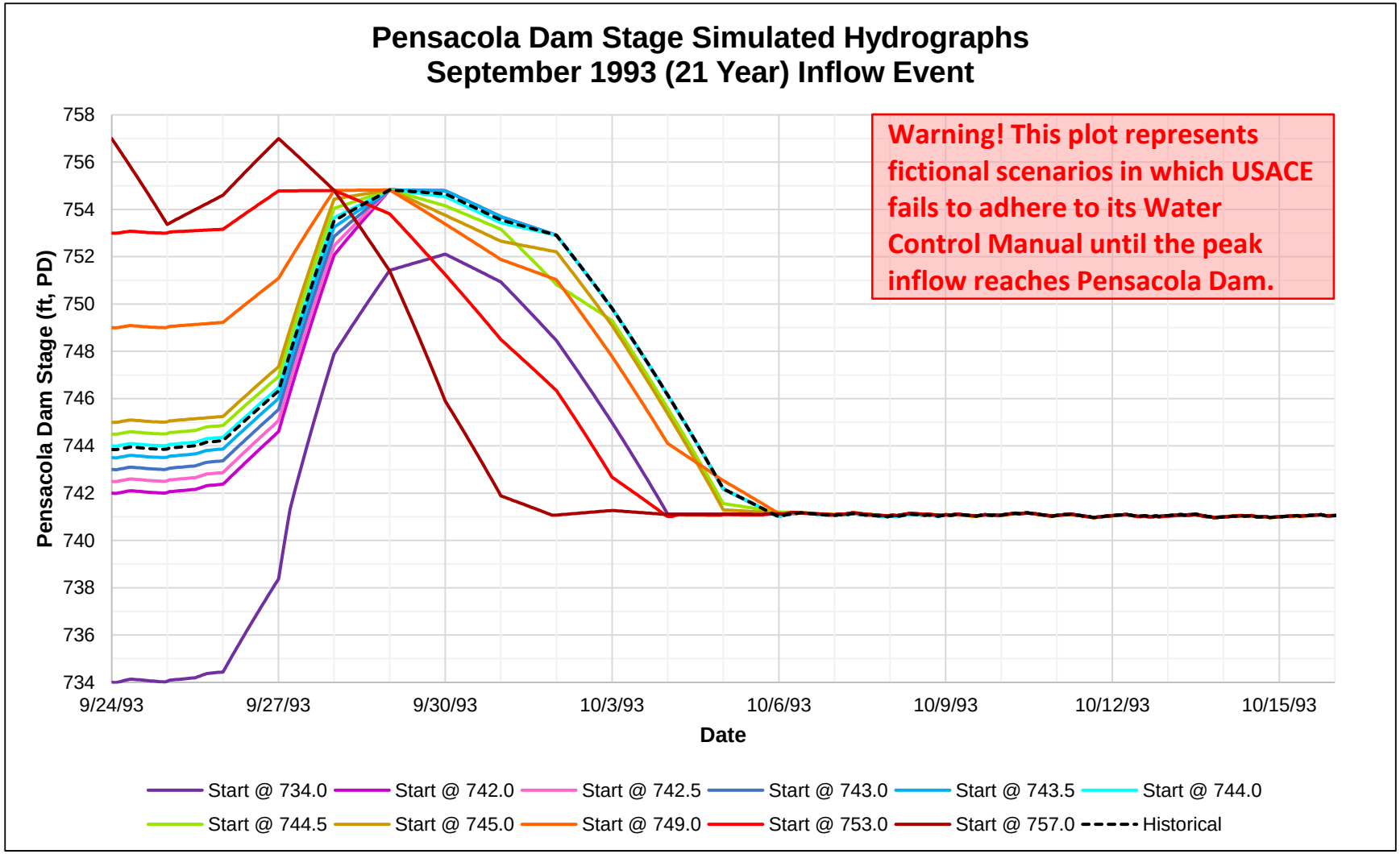


Figure A.1. Simulated stage hydrographs for the September 1993 (21 year) inflow event upstream of Pensacola Dam.

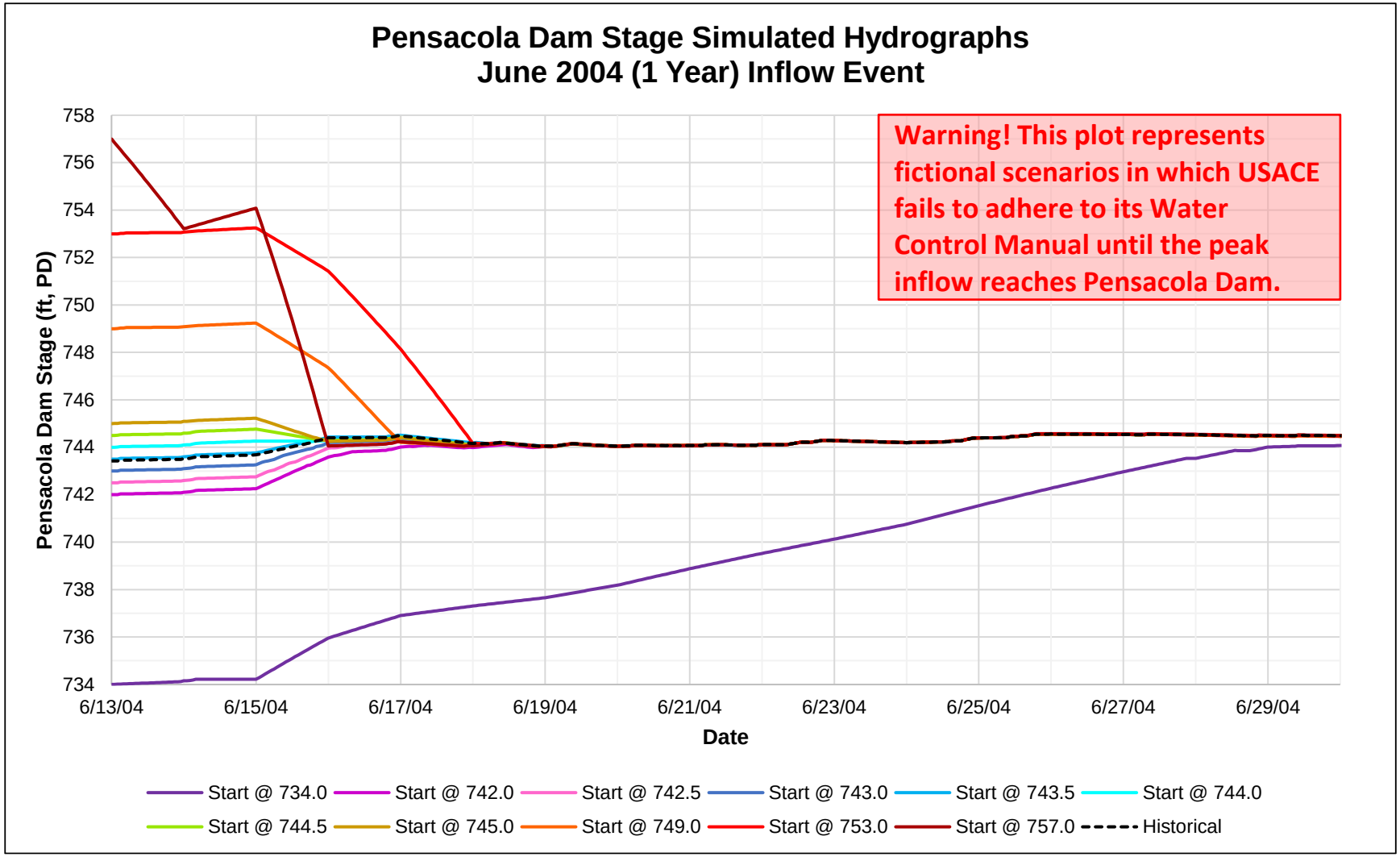


Figure A.2. Simulated stage hydrographs for the June 2004 (1 year) inflow event upstream of Pensacola Dam.

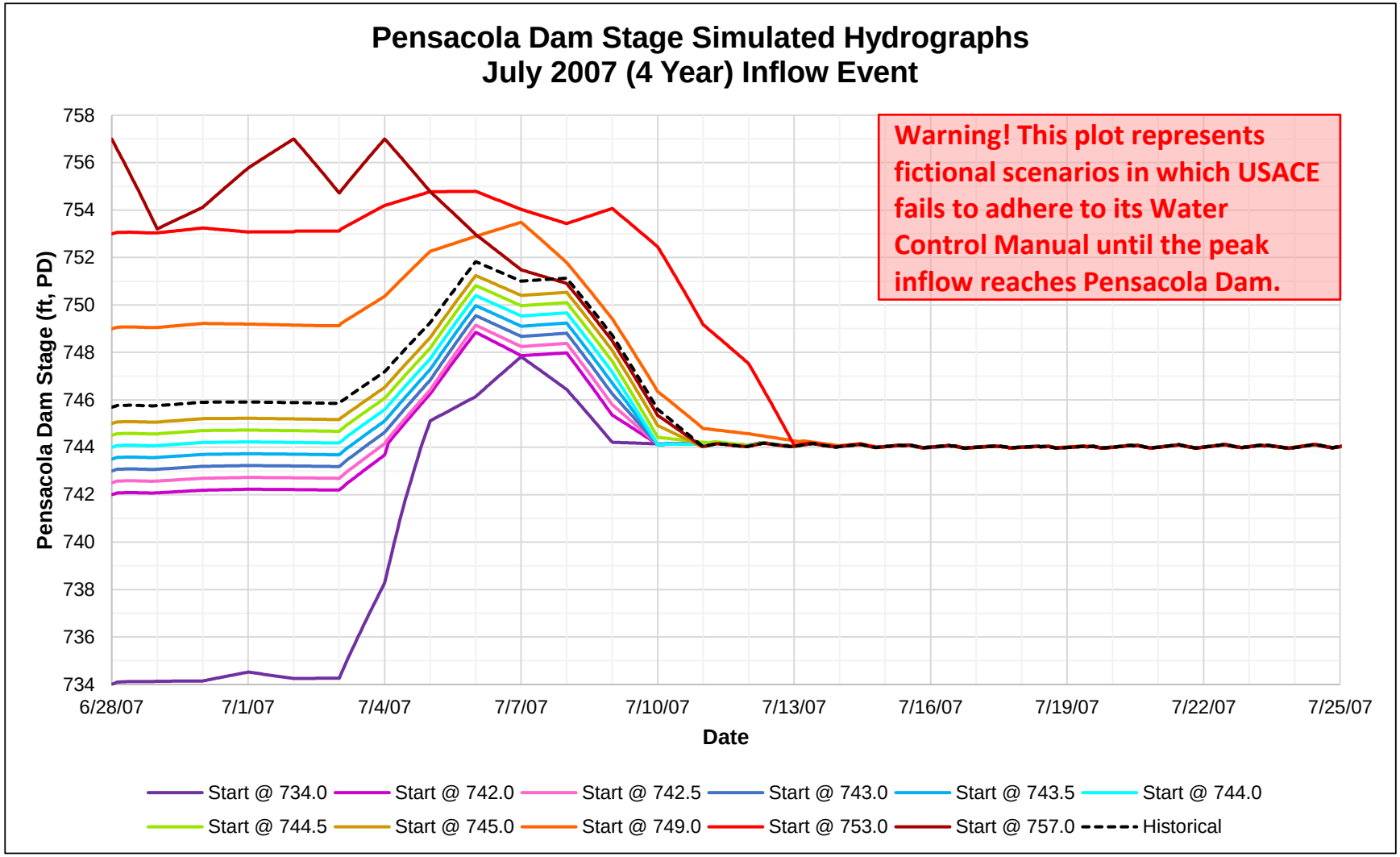


Figure A.3. Simulated stage hydrographs for the July 2007 (4 year) inflow event upstream of Pensacola Dam.

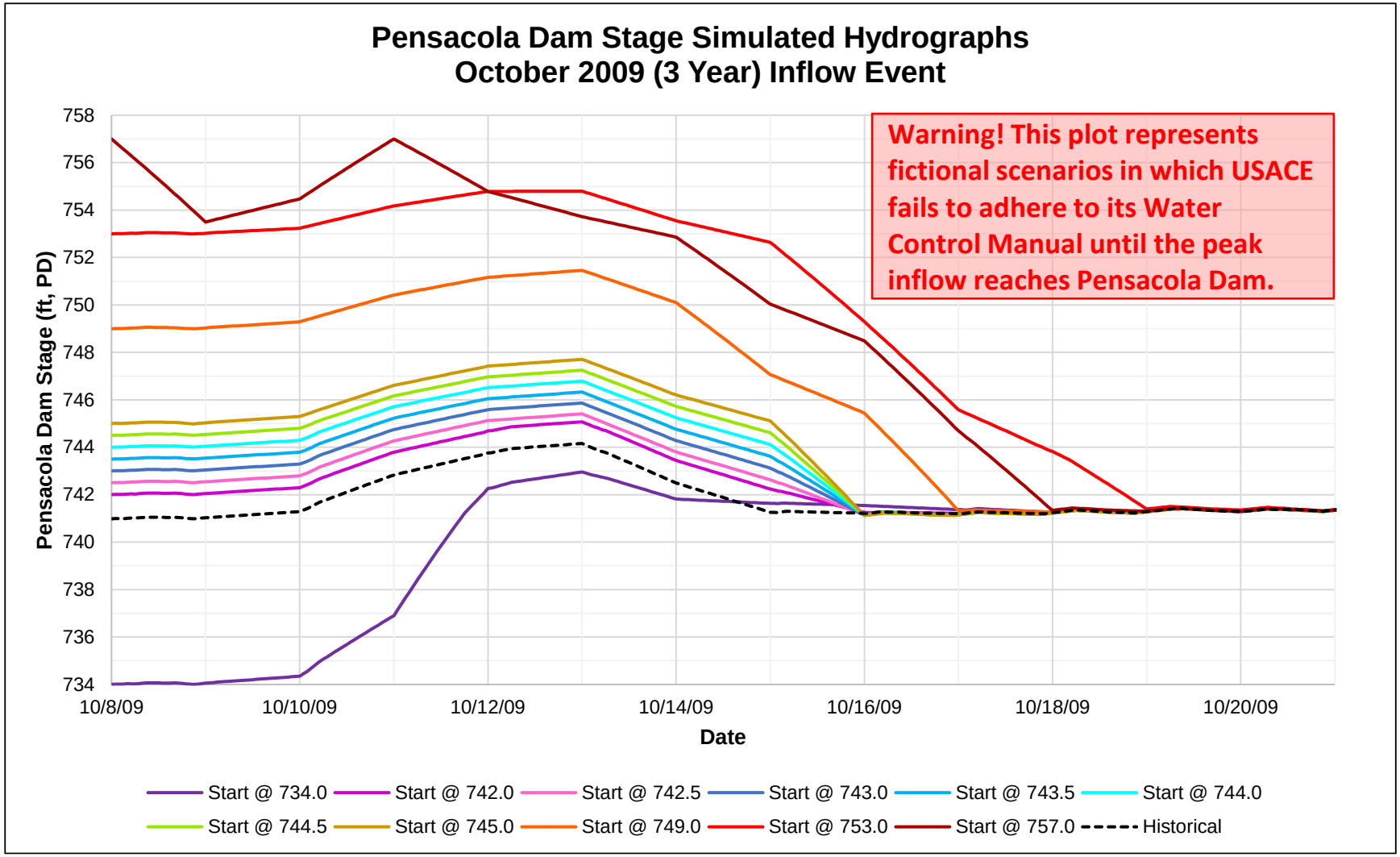


Figure A.4. Simulated stage hydrographs for the October 2009 (3 year) inflow event upstream of Pensacola Dam.

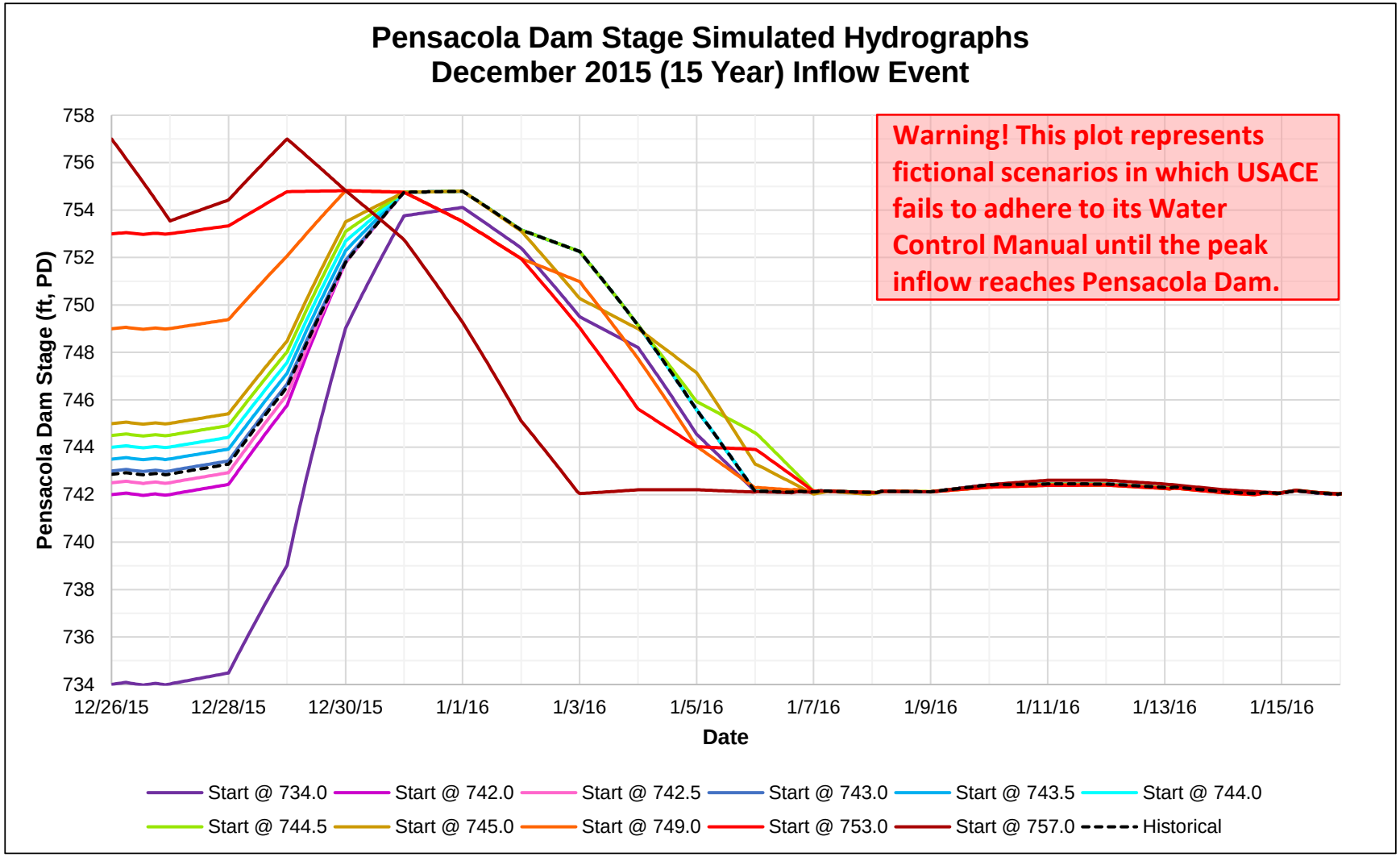


Figure A.5. Simulated stage hydrographs for the December 2015 (15 year) inflow event upstream of Pensacola Dam.

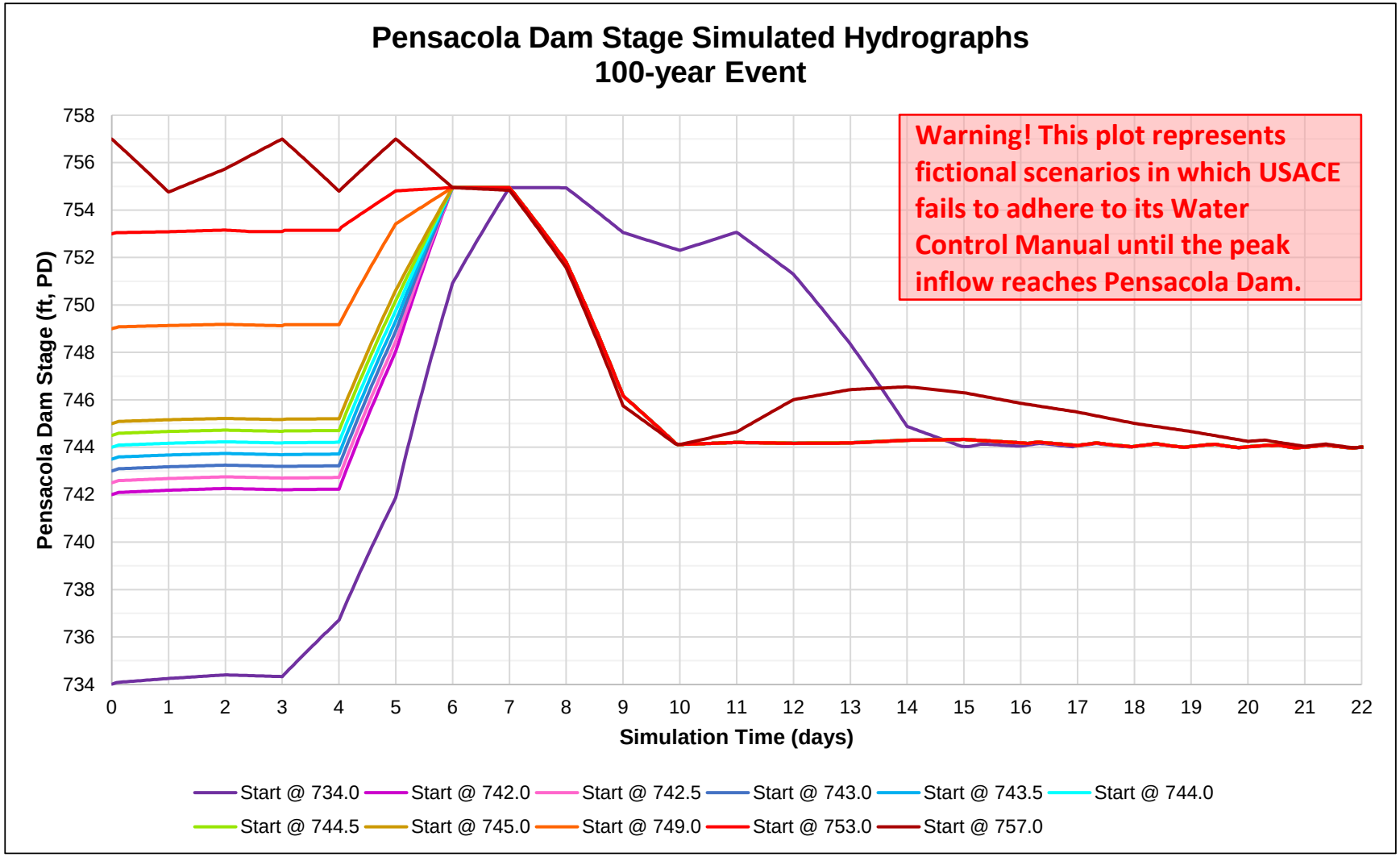


Figure A.6. Simulated stage hydrographs for the 100-year event upstream of Pensacola Dam.

Note: Because the 100-year event is synthetic, there is no historical start or end date, so stage hydrographs for the 100-year event are presented as a function of simulation time rather than date.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX B
MAXIMUM WATER SURFACE ELEVATIONS

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX B.1
SEPTEMBER 1993 (21 YEAR) INFLOW EVENT
MAXIMUM WATER SURFACE ELEVATIONS

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.1**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - SEP 1993 (21 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0 Max WSE (ft, PD)	El. 742.0 Max WSE (ft, PD)	El. 742.5 Max WSE (ft, PD)	El. 743.0 Max WSE (ft, PD)	El. 743.5 Max WSE (ft, PD)	El. 744.0 Max WSE (ft, PD)	El. 744.5 Max WSE (ft, PD)	El. 745.0 Max WSE (ft, PD)	El. 749.0 Max WSE (ft, PD)	El. 753.0 Max WSE (ft, PD)	El. 757.0 Max WSE (ft, PD)		
152.175	Upstream end of model													
152.175	752.29	780.71	780.71	780.71	780.71	780.71	780.71	780.71	780.71	780.71	780.71	780.71	0.00	0.00
151.000	748.53	777.94	777.94	777.94	777.94	777.94	777.94	777.94	777.94	777.94	777.95	777.95	0.00	0.01
150.000	748.47	776.66	776.66	776.66	776.66	776.66	776.66	776.66	776.66	776.66	776.67	776.67	0.00	0.01
149.000	750.14	775.12	775.12	775.12	775.12	775.12	775.12	775.12	775.13	775.13	775.15	775.16	0.00	0.03
148.000	749.29	774.25	774.25	774.25	774.25	774.25	774.25	774.25	774.25	774.27	774.31	774.32	0.01	0.08
147.000	747.76	772.70	772.71	772.71	772.71	772.72	772.72	772.72	772.73	772.77	772.84	772.88	0.02	0.18
145.500	745.12	771.59	771.61	771.61	771.62	771.63	771.63	771.64	771.65	771.72	771.84	771.90	0.04	0.32
145.480	E 60 Road Bridge													
145.400	748.01	771.52	771.54	771.55	771.55	771.56	771.57	771.57	771.58	771.66	771.78	771.84	0.04	0.32
144.000	743.43	770.47	770.52	770.53	770.54	770.55	770.57	770.58	770.59	770.69	770.85	770.93	0.07	0.46
143.000	737.95	769.98	770.05	770.06	770.07	770.08	770.10	770.12	770.14	770.25	770.42	770.51	0.09	0.53
142.000	742.91	769.60	769.68	769.70	769.71	769.73	769.75	769.77	769.79	769.91	770.08	770.18	0.10	0.58
141.000	741.01	769.45	769.54	769.55	769.57	769.59	769.61	769.63	769.65	769.77	769.95	770.05	0.11	0.60
140.000	736.33	769.40	769.50	769.51	769.53	769.54	769.56	769.58	769.61	769.73	769.91	770.01	0.11	0.61
139.000	743.99	769.35	769.45	769.46	769.48	769.50	769.52	769.54	769.56	769.69	769.87	769.97	0.11	0.61
138.000	736.48	769.26	769.36	769.38	769.40	769.41	769.43	769.46	769.48	769.61	769.79	769.89	0.11	0.63
137.000	733.33	768.93	769.04	769.06	769.08	769.10	769.12	769.14	769.17	769.30	769.49	769.60	0.13	0.67
135.950	731.18	768.17	768.32	768.34	768.36	768.39	768.41	768.44	768.47	768.61	768.81	768.93	0.15	0.76
135.941	Highway 69 Bridge													
135.940	731.21	768.16	768.31	768.33	768.36	768.38	768.41	768.44	768.47	768.62	768.82	768.94	0.16	0.78
135.590	731.77	767.99	768.16	768.18	768.20	768.23	768.26	768.29	768.32	768.47	768.68	768.80	0.16	0.81
135.586	BN RR Bridge													
135.580	731.07	767.80	767.97	767.99	768.02	768.05	768.08	768.11	768.14	768.29	768.50	768.62	0.17	0.82
135.470	732.63	767.75	767.92	767.94	767.97	768.00	768.02	768.06	768.09	768.24	768.45	768.57	0.17	0.82
135.460	Highway 125 Bridge													
135.440	731.60	767.79	767.96	767.98	768.01	768.03	768.06	768.10	768.13	768.28	768.49	768.61	0.17	0.82

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.1**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - SEP 1993 (21 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
135.000	732.64	767.49	767.67	767.69	767.72	767.75	767.78	767.82	767.85	768.01	768.22	768.34	0.18	0.85
134.610	728.75	766.96	767.16	767.19	767.22	767.25	767.28	767.32	767.36	767.52	767.73	767.85	0.20	0.89
134.599	Abandonded RR Bridge													
134.595	728.58	766.66	766.87	766.89	766.92	766.95	766.99	767.02	767.06	767.21	767.41	767.53	0.19	0.87
134.000	727.23	766.24	766.49	766.51	766.55	766.58	766.62	766.66	766.70	766.86	767.07	767.18	0.22	0.93
133.973	Tar Creek													
133.900	727.72	766.02	766.27	766.30	766.33	766.37	766.40	766.45	766.49	766.65	766.86	766.97	0.22	0.95
133.800	Interstate 44 Bridge													
133.700	728.57	765.81	766.07	766.10	766.14	766.17	766.21	766.26	766.30	766.46	766.67	766.78	0.23	0.97
133.000	727.70	765.06	765.38	765.42	765.46	765.50	765.55	765.59	765.65	765.82	766.04	766.16	0.27	1.10
132.000	727.96	764.08	764.47	764.51	764.56	764.61	764.66	764.72	764.78	764.97	765.19	765.37	0.31	1.29
131.000	726.82	763.25	763.70	763.75	763.80	763.85	763.92	763.98	764.05	764.25	764.49	764.76	0.35	1.51
130.000	723.18	762.37	762.79	762.85	762.91	762.98	763.05	763.12	763.20	763.43	763.78	764.09	0.41	1.72
129.000	719.79	761.75	761.93	761.99	762.04	762.13	762.22	762.31	762.40	762.65	763.16	763.50	0.47	1.76
128.000	719.69	761.60	761.70	761.72	761.74	761.77	761.80	761.83	761.87	762.24	762.77	763.09	0.16	1.49
126.710	715.94	761.44	761.54	761.56	761.58	761.61	761.64	761.68	761.71	762.09	762.60	762.84	0.17	1.40
126.700	S 590 Road Bridge													
126.670	715.61	761.42	761.52	761.54	761.56	761.59	761.62	761.65	761.69	762.07	762.58	762.82	0.17	1.40
126.000	720.35	761.40	761.49	761.51	761.53	761.56	761.59	761.63	761.66	762.04	762.55	762.80	0.17	1.41
125.000	717.08	761.30	761.40	761.42	761.44	761.47	761.50	761.53	761.57	761.96	762.47	762.71	0.17	1.41
124.000	715.62	761.26	761.35	761.37	761.40	761.42	761.46	761.49	761.53	761.92	762.43	762.68	0.18	1.42
123.000	713.34	761.18	761.27	761.29	761.32	761.34	761.37	761.41	761.45	761.84	762.36	762.60	0.17	1.43
122.580	711.08	761.13	761.23	761.24	761.27	761.30	761.33	761.36	761.40	761.80	762.32	762.56	0.17	1.43
122.570	Highway 60 Bridge													
122.550	709.97	761.12	761.22	761.24	761.26	761.29	761.32	761.35	761.39	761.78	762.30	762.54	0.17	1.42
122.350	Spring River													
122.000	710.64	760.01	760.12	760.14	760.16	760.19	760.23	760.27	760.30	760.70	761.19	761.43	0.18	1.42

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.1**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - SEP 1993 (21 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0 Max WSE (ft, PD)	El. 742.0 Max WSE (ft, PD)	El. 742.5 Max WSE (ft, PD)	El. 743.0 Max WSE (ft, PD)	El. 743.5 Max WSE (ft, PD)	El. 744.0 Max WSE (ft, PD)	El. 744.5 Max WSE (ft, PD)	El. 745.0 Max WSE (ft, PD)	El. 749.0 Max WSE (ft, PD)	El. 753.0 Max WSE (ft, PD)	El. 757.0 Max WSE (ft, PD)		
121.980	709.90	759.54	759.65	759.67	759.70	759.73	759.76	759.80	759.84	760.21	760.66	760.91	0.19	1.37
121.970	BN RR Bridge													
121.960	710.89	756.80	756.91	756.93	756.96	756.99	757.03	757.07	757.11	757.85	759.25	760.34	0.20	3.54
120.000	717.63	755.11	755.58	755.58	755.59	755.59	755.60	755.67	755.97	756.57	758.32	759.53	0.40	4.42
118.000	720.29	753.32	755.35	755.36	755.36	755.36	755.36	755.37	755.54	755.84	757.26	758.71	0.19	5.39
116.000	725.99	752.43	755.25	755.25	755.25	755.25	755.25	755.26	755.32	755.63	756.75	758.36	0.07	5.93
114.000	718.27	752.29	755.08	755.07	755.07	755.07	755.06	755.06	755.06	755.27	755.85	757.73	0.02	5.43
112.000	714.31	752.21	754.99	754.98	754.98	754.97	754.97	754.97	754.97	755.09	755.41	757.43	0.02	5.22
110.000	719.24	752.18	754.95	754.94	754.94	754.93	754.93	754.93	754.92	755.00	755.20	757.30	0.03	5.12
108.000	710.68	752.14	754.89	754.88	754.88	754.88	754.87	754.87	754.86	754.88	754.91	757.10	0.03	4.96
106.000	700.35	752.13	754.88	754.87	754.87	754.87	754.86	754.86	754.86	754.87	754.89	757.08	0.02	4.95
105.350	Elk River													
105.000	701.60	752.13	754.88	754.87	754.87	754.87	754.86	754.86	754.86	754.87	754.90	757.09	0.02	4.96
104.000	696.61	752.13	754.87	754.87	754.87	754.86	754.86	754.86	754.86	754.86	754.89	757.08	0.01	4.95
102.000	688.58	752.13	754.86	754.86	754.86	754.86	754.85	754.85	754.85	754.85	754.86	757.05	0.01	4.93
101.750	685.91	752.12	754.85	754.85	754.85	754.85	754.85	754.85	754.85	754.85	754.84	757.04	0.00	4.92
101.730	Highway 59 (Sailboat Bridge)													
101.710	682.31	752.11	754.84	754.84	754.84	754.84	754.84	754.84	754.83	754.84	754.82	757.02	0.01	4.91
100.000	702.62	752.11	754.84	754.84	754.84	754.84	754.84	754.84	754.84	754.84	754.83	757.03	0.00	4.92
90.000	681.52	752.11	754.83	754.83	754.83	754.83	754.83	754.83	754.83	754.83	754.81	757.01	0.00	4.90
80.000	657.03	752.11	754.83	754.83	754.83	754.83	754.83	754.83	754.83	754.83	754.80	757.00	0.00	4.89
78.000	653.11	752.11	754.83	754.83	754.83	754.83	754.83	754.83	754.83	754.83	754.80	757.00	0.00	4.89
77.000	Pensacola Dam													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.2**

GRAND RIVER DAM AUTHORITY SPRING RIVER MAX WSELs - SEP 1993 (21 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
21.000	Upstream end of model													
21.000	762.67	805.10	805.10	805.10	805.10	805.10	805.10	805.10	805.10	805.10	805.10	805.10	0.00	0.00
20.000	760.13	804.41	804.41	804.41	804.41	804.41	804.41	804.41	804.41	804.41	804.41	804.41	0.00	0.00
19.000	759.04	803.09	803.09	803.09	803.09	803.09	803.09	803.09	803.09	803.09	803.09	803.09	0.00	0.00
18.000	753.18	800.93	800.93	800.93	800.93	800.93	800.93	800.93	800.93	800.93	800.93	800.93	0.00	0.00
17.000	750.54	799.10	799.10	799.10	799.10	799.10	799.10	799.10	799.10	799.10	799.10	799.10	0.00	0.00
16.000	749.28	796.17	796.17	796.17	796.17	796.17	796.17	796.17	796.17	796.17	796.17	796.17	0.00	0.00
15.000	746.37	794.15	794.15	794.15	794.15	794.15	794.15	794.15	794.15	794.15	794.15	794.15	0.00	0.00
14.170	741.32	791.71	791.71	791.71	791.71	791.71	791.71	791.71	791.71	791.71	791.71	791.71	0.00	0.00
14.160	E 57 Road													
14.120	744.21	789.81	789.81	789.81	789.81	789.81	789.81	789.81	789.81	789.81	789.81	789.81	0.00	0.00
13.510	744.59	786.79	786.79	786.79	786.79	786.79	786.79	786.79	786.79	786.79	786.79	786.79	0.00	0.00
13.500	Interstate 44 Bridge													
13.450	745.52	784.91	784.91	784.91	784.91	784.91	784.91	784.91	784.91	784.91	784.91	784.91	0.00	0.00
12.000	742.72	780.13	780.13	780.13	780.13	780.13	780.13	780.13	780.13	780.13	780.13	780.13	0.00	0.00
11.000	742.23	778.45	778.45	778.45	778.45	778.45	778.45	778.45	778.45	778.45	778.45	778.45	0.00	0.00
10.000	737.62	776.97	776.97	776.97	776.97	776.97	776.97	776.97	776.97	776.97	776.97	776.97	0.00	0.00
9.000	733.92	774.02	774.02	774.02	774.02	774.02	774.02	774.02	774.02	774.02	774.02	774.04	0.00	0.01
8.020	733.14	772.73	772.73	772.73	772.73	772.73	772.73	772.73	772.73	772.72	772.73	772.72	0.00	0.01
8.010	OK Highway 10 Bridge													
7.970	731.28	771.27	771.29	771.29	771.30	771.30	771.31	771.32	771.32	771.61	771.67	771.76	0.03	0.49
7.000	730.33	769.20	769.23	769.24	769.24	769.25	769.26	769.27	769.28	769.46	769.76	769.90	0.05	0.70
6.000	727.95	767.84	767.88	767.89	767.89	767.90	767.92	767.93	767.94	768.17	768.52	768.67	0.06	0.83
5.000	722.10	766.48	766.53	766.53	766.54	766.56	766.57	766.59	766.61	766.87	767.28	767.45	0.08	0.97
4.000	720.00	765.57	765.63	765.64	765.65	765.66	765.68	765.70	765.72	766.02	766.45	766.64	0.09	1.07
3.000	723.22	764.29	764.36	764.37	764.39	764.40	764.43	764.45	764.47	764.81	765.28	765.50	0.11	1.21
2.000	723.73	763.42	763.50	763.51	763.53	763.55	763.57	763.60	763.63	763.99	764.49	764.73	0.13	1.31
1.000	728.44	762.55	762.63	762.65	762.67	762.69	762.72	762.75	762.77	763.15	763.68	763.94	0.14	1.39
0.580	716.17	760.56	760.66	760.67	760.70	760.72	760.75	760.79	760.82	761.19	761.71	762.02	0.16	1.46
0.570	Highway 60 Bridge													
0.560	713.76	760.07	760.17	760.19	760.22	760.24	760.28	760.31	760.35	760.72	761.24	761.54	0.18	1.47
0.460	715.35	760.72	760.82	760.84	760.86	760.89	760.92	760.96	760.99	761.38	761.87	762.13	0.17	1.41
0.000	Downstream end of Spring River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.3**

GRAND RIVER DAM AUTHORITY ELK RIVER MAX WSELs - SEP 1993 (21 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
19.590	Upstream end of model													
19.590	771.15	787.52	787.52	787.52	787.52	787.52	787.52	787.52	787.52	787.52	787.52	787.52	0.00	0.00
19.000	767.51	785.42	785.42	785.42	785.42	785.42	785.42	785.42	785.42	785.42	785.42	785.42	0.00	0.00
18.000	765.41	781.77	781.77	781.77	781.77	781.77	781.77	781.77	781.77	781.77	781.77	781.77	0.00	0.00
17.000	762.53	777.78	777.78	777.78	777.78	777.78	777.78	777.78	777.78	777.78	777.78	777.78	0.00	0.00
16.000	756.63	773.42	773.42	773.42	773.42	773.42	773.42	773.42	773.42	773.42	773.42	773.42	0.00	0.00
15.000	754.26	769.55	769.55	769.55	769.55	769.55	769.55	769.55	769.55	769.55	769.55	769.55	0.00	0.00
14.240	750.52	766.33	766.33	766.33	766.33	766.33	766.33	766.33	766.33	766.33	766.34	766.35	0.00	0.02
14.220	Highway 43 Bridge													
14.200	750.12	766.08	766.08	766.08	766.08	766.08	766.08	766.08	766.08	766.08	766.09	766.10	0.00	0.02
14.000	747.07	764.91	764.91	764.91	764.91	764.91	764.91	764.91	764.91	764.92	764.93	764.95	0.00	0.04
13.000	745.41	760.77	760.77	760.77	760.77	760.77	760.77	760.77	760.77	760.78	760.85	760.94	0.00	0.17
12.000	741.15	757.41	757.41	757.41	757.41	757.41	757.41	757.41	757.41	757.45	757.72	758.09	0.00	0.68
11.910	OK/MO State Line													
11.000	741.93	752.19	754.96	754.95	754.93	754.93	754.91	754.91	754.89	754.94	755.00	757.18	0.07	4.99
10.000	734.62	752.15	754.94	754.93	754.92	754.91	754.90	754.89	754.88	754.91	754.94	757.15	0.06	5.00
9.000	734.66	752.15	754.93	754.92	754.91	754.90	754.89	754.88	754.88	754.90	754.93	757.14	0.05	4.99
8.000	724.21	752.14	754.92	754.91	754.90	754.90	754.89	754.88	754.87	754.90	754.92	757.13	0.05	4.99
7.000	728.21	752.14	754.91	754.91	754.90	754.89	754.88	754.88	754.87	754.89	754.92	757.12	0.04	4.98
6.000	727.13	752.14	754.91	754.90	754.90	754.89	754.88	754.87	754.87	754.89	754.92	757.12	0.04	4.98
5.000	721.05	752.14	754.90	754.90	754.89	754.88	754.88	754.87	754.87	754.89	754.91	757.11	0.03	4.97
4.700	716.13	752.14	754.90	754.89	754.89	754.88	754.88	754.87	754.87	754.89	754.91	757.11	0.03	4.97
4.670	OK Highway 10 Bridge													
4.640	715.21	752.14	754.90	754.89	754.89	754.88	754.87	754.87	754.87	754.89	754.91	757.11	0.03	4.97
4.000	716.61	752.14	754.90	754.89	754.89	754.88	754.87	754.87	754.86	754.88	754.91	757.11	0.04	4.97
3.000	714.74	752.14	754.89	754.89	754.88	754.88	754.87	754.87	754.86	754.88	754.90	757.10	0.03	4.96
2.000	709.09	752.13	754.89	754.88	754.88	754.87	754.87	754.86	754.86	754.88	754.90	757.10	0.03	4.97
1.000	705.82	752.13	754.88	754.88	754.87	754.87	754.87	754.86	754.86	754.87	754.90	757.09	0.02	4.96
0.320	706.36	752.13	754.88	754.87	754.87	754.87	754.86	754.86	754.86	754.87	754.90	757.09	0.02	4.96
0.000	Downstream end of Elk River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.4**

GRAND RIVER DAM AUTHORITY TAR CREEK MAX WSELs - SEP 1993 (21 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
4.152	Upstream end of model													
4.152	762.17	776.77	776.77	776.77	776.77	776.77	776.77	776.77	776.77	776.77	776.77	776.77	0.00	0.00
3.900	760.10	775.76	775.76	775.76	775.76	775.76	775.76	775.76	775.76	775.76	775.76	775.76	0.00	0.00
3.840	22nd Ave Bridge													
3.800	762.30	774.50	774.50	774.50	774.50	774.50	774.50	774.50	774.50	774.50	774.50	774.50	0.00	0.00
3.300	759.46	772.27	772.27	772.27	772.27	772.27	772.27	772.27	772.27	772.27	772.27	772.27	0.00	0.00
2.800	756.73	768.46	768.46	768.46	768.46	768.46	768.46	768.46	768.46	768.46	768.47	768.47	0.00	0.01
2.710	BN RR Bridge													
2.700	755.72	767.11	767.11	767.11	767.11	767.11	767.11	767.11	767.11	767.12	767.21	767.27	0.01	0.17
2.500	754.95	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
2.300	754.15	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
2.200	Rockdale Blvd Bridge													
2.100	751.51	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
1.900	750.02	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
1.700	749.58	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
1.660	Central Ave Bridge													
1.600	746.47	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
1.500	744.29	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
1.400	OK Highway 10 Bridge													
1.300	742.00	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
1.000	739.34	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
0.700	737.06	766.14	766.39	766.42	766.45	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
0.300	736.42	766.15	766.40	766.42	766.46	766.49	766.53	766.57	766.61	766.77	766.98	767.10	0.22	0.95
0.041	735.85	766.13	766.38	766.41	766.44	766.48	766.52	766.56	766.60	766.76	766.97	767.08	0.22	0.95
0.000	Downstream end of Tar Creek													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX B.2
JUNE 2004 (1 YEAR) INFLOW EVENT
MAXIMUM WATER SURFACE ELEVATIONS

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.5**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - JUN 2004 (1 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0 Max WSE (ft, PD)	El. 742.0 Max WSE (ft, PD)	El. 742.5 Max WSE (ft, PD)	El. 743.0 Max WSE (ft, PD)	El. 743.5 Max WSE (ft, PD)	El. 744.0 Max WSE (ft, PD)	El. 744.5 Max WSE (ft, PD)	El. 745.0 Max WSE (ft, PD)	El. 749.0 Max WSE (ft, PD)	El. 753.0 Max WSE (ft, PD)	El. 757.0 Max WSE (ft, PD)		
152.175	Upstream end of model													
152.175	752.29	773.78	773.78	773.78	773.79	773.79	773.79	773.79	773.79	773.81	773.84	773.85	0.01	0.07
151.000	748.53	772.51	772.51	772.52	772.52	772.52	772.52	772.52	772.52	772.54	772.58	772.59	0.01	0.08
150.000	748.47	771.80	771.81	771.81	771.81	771.82	771.82	771.82	771.82	771.84	771.88	771.90	0.01	0.09
149.000	750.14	770.43	770.44	770.44	770.44	770.44	770.44	770.44	770.45	770.48	770.52	770.54	0.01	0.11
148.000	749.29	768.73	768.75	768.75	768.76	768.76	768.76	768.77	768.77	768.81	768.88	768.90	0.02	0.17
147.000	747.76	766.90	766.92	766.93	766.93	766.94	766.94	766.95	766.95	767.01	767.10	767.13	0.03	0.23
145.500	745.12	764.65	764.69	764.70	764.70	764.71	764.72	764.72	764.73	764.83	764.97	765.01	0.04	0.36
145.480	E 60 Road Bridge													
145.400	748.01	764.55	764.59	764.60	764.60	764.61	764.61	764.62	764.63	764.73	764.87	764.91	0.04	0.36
144.000	743.43	763.27	763.32	763.32	763.33	763.34	763.35	763.36	763.37	763.49	763.66	763.71	0.05	0.44
143.000	737.95	762.10	762.15	762.16	762.16	762.17	762.19	762.20	762.22	762.36	762.60	762.65	0.06	0.55
142.000	742.91	761.17	761.23	761.24	761.24	761.25	761.27	761.28	761.30	761.47	761.75	761.82	0.07	0.64
141.000	741.01	759.97	760.05	760.06	760.08	760.10	760.11	760.13	760.15	760.40	760.81	760.89	0.10	0.93
140.000	736.33	758.57	758.69	758.71	758.74	758.76	758.78	758.81	758.84	759.25	759.93	760.06	0.14	1.49
139.000	743.99	756.44	756.64	756.67	756.71	756.74	756.79	756.82	756.87	757.48	758.50	758.73	0.23	2.30
138.000	736.48	754.94	755.20	755.25	755.29	755.34	755.40	755.45	755.51	756.27	757.66	757.99	0.31	3.05
137.000	733.33	752.66	753.08	753.15	753.23	753.33	753.42	753.52	753.62	754.77	756.60	757.09	0.54	4.43
135.950	731.18	752.00	752.46	752.54	752.62	752.72	752.83	752.94	753.05	754.33	756.28	757.08	0.59	5.08
135.941	Highway 69 Bridge													
135.940	731.21	751.69	752.20	752.28	752.38	752.49	752.60	752.73	752.85	754.22	756.23	757.08	0.65	5.39
135.590	731.77	751.78	752.28	752.35	752.45	752.56	752.66	752.79	752.90	754.24	756.22	757.08	0.62	5.30
135.586	BN RR Bridge													
135.580	731.07	751.82	752.32	752.39	752.48	752.59	752.69	752.82	752.93	754.25	756.22	757.07	0.61	5.25
135.470	732.63	751.70	752.20	752.28	752.37	752.48	752.59	752.72	752.83	754.18	756.18	757.07	0.63	5.37
135.460	Highway 125 Bridge													
135.440	731.60	751.76	752.26	752.33	752.43	752.53	752.64	752.77	752.88	754.21	756.19	757.07	0.62	5.31

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.5**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - JUN 2004 (1 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
135.000	732.64	751.38	751.93	752.01	752.11	752.23	752.35	752.49	752.61	754.03	756.10	757.07	0.67	5.69
134.610	728.75	751.19	751.76	751.84	751.95	752.06	752.18	752.32	752.45	753.91	756.01	757.07	0.69	5.88
134.599	Abandonded RR Bridge													
134.595	728.58	751.09	751.66	751.75	751.85	751.97	752.10	752.24	752.36	753.84	755.94	757.07	0.70	5.98
134.000	727.23	750.36	751.01	751.11	751.23	751.36	751.49	751.65	751.80	753.41	755.64	757.06	0.79	6.70
133.973	Tar Creek													
133.900	727.72	750.11	750.79	750.89	751.01	751.14	751.28	751.44	751.60	753.25	755.54	757.06	0.81	6.95
133.800	Interstate 44 Bridge													
133.700	728.57	749.70	750.43	750.53	750.66	750.81	750.96	751.13	751.29	753.04	755.41	757.05	0.86	7.36
133.000	727.70	748.13	749.11	749.26	749.42	749.60	749.78	749.99	750.18	752.24	754.90	757.04	1.07	8.92
132.000	727.96	746.40	747.71	747.90	748.10	748.32	748.55	748.80	749.04	751.46	754.42	757.03	1.33	10.63
131.000	726.82	745.56	746.43	746.67	746.91	747.18	747.46	747.76	748.21	750.86	754.06	757.03	1.79	11.47
130.000	723.18	745.42	746.06	746.31	746.57	746.85	747.15	747.46	747.78	750.68	753.97	757.02	1.72	11.60
129.000	719.79	745.20	745.56	745.73	746.02	746.32	746.64	746.98	747.36	750.43	753.83	757.02	1.81	11.82
128.000	719.69	745.15	745.52	745.59	745.89	746.20	746.53	746.88	747.21	750.34	753.78	757.02	1.69	11.87
126.710	715.94	745.03	745.43	745.43	745.58	745.90	746.24	746.60	746.98	750.16	753.66	757.02	1.55	11.99
126.700	S 590 Road Bridge													
126.670	715.61	745.03	745.42	745.42	745.56	745.88	746.22	746.58	746.96	750.15	753.65	757.02	1.54	11.99
126.000	720.35	744.98	745.38	745.38	745.44	745.77	746.12	746.48	746.83	750.13	753.66	757.02	1.44	12.04
125.000	717.08	744.91	745.33	745.33	745.33	745.57	745.93	746.30	746.66	750.01	753.59	757.02	1.33	12.11
124.000	715.62	744.85	745.28	745.28	745.29	745.43	745.79	746.17	746.53	749.95	753.56	757.02	1.25	12.17
123.000	713.34	744.80	745.24	745.24	745.25	745.29	745.66	746.05	746.42	749.87	753.52	757.02	1.18	12.22
122.580	711.08	744.79	745.23	745.23	745.24	745.25	745.63	746.01	746.39	749.85	753.50	757.02	1.16	12.23
122.570	Highway 60 Bridge													
122.550	709.97	744.34	744.79	744.79	744.80	744.81	745.19	745.58	745.96	749.51	753.37	757.01	1.17	12.67
122.350	Spring River													
122.000	710.64	744.33	744.78	744.78	744.79	744.79	745.17	745.56	745.94	749.50	753.37	757.01	1.16	12.68

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.5**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - JUN 2004 (1 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
121.980	709.90	744.33	744.78	744.78	744.79	744.78	745.16	745.55	745.93	749.50	753.36	757.01	1.15	12.68
121.970	BN RR Bridge													
121.960	710.89	744.32	744.77	744.77	744.78	744.76	745.14	745.54	745.92	749.48	753.35	757.00	1.16	12.68
120.000	717.63	744.27	744.73	744.73	744.74	744.71	744.93	745.34	745.73	749.42	753.33	757.00	1.02	12.73
118.000	720.29	744.22	744.69	744.69	744.70	744.68	744.77	745.20	745.61	749.37	753.31	757.00	0.93	12.78
116.000	725.99	744.19	744.66	744.66	744.67	744.65	744.67	745.11	745.53	749.34	753.30	757.00	0.88	12.81
114.000	718.27	744.13	744.61	744.61	744.62	744.60	744.60	744.91	745.36	749.30	753.28	757.00	0.76	12.88
112.000	714.31	744.10	744.59	744.59	744.60	744.58	744.58	744.84	745.30	749.27	753.26	757.00	0.71	12.90
110.000	719.24	744.09	744.58	744.58	744.59	744.57	744.57	744.81	745.27	749.26	753.26	757.00	0.70	12.91
108.000	710.68	744.08	744.58	744.57	744.58	744.56	744.56	744.77	745.24	749.25	753.25	757.00	0.68	12.92
106.000	700.35	744.08	744.58	744.57	744.58	744.56	744.56	744.77	745.24	749.25	753.25	757.00	0.68	12.92
105.350	Elk River													
105.000	701.60	744.08	744.58	744.57	744.58	744.56	744.56	744.77	745.24	749.25	753.25	757.00	0.68	12.92
104.000	696.61	744.08	744.57	744.57	744.58	744.56	744.56	744.77	745.24	749.25	753.25	757.00	0.68	12.92
102.000	688.58	744.07	744.57	744.56	744.57	744.56	744.56	744.77	745.24	749.24	753.25	757.00	0.68	12.93
101.750	685.91	744.07	744.57	744.56	744.57	744.56	744.56	744.77	745.24	749.24	753.25	757.00	0.68	12.93
101.730	Highway 59 (Sailboat Bridge)													
101.710	682.31	744.07	744.57	744.56	744.57	744.56	744.56	744.76	745.23	749.24	753.25	757.00	0.67	12.93
100.000	702.62	744.07	744.57	744.56	744.57	744.56	744.56	744.76	745.23	749.24	753.25	757.00	0.67	12.93
90.000	681.52	744.07	744.57	744.56	744.57	744.56	744.56	744.76	745.23	749.24	753.25	757.00	0.67	12.93
80.000	657.03	744.07	744.57	744.56	744.57	744.56	744.56	744.76	745.23	749.24	753.25	757.00	0.67	12.93
78.000	653.11	744.07	744.57	744.56	744.57	744.56	744.56	744.76	745.23	749.24	753.25	757.00	0.67	12.93
77.000	Pensacola Dam													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.6**

GRAND RIVER DAM AUTHORITY SPRING RIVER MAX WSELs - JUN 2004 (1 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
21.000	Upstream end of model													
21.000	762.67	773.88	773.88	773.88	773.88	773.88	773.88	773.88	773.88	773.88	773.88	773.88	0.00	0.00
20.000	760.13	771.04	771.04	771.04	771.04	771.04	771.04	771.04	771.04	771.04	771.04	771.04	0.00	0.00
19.000	759.04	768.52	768.52	768.52	768.52	768.52	768.52	768.52	768.52	768.52	768.53	768.54	0.00	0.02
18.000	753.18	764.57	764.57	764.57	764.57	764.57	764.57	764.57	764.57	764.58	764.64	764.71	0.00	0.14
17.000	750.54	762.75	762.75	762.75	762.75	762.75	762.75	762.75	762.75	762.77	762.90	763.03	0.00	0.28
16.000	749.28	760.33	760.33	760.34	760.34	760.34	760.34	760.34	760.34	760.41	760.73	761.04	0.01	0.71
15.000	746.37	758.32	758.33	758.33	758.33	758.33	758.34	758.34	758.35	758.48	759.11	759.60	0.02	1.27
14.170	741.32	757.45	757.45	757.45	757.46	757.46	757.47	757.47	757.48	757.66	758.44	759.03	0.03	1.58
14.160	E 57 Road													
14.120	744.21	757.47	757.48	757.48	757.48	757.49	757.49	757.50	757.51	757.69	758.47	759.05	0.03	1.58
13.510	744.59	756.82	756.83	756.83	756.84	756.84	756.85	756.86	756.87	757.09	758.02	758.70	0.04	1.88
13.500	Interstate 44 Bridge													
13.450	745.52	756.56	756.56	756.57	756.57	756.58	756.59	756.59	756.61	756.86	757.86	758.57	0.05	2.01
12.000	742.72	753.20	753.25	753.27	753.30	753.33	753.36	753.41	753.46	754.46	756.57	757.70	0.21	4.50
11.000	742.23	751.43	751.56	751.61	751.66	751.73	751.81	751.90	752.01	753.58	756.13	757.46	0.45	6.03
10.000	737.62	749.79	750.07	750.16	750.26	750.37	750.51	750.66	750.83	752.96	755.83	757.44	0.76	7.65
9.000	733.92	748.61	749.05	749.17	749.31	749.48	749.65	749.85	750.08	752.57	755.64	757.44	1.03	8.83
8.020	733.14	747.09	747.84	748.02	748.21	748.44	748.68	748.95	749.24	752.15	755.47	757.44	1.40	10.35
8.010	OK Highway 10 Bridge													
7.970	731.28	744.73	745.54	745.73	745.93	746.17	746.42	746.69	746.99	749.91	753.50	757.01	1.45	12.28
7.000	730.33	744.38	744.91	745.09	745.34	745.63	745.93	746.25	746.56	749.76	753.45	757.01	1.66	12.63
6.000	727.95	744.37	744.82	744.83	744.92	745.24	745.59	745.95	746.29	749.65	753.43	757.01	1.47	12.64
5.000	722.10	744.36	744.81	744.82	744.83	745.11	745.46	745.83	746.19	749.60	753.42	757.01	1.38	12.65
4.000	720.00	744.36	744.81	744.81	744.82	745.01	745.37	745.74	746.11	749.58	753.41	757.01	1.30	12.65
3.000	723.22	744.36	744.81	744.81	744.82	744.97	745.33	745.71	746.07	749.57	753.41	757.01	1.26	12.65
2.000	723.73	744.35	744.80	744.80	744.81	744.91	745.28	745.67	746.04	749.56	753.40	757.01	1.24	12.66
1.000	728.44	744.35	744.80	744.80	744.81	744.88	745.25	745.64	746.02	749.55	753.40	757.01	1.22	12.66
0.580	716.17	744.35	744.80	744.80	744.81	744.86	745.24	745.63	746.01	749.54	753.40	757.01	1.21	12.66
0.570	Highway 60 Bridge													
0.560	713.76	744.35	744.80	744.80	744.81	744.86	745.23	745.62	746.00	749.54	753.39	757.01	1.20	12.66
0.460	715.35	744.35	744.80	744.80	744.81	744.86	745.23	745.62	746.00	749.54	753.39	757.01	1.20	12.66
0.000	Downstream end of Spring River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.7**

GRAND RIVER DAM AUTHORITY ELK RIVER MAX WSELs - JUN 2004 (1 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
19.590	Upstream end of model													
19.590	771.15	774.17	774.17	774.17	774.17	774.17	774.17	774.17	774.17	774.17	774.17	774.17	0.00	0.00
19.000	767.51	772.64	772.64	772.64	772.64	772.64	772.64	772.64	772.64	772.64	772.64	772.64	0.00	0.00
18.000	765.41	769.18	769.18	769.18	769.18	769.18	769.18	769.18	769.18	769.18	769.18	769.18	0.00	0.00
17.000	762.53	766.13	766.13	766.13	766.13	766.13	766.13	766.13	766.13	766.13	766.13	766.13	0.00	0.00
16.000	756.63	761.16	761.16	761.16	761.16	761.16	761.16	761.16	761.16	761.16	761.16	761.16	0.00	0.00
15.000	754.26	757.92	757.92	757.92	757.92	757.92	757.92	757.92	757.92	757.92	757.91	757.90	0.00	0.02
14.240	750.52	753.18	753.18	753.18	753.18	753.18	753.18	753.18	753.18	753.18	753.88	757.03	0.00	3.85
14.220	Highway 43 Bridge													
14.200	750.12	753.10	753.10	753.10	753.10	753.10	753.10	753.10	753.10	753.10	753.85	757.02	0.00	3.92
14.000	747.07	752.78	752.78	752.78	752.78	752.78	752.78	752.78	752.78	752.78	753.73	757.02	0.00	4.24
13.000	745.41	749.01	749.01	749.01	749.01	749.01	749.01	749.01	749.01	749.95	753.32	757.00	0.00	8.00
12.000	741.15	746.01	746.06	746.06	746.06	746.05	746.01	746.03	746.15	749.32	753.28	757.00	0.14	10.99
11.910	OK/MO State Line													
11.000	741.93	744.92	744.78	744.79	744.79	744.83	744.86	745.11	745.43	749.26	753.27	757.00	0.65	12.22
10.000	734.62	744.09	744.59	744.59	744.60	744.58	744.58	744.78	745.25	749.25	753.27	757.00	0.67	12.91
9.000	734.66	744.09	744.58	744.59	744.60	744.58	744.58	744.78	745.25	749.25	753.26	757.00	0.67	12.91
8.000	724.21	744.09	744.58	744.58	744.60	744.58	744.58	744.78	745.24	749.25	753.26	757.00	0.66	12.91
7.000	728.21	744.09	744.58	744.58	744.59	744.57	744.57	744.78	745.24	749.25	753.26	757.00	0.67	12.91
6.000	727.13	744.09	744.58	744.58	744.59	744.57	744.57	744.77	745.24	749.25	753.26	757.00	0.67	12.91
5.000	721.05	744.08	744.58	744.58	744.59	744.57	744.57	744.77	745.24	749.25	753.26	757.00	0.67	12.92
4.700	716.13	744.08	744.58	744.58	744.59	744.57	744.57	744.77	745.24	749.25	753.26	757.00	0.67	12.92
4.670	OK Highway 10 Bridge													
4.640	715.21	744.08	744.58	744.57	744.59	744.57	744.57	744.77	745.24	749.25	753.26	757.00	0.67	12.92
4.000	716.61	744.08	744.58	744.57	744.59	744.57	744.57	744.77	745.24	749.25	753.26	757.00	0.67	12.92
3.000	714.74	744.08	744.58	744.57	744.58	744.57	744.57	744.77	745.24	749.25	753.26	757.00	0.67	12.92
2.000	709.09	744.08	744.58	744.57	744.58	744.56	744.56	744.77	745.24	749.25	753.25	757.00	0.68	12.92
1.000	705.82	744.08	744.58	744.57	744.58	744.56	744.56	744.77	745.24	749.25	753.25	757.00	0.68	12.92
0.320	706.36	744.08	744.58	744.57	744.58	744.56	744.56	744.77	745.24	749.25	753.25	757.00	0.68	12.92
0.000	Downstream end of Elk River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.8**

GRAND RIVER DAM AUTHORITY TAR CREEK MAX WSELs - JUN 2004 (1 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
4.152	Upstream end of model													
4.152	762.17	768.17	768.17	768.17	768.17	768.17	768.17	768.17	768.17	768.17	768.17	768.17	0.00	0.00
3.900	760.10	767.29	767.29	767.29	767.29	767.29	767.29	767.29	767.29	767.29	767.29	767.29	0.00	0.00
3.840	22nd Ave Bridge													
3.800	762.30	766.05	766.05	766.05	766.05	766.05	766.05	766.05	766.05	766.05	766.05	766.05	0.00	0.00
3.300	759.46	764.09	764.09	764.09	764.09	764.09	764.09	764.09	764.09	764.09	764.09	764.09	0.00	0.00
2.800	756.73	760.95	760.95	760.95	760.95	760.95	760.95	760.95	760.95	760.96	760.96	760.96	0.00	0.01
2.710	BN RR Bridge													
2.700	755.72	760.45	760.45	760.45	760.45	760.45	760.45	760.45	760.45	760.45	760.46	760.46	0.00	0.01
2.500	754.95	759.30	759.30	759.30	759.30	759.30	759.30	759.30	759.30	759.30	759.31	759.33	0.00	0.03
2.300	754.15	757.47	757.47	757.47	757.47	757.47	757.47	757.47	757.47	757.47	757.52	757.63	0.00	0.16
2.200	Rockdale Blvd Bridge													
2.100	751.51	754.83	754.83	754.83	754.84	754.84	754.84	754.84	754.84	754.90	755.61	757.06	0.01	2.23
1.900	750.02	753.18	753.20	753.21	753.21	753.22	753.23	753.24	753.25	753.58	755.59	757.06	0.04	3.87
1.700	749.58	750.72	751.07	751.14	751.24	751.34	751.45	751.59	751.74	753.35	755.59	757.06	0.67	6.34
1.660	Central Ave Bridge													
1.600	746.47	750.27	750.93	751.03	751.15	751.28	751.42	751.58	751.73	753.35	755.59	757.06	0.79	6.79
1.500	744.29	750.27	750.93	751.03	751.15	751.28	751.42	751.58	751.73	753.35	755.59	757.06	0.80	6.79
1.400	OK Highway 10 Bridge													
1.300	742.00	750.27	750.93	751.03	751.15	751.28	751.42	751.58	751.73	753.35	755.59	757.06	0.80	6.79
1.000	739.34	750.27	750.93	751.03	751.15	751.28	751.42	751.58	751.73	753.35	755.59	757.06	0.80	6.79
0.700	737.06	750.27	750.93	751.03	751.15	751.28	751.42	751.58	751.73	753.35	755.59	757.06	0.80	6.79
0.300	736.42	750.27	750.93	751.03	751.15	751.28	751.42	751.58	751.73	753.35	755.59	757.06	0.80	6.79
0.041	735.85	750.27	750.93	751.03	751.14	751.28	751.42	751.57	751.73	753.35	755.59	757.06	0.80	6.79
0.000	Downstream end of Tar Creek													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX B.3
JULY 2007 (4 YEAR) INFLOW EVENT
MAXIMUM WATER SURFACE ELEVATIONS

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.9**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - JUL 2007 (4 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
152.175	Upstream end of model													
152.175	752.29	784.43	784.43	784.43	784.43	784.43	784.43	784.43	784.43	784.43	784.44	784.44	0.00	0.00
151.000	748.53	780.33	780.33	780.33	780.33	780.33	780.33	780.33	780.33	780.33	780.33	780.34	0.00	0.00
150.000	748.47	778.90	778.90	778.90	778.90	778.90	778.90	778.90	778.90	778.90	778.90	778.91	0.00	0.01
149.000	750.14	777.43	777.43	777.44	777.44	777.44	777.44	777.44	777.44	777.46	777.51	777.57	0.01	0.14
148.000	749.29	777.06	777.06	777.06	777.06	777.07	777.07	777.07	777.07	777.09	777.15	777.23	0.01	0.17
147.000	747.76	776.17	776.18	776.18	776.19	776.19	776.19	776.19	776.19	776.23	776.31	776.42	0.01	0.25
145.500	745.12	775.67	775.68	775.68	775.69	775.69	775.69	775.69	775.69	775.74	775.84	775.97	0.01	0.30
145.480	E 60 Road Bridge													
145.400	748.01	775.63	775.64	775.64	775.64	775.64	775.65	775.65	775.65	775.69	775.80	775.93	0.01	0.30
144.000	743.43	775.02	775.03	775.03	775.03	775.04	775.04	775.04	775.05	775.10	775.22	775.37	0.02	0.36
143.000	737.95	774.73	774.74	774.75	774.75	774.75	774.75	774.76	774.76	774.82	774.95	775.11	0.02	0.38
142.000	742.91	774.49	774.50	774.51	774.51	774.51	774.52	774.52	774.52	774.58	774.73	774.89	0.02	0.40
141.000	741.01	774.36	774.38	774.38	774.38	774.38	774.39	774.39	774.39	774.46	774.61	774.78	0.02	0.41
140.000	736.33	774.32	774.33	774.34	774.34	774.34	774.35	774.35	774.35	774.42	774.57	774.74	0.02	0.41
139.000	743.99	774.29	774.30	774.31	774.31	774.31	774.31	774.32	774.32	774.38	774.54	774.71	0.02	0.42
138.000	736.48	774.22	774.23	774.23	774.24	774.24	774.24	774.25	774.25	774.31	774.47	774.64	0.02	0.42
137.000	733.33	773.99	774.01	774.01	774.01	774.02	774.02	774.02	774.03	774.10	774.26	774.44	0.02	0.45
135.950	731.18	773.32	773.34	773.34	773.34	773.35	773.35	773.36	773.36	773.44	773.63	773.83	0.02	0.51
135.941	Highway 69 Bridge													
135.940	731.21	773.35	773.36	773.37	773.37	773.37	773.38	773.38	773.39	773.47	773.66	773.86	0.03	0.51
135.590	731.77	773.16	773.18	773.18	773.19	773.19	773.20	773.20	773.20	773.29	773.48	773.68	0.02	0.52
135.586	BN RR Bridge													
135.580	731.07	773.09	773.11	773.11	773.12	773.12	773.12	773.13	773.13	773.22	773.41	773.62	0.02	0.53
135.470	732.63	773.01	773.03	773.03	773.04	773.04	773.05	773.05	773.06	773.14	773.34	773.55	0.03	0.54
135.460	Highway 125 Bridge													
135.440	731.60	773.06	773.08	773.08	773.09	773.09	773.10	773.10	773.11	773.19	773.39	773.60	0.03	0.54

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.9**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - JUL 2007 (4 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
135.000	732.64	772.72	772.74	772.75	772.75	772.75	772.76	772.76	772.77	772.86	773.07	773.28	0.03	0.56
134.610	728.75	772.24	772.26	772.26	772.27	772.27	772.28	772.28	772.29	772.39	772.61	772.84	0.03	0.60
134.599	Abandonded RR Bridge													
134.595	728.58	771.97	771.99	771.99	772.00	772.00	772.01	772.01	772.02	772.12	772.36	772.60	0.03	0.63
134.000	727.23	771.68	771.70	771.71	771.71	771.72	771.72	771.73	771.74	771.85	772.10	772.34	0.03	0.66
133.973	Tar Creek													
133.900	727.72	771.36	771.38	771.38	771.39	771.39	771.40	771.41	771.41	771.53	771.79	772.04	0.03	0.68
133.800	Interstate 44 Bridge													
133.700	728.57	771.01	771.03	771.03	771.04	771.04	771.05	771.06	771.06	771.19	771.45	771.70	0.04	0.69
133.000	727.70	770.30	770.32	770.33	770.33	770.34	770.35	770.36	770.36	770.50	770.80	771.07	0.04	0.77
132.000	727.96	769.07	769.10	769.11	769.11	769.12	769.13	769.14	769.15	769.32	769.66	769.95	0.05	0.87
131.000	726.82	768.05	768.08	768.09	768.09	768.10	768.11	768.12	768.14	768.34	768.73	769.05	0.06	0.99
130.000	723.18	766.69	766.72	766.73	766.74	766.75	766.76	766.78	766.79	767.03	767.50	767.87	0.07	1.18
129.000	719.79	765.34	765.38	765.39	765.40	765.41	765.43	765.45	765.47	765.78	766.34	766.76	0.09	1.41
128.000	719.69	764.15	764.20	764.21	764.22	764.24	764.26	764.28	764.31	764.67	765.30	765.76	0.11	1.62
126.710	715.94	762.04	762.11	762.12	762.14	762.16	762.19	762.22	762.26	762.78	763.59	764.15	0.15	2.11
126.700	S 590 Road Bridge													
126.670	715.61	761.97	762.04	762.05	762.07	762.09	762.12	762.16	762.19	762.72	763.54	764.11	0.15	2.14
126.000	720.35	761.22	761.30	761.31	761.33	761.36	761.39	761.43	761.47	762.07	762.96	763.57	0.17	2.35
125.000	717.08	759.40	759.50	759.51	759.54	759.58	759.63	759.68	759.73	760.51	761.56	762.31	0.24	2.91
124.000	715.62	757.27	757.39	757.41	757.45	757.50	757.56	757.64	757.72	758.84	760.15	761.12	0.33	3.85
123.000	713.34	754.65	754.83	754.85	754.92	755.00	755.10	755.21	755.34	756.90	758.51	759.85	0.51	5.21
122.580	711.08	752.74	752.97	753.00	753.11	753.32	753.54	753.77	754.01	755.53	757.32	759.00	1.04	6.26
122.570	Highway 60 Bridge													
122.550	709.97	752.59	752.82	752.85	752.96	753.17	753.40	753.64	753.89	755.47	757.33	759.02	1.07	6.43
122.350	Spring River													
122.000	710.64	751.90	752.16	752.29	752.50	752.73	752.98	753.24	753.51	755.09	757.04	758.80	1.35	6.90

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.9**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - JUL 2007 (4 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
121.980	709.90	751.66	751.97	752.12	752.34	752.57	752.83	753.09	753.36	754.92	756.88	758.66	1.39	7.00
121.970	BN RR Bridge													
121.960	710.89	751.52	751.88	752.02	752.24	752.48	752.73	753.00	753.27	754.57	756.35	758.12	1.39	6.60
120.000	717.63	749.74	750.82	751.01	751.27	751.57	751.88	752.19	752.51	754.09	755.76	757.71	1.70	7.97
118.000	720.29	749.08	750.30	750.51	750.81	751.13	751.46	751.80	752.15	753.90	755.45	757.49	1.85	8.41
116.000	725.99	748.82	749.99	750.22	750.54	750.88	751.24	751.60	751.96	753.81	755.31	757.39	1.96	8.58
114.000	718.27	748.34	749.47	749.74	750.09	750.47	750.86	751.25	751.64	753.67	755.07	757.23	2.18	8.89
112.000	714.31	748.11	749.20	749.48	749.86	750.26	750.67	751.08	751.48	753.59	754.95	757.15	2.27	9.04
110.000	719.24	748.00	749.07	749.37	749.75	750.16	750.58	750.99	751.40	753.56	754.90	757.11	2.33	9.11
108.000	710.68	747.88	748.93	749.23	749.63	750.04	750.47	750.89	751.31	753.52	754.82	757.06	2.38	9.18
106.000	700.35	747.86	748.91	749.21	749.61	750.03	750.45	750.87	751.29	753.51	754.82	757.04	2.38	9.18
105.350	Elk River													
105.000	701.60	747.86	748.91	749.21	749.61	750.03	750.45	750.87	751.29	753.51	754.82	757.04	2.38	9.18
104.000	696.61	747.86	748.90	749.20	749.60	750.02	750.45	750.86	751.28	753.51	754.82	757.04	2.38	9.18
102.000	688.58	747.84	748.88	749.18	749.58	750.00	750.43	750.85	751.27	753.51	754.81	757.02	2.39	9.18
101.750	685.91	747.84	748.87	749.17	749.57	749.99	750.42	750.84	751.26	753.50	754.81	757.02	2.39	9.18
101.730	Highway 59 (Sailboat Bridge)													
101.710	682.31	747.83	748.86	749.16	749.56	749.98	750.41	750.83	751.25	753.49	754.80	757.01	2.39	9.18
100.000	702.62	747.83	748.86	749.16	749.56	749.98	750.41	750.83	751.25	753.50	754.80	757.01	2.39	9.18
90.000	681.52	747.82	748.85	749.15	749.55	749.97	750.40	750.82	751.24	753.49	754.79	757.00	2.39	9.18
80.000	657.03	747.82	748.85	749.15	749.55	749.97	750.40	750.82	751.24	753.49	754.79	757.00	2.39	9.18
78.000	653.11	747.82	748.85	749.15	749.55	749.97	750.40	750.82	751.24	753.49	754.79	757.00	2.39	9.18
77.000	Pensacola Dam													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.10**

GRAND RIVER DAM AUTHORITY SPRING RIVER MAX WSELs - JUL 2007 (4 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
21.000	Upstream end of model													
21.000	762.67	783.49	783.49	783.49	783.49	783.49	783.49	783.49	783.49	783.49	783.50	783.51	0.00	0.02
20.000	760.13	780.70	780.70	780.70	780.70	780.70	780.70	780.70	780.70	780.70	780.71	780.72	0.00	0.02
19.000	759.04	777.52	777.52	777.52	777.52	777.52	777.52	777.52	777.52	777.52	777.53	777.55	0.00	0.04
18.000	753.18	774.19	774.19	774.19	774.20	774.20	774.20	774.20	774.20	774.20	774.23	774.27	0.01	0.08
17.000	750.54	772.20	772.20	772.20	772.20	772.20	772.20	772.20	772.20	772.21	772.25	772.32	0.00	0.12
16.000	749.28	770.00	770.00	770.00	770.00	770.00	770.00	770.00	770.00	770.00	770.08	770.18	0.00	0.18
15.000	746.37	767.51	767.51	767.51	767.51	767.51	767.51	767.51	767.51	767.52	767.65	767.79	0.01	0.28
14.170	741.32	765.96	765.96	765.96	765.96	765.96	765.96	765.96	765.96	765.97	766.14	766.33	0.00	0.37
14.160	E 57 Road													
14.120	744.21	766.18	766.18	766.18	766.18	766.18	766.18	766.18	766.18	766.18	766.35	766.54	0.00	0.36
13.510	744.59	765.30	765.30	765.30	765.30	765.30	765.30	765.30	765.30	765.31	765.51	765.73	0.00	0.43
13.500	Interstate 44 Bridge													
13.450	745.52	764.98	764.98	764.98	764.98	764.98	764.98	764.98	764.98	764.98	765.20	765.43	0.00	0.45
12.000	742.72	762.16	762.16	762.16	762.16	762.16	762.16	762.16	762.16	762.17	762.58	762.97	0.00	0.81
11.000	742.23	760.39	760.39	760.39	760.39	760.39	760.39	760.39	760.39	760.41	761.04	761.59	0.00	1.20
10.000	737.62	758.86	758.86	758.86	758.86	758.86	758.85	758.85	758.85	758.89	759.79	760.98	0.01	2.14
9.000	733.92	757.29	757.29	757.29	757.29	757.28	757.28	757.28	757.28	757.34	759.05	760.63	0.01	3.35
8.020	733.14	755.94	755.93	755.93	755.93	755.92	755.92	755.92	755.92	756.67	758.74	760.44	0.01	4.52
8.010	OK Highway 10 Bridge													
7.970	731.28	753.85	753.98	754.01	754.05	754.10	754.15	754.21	754.27	755.63	757.62	759.51	0.29	5.66
7.000	730.33	753.00	753.24	753.29	753.33	753.39	753.48	753.71	753.96	755.58	757.48	759.35	0.71	6.35
6.000	727.95	752.70	752.95	752.98	753.04	753.20	753.44	753.68	753.94	755.56	757.46	759.29	0.98	6.58
5.000	722.10	752.60	752.85	752.88	752.97	753.18	753.42	753.67	753.92	755.55	757.44	759.24	1.07	6.64
4.000	720.00	752.58	752.83	752.86	752.95	753.17	753.41	753.66	753.91	755.54	757.44	759.22	1.08	6.64
3.000	723.22	752.57	752.82	752.85	752.95	753.17	753.40	753.65	753.91	755.53	757.43	759.19	1.09	6.62
2.000	723.73	752.56	752.80	752.84	752.94	753.16	753.40	753.65	753.90	755.53	757.43	759.18	1.10	6.62
1.000	728.44	752.55	752.80	752.83	752.94	753.16	753.40	753.64	753.90	755.53	757.43	759.17	1.10	6.62
0.580	716.17	752.54	752.79	752.82	752.93	753.16	753.39	753.64	753.89	755.52	757.42	759.14	1.10	6.60
0.570	Highway 60 Bridge													
0.560	713.76	752.54	752.78	752.81	752.93	753.15	753.39	753.63	753.89	755.51	757.41	759.12	1.11	6.58
0.460	715.35	752.54	752.78	752.82	752.93	753.15	753.39	753.63	753.89	755.52	757.42	759.13	1.11	6.59
0.000	Downstream end of Spring River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.11**

GRAND RIVER DAM AUTHORITY ELK RIVER MAX WSELs - JUL 2007 (4 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
19.590	Upstream end of model													
19.590	771.15	775.57	775.57	775.57	775.57	775.57	775.57	775.57	775.57	775.57	775.57	775.57	0.00	0.00
19.000	767.51	774.03	774.03	774.03	774.03	774.03	774.03	774.03	774.03	774.03	774.03	774.03	0.00	0.00
18.000	765.41	770.46	770.46	770.46	770.46	770.46	770.46	770.46	770.46	770.46	770.46	770.46	0.00	0.00
17.000	762.53	767.01	767.01	767.01	767.01	767.01	767.01	767.01	767.01	767.01	767.01	767.01	0.00	0.00
16.000	756.63	762.78	762.78	762.78	762.78	762.78	762.78	762.78	762.78	762.78	762.78	762.78	0.00	0.00
15.000	754.26	759.23	759.23	759.23	759.23	759.23	759.23	759.23	759.23	759.23	759.23	759.23	0.00	0.00
14.240	750.52	754.63	754.63	754.63	754.63	754.63	754.63	754.63	754.63	754.69	755.36	757.22	0.00	2.59
14.220	Highway 43 Bridge													
14.200	750.12	754.57	754.57	754.57	754.58	754.58	754.58	754.58	754.58	754.65	755.34	757.21	0.01	2.64
14.000	747.07	754.25	754.25	754.25	754.25	754.25	754.25	754.25	754.25	754.46	755.23	757.19	0.01	2.94
13.000	745.41	750.30	750.47	750.54	750.66	750.84	751.10	751.40	751.72	753.65	754.90	757.12	1.25	6.82
12.000	741.15	748.27	749.16	749.43	749.81	750.20	750.62	751.03	751.43	753.56	754.85	757.11	2.27	8.84
11.910	OK/MO State Line													
11.000	741.93	747.96	749.01	749.31	749.70	750.10	750.54	750.96	751.37	753.53	754.83	757.09	2.36	9.13
10.000	734.62	747.90	748.98	749.28	749.68	750.08	750.52	750.94	751.35	753.53	754.83	757.09	2.37	9.19
9.000	734.66	747.90	748.96	749.27	749.67	750.07	750.51	750.93	751.34	753.52	754.83	757.08	2.38	9.18
8.000	724.21	747.89	748.95	749.26	749.66	750.07	750.50	750.92	751.33	753.52	754.83	757.08	2.38	9.19
7.000	728.21	747.89	748.95	749.25	749.65	750.06	750.49	750.91	751.33	753.52	754.83	757.07	2.38	9.18
6.000	727.13	747.88	748.94	749.25	749.64	750.06	750.49	750.91	751.32	753.52	754.83	757.07	2.38	9.19
5.000	721.05	747.88	748.93	749.24	749.64	750.05	750.48	750.90	751.31	753.52	754.82	757.06	2.38	9.18
4.700	716.13	747.88	748.93	749.23	749.63	750.05	750.48	750.90	751.31	753.52	754.82	757.06	2.38	9.18
4.670	OK Highway 10 Bridge													
4.640	715.21	747.88	748.93	749.23	749.63	750.05	750.48	750.90	751.31	753.52	754.82	757.06	2.38	9.18
4.000	716.61	747.87	748.93	749.23	749.63	750.04	750.47	750.89	751.31	753.51	754.82	757.06	2.38	9.19
3.000	714.74	747.87	748.92	749.23	749.62	750.04	750.47	750.89	751.30	753.51	754.82	757.05	2.38	9.18
2.000	709.09	747.87	748.92	749.22	749.62	750.04	750.46	750.88	751.30	753.51	754.82	757.05	2.38	9.18
1.000	705.82	747.86	748.91	749.21	749.61	750.03	750.46	750.88	751.29	753.51	754.82	757.05	2.38	9.19
0.320	706.36	747.86	748.91	749.21	749.61	750.03	750.45	750.87	751.29	753.51	754.82	757.04	2.38	9.18
0.000	Downstream end of Elk River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.12**

GRAND RIVER DAM AUTHORITY TAR CREEK MAX WSELs - JUL 2007 (4 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
4.152	Upstream end of model													
4.152	762.17	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.19	772.44	0.03	0.67
3.900	760.10	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.19	772.44	0.03	0.67
3.840	22nd Ave Bridge													
3.800	762.30	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.44	0.03	0.67
3.300	759.46	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.44	0.03	0.67
2.800	756.73	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.44	0.03	0.67
2.710	BN RR Bridge													
2.700	755.72	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.44	0.03	0.67
2.500	754.95	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.44	0.03	0.67
2.300	754.15	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.43	0.03	0.67
2.200	Rockdale Blvd Bridge													
2.100	751.51	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.43	0.03	0.67
1.900	750.02	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.43	0.03	0.67
1.700	749.58	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.43	0.03	0.67
1.660	Central Ave Bridge													
1.600	746.47	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.82	771.93	772.18	772.43	0.03	0.67
1.500	744.29	771.76	771.78	771.79	771.79	771.80	771.80	771.81	771.81	771.93	772.18	772.43	0.03	0.67
1.400	OK Highway 10 Bridge													
1.300	742.00	771.76	771.78	771.78	771.79	771.79	771.80	771.81	771.81	771.93	772.18	772.43	0.03	0.67
1.000	739.34	771.75	771.77	771.78	771.78	771.79	771.80	771.80	771.81	771.92	772.18	772.43	0.03	0.67
0.700	737.06	771.74	771.77	771.77	771.78	771.78	771.79	771.79	771.80	771.91	772.17	772.42	0.03	0.67
0.300	736.42	771.68	771.70	771.70	771.71	771.71	771.72	771.73	771.73	771.85	772.10	772.35	0.03	0.67
0.041	735.85	771.59	771.61	771.62	771.62	771.63	771.64	771.64	771.65	771.76	772.02	772.26	0.03	0.67
0.000	Downstream end of Tar Creek													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX B.4
OCTOBER 2009 (3 YEAR) INFLOW EVENT
MAXIMUM WATER SURFACE ELEVATIONS

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.13**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - OCT 2009 (3 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
152.175	Upstream end of model													
152.175	752.29	778.47	778.47	778.47	778.47	778.47	778.47	778.47	778.47	778.47	778.47	778.47	0.00	0.00
151.000	748.53	776.35	776.35	776.35	776.35	776.35	776.35	776.35	776.35	776.35	776.35	776.35	0.00	0.00
150.000	748.47	775.17	775.17	775.17	775.17	775.17	775.17	775.17	775.17	775.17	775.18	775.18	0.00	0.00
149.000	750.14	773.78	773.78	773.78	773.78	773.78	773.78	773.78	773.78	773.78	773.78	773.78	0.00	0.01
148.000	749.29	772.40	772.40	772.40	772.40	772.40	772.40	772.40	772.40	772.40	772.41	772.41	0.00	0.02
147.000	747.76	770.52	770.52	770.52	770.52	770.52	770.52	770.52	770.52	770.52	770.54	770.55	0.00	0.04
145.500	745.12	768.34	768.34	768.34	768.34	768.34	768.34	768.35	768.35	768.36	768.40	768.45	0.00	0.10
145.480	E 60 Road Bridge													
145.400	748.01	768.23	768.23	768.23	768.23	768.23	768.24	768.24	768.24	768.25	768.29	768.34	0.00	0.11
144.000	743.43	766.45	766.46	766.46	766.46	766.46	766.46	766.46	766.46	766.49	766.57	766.66	0.01	0.21
143.000	737.95	764.99	765.00	765.00	765.00	765.00	765.01	765.01	765.01	765.07	765.25	765.41	0.01	0.42
142.000	742.91	763.79	763.81	763.81	763.82	763.82	763.83	763.83	763.84	763.93	764.24	764.45	0.03	0.65
141.000	741.01	763.11	763.14	763.15	763.15	763.16	763.17	763.17	763.18	763.33	763.75	764.00	0.04	0.89
140.000	736.33	762.75	762.78	762.79	762.79	762.80	762.81	762.83	762.84	763.02	763.53	763.81	0.06	1.06
139.000	743.99	762.19	762.24	762.24	762.26	762.27	762.28	762.30	762.32	762.57	763.21	763.54	0.08	1.36
138.000	736.48	761.73	761.78	761.80	761.81	761.82	761.84	761.86	761.88	762.18	762.92	763.28	0.10	1.56
137.000	733.33	760.62	760.69	760.71	760.73	760.75	760.77	760.80	760.83	761.22	762.15	762.56	0.14	1.94
135.950	731.18	759.91	760.00	760.01	760.04	760.06	760.09	760.12	760.15	760.59	761.61	762.05	0.15	2.14
135.941	Highway 69 Bridge													
135.940	731.21	759.87	759.95	759.97	759.99	760.02	760.05	760.08	760.11	760.55	761.58	762.02	0.16	2.15
135.590	731.77	759.80	759.89	759.91	759.93	759.95	759.98	760.01	760.05	760.49	761.53	761.97	0.16	2.17
135.586	BN RR Bridge													
135.580	731.07	759.78	759.86	759.88	759.90	759.93	759.96	759.99	760.02	760.47	761.51	761.94	0.16	2.16
135.470	732.63	759.69	759.78	759.79	759.82	759.84	759.87	759.90	759.94	760.39	761.44	761.89	0.16	2.20
135.460	Highway 125 Bridge													
135.440	731.60	759.73	759.82	759.84	759.86	759.89	759.92	759.95	759.98	760.43	761.48	761.92	0.16	2.19

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.13**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - OCT 2009 (3 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
135.000	732.64	759.60	759.69	759.71	759.73	759.76	759.79	759.82	759.86	760.32	761.40	761.86	0.17	2.26
134.610	728.75	759.31	759.41	759.43	759.45	759.48	759.51	759.55	759.59	760.07	761.18	761.65	0.18	2.34
134.599	Abandonded RR Bridge													
134.595	728.58	759.12	759.22	759.24	759.26	759.29	759.33	759.36	759.40	759.89	761.02	761.50	0.18	2.38
134.000	727.23	758.47	758.57	758.60	758.62	758.65	758.69	758.73	758.77	759.32	760.56	761.12	0.20	2.65
133.973	Tar Creek													
133.900	727.72	758.20	758.32	758.34	758.37	758.40	758.44	758.48	758.53	759.10	760.38	760.96	0.21	2.76
133.800	Interstate 44 Bridge													
133.700	728.57	757.91	758.03	758.06	758.08	758.12	758.16	758.21	758.25	758.85	760.19	760.81	0.22	2.90
133.000	727.70	756.62	756.77	756.81	756.84	756.89	756.94	756.99	757.05	757.79	759.36	760.20	0.28	3.57
132.000	727.96	755.19	755.40	755.43	755.48	755.53	755.60	755.66	755.73	756.63	758.50	759.61	0.34	4.42
131.000	726.82	753.99	754.25	754.29	754.34	754.41	754.49	754.56	754.64	755.70	757.82	759.18	0.38	5.19
130.000	723.18	753.52	753.81	753.85	753.90	753.97	754.06	754.13	754.22	755.34	757.58	759.04	0.41	5.51
129.000	719.79	752.80	753.12	753.17	753.22	753.30	753.39	753.48	753.57	754.98	757.32	758.91	0.45	6.11
128.000	719.69	752.51	752.85	752.90	752.96	753.04	753.13	753.22	753.32	754.78	757.18	758.84	0.46	6.32
126.710	715.94	751.97	752.33	752.39	752.45	752.53	752.63	752.72	752.83	754.36	756.91	758.69	0.50	6.72
126.700	S 590 Road Bridge													
126.670	715.61	751.94	752.31	752.37	752.43	752.51	752.61	752.70	752.81	754.33	756.91	758.67	0.50	6.73
126.000	720.35	751.90	752.27	752.33	752.39	752.48	752.58	752.67	752.78	754.32	756.88	758.65	0.51	6.75
125.000	717.08	751.58	751.98	752.04	752.11	752.19	752.30	752.40	752.51	754.10	756.73	758.57	0.53	6.99
124.000	715.62	751.40	751.81	751.87	751.94	752.03	752.14	752.24	752.35	753.97	756.64	758.53	0.54	7.13
123.000	713.34	751.15	751.58	751.64	751.72	751.81	751.92	752.02	752.14	753.81	756.53	758.46	0.56	7.31
122.580	711.08	751.07	751.50	751.56	751.63	751.73	751.84	751.94	752.06	753.73	756.47	758.43	0.56	7.36
122.570	Highway 60 Bridge													
122.550	709.97	750.79	751.24	751.30	751.38	751.47	751.59	751.70	751.82	753.56	756.39	758.41	0.58	7.62
122.350	Spring River													
122.000	710.64	750.32	750.80	750.87	750.95	751.05	751.18	751.29	751.42	753.26	756.19	758.23	0.62	7.91

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.13**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - OCT 2009 (3 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0 Max WSE (ft, PD)	El. 742.0 Max WSE (ft, PD)	El. 742.5 Max WSE (ft, PD)	El. 743.0 Max WSE (ft, PD)	El. 743.5 Max WSE (ft, PD)	El. 744.0 Max WSE (ft, PD)	El. 744.5 Max WSE (ft, PD)	El. 745.0 Max WSE (ft, PD)	El. 749.0 Max WSE (ft, PD)	El. 753.0 Max WSE (ft, PD)	El. 757.0 Max WSE (ft, PD)		
121.980	709.90	750.11	750.60	750.66	750.75	750.85	750.98	751.10	751.23	753.11	756.08	758.14	0.63	8.03
121.970	BN RR Bridge													
121.960	710.89	750.00	750.49	750.56	750.64	750.75	750.88	750.99	751.12	753.01	755.75	757.79	0.63	7.79
120.000	717.63	747.96	748.68	748.81	748.96	749.13	749.32	749.53	749.75	752.26	755.38	757.51	1.08	9.54
118.000	720.29	746.98	747.82	747.99	748.17	748.38	748.61	748.86	749.12	751.94	755.20	757.35	1.31	10.37
116.000	725.99	746.25	747.21	747.41	747.62	747.88	748.15	748.44	748.75	751.78	755.11	757.28	1.54	11.03
114.000	718.27	744.52	746.00	746.30	746.64	747.00	747.37	747.75	748.12	751.59	754.97	757.18	2.13	12.66
112.000	714.31	743.59	745.47	745.76	746.16	746.57	747.00	747.43	747.88	751.53	754.90	757.14	2.41	13.55
110.000	719.24	743.28	745.25	745.57	746.02	746.47	746.91	747.36	747.81	751.51	754.87	757.11	2.56	13.83
108.000	710.68	743.02	745.11	745.44	745.91	746.36	746.82	747.28	747.74	751.48	754.82	757.09	2.63	14.07
106.000	700.35	743.00	745.10	745.44	745.90	746.36	746.81	747.27	747.73	751.48	754.82	757.06	2.63	14.07
105.350	Elk River													
105.000	701.60	743.00	745.10	745.44	745.90	746.36	746.81	747.27	747.73	751.48	754.82	757.06	2.63	14.06
104.000	696.61	742.99	745.10	745.43	745.90	746.36	746.81	747.27	747.73	751.47	754.81	757.05	2.63	14.06
102.000	688.58	742.98	745.09	745.43	745.89	746.35	746.81	747.27	747.72	751.47	754.81	757.02	2.63	14.04
101.750	685.91	742.98	745.09	745.43	745.89	746.35	746.80	747.26	747.72	751.47	754.81	757.02	2.63	14.04
101.730	Highway 59 (Sailboat Bridge)													
101.710	682.31	742.97	745.08	745.42	745.88	746.34	746.79	747.25	747.71	751.46	754.80	757.02	2.63	14.05
100.000	702.62	742.97	745.08	745.42	745.88	746.34	746.80	747.26	747.72	751.46	754.80	757.00	2.64	14.04
90.000	681.52	742.96	745.07	745.41	745.87	746.33	746.79	747.25	747.71	751.46	754.80	757.00	2.64	14.04
80.000	657.03	742.96	745.07	745.41	745.87	746.33	746.79	747.25	747.71	751.46	754.80	757.00	2.64	14.04
78.000	653.11	742.96	745.07	745.41	745.87	746.33	746.79	747.25	747.71	751.46	754.80	757.00	2.64	14.04
77.000	Pensacola Dam													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.14**

GRAND RIVER DAM AUTHORITY SPRING RIVER MAX WSELs - OCT 2009 (3 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
21.000	Upstream end of model													
21.000	762.67	790.77	790.77	790.77	790.77	790.77	790.77	790.77	790.77	790.77	790.77	790.77	0.00	0.00
20.000	760.13	788.92	788.92	788.92	788.92	788.92	788.92	788.92	788.92	788.92	788.92	788.92	0.00	0.00
19.000	759.04	785.68	785.68	785.68	785.68	785.68	785.68	785.68	785.68	785.68	785.68	785.69	0.00	0.01
18.000	753.18	782.60	782.60	782.60	782.60	782.60	782.60	782.60	782.60	782.60	782.61	782.61	0.00	0.01
17.000	750.54	780.53	780.53	780.53	780.53	780.53	780.53	780.53	780.53	780.53	780.54	780.56	0.00	0.02
16.000	749.28	778.12	778.12	778.12	778.12	778.12	778.12	778.12	778.12	778.12	778.14	778.15	0.00	0.03
15.000	746.37	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.16	775.19	775.22	0.00	0.06
14.170	741.32	772.80	772.81	772.81	772.81	772.81	772.81	772.81	772.81	772.82	772.86	772.90	0.00	0.10
14.160	E 57 Road													
14.120	744.21	773.22	773.22	773.22	773.22	773.22	773.22	773.22	773.22	773.23	773.27	773.31	0.00	0.09
13.510	744.59	772.08	772.08	772.08	772.08	772.08	772.08	772.08	772.08	772.09	772.14	772.19	0.00	0.11
13.500	Interstate 44 Bridge													
13.450	745.52	771.61	771.61	771.61	771.61	771.61	771.61	771.61	771.61	771.63	771.67	771.73	0.00	0.12
12.000	742.72	767.88	767.89	767.89	767.89	767.89	767.89	767.90	767.90	767.93	768.03	768.16	0.01	0.28
11.000	742.23	765.97	765.98	765.98	765.98	765.98	765.99	765.99	765.99	766.05	766.22	766.45	0.01	0.48
10.000	737.62	764.44	764.46	764.46	764.46	764.47	764.47	764.47	764.48	764.57	764.83	765.18	0.02	0.75
9.000	733.92	762.25	762.28	762.29	762.29	762.30	762.30	762.31	762.32	762.46	762.90	763.50	0.04	1.25
8.020	733.14	760.71	760.75	760.76	760.77	760.78	760.79	760.80	760.81	761.04	761.68	762.51	0.06	1.80
8.010	OK Highway 10 Bridge													
7.970	731.28	759.40	759.45	759.46	759.47	759.48	759.49	759.50	759.52	759.80	760.57	761.54	0.07	2.14
7.000	730.33	756.95	757.05	757.07	757.09	757.11	757.13	757.16	757.20	757.71	758.98	760.33	0.15	3.38
6.000	727.95	755.35	755.50	755.53	755.56	755.60	755.64	755.68	755.73	756.51	758.19	759.76	0.23	4.41
5.000	722.10	754.02	754.24	754.28	754.32	754.36	754.42	754.49	754.55	755.57	757.61	759.36	0.31	5.34
4.000	720.00	753.17	753.44	753.49	753.54	753.60	753.67	753.75	753.82	755.02	757.29	759.13	0.38	5.96
3.000	723.22	752.38	752.71	752.76	752.82	752.89	752.97	753.06	753.15	754.51	756.97	758.88	0.44	6.49
2.000	723.73	751.73	752.11	752.17	752.24	752.32	752.42	752.51	752.61	754.14	756.77	758.73	0.50	6.99
1.000	728.44	751.24	751.67	751.73	751.80	751.89	752.00	752.10	752.21	753.87	756.61	758.59	0.54	7.35
0.580	716.17	750.79	751.24	751.30	751.38	751.47	751.59	751.70	751.82	753.56	756.40	758.38	0.58	7.59
0.570	Highway 60 Bridge													
0.560	713.76	750.74	751.19	751.25	751.33	751.42	751.54	751.65	751.77	753.52	756.36	758.34	0.58	7.60
0.460	715.35	750.77	751.23	751.29	751.37	751.46	751.58	751.69	751.81	753.56	756.41	758.40	0.58	7.63
0.000	Downstream end of Spring River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.15**

GRAND RIVER DAM AUTHORITY ELK RIVER MAX WSELs - OCT 2009 (3 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
19.590	Upstream end of model													
19.590	771.15	793.77	793.77	793.77	793.77	793.77	793.77	793.77	793.77	793.77	793.77	793.77	0.00	0.00
19.000	767.51	791.13	791.13	791.13	791.13	791.13	791.13	791.13	791.13	791.13	791.13	791.13	0.00	0.00
18.000	765.41	787.17	787.17	787.17	787.17	787.17	787.17	787.17	787.17	787.17	787.17	787.17	0.00	0.00
17.000	762.53	783.91	783.91	783.91	783.91	783.91	783.91	783.91	783.91	783.91	783.91	783.91	0.00	0.00
16.000	756.63	779.22	779.22	779.22	779.22	779.22	779.22	779.22	779.22	779.22	779.22	779.22	0.00	0.00
15.000	754.26	775.00	775.00	775.00	775.00	775.00	775.00	775.00	775.00	775.00	775.00	775.00	0.00	0.00
14.240	750.52	771.70	771.70	771.70	771.70	771.70	771.70	771.70	771.70	771.70	771.71	771.71	0.00	0.01
14.220	Highway 43 Bridge													
14.200	750.12	771.20	771.20	771.20	771.20	771.20	771.20	771.20	771.20	771.20	771.20	771.21	0.00	0.01
14.000	747.07	770.02	770.02	770.02	770.02	770.02	770.02	770.02	770.02	770.02	770.02	770.02	0.00	0.01
13.000	745.41	764.84	764.84	764.84	764.84	764.84	764.84	764.84	764.84	764.84	764.87	764.88	0.00	0.04
12.000	741.15	761.15	761.15	761.15	761.15	761.15	761.15	761.15	761.15	761.17	761.27	761.35	0.00	0.19
11.910	OK/MO State Line													
11.000	741.93	755.16	755.17	755.17	755.18	755.18	755.19	755.20	755.21	755.45	756.42	757.14	0.04	1.98
10.000	734.62	750.86	750.90	750.92	750.95	750.98	751.02	751.07	751.13	752.25	754.84	757.13	0.23	6.27
9.000	734.66	747.82	747.96	748.02	748.08	748.18	748.29	748.43	748.59	751.48	754.84	757.13	0.63	9.31
8.000	724.21	745.54	745.85	745.98	746.16	746.37	746.82	747.28	747.74	751.48	754.83	757.12	1.89	11.58
7.000	728.21	743.07	745.11	745.44	745.91	746.37	746.82	747.28	747.73	751.48	754.83	757.11	2.62	14.04
6.000	727.13	743.02	745.11	745.44	745.91	746.36	746.82	747.28	747.73	751.48	754.83	757.11	2.62	14.09
5.000	721.05	743.01	745.10	745.44	745.90	746.36	746.82	747.27	747.73	751.48	754.82	757.10	2.63	14.09
4.700	716.13	743.01	745.10	745.44	745.90	746.36	746.82	747.27	747.73	751.48	754.82	757.10	2.63	14.09
4.670	OK Highway 10 Bridge													
4.640	715.21	743.01	745.10	745.44	745.90	746.36	746.81	747.27	747.73	751.48	754.82	757.10	2.63	14.09
4.000	716.61	743.01	745.10	745.44	745.90	746.36	746.81	747.27	747.73	751.48	754.82	757.09	2.63	14.08
3.000	714.74	743.00	745.10	745.44	745.90	746.36	746.81	747.27	747.73	751.48	754.82	757.08	2.63	14.08
2.000	709.09	743.00	745.10	745.44	745.90	746.36	746.81	747.27	747.73	751.48	754.82	757.08	2.63	14.08
1.000	705.82	743.00	745.10	745.44	745.90	746.36	746.81	747.27	747.73	751.48	754.82	757.07	2.63	14.07
0.320	706.36	743.00	745.10	745.44	745.90	746.36	746.81	747.27	747.73	751.48	754.82	757.06	2.63	14.06
0.000	Downstream end of Elk River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.16**

GRAND RIVER DAM AUTHORITY TAR CREEK MAX WSELs - OCT 2009 (3 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
4.152	Upstream end of model													
4.152	762.17	775.04	775.04	775.04	775.04	775.04	775.04	775.04	775.04	775.04	775.04	775.04	0.00	0.00
3.900	760.10	774.11	774.11	774.11	774.11	774.11	774.11	774.11	774.11	774.11	774.11	774.11	0.00	0.00
3.840	22nd Ave Bridge													
3.800	762.30	772.86	772.86	772.86	772.86	772.86	772.86	772.86	772.86	772.86	772.86	772.86	0.00	0.00
3.300	759.46	770.57	770.57	770.57	770.57	770.57	770.57	770.57	770.57	770.57	770.57	770.57	0.00	0.00
2.800	756.73	766.52	766.52	766.52	766.52	766.52	766.52	766.52	766.52	766.53	766.53	766.53	0.00	0.00
2.710	BN RR Bridge													
2.700	755.72	765.50	765.50	765.50	765.50	765.50	765.50	765.50	765.50	765.50	765.50	765.50	0.00	0.01
2.500	754.95	764.13	764.13	764.13	764.13	764.13	764.13	764.13	764.13	764.13	764.14	764.14	0.00	0.02
2.300	754.15	762.23	762.23	762.23	762.23	762.23	762.23	762.23	762.23	762.24	762.28	762.30	0.00	0.07
2.200	Rockdale Blvd Bridge													
2.100	751.51	759.49	759.50	759.51	759.51	759.51	759.51	759.51	759.52	759.57	760.48	761.04	0.01	1.55
1.900	750.02	758.35	758.46	758.48	758.51	758.54	758.58	758.62	758.66	759.22	760.48	761.04	0.21	2.70
1.700	749.58	758.35	758.46	758.48	758.51	758.54	758.58	758.62	758.66	759.22	760.48	761.04	0.21	2.70
1.660	Central Ave Bridge													
1.600	746.47	758.35	758.46	758.48	758.51	758.54	758.58	758.62	758.66	759.22	760.48	761.04	0.21	2.70
1.500	744.29	758.35	758.46	758.48	758.51	758.54	758.58	758.62	758.66	759.22	760.48	761.04	0.21	2.70
1.400	OK Highway 10 Bridge													
1.300	742.00	758.35	758.46	758.48	758.51	758.54	758.58	758.62	758.66	759.22	760.48	761.04	0.21	2.70
1.000	739.34	758.35	758.46	758.48	758.51	758.54	758.58	758.62	758.66	759.22	760.48	761.04	0.21	2.70
0.700	737.06	758.35	758.46	758.48	758.51	758.54	758.58	758.62	758.66	759.22	760.48	761.04	0.21	2.70
0.300	736.42	758.35	758.46	758.49	758.51	758.54	758.58	758.62	758.67	759.23	760.48	761.05	0.21	2.70
0.041	735.85	758.34	758.45	758.47	758.50	758.53	758.57	758.61	758.65	759.21	760.47	761.04	0.21	2.70
0.000	Downstream end of Tar Creek													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX B.5
DECEMBER 2015 (15 YEAR) INFLOW EVENT
MAXIMUM WATER SURFACE ELEVATIONS

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.17**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - DEC 2015 (15 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
152.175	Upstream end of model													
152.175	752.29	778.38	778.38	778.38	778.38	778.38	778.38	778.38	778.38	778.38	778.38	778.39	0.00	0.00
151.000	748.53	776.27	776.27	776.27	776.27	776.27	776.27	776.27	776.27	776.27	776.27	776.27	0.00	0.00
150.000	748.47	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.15	0.00	0.00
149.000	750.14	773.76	773.76	773.76	773.76	773.76	773.76	773.76	773.76	773.76	773.76	773.76	0.00	0.00
148.000	749.29	772.37	772.37	772.37	772.37	772.37	772.37	772.37	772.37	772.37	772.38	772.38	0.00	0.02
147.000	747.76	770.49	770.50	770.50	770.50	770.50	770.50	770.50	770.50	770.51	770.53	770.56	0.00	0.06
145.500	745.12	768.33	768.33	768.33	768.33	768.33	768.34	768.34	768.34	768.37	768.44	768.52	0.01	0.19
145.480	E 60 Road Bridge													
145.400	748.01	768.22	768.22	768.22	768.23	768.23	768.23	768.23	768.23	768.26	768.33	768.41	0.01	0.20
144.000	743.43	766.47	766.49	766.49	766.49	766.50	766.50	766.51	766.51	766.60	766.75	766.90	0.02	0.43
143.000	737.95	765.14	765.17	765.18	765.18	765.19	765.20	765.22	765.23	765.42	765.67	765.92	0.06	0.78
142.000	742.91	764.11	764.18	764.19	764.20	764.22	764.24	764.26	764.29	764.57	764.90	765.22	0.11	1.11
141.000	741.01	763.60	763.71	763.72	763.74	763.76	763.79	763.82	763.86	764.20	764.58	764.95	0.15	1.34
140.000	736.33	763.37	763.50	763.51	763.53	763.56	763.59	763.63	763.67	764.05	764.46	764.85	0.17	1.48
139.000	743.99	763.03	763.20	763.21	763.24	763.27	763.31	763.36	763.41	763.85	764.29	764.71	0.22	1.68
138.000	736.48	762.73	762.93	762.95	762.97	763.01	763.06	763.11	763.17	763.64	764.11	764.56	0.25	1.82
137.000	733.33	761.96	762.23	762.25	762.28	762.33	762.40	762.47	762.55	763.07	763.58	764.08	0.32	2.11
135.950	731.18	761.44	761.75	761.77	761.80	761.86	761.94	762.02	762.11	762.66	763.18	763.70	0.36	2.26
135.941	Highway 69 Bridge													
135.940	731.21	761.41	761.72	761.74	761.77	761.84	761.91	762.00	762.08	762.64	763.16	763.69	0.36	2.28
135.590	731.77	761.36	761.67	761.69	761.73	761.79	761.87	761.95	762.04	762.59	763.11	763.64	0.37	2.28
135.586	BN RR Bridge													
135.580	731.07	761.33	761.65	761.67	761.70	761.77	761.84	761.93	762.02	762.57	763.09	763.62	0.37	2.29
135.470	732.63	761.27	761.60	761.62	761.65	761.71	761.79	761.88	761.97	762.53	763.05	763.58	0.37	2.31
135.460	Highway 125 Bridge													
135.440	731.60	761.30	761.63	761.65	761.68	761.75	761.82	761.91	762.00	762.56	763.08	763.61	0.37	2.31

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.17**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - DEC 2015 (15 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
135.000	732.64	761.23	761.57	761.59	761.62	761.68	761.76	761.85	761.94	762.51	763.03	763.57	0.37	2.34
134.610	728.75	761.02	761.37	761.39	761.42	761.49	761.58	761.67	761.76	762.33	762.86	763.41	0.39	2.39
134.599	Abandonded RR Bridge													
134.595	728.58	760.86	761.23	761.24	761.28	761.35	761.44	761.53	761.63	762.20	762.73	763.28	0.40	2.42
134.000	727.23	760.42	760.84	760.86	760.89	760.97	761.07	761.17	761.28	761.88	762.42	763.01	0.43	2.60
133.973	Tar Creek													
133.900	727.72	760.23	760.68	760.69	760.72	760.81	760.91	761.02	761.13	761.73	762.28	762.89	0.45	2.65
133.800	Interstate 44 Bridge													
133.700	728.57	760.05	760.52	760.53	760.56	760.66	760.76	760.87	760.98	761.60	762.16	762.78	0.46	2.73
133.000	727.70	759.24	759.81	759.82	759.86	759.97	760.09	760.22	760.35	761.02	761.62	762.31	0.53	3.07
132.000	727.96	758.40	759.08	759.09	759.12	759.25	759.40	759.55	759.69	760.41	761.07	761.85	0.62	3.45
131.000	726.82	757.77	758.50	758.50	758.54	758.69	758.85	759.02	759.19	759.93	760.67	761.50	0.69	3.73
130.000	723.18	757.51	758.29	758.29	758.33	758.49	758.66	758.83	759.01	759.76	760.51	761.37	0.72	3.86
129.000	719.79	757.27	758.08	758.08	758.12	758.28	758.46	758.64	758.83	759.60	760.37	761.27	0.75	4.00
128.000	719.69	757.12	757.95	757.95	757.99	758.16	758.34	758.53	758.72	759.49	760.29	761.20	0.77	4.08
126.710	715.94	756.84	757.71	757.71	757.75	757.93	758.12	758.32	758.53	759.31	760.14	761.09	0.82	4.25
126.700	S 590 Road Bridge													
126.670	715.61	756.84	757.69	757.69	757.74	757.91	758.09	758.29	758.50	759.28	760.12	761.07	0.81	4.23
126.000	720.35	756.81	757.67	757.67	757.71	757.88	758.07	758.27	758.48	759.29	760.10	761.05	0.81	4.24
125.000	717.08	756.65	757.52	757.52	757.57	757.74	757.94	758.14	758.37	759.16	760.01	760.98	0.85	4.33
124.000	715.62	756.57	757.45	757.45	757.49	757.67	757.87	758.08	758.31	759.10	759.97	760.94	0.86	4.37
123.000	713.34	756.45	757.36	757.36	757.40	757.58	757.78	757.99	758.23	759.00	759.89	760.88	0.88	4.44
122.580	711.08	756.39	757.30	757.29	757.34	757.52	757.72	757.94	758.18	758.95	759.85	760.84	0.89	4.45
122.570	Highway 60 Bridge													
122.550	709.97	756.31	757.25	757.25	757.29	757.48	757.69	757.91	758.16	758.94	759.84	760.84	0.91	4.53
122.350	Spring River													
122.000	710.64	755.50	756.69	756.69	756.74	756.94	757.15	757.38	757.62	758.44	759.24	760.25	0.93	4.75

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.17**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - DEC 2015 (15 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0 Max WSE (ft, PD)	El. 742.0 Max WSE (ft, PD)	El. 742.5 Max WSE (ft, PD)	El. 743.0 Max WSE (ft, PD)	El. 743.5 Max WSE (ft, PD)	El. 744.0 Max WSE (ft, PD)	El. 744.5 Max WSE (ft, PD)	El. 745.0 Max WSE (ft, PD)	El. 749.0 Max WSE (ft, PD)	El. 753.0 Max WSE (ft, PD)	El. 757.0 Max WSE (ft, PD)		
121.980	709.90	755.19	756.43	756.43	756.48	756.68	756.89	757.12	757.37	758.23	758.99	760.15	0.94	4.96
121.970	BN RR Bridge													
121.960	710.89	754.75	755.64	755.64	755.65	755.84	756.04	756.26	756.48	757.25	757.58	758.83	0.84	4.08
120.000	717.63	754.41	755.32	755.32	755.33	755.33	755.33	755.35	755.59	756.59	756.93	758.38	0.27	3.97
118.000	720.29	754.23	755.16	755.16	755.16	755.16	755.16	755.16	755.17	756.07	756.30	757.95	0.01	3.72
116.000	725.99	754.15	755.08	755.08	755.08	755.08	755.08	755.08	755.08	755.81	756.00	757.77	0.00	3.62
114.000	718.27	754.12	754.95	754.95	754.95	754.95	754.94	754.94	754.94	755.39	755.47	757.45	0.01	3.33
112.000	714.31	754.12	754.88	754.88	754.88	754.88	754.87	754.87	754.86	755.17	755.20	757.30	0.02	3.18
110.000	719.24	754.12	754.85	754.85	754.85	754.85	754.84	754.84	754.83	755.06	755.07	757.22	0.02	3.10
108.000	710.68	754.11	754.80	754.80	754.81	754.80	754.80	754.80	754.80	754.92	754.90	757.10	0.01	2.99
106.000	700.35	754.12	754.80	754.80	754.80	754.80	754.80	754.80	754.80	754.90	754.88	757.08	0.00	2.96
105.350	Elk River													
105.000	701.60	754.12	754.80	754.80	754.80	754.80	754.80	754.80	754.80	754.90	754.89	757.08	0.00	2.96
104.000	696.61	754.12	754.80	754.80	754.80	754.80	754.80	754.80	754.80	754.89	754.88	757.08	0.00	2.96
102.000	688.58	754.11	754.80	754.80	754.80	754.80	754.80	754.80	754.80	754.87	754.86	757.05	0.00	2.94
101.750	685.91	754.11	754.80	754.80	754.80	754.80	754.80	754.80	754.80	754.86	754.85	757.04	0.00	2.93
101.730	Highway 59 (Sailboat Bridge)													
101.710	682.31	754.11	754.79	754.79	754.79	754.79	754.79	754.79	754.79	754.84	754.83	757.02	0.00	2.91
100.000	702.62	754.11	754.79	754.79	754.79	754.79	754.79	754.79	754.79	754.84	754.85	757.02	0.00	2.90
90.000	681.52	754.11	754.79	754.79	754.79	754.79	754.79	754.79	754.79	754.83	754.83	757.01	0.00	2.90
80.000	657.03	754.11	754.79	754.79	754.79	754.79	754.79	754.79	754.79	754.82	754.82	757.00	0.00	2.89
78.000	653.11	754.11	754.79	754.79	754.79	754.79	754.79	754.79	754.79	754.82	754.82	757.00	0.00	2.89
77.000	Pensacola Dam													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.18**

GRAND RIVER DAM AUTHORITY SPRING RIVER MAX WSELs - DEC 2015 (15 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
21.000	Upstream end of model													
21.000	762.67	800.70	800.70	800.69	800.69	800.69	800.69	800.69	800.69	800.68	800.67	800.66	0.01	0.04
20.000	760.13	799.50	799.50	799.50	799.50	799.50	799.50	799.50	799.50	799.50	799.51	799.51	0.00	0.01
19.000	759.04	797.69	797.69	797.69	797.69	797.69	797.69	797.69	797.69	797.69	797.69	797.69	0.00	0.00
18.000	753.18	795.45	795.45	795.45	795.45	795.45	795.45	795.45	795.45	795.45	795.45	795.45	0.00	0.00
17.000	750.54	793.53	793.52	793.52	793.52	793.52	793.52	793.52	793.52	793.51	793.51	793.51	0.00	0.02
16.000	749.28	790.74	790.74	790.74	790.74	790.74	790.74	790.74	790.74	790.74	790.75	790.75	0.00	0.00
15.000	746.37	788.26	788.26	788.26	788.26	788.26	788.26	788.26	788.26	788.26	788.26	788.27	0.00	0.01
14.170	741.32	785.82	785.82	785.82	785.82	785.82	785.82	785.82	785.82	785.82	785.82	785.82	0.00	0.00
14.160	E 57 Road													
14.120	744.21	784.99	784.97	784.97	784.97	784.97	784.97	784.97	784.97	784.95	784.96	784.95	0.00	0.04
13.510	744.59	783.37	783.33	783.33	783.33	783.32	783.32	783.32	783.32	783.26	783.25	783.18	0.01	0.19
13.500	Interstate 44 Bridge													
13.450	745.52	782.62	782.64	782.64	782.64	782.64	782.64	782.64	782.63	782.55	782.54	782.44	0.01	0.20
12.000	742.72	777.95	777.94	777.94	777.94	777.94	777.94	777.93	777.93	777.89	777.93	777.86	0.01	0.09
11.000	742.23	776.26	776.26	776.26	776.26	776.26	776.26	776.26	776.26	776.25	776.26	776.25	0.00	0.01
10.000	737.62	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.15	775.15	0.00	0.00
9.000	733.92	773.56	773.56	773.56	773.56	773.56	773.56	773.56	773.56	773.54	773.54	773.52	0.00	0.04
8.020	733.14	772.72	772.72	772.72	772.72	772.72	772.72	772.72	772.72	772.87	772.87	772.86	0.00	0.15
8.010	OK Highway 10 Bridge													
7.970	731.28	767.77	767.81	767.82	767.82	767.83	767.84	767.86	767.87	768.10	768.38	768.68	0.06	0.91
7.000	730.33	765.06	765.13	765.15	765.16	765.18	765.21	765.23	765.26	765.67	766.13	766.59	0.13	1.53
6.000	727.95	763.45	763.56	763.58	763.60	763.63	763.66	763.70	763.74	764.28	764.87	765.45	0.18	2.00
5.000	722.10	761.92	762.07	762.09	762.12	762.16	762.21	762.27	762.32	763.00	763.73	764.40	0.25	2.48
4.000	720.00	760.84	761.03	761.07	761.10	761.15	761.21	761.28	761.35	762.15	762.97	763.71	0.32	2.87
3.000	723.22	759.46	759.73	759.77	759.82	759.89	759.97	760.06	760.15	761.06	761.99	762.83	0.42	3.37
2.000	723.73	758.43	758.80	758.85	758.91	759.00	759.10	759.21	759.32	760.35	761.33	762.22	0.52	3.80
1.000	728.44	757.49	757.96	758.02	758.09	758.19	758.31	758.47	758.73	759.78	760.71	761.66	0.78	4.17
0.580	716.17	756.12	757.09	757.09	757.14	757.32	757.53	757.74	757.97	758.75	759.61	760.59	0.88	4.47
0.570	Highway 60 Bridge													
0.560	713.76	755.88	756.96	756.96	757.01	757.20	757.40	757.61	757.83	758.60	759.40	760.37	0.87	4.49
0.460	715.35	756.12	757.13	757.14	757.18	757.37	757.58	757.79	758.03	758.81	759.68	760.66	0.90	4.54
0.000	Downstream end of Spring River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.19**

GRAND RIVER DAM AUTHORITY ELK RIVER MAX WSELs - DEC 2015 (15 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
19.590	Upstream end of model													
19.590	771.15	800.12	800.12	800.12	800.12	800.12	800.12	800.12	800.12	800.12	800.12	800.12	0.00	0.00
19.000	767.51	797.92	797.92	797.92	797.92	797.92	797.92	797.92	797.92	797.92	797.92	797.92	0.00	0.00
18.000	765.41	794.01	794.01	794.01	794.01	794.01	794.01	794.01	794.01	794.01	794.01	794.01	0.00	0.00
17.000	762.53	790.87	790.87	790.87	790.87	790.87	790.87	790.87	790.87	790.87	790.87	790.87	0.00	0.00
16.000	756.63	786.22	786.22	786.22	786.22	786.22	786.22	786.22	786.22	786.22	786.22	786.22	0.00	0.00
15.000	754.26	782.38	782.38	782.38	782.38	782.38	782.38	782.38	782.38	782.38	782.38	782.38	0.00	0.00
14.240	750.52	779.28	779.28	779.28	779.28	779.28	779.28	779.28	779.28	779.28	779.28	779.28	0.00	0.00
14.220	Highway 43 Bridge													
14.200	750.12	776.85	776.85	776.85	776.85	776.85	776.85	776.85	776.85	776.85	776.85	776.85	0.00	0.00
14.000	747.07	775.82	775.82	775.82	775.82	775.82	775.82	775.82	775.82	775.82	775.82	775.82	0.00	0.00
13.000	745.41	769.73	769.73	769.73	769.73	769.73	769.73	769.73	769.73	769.73	769.74	769.75	0.00	0.02
12.000	741.15	765.85	765.86	765.86	765.86	765.86	765.86	765.86	765.86	765.87	765.90	765.94	0.00	0.08
11.910	OK/MO State Line													
11.000	741.93	760.17	760.17	760.18	760.18	760.18	760.19	760.19	760.20	760.33	760.74	761.02	0.03	0.85
10.000	734.62	756.32	756.36	756.37	756.39	756.41	756.42	756.45	756.48	756.97	758.06	758.71	0.12	2.38
9.000	734.66	754.13	754.86	754.86	754.85	754.85	754.83	754.82	754.82	754.97	756.39	757.38	0.04	3.25
8.000	724.21	754.12	754.85	754.85	754.84	754.83	754.82	754.81	754.81	754.95	755.02	757.19	0.04	3.07
7.000	728.21	754.12	754.84	754.84	754.83	754.83	754.81	754.81	754.81	754.94	754.92	757.15	0.03	3.03
6.000	727.13	754.12	754.83	754.83	754.83	754.82	754.81	754.80	754.81	754.94	754.92	757.14	0.03	3.02
5.000	721.05	754.12	754.83	754.83	754.83	754.82	754.81	754.80	754.80	754.93	754.91	757.13	0.03	3.01
4.700	716.13	754.12	754.82	754.82	754.82	754.82	754.81	754.80	754.80	754.93	754.90	757.12	0.02	3.00
4.670	OK Highway 10 Bridge													
4.640	715.21	754.12	754.82	754.82	754.82	754.81	754.80	754.80	754.80	754.92	754.89	757.11	0.02	2.99
4.000	716.61	754.12	754.82	754.82	754.82	754.81	754.80	754.80	754.80	754.92	754.89	757.11	0.02	2.99
3.000	714.74	754.12	754.81	754.81	754.81	754.81	754.80	754.80	754.80	754.92	754.89	757.10	0.01	2.98
2.000	709.09	754.12	754.81	754.81	754.81	754.80	754.80	754.80	754.80	754.91	754.89	757.09	0.01	2.97
1.000	705.82	754.12	754.80	754.80	754.80	754.80	754.80	754.80	754.80	754.90	754.89	757.09	0.00	2.97
0.320	706.36	754.12	754.80	754.80	754.80	754.80	754.80	754.80	754.80	754.90	754.89	757.08	0.00	2.96
0.000	Downstream end of Elk River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.20**

GRAND RIVER DAM AUTHORITY TAR CREEK MAX WSELs - DEC 2015 (15 YEAR) EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
4.152	Upstream end of model													
4.152	762.17	775.09	775.09	775.09	775.09	775.09	775.09	775.09	775.09	775.09	775.09	775.09	0.00	0.00
3.900	760.10	774.16	774.16	774.16	774.16	774.16	774.16	774.16	774.16	774.16	774.16	774.16	0.00	0.00
3.840	22nd Ave Bridge													
3.800	762.30	772.90	772.90	772.90	772.90	772.90	772.90	772.90	772.90	772.90	772.90	772.90	0.00	0.00
3.300	759.46	770.62	770.62	770.62	770.62	770.62	770.62	770.62	770.62	770.62	770.62	770.62	0.00	0.00
2.800	756.73	766.58	766.58	766.58	766.58	766.58	766.58	766.58	766.58	766.58	766.59	766.59	0.00	0.01
2.710	BN RR Bridge													
2.700	755.72	765.54	765.54	765.54	765.54	765.54	765.54	765.54	765.54	765.54	765.54	765.55	0.00	0.01
2.500	754.95	764.16	764.16	764.16	764.16	764.16	764.16	764.16	764.16	764.17	764.18	764.18	0.00	0.02
2.300	754.15	762.23	762.24	762.24	762.24	762.24	762.24	762.24	762.24	762.30	762.49	762.97	0.00	0.73
2.200	Rockdale Blvd Bridge													
2.100	751.51	760.34	760.77	760.78	760.82	760.90	761.00	761.10	761.21	761.81	762.36	762.96	0.44	2.62
1.900	750.02	760.34	760.77	760.78	760.81	760.90	761.00	761.10	761.21	761.81	762.36	762.96	0.44	2.62
1.700	749.58	760.34	760.77	760.78	760.81	760.90	761.00	761.10	761.21	761.81	762.36	762.96	0.44	2.62
1.660	Central Ave Bridge													
1.600	746.47	760.34	760.77	760.78	760.81	760.90	761.00	761.10	761.21	761.81	762.36	762.96	0.44	2.62
1.500	744.29	760.34	760.77	760.78	760.81	760.90	761.00	761.10	761.21	761.81	762.36	762.96	0.44	2.62
1.400	OK Highway 10 Bridge													
1.300	742.00	760.34	760.77	760.78	760.81	760.90	761.00	761.10	761.21	761.81	762.36	762.96	0.44	2.62
1.000	739.34	760.34	760.77	760.78	760.81	760.90	761.00	761.10	761.21	761.81	762.36	762.96	0.44	2.62
0.700	737.06	760.34	760.77	760.78	760.81	760.90	761.00	761.10	761.21	761.81	762.36	762.96	0.44	2.62
0.300	736.42	760.34	760.77	760.79	760.82	760.91	761.00	761.10	761.21	761.82	762.36	762.96	0.44	2.62
0.041	735.85	760.33	760.76	760.77	760.81	760.89	760.99	761.09	761.20	761.81	762.35	762.95	0.44	2.63
0.000	Downstream end of Tar Creek													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX B.6
100-YEAR EVENT
MAXIMUM WATER SURFACE ELEVATIONS

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.21**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - 100-YEAR EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
152.175	Upstream end of model													
152.175	752.29	791.90	791.90	791.90	791.90	791.90	791.91	791.91	791.91	791.92	791.93	791.94	0.00	0.04
151.000	748.53	788.11	788.11	788.12	788.12	788.12	788.12	788.12	788.12	788.14	788.16	788.19	0.01	0.09
150.000	748.47	787.41	787.42	787.42	787.42	787.42	787.43	787.43	787.43	787.45	787.47	787.50	0.01	0.09
149.000	750.14	786.88	786.89	786.89	786.89	786.90	786.90	786.90	786.90	786.92	786.95	786.98	0.01	0.10
148.000	749.29	786.81	786.82	786.82	786.82	786.82	786.82	786.83	786.83	786.85	786.87	786.91	0.01	0.10
147.000	747.76	786.44	786.45	786.45	786.45	786.46	786.46	786.46	786.46	786.48	786.51	786.54	0.01	0.10
145.500	745.12	786.20	786.21	786.21	786.21	786.21	786.22	786.22	786.22	786.24	786.27	786.30	0.01	0.10
145.480	E 60 Road Bridge													
145.400	748.01	786.17	786.18	786.19	786.19	786.19	786.19	786.19	786.20	786.21	786.24	786.28	0.01	0.10
144.000	743.43	785.78	785.79	785.80	785.80	785.80	785.80	785.80	785.81	785.83	785.85	785.89	0.01	0.10
143.000	737.95	785.59	785.60	785.60	785.60	785.61	785.61	785.61	785.61	785.63	785.66	785.69	0.01	0.10
142.000	742.91	785.43	785.44	785.44	785.44	785.44	785.44	785.44	785.45	785.47	785.49	785.53	0.01	0.10
141.000	741.01	785.30	785.31	785.31	785.31	785.31	785.31	785.32	785.32	785.34	785.36	785.40	0.01	0.10
140.000	736.33	785.25	785.26	785.27	785.27	785.27	785.27	785.27	785.28	785.29	785.32	785.36	0.01	0.10
139.000	743.99	785.21	785.22	785.22	785.22	785.23	785.23	785.23	785.23	785.25	785.28	785.32	0.01	0.10
138.000	736.48	785.15	785.16	785.16	785.16	785.16	785.16	785.17	785.17	785.19	785.21	785.25	0.01	0.10
137.000	733.33	785.01	785.02	785.02	785.02	785.02	785.02	785.02	785.03	785.05	785.07	785.11	0.01	0.10
135.950	731.18	784.60	784.61	784.61	784.61	784.61	784.61	784.61	784.62	784.64	784.66	784.70	0.01	0.10
135.941	Highway 69 Bridge													
135.940	731.21	784.49	784.50	784.50	784.50	784.50	784.50	784.51	784.51	784.53	784.55	784.59	0.01	0.10
135.590	731.77	784.38	784.39	784.39	784.39	784.39	784.40	784.40	784.40	784.42	784.45	784.48	0.01	0.10
135.586	BN RR Bridge													
135.580	731.07	784.24	784.25	784.26	784.26	784.26	784.26	784.26	784.27	784.28	784.31	784.35	0.02	0.11
135.470	732.63	784.18	784.19	784.19	784.19	784.19	784.20	784.20	784.20	784.22	784.25	784.28	0.01	0.10
135.460	Highway 125 Bridge													
135.440	731.60	784.22	784.23	784.24	784.24	784.24	784.24	784.24	784.25	784.26	784.29	784.33	0.02	0.11

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.21**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - 100-YEAR EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
135.000	732.64	784.01	784.02	784.02	784.03	784.03	784.03	784.03	784.03	784.05	784.08	784.11	0.01	0.10
134.610	728.75	783.78	783.79	783.79	783.79	783.80	783.80	783.80	783.80	783.82	783.85	783.88	0.01	0.10
134.599	Abandonded RR Bridge													
134.595	728.58	783.58	783.59	783.59	783.59	783.60	783.60	783.60	783.60	783.62	783.65	783.68	0.01	0.10
134.000	727.23	783.15	783.16	783.16	783.17	783.17	783.17	783.17	783.17	783.19	783.22	783.25	0.01	0.10
133.973	Tar Creek													
133.900	727.72	782.60	782.61	782.61	782.61	782.62	782.62	782.62	782.62	782.64	782.67	782.70	0.01	0.10
133.800	Interstate 44 Bridge													
133.700	728.57	781.91	781.92	781.92	781.92	781.93	781.93	781.93	781.93	781.95	781.98	782.02	0.01	0.11
133.000	727.70	781.09	781.10	781.10	781.10	781.10	781.11	781.11	781.11	781.13	781.16	781.20	0.01	0.11
132.000	727.96	779.45	779.46	779.46	779.46	779.46	779.47	779.47	779.47	779.49	779.52	779.56	0.01	0.11
131.000	726.82	777.62	777.63	777.63	777.63	777.63	777.64	777.64	777.64	777.66	777.69	777.72	0.01	0.10
130.000	723.18	776.29	776.29	776.29	776.29	776.29	776.30	776.30	776.30	776.32	776.34	776.38	0.01	0.09
129.000	719.79	775.16	775.16	775.16	775.16	775.17	775.17	775.17	775.17	775.19	775.21	775.25	0.01	0.09
128.000	719.69	774.10	774.10	774.11	774.11	774.11	774.11	774.11	774.11	774.13	774.16	774.19	0.01	0.09
126.710	715.94	772.61	772.60	772.60	772.61	772.61	772.61	772.61	772.61	772.63	772.65	772.69	0.01	0.09
126.700	S 590 Road Bridge													
126.670	715.61	772.25	772.24	772.24	772.24	772.25	772.25	772.25	772.25	772.26	772.29	772.33	0.01	0.09
126.000	720.35	771.57	771.57	771.57	771.57	771.57	771.57	771.57	771.57	771.59	771.61	771.65	0.00	0.08
125.000	717.08	769.65	769.64	769.65	769.65	769.65	769.65	769.65	769.65	769.66	769.69	769.73	0.01	0.08
124.000	715.62	767.97	767.96	767.96	767.96	767.96	767.96	767.96	767.96	767.97	767.99	768.03	0.00	0.07
123.000	713.34	765.55	765.52	765.52	765.52	765.52	765.52	765.52	765.52	765.52	765.54	765.58	0.00	0.06
122.580	711.08	762.55	762.56	762.55	762.55	762.55	762.55	762.55	762.55	762.55	762.55	762.55	0.01	0.01
122.570	Highway 60 Bridge													
122.550	709.97	761.78	762.25	762.25	762.26	762.26	762.27	762.27	762.28	762.33	762.39	762.47	0.03	0.69
122.350	Spring River													
122.000	710.64	761.54	762.38	762.39	762.40	762.40	762.41	762.42	762.43	762.50	762.58	762.69	0.05	1.15

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.21**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - 100-YEAR EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0 Max WSE (ft, PD)	El. 742.0 Max WSE (ft, PD)	El. 742.5 Max WSE (ft, PD)	El. 743.0 Max WSE (ft, PD)	El. 743.5 Max WSE (ft, PD)	El. 744.0 Max WSE (ft, PD)	El. 744.5 Max WSE (ft, PD)	El. 745.0 Max WSE (ft, PD)	El. 749.0 Max WSE (ft, PD)	El. 753.0 Max WSE (ft, PD)	El. 757.0 Max WSE (ft, PD)		
121.980	709.90	760.84	761.86	761.86	761.87	761.88	761.88	761.89	761.90	761.98	762.09	762.23	0.04	1.39
121.970	BN RR Bridge													
121.960	710.89	760.10	761.16	761.16	761.16	761.16	761.16	761.16	761.16	761.18	761.20	761.21	0.00	1.11
120.000	717.63	758.80	759.86	759.86	759.87	759.87	759.87	759.87	759.87	759.88	759.89	759.90	0.01	1.09
118.000	720.29	757.66	758.57	758.57	758.57	758.57	758.57	758.57	758.57	758.58	758.59	758.58	0.01	0.92
116.000	725.99	757.17	757.92	757.92	757.93	757.93	757.93	757.93	757.93	757.93	757.94	758.16	0.01	0.99
114.000	718.27	756.23	756.68	756.68	756.68	756.68	756.68	756.68	756.68	756.68	756.69	757.53	0.00	1.31
112.000	714.31	755.74	756.01	756.01	756.01	756.01	756.01	756.01	756.01	756.01	756.02	757.31	0.00	1.57
110.000	719.24	755.48	755.66	755.66	755.66	755.66	755.66	755.66	755.66	755.66	755.66	757.21	0.00	1.73
108.000	710.68	755.13	755.20	755.19	755.19	755.19	755.19	755.18	755.18	755.16	755.15	757.08	0.02	1.95
106.000	700.35	755.09	755.14	755.14	755.13	755.13	755.13	755.13	755.12	755.11	755.10	757.06	0.01	1.98
105.350	Elk River													
105.000	701.60	755.10	755.15	755.15	755.14	755.14	755.14	755.14	755.14	755.13	755.12	757.07	0.01	1.97
104.000	696.61	755.08	755.12	755.12	755.12	755.12	755.12	755.12	755.11	755.11	755.11	757.06	0.01	1.98
102.000	688.58	755.04	755.07	755.07	755.07	755.07	755.07	755.07	755.06	755.06	755.06	757.04	0.00	2.00
101.750	685.91	755.01	755.03	755.03	755.03	755.03	755.03	755.03	755.02	755.02	755.02	757.03	0.01	2.02
101.730	Highway 59 (Sailboat Bridge)													
101.710	682.31	754.99	755.00	755.00	755.00	755.00	755.00	755.00	755.00	754.99	754.99	757.01	0.00	2.02
100.000	702.62	755.00	755.02	755.02	755.02	755.02	755.02	755.02	755.02	755.02	755.02	757.01	0.00	2.01
90.000	681.52	754.97	754.98	754.98	754.98	754.98	754.98	754.98	754.98	754.98	754.98	757.00	0.00	2.03
80.000	657.03	754.95	754.95	754.95	754.95	754.95	754.95	754.95	754.95	754.95	754.95	757.00	0.00	2.05
78.000	653.11	754.95	754.95	754.95	754.95	754.95	754.95	754.95	754.95	754.95	754.95	757.00	0.00	2.05
77.000	Pensacola Dam													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.22**

GRAND RIVER DAM AUTHORITY SPRING RIVER MAX WSELs - 100-YEAR EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
21.000	Upstream end of model													
21.000	762.67	791.80	791.80	791.80	791.80	791.80	791.80	791.80	791.80	791.80	791.80	791.80	0.00	0.00
20.000	760.13	790.14	790.14	790.14	790.14	790.14	790.14	790.14	790.14	790.15	790.15	790.15	0.00	0.01
19.000	759.04	786.91	786.91	786.91	786.91	786.91	786.91	786.91	786.91	786.91	786.91	786.92	0.00	0.02
18.000	753.18	783.88	783.88	783.88	783.88	783.88	783.88	783.88	783.88	783.88	783.89	783.90	0.00	0.02
17.000	750.54	781.90	781.90	781.90	781.90	781.90	781.90	781.91	781.91	781.91	781.93	781.94	0.01	0.04
16.000	749.28	779.42	779.42	779.42	779.42	779.42	779.42	779.42	779.42	779.44	779.45	779.48	0.00	0.06
15.000	746.37	776.43	776.44	776.44	776.44	776.44	776.44	776.44	776.44	776.47	776.50	776.54	0.00	0.11
14.170	741.32	773.94	773.95	773.95	773.95	773.95	773.95	773.96	773.96	774.00	774.04	774.11	0.01	0.17
14.160	E 57 Road													
14.120	744.21	774.40	774.41	774.41	774.41	774.41	774.41	774.42	774.42	774.45	774.50	774.56	0.01	0.16
13.510	744.59	773.22	773.22	773.23	773.23	773.23	773.23	773.23	773.24	773.28	773.34	773.41	0.02	0.19
13.500	Interstate 44 Bridge													
13.450	745.52	772.70	772.70	772.70	772.71	772.71	772.71	772.71	772.72	772.77	772.82	772.90	0.02	0.20
12.000	742.72	768.82	768.84	768.84	768.84	768.85	768.85	768.86	768.87	769.03	769.15	769.32	0.03	0.50
11.000	742.23	767.32	767.45	767.46	767.46	767.48	767.49	767.50	767.52	767.65	767.77	767.96	0.06	0.64
10.000	737.62	766.48	766.63	766.63	766.64	766.65	766.65	766.66	766.66	766.72	766.80	766.98	0.03	0.50
9.000	733.92	765.45	765.63	765.63	765.64	765.64	765.65	765.65	765.66	765.70	765.74	765.80	0.03	0.35
8.020	733.14	764.96	765.19	765.19	765.20	765.20	765.20	765.21	765.21	765.25	765.30	765.37	0.02	0.41
8.010	OK Highway 10 Bridge													
7.970	731.28	764.26	764.52	764.52	764.53	764.53	764.54	764.54	764.55	764.59	764.64	764.71	0.03	0.45
7.000	730.33	763.83	764.21	764.21	764.22	764.22	764.22	764.23	764.24	764.28	764.33	764.41	0.03	0.58
6.000	727.95	763.67	764.09	764.09	764.09	764.10	764.10	764.11	764.11	764.16	764.21	764.29	0.03	0.62
5.000	722.10	763.54	763.99	764.00	764.00	764.01	764.01	764.02	764.02	764.07	764.12	764.20	0.03	0.66
4.000	720.00	763.48	763.95	763.95	763.95	763.96	763.96	763.97	763.97	764.02	764.08	764.15	0.02	0.67
3.000	723.22	763.40	763.89	763.89	763.89	763.90	763.90	763.91	763.92	763.96	764.02	764.09	0.03	0.69
2.000	723.73	763.36	763.85	763.85	763.86	763.86	763.87	763.87	763.88	763.93	763.98	764.06	0.03	0.70
1.000	728.44	763.32	763.82	763.82	763.83	763.83	763.84	763.84	763.85	763.89	763.95	764.03	0.03	0.71
0.580	716.17	763.23	763.75	763.75	763.76	763.76	763.76	763.77	763.78	763.82	763.88	763.96	0.03	0.73
0.570	Highway 60 Bridge													
0.560	713.76	763.21	763.72	763.73	763.73	763.73	763.74	763.75	763.75	763.80	763.85	763.93	0.03	0.72
0.460	715.35	763.23	763.74	763.74	763.75	763.75	763.76	763.76	763.77	763.81	763.87	763.95	0.03	0.72
0.000	Downstream end of Spring River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.23**

GRAND RIVER DAM AUTHORITY ELK RIVER MAX WSELs - 100-YEAR EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
19.590	Upstream end of model													
19.590	771.15	777.77	777.77	777.77	777.77	777.77	777.77	777.77	777.77	777.77	777.77	777.77	0.00	0.00
19.000	767.51	776.22	776.22	776.22	776.22	776.22	776.22	776.22	776.22	776.22	776.22	776.22	0.00	0.00
18.000	765.41	772.64	772.64	772.64	772.64	772.64	772.64	772.64	772.64	772.64	772.64	772.64	0.00	0.00
17.000	762.53	768.77	768.77	768.77	768.77	768.77	768.77	768.77	768.77	768.77	768.77	768.77	0.00	0.00
16.000	756.63	764.95	764.95	764.95	764.95	764.95	764.95	764.95	764.95	764.95	764.95	764.95	0.00	0.00
15.000	754.26	761.27	761.27	761.27	761.27	761.27	761.27	761.27	761.27	761.27	761.27	761.27	0.00	0.00
14.240	750.52	757.00	756.89	756.89	756.89	756.89	756.89	756.89	756.89	756.89	756.89	757.70	0.00	0.81
14.220	Highway 43 Bridge													
14.200	750.12	756.95	756.83	756.83	756.83	756.83	756.83	756.83	756.83	756.83	756.83	757.67	0.00	0.84
14.000	747.07	756.51	756.37	756.37	756.37	756.37	756.37	756.37	756.37	756.37	756.37	757.55	0.00	1.18
13.000	745.41	755.41	755.46	755.45	755.43	755.43	755.41	755.41	755.39	755.34	755.34	757.22	0.07	1.88
12.000	741.15	755.25	755.35	755.34	755.32	755.31	755.30	755.30	755.28	755.20	755.18	757.15	0.07	1.97
11.910	OK/MO State Line													
11.000	741.93	755.19	755.31	755.30	755.27	755.27	755.26	755.25	755.24	755.16	755.13	757.12	0.07	1.99
10.000	734.62	755.18	755.29	755.28	755.26	755.25	755.24	755.24	755.22	755.16	755.13	757.11	0.07	1.98
9.000	734.66	755.17	755.27	755.26	755.24	755.24	755.23	755.23	755.21	755.15	755.13	757.10	0.06	1.97
8.000	724.21	755.16	755.25	755.24	755.23	755.23	755.22	755.21	755.20	755.15	755.13	757.10	0.05	1.97
7.000	728.21	755.15	755.23	755.23	755.21	755.21	755.21	755.20	755.19	755.14	755.13	757.09	0.04	1.96
6.000	727.13	755.14	755.22	755.22	755.21	755.21	755.20	755.19	755.18	755.14	755.13	757.09	0.04	1.96
5.000	721.05	755.13	755.21	755.20	755.20	755.19	755.19	755.18	755.17	755.14	755.13	757.08	0.04	1.95
4.700	716.13	755.13	755.20	755.20	755.19	755.19	755.19	755.18	755.17	755.14	755.13	757.08	0.03	1.95
4.670	OK Highway 10 Bridge													
4.640	715.21	755.13	755.20	755.20	755.19	755.19	755.19	755.18	755.17	755.14	755.12	757.08	0.03	1.96
4.000	716.61	755.12	755.19	755.19	755.18	755.18	755.18	755.17	755.16	755.14	755.12	757.08	0.03	1.96
3.000	714.74	755.12	755.18	755.18	755.17	755.17	755.17	755.16	755.16	755.13	755.12	757.08	0.02	1.96
2.000	709.09	755.11	755.17	755.17	755.17	755.16	755.16	755.16	755.15	755.13	755.12	757.07	0.02	1.96
1.000	705.82	755.10	755.16	755.16	755.15	755.15	755.15	755.15	755.14	755.13	755.12	757.07	0.02	1.97
0.320	706.36	755.10	755.15	755.15	755.15	755.15	755.14	755.14	755.14	755.13	755.12	757.07	0.01	1.97
0.000	Downstream end of Elk River													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.24**

GRAND RIVER DAM AUTHORITY TAR CREEK MAX WSELs - 100-YEAR EVENT

River Mile	Bed El. (ft, PD)	Pensacola Dam Starting Stage (ft, PD)											Anticipated Operation Range WSE Difference[1] (ft)	Extreme, Hypothetical Range WSE Difference[2] (ft)
		El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
		Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)	Max WSE (ft, PD)		
4.152	Upstream end of model													
4.152	762.17	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
3.900	760.10	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
3.840	22nd Ave Bridge													
3.800	762.30	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
3.300	759.46	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
2.800	756.73	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
2.710	BN RR Bridge													
2.700	755.72	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
2.500	754.95	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
2.300	754.15	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
2.200	Rockdale Blvd Bridge													
2.100	751.51	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
1.900	750.02	783.58	783.59	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
1.700	749.58	783.58	783.58	783.59	783.59	783.59	783.59	783.59	783.60	783.62	783.64	783.68	0.01	0.10
1.660	Central Ave Bridge													
1.600	746.47	783.57	783.58	783.58	783.59	783.59	783.59	783.59	783.59	783.61	783.64	783.68	0.01	0.10
1.500	744.29	783.57	783.58	783.58	783.58	783.58	783.59	783.59	783.59	783.61	783.64	783.67	0.01	0.10
1.400	OK Highway 10 Bridge													
1.300	742.00	783.55	783.56	783.56	783.56	783.57	783.57	783.57	783.57	783.59	783.62	783.65	0.01	0.10
1.000	739.34	783.51	783.52	783.52	783.52	783.52	783.52	783.53	783.53	783.55	783.57	783.61	0.01	0.10
0.700	737.06	783.46	783.47	783.48	783.48	783.48	783.48	783.48	783.49	783.50	783.53	783.57	0.01	0.10
0.300	736.42	783.24	783.25	783.25	783.25	783.25	783.25	783.25	783.26	783.28	783.30	783.34	0.01	0.10
0.041	735.85	783.03	783.04	783.04	783.05	783.05	783.05	783.05	783.05	783.07	783.10	783.13	0.01	0.10
0.000	Downstream end of Tar Creek													

1 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in Max WSEL from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX B.7
HISTORICAL STARTING STAGE
MAXIMUM WATER SURFACE ELEVATIONS

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.25**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - HISTORICAL STARTING STAGES

River Mile	Bed El. (ft, PD)	Historical Inflow Event					Max WSEL Difference* (ft)
		Sept 1993 (21 Yr) Max WSEL (ft, PD)	June 2004 (1 Yr) Max WSEL (ft, PD)	July 2007 (4 Yr) Max WSEL (ft, PD)	Oct 2009 (3 Yr) Max WSEL (ft, PD)	Dec 2015 (15 Yr) Max WSEL (ft, PD)	
152.175	Upstream end of model						
152.175	752.29	780.71	773.79	784.43	778.47	778.38	10.65
151.000	748.53	777.94	772.52	780.33	776.35	776.27	7.81
150.000	748.47	776.66	771.82	778.90	775.17	775.15	7.09
149.000	750.14	775.12	770.44	777.44	773.78	773.76	7.00
148.000	749.29	774.25	768.76	777.07	772.40	772.37	8.31
147.000	747.76	772.72	766.93	776.20	770.52	770.50	9.26
145.500	745.12	771.63	764.71	775.70	768.34	768.33	10.99
145.480	E 60 Road Bridge						
145.400	748.01	771.56	764.61	775.65	768.23	768.23	11.05
144.000	743.43	770.56	763.34	775.05	766.45	766.50	11.72
143.000	737.95	770.10	762.17	774.77	764.99	765.18	12.59
142.000	742.91	769.74	761.25	774.53	763.81	764.20	13.28
141.000	741.01	769.60	760.09	774.40	763.13	763.73	14.31
140.000	736.33	769.56	758.76	774.36	762.77	763.52	15.61
139.000	743.99	769.51	756.74	774.33	762.22	763.23	17.59
138.000	736.48	769.43	755.33	774.26	761.76	762.97	18.92
137.000	733.33	769.11	753.31	774.03	760.66	762.27	20.73
135.950	731.18	768.41	752.71	773.37	759.96	761.79	20.66
135.941	Highway 69 Bridge						
135.940	731.21	768.40	752.47	773.40	759.92	761.76	20.93
135.590	731.77	768.25	752.54	773.21	759.85	761.72	20.67
135.586	BN RR Bridge						
135.580	731.07	768.07	752.57	773.14	759.83	761.69	20.57
135.470	732.63	768.02	752.46	773.07	759.74	761.64	20.61
135.460	Highway 125 Bridge						
135.440	731.60	768.06	752.51	773.12	759.79	761.67	20.61
135.000	732.64	767.77	752.21	772.78	759.65	761.61	20.56

*Difference between the highest and lowest Max WSELs from the simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.25**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - HISTORICAL STARTING STAGES

River Mile	Bed El. (ft, PD)	Historical Inflow Event					Max WSEL Difference* (ft)
		Sept 1993 (21 Yr) Max WSEL (ft, PD)	June 2004 (1 Yr) Max WSEL (ft, PD)	July 2007 (4 Yr) Max WSEL (ft, PD)	Oct 2009 (3 Yr) Max WSEL (ft, PD)	Dec 2015 (15 Yr) Max WSEL (ft, PD)	
134.610	728.75	767.27	752.05	772.30	759.37	761.41	20.25
134.599	Abandonded RR Bridge						
134.595	728.58	766.98	751.96	772.03	759.18	761.26	20.07
134.000	727.23	766.61	751.33	771.75	758.53	760.87	20.42
133.973	Tar Creek						
133.900	727.72	766.39	751.12	771.43	758.27	760.71	20.31
133.800	Interstate 44 Bridge						
133.700	728.57	766.20	750.78	771.08	757.98	760.55	20.30
133.000	727.70	765.53	749.57	770.38	756.71	759.84	20.81
132.000	727.96	764.65	748.28	769.17	755.32	759.10	20.89
131.000	726.82	763.90	747.13	768.16	754.16	758.51	21.04
130.000	723.18	763.03	746.80	766.82	753.71	758.30	20.02
129.000	719.79	762.19	746.27	765.51	753.01	758.09	19.24
128.000	719.69	761.79	746.15	764.35	752.74	757.96	18.20
126.710	715.94	761.63	745.85	762.32	752.22	757.72	16.47
126.700	S 590 Road Bridge						
126.670	715.61	761.61	745.83	762.26	752.20	757.70	16.43
126.000	720.35	761.58	745.72	761.55	752.15	757.67	15.87
125.000	717.08	761.49	745.52	759.82	751.85	757.53	15.97
124.000	715.62	761.45	745.37	757.84	751.68	757.45	16.08
123.000	713.34	761.36	745.24	755.59	751.45	757.36	16.13
122.580	711.08	761.32	745.22	754.37	751.37	757.30	16.10
122.570	Highway 60 Bridge						
122.550	709.97	761.31	744.78	754.26	751.09	757.25	16.53
122.350	Spring River						
122.000	710.64	760.22	744.78	753.91	750.65	756.70	15.44
121.980	709.90	759.75	744.77	753.76	750.44	756.43	14.98
121.970	BN RR Bridge						

*Difference between the highest and lowest Max WSELs from the simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.25**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER MAX WSELs - HISTORICAL STARTING STAGES

River Mile	Bed El. (ft, PD)	Historical Inflow Event					Max WSEL Difference* (ft)
		Sept 1993 (21 Yr) Max WSEL (ft, PD)	June 2004 (1 Yr) Max WSEL (ft, PD)	July 2007 (4 Yr) Max WSEL (ft, PD)	Oct 2009 (3 Yr) Max WSEL (ft, PD)	Dec 2015 (15 Yr) Max WSEL (ft, PD)	
121.960	710.89	757.02	744.76	753.67	750.34	755.64	12.26
120.000	717.63	755.60	744.72	752.98	748.47	755.32	10.88
118.000	720.29	755.36	744.68	752.65	747.56	755.16	10.68
116.000	725.99	755.25	744.66	752.48	746.90	755.08	10.59
114.000	718.27	755.07	744.61	752.19	745.38	754.95	10.47
112.000	714.31	754.97	744.58	752.05	744.69	754.88	10.39
110.000	719.24	754.93	744.58	751.98	744.39	754.85	10.54
108.000	710.68	754.87	744.57	751.89	744.21	754.80	10.66
106.000	700.35	754.87	744.57	751.88	744.19	754.80	10.68
105.350	Elk River						
105.000	701.60	754.87	744.57	751.88	744.19	754.80	10.68
104.000	696.61	754.86	744.57	751.87	744.19	754.80	10.67
102.000	688.58	754.85	744.56	751.86	744.18	754.80	10.67
101.750	685.91	754.85	744.56	751.85	744.18	754.80	10.67
101.730	Highway 59 (Sailboat Bridge)						
101.710	682.31	754.84	744.56	751.84	744.17	754.79	10.67
100.000	702.62	754.84	744.56	751.84	744.17	754.79	10.67
90.000	681.52	754.83	744.56	751.83	744.16	754.79	10.67
80.000	657.03	754.83	744.56	751.83	744.16	754.79	10.67
78.000	653.11	754.83	744.56	751.83	744.16	754.79	10.67
77.000	Pensacola Dam						

*Difference between the highest and lowest Max WSELs from the simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.26**

GRAND RIVER DAM AUTHORITY SPRING RIVER MAX WSELs - HISTORICAL STARTING STAGES

River Mile	Bed El. (ft, PD)	Historical Inflow Event					Max WSEL Difference* (ft)
		Sept 1993 (21 Yr) Max WSEL (ft, PD)	June 2004 (1 Yr) Max WSEL (ft, PD)	July 2007 (4 Yr) Max WSEL (ft, PD)	Oct 2009 (3 Yr) Max WSEL (ft, PD)	Dec 2015 (15 Yr) Max WSEL (ft, PD)	
21.000	Upstream end of model						
21.000	762.67	805.10	773.88	783.49	790.77	800.69	31.22
20.000	760.13	804.41	771.04	780.70	788.92	799.50	33.37
19.000	759.04	803.09	768.52	777.52	785.68	797.69	34.58
18.000	753.18	800.93	764.57	774.20	782.60	795.45	36.37
17.000	750.54	799.10	762.75	772.20	780.53	793.52	36.34
16.000	749.28	796.17	760.34	770.00	778.12	790.74	35.83
15.000	746.37	794.15	758.33	767.51	775.15	788.26	35.81
14.170	741.32	791.71	757.46	765.96	772.81	785.82	34.25
14.160	E 57 Road						
14.120	744.21	789.81	757.49	766.18	773.22	784.97	32.32
13.510	744.59	786.79	756.84	765.30	772.08	783.33	29.95
13.500	Interstate 44 Bridge						
13.450	745.52	784.91	756.58	764.98	771.61	782.64	28.33
12.000	742.72	780.13	753.32	762.16	767.89	777.94	26.82
11.000	742.23	778.45	751.72	760.39	765.98	776.26	26.73
10.000	737.62	776.97	750.35	758.85	764.45	775.15	26.62
9.000	733.92	774.02	749.45	757.28	762.28	773.56	24.58
8.020	733.14	772.73	748.40	755.93	760.74	772.72	24.33
8.010	OK Highway 10 Bridge						
7.970	731.28	771.31	746.13	754.38	759.43	767.82	25.18
7.000	730.33	769.26	745.58	754.34	757.02	765.16	23.68
6.000	727.95	767.91	745.19	754.32	755.46	763.59	22.72
5.000	722.10	766.57	745.06	754.30	754.17	762.11	21.51
4.000	720.00	765.68	744.95	754.29	753.36	761.09	20.73
3.000	723.22	764.42	744.91	754.29	752.61	759.80	19.51
2.000	723.73	763.57	744.86	754.28	752.00	758.89	18.71
1.000	728.44	762.71	744.82	754.28	751.54	758.06	17.89
0.580	716.17	760.75	744.81	754.27	751.10	757.10	15.94
0.570	Highway 60 Bridge						
0.560	713.76	760.27	744.80	754.27	751.05	756.97	15.47
0.460	715.35	760.91	744.80	754.27	751.08	757.14	16.11
0.000	Downstream end of Spring River						

*Difference between the highest and lowest Max WSELs from the simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.27**

GRAND RIVER DAM AUTHORITY ELK RIVER MAX WSELs - HISTORICAL STARTING STAGES

River Mile	Bed El. (ft, PD)	Historical Inflow Event					Max WSEL Difference* (ft)
		Sept 1993 (21 Yr) Max WSEL (ft, PD)	June 2004 (1 Yr) Max WSEL (ft, PD)	July 2007 (4 Yr) Max WSEL (ft, PD)	Oct 2009 (3 Yr) Max WSEL (ft, PD)	Dec 2015 (15 Yr) Max WSEL (ft, PD)	
19.590	Upstream end of model						
19.590	771.15	787.52	774.17	775.57	793.77	800.12	25.95
19.000	767.51	785.42	772.64	774.03	791.13	797.92	25.28
18.000	765.41	781.77	769.18	770.46	787.17	794.01	24.83
17.000	762.53	777.78	766.13	767.01	783.91	790.87	24.74
16.000	756.63	773.42	761.16	762.78	779.22	786.22	25.06
15.000	754.26	769.55	757.92	759.23	775.00	782.38	24.46
14.240	750.52	766.33	753.18	754.64	771.70	779.28	26.10
14.220	Highway 43 Bridge						
14.200	750.12	766.08	753.10	754.58	771.20	776.85	23.75
14.000	747.07	764.91	752.78	754.26	770.02	775.82	23.04
13.000	745.41	760.77	749.01	752.21	764.84	769.73	20.72
12.000	741.15	757.41	746.06	752.02	761.15	765.86	19.80
11.910	OK/MO State Line						
11.000	741.93	754.93	744.81	751.97	755.17	760.18	15.37
10.000	734.62	754.91	744.59	751.95	750.88	756.38	11.79
9.000	734.66	754.90	744.58	751.94	747.88	754.86	10.32
8.000	724.21	754.90	744.58	751.93	745.68	754.85	10.32
7.000	728.21	754.89	744.57	751.92	744.20	754.84	10.69
6.000	727.13	754.89	744.57	751.92	744.20	754.83	10.69
5.000	721.05	754.88	744.57	751.91	744.20	754.83	10.68
4.700	716.13	754.88	744.57	751.90	744.20	754.82	10.68
4.670	OK Highway 10 Bridge						
4.640	715.21	754.88	744.57	751.90	744.20	754.82	10.68
4.000	716.61	754.88	744.57	751.90	744.20	754.82	10.68
3.000	714.74	754.88	744.57	751.89	744.20	754.81	10.68
2.000	709.09	754.87	744.57	751.89	744.20	754.81	10.67
1.000	705.82	754.87	744.57	751.88	744.20	754.80	10.67
0.320	706.36	754.87	744.57	751.88	744.19	754.80	10.68
0.000	Downstream end of Elk River						

*Difference between the highest and lowest Max WSELs from the simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE B.28**

GRAND RIVER DAM AUTHORITY TAR CREEK MAX WSELs - HISTORICAL STARTING STAGES

River Mile	Bed El. (ft, PD)	Historical Inflow Event					Max WSEL Difference* (ft)
		Sept 1993 (21 Yr) Max WSEL (ft, PD)	June 2004 (1 Yr) Max WSEL (ft, PD)	July 2007 (4 Yr) Max WSEL (ft, PD)	Oct 2009 (3 Yr) Max WSEL (ft, PD)	Dec 2015 (15 Yr) Max WSEL (ft, PD)	
4.152	Upstream end of model						
4.152	762.17	776.77	768.17	771.83	775.04	775.09	8.60
3.900	760.10	775.76	767.29	771.83	774.11	774.16	8.47
3.840	22nd Ave Bridge						
3.800	762.30	774.50	766.05	771.83	772.86	772.90	8.45
3.300	759.46	772.27	764.09	771.83	770.57	770.62	8.18
2.800	756.73	768.46	760.95	771.83	766.52	766.58	10.87
2.710	BN RR Bridge						
2.700	755.72	767.11	760.45	771.83	765.50	765.54	11.37
2.500	754.95	766.51	759.30	771.83	764.13	764.16	12.53
2.300	754.15	766.51	757.47	771.83	762.23	762.24	14.36
2.200	Rockdale Blvd Bridge						
2.100	751.51	766.51	754.84	771.83	759.50	760.80	16.99
1.900	750.02	766.51	753.22	771.83	758.41	760.80	18.61
1.700	749.58	766.51	751.32	771.83	758.41	760.80	20.51
1.660	Central Ave Bridge						
1.600	746.47	766.51	751.26	771.83	758.41	760.80	20.57
1.500	744.29	766.51	751.26	771.83	758.41	760.80	20.57
1.400	OK Highway 10 Bridge						
1.300	742.00	766.51	751.26	771.83	758.41	760.80	20.57
1.000	739.34	766.51	751.26	771.82	758.41	760.80	20.56
0.700	737.06	766.51	751.26	771.81	758.41	760.80	20.55
0.300	736.42	766.52	751.26	771.75	758.42	760.80	20.49
0.041	735.85	766.50	751.25	771.66	758.40	760.79	20.41
0.000	Downstream end of Tar Creek						

*Difference between the highest and lowest Max WSELs from the simulations with historical starting stages.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX C
WATER SURFACE ELEVATION PROFILES

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX C.1
SEPTEMBER 1993 (21 YEAR) INFLOW EVENT
WATER SURFACE ELEVATION PROFILES

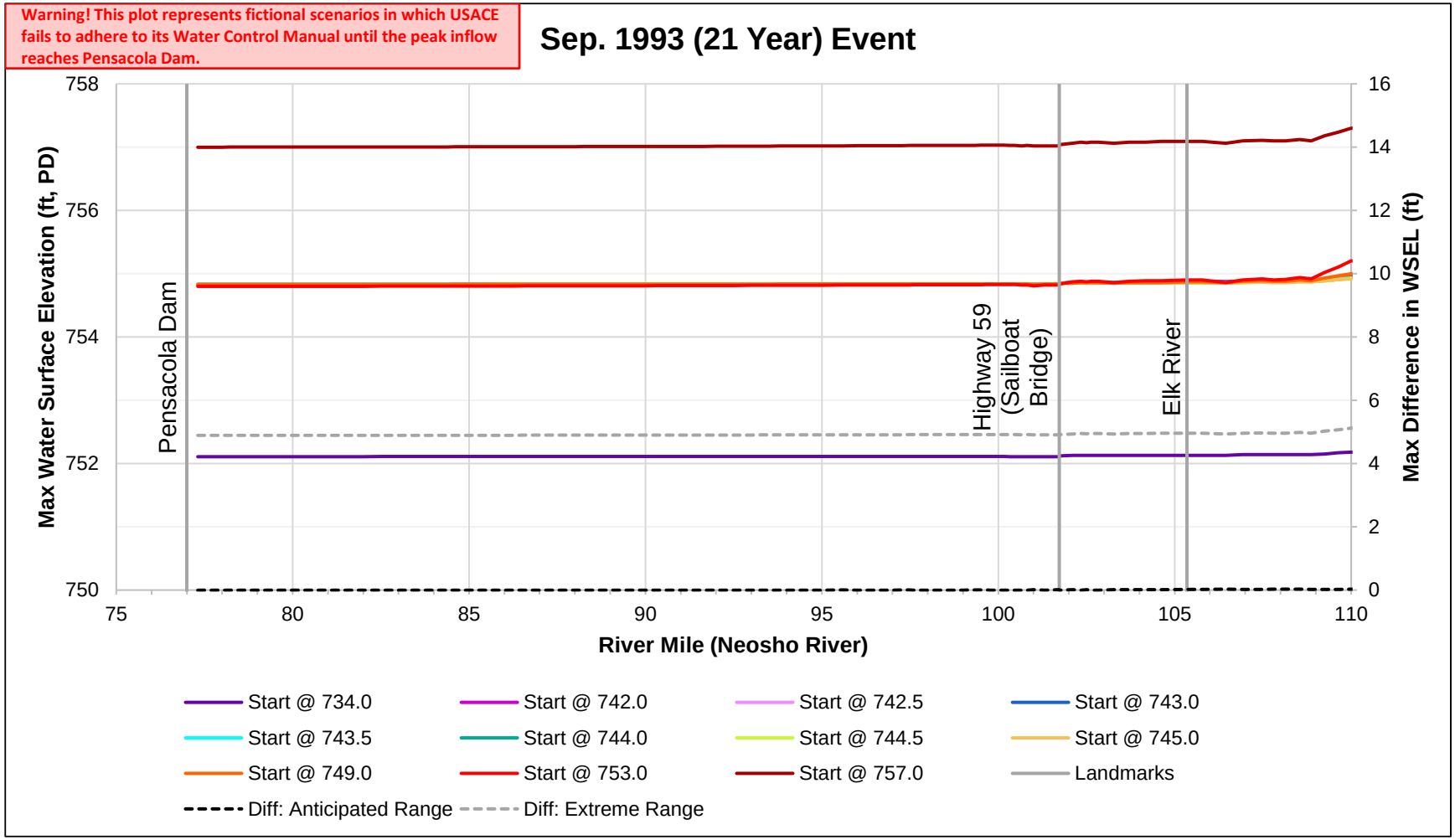


Figure C.1. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Neosho River profile (1 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

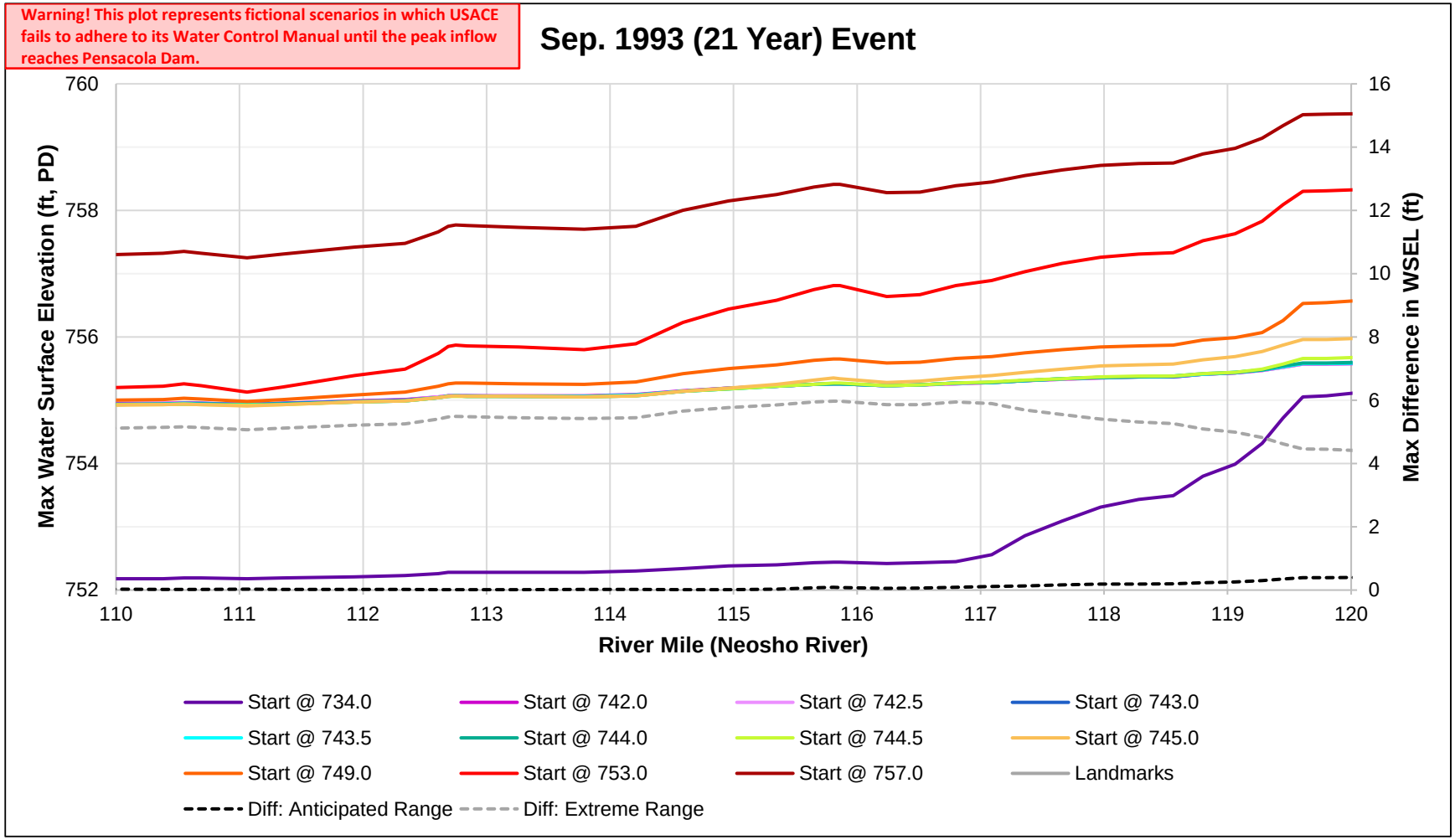


Figure C.2. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Neosho River profile (2 of 5).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

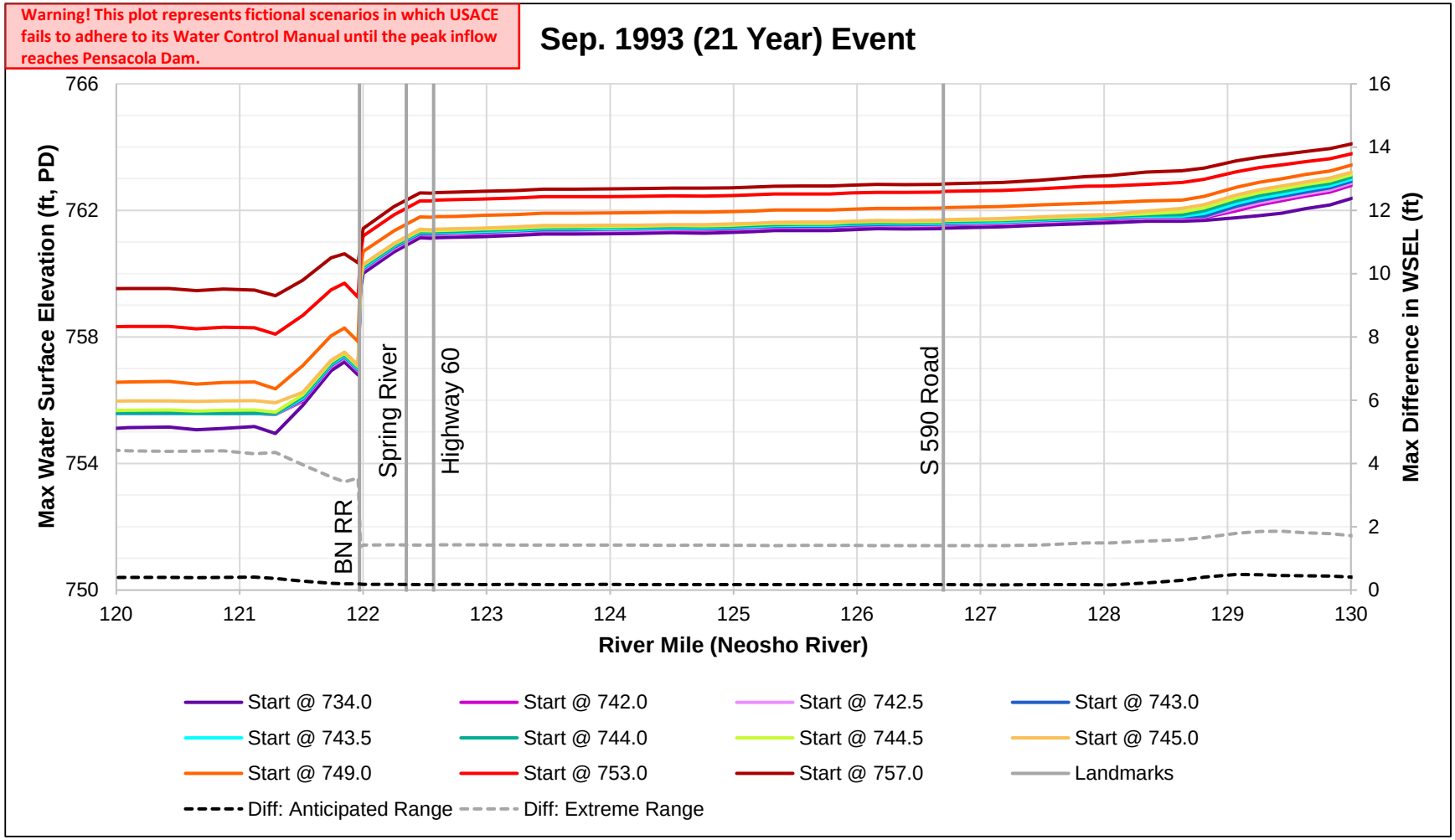


Figure C.3. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Neosho River profile (3 of 5).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

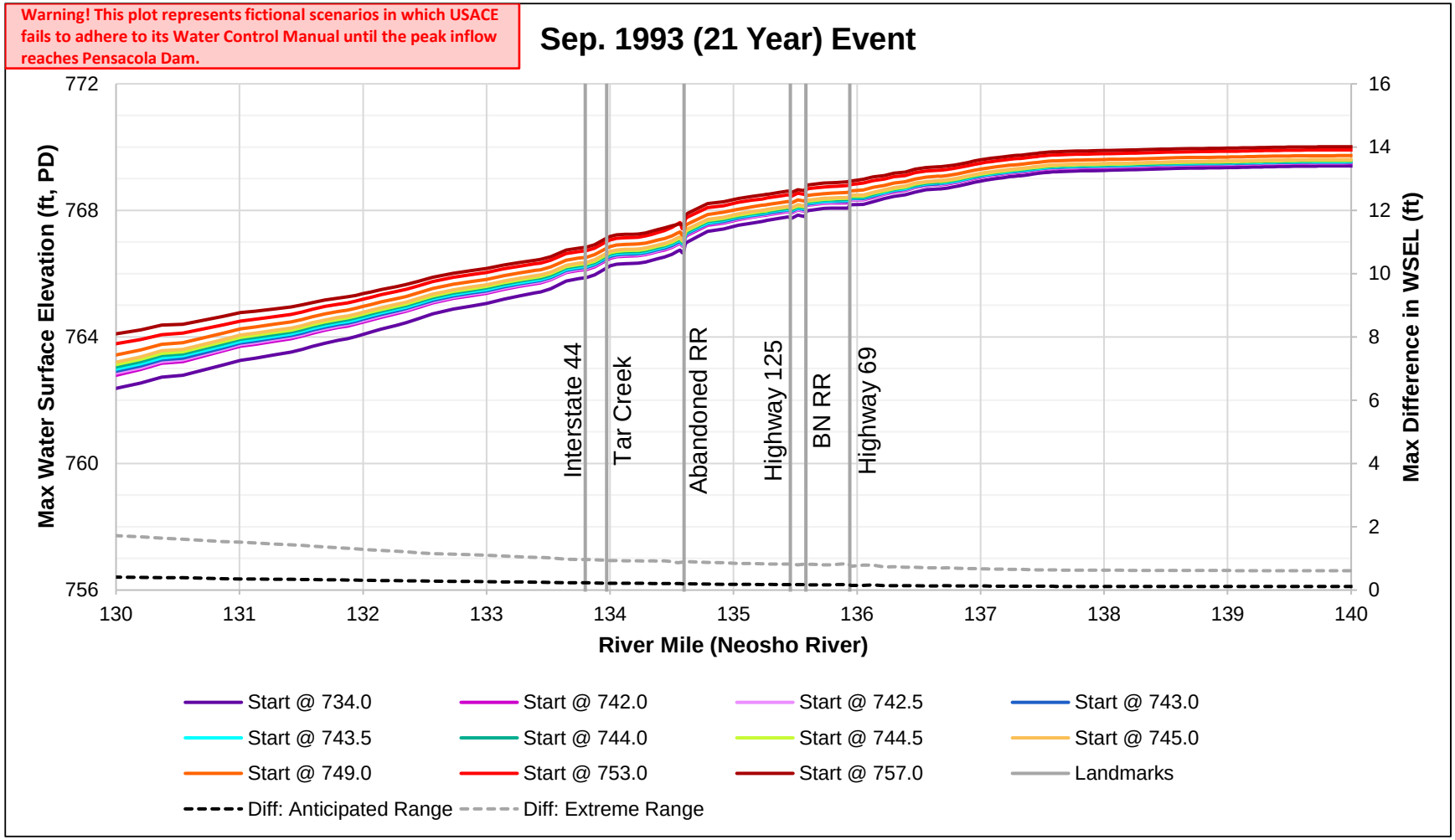


Figure C.4. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Neosho River profile (4 of 5).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

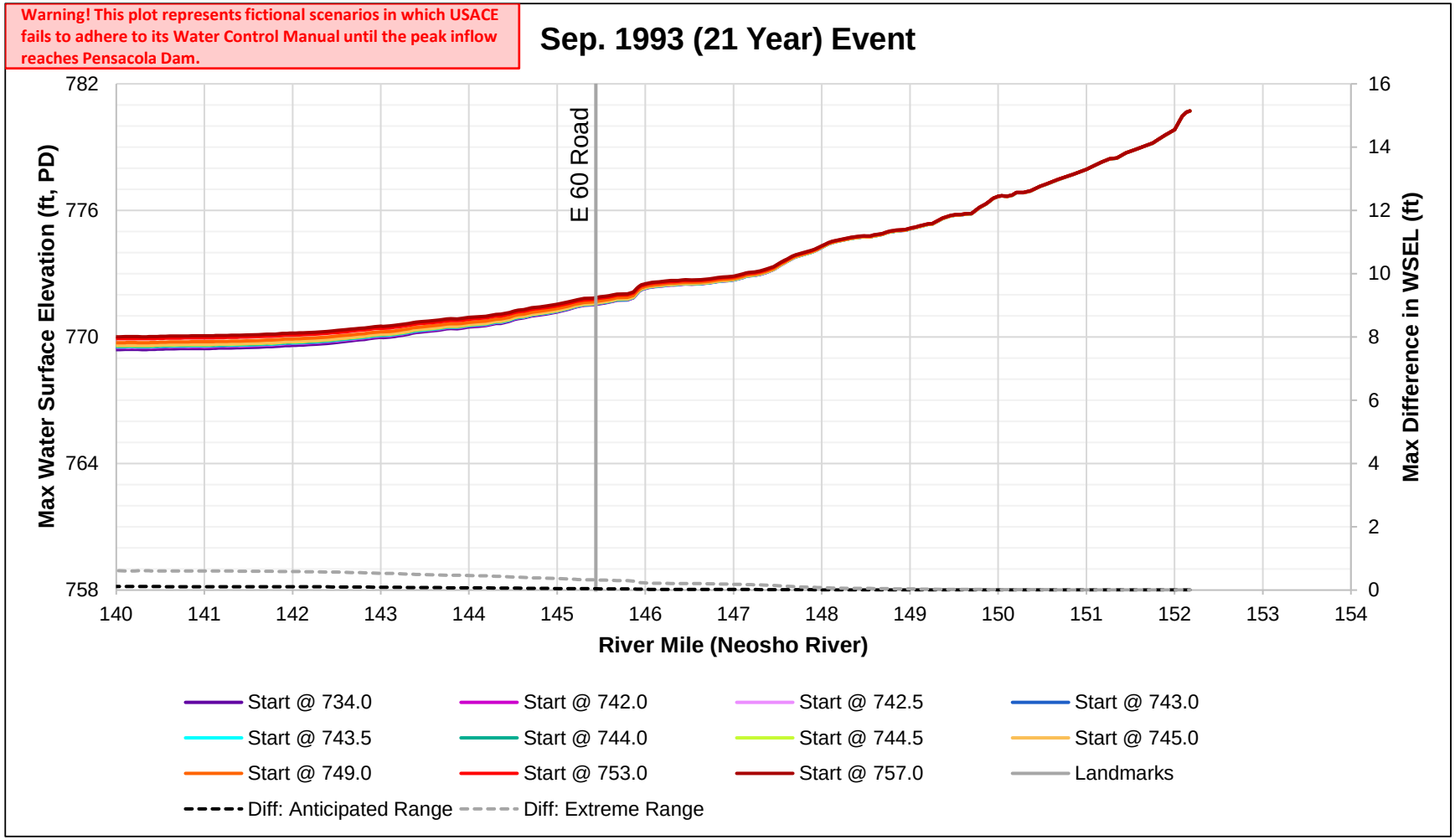


Figure C.5. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Neosho River profile (5 of 5).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

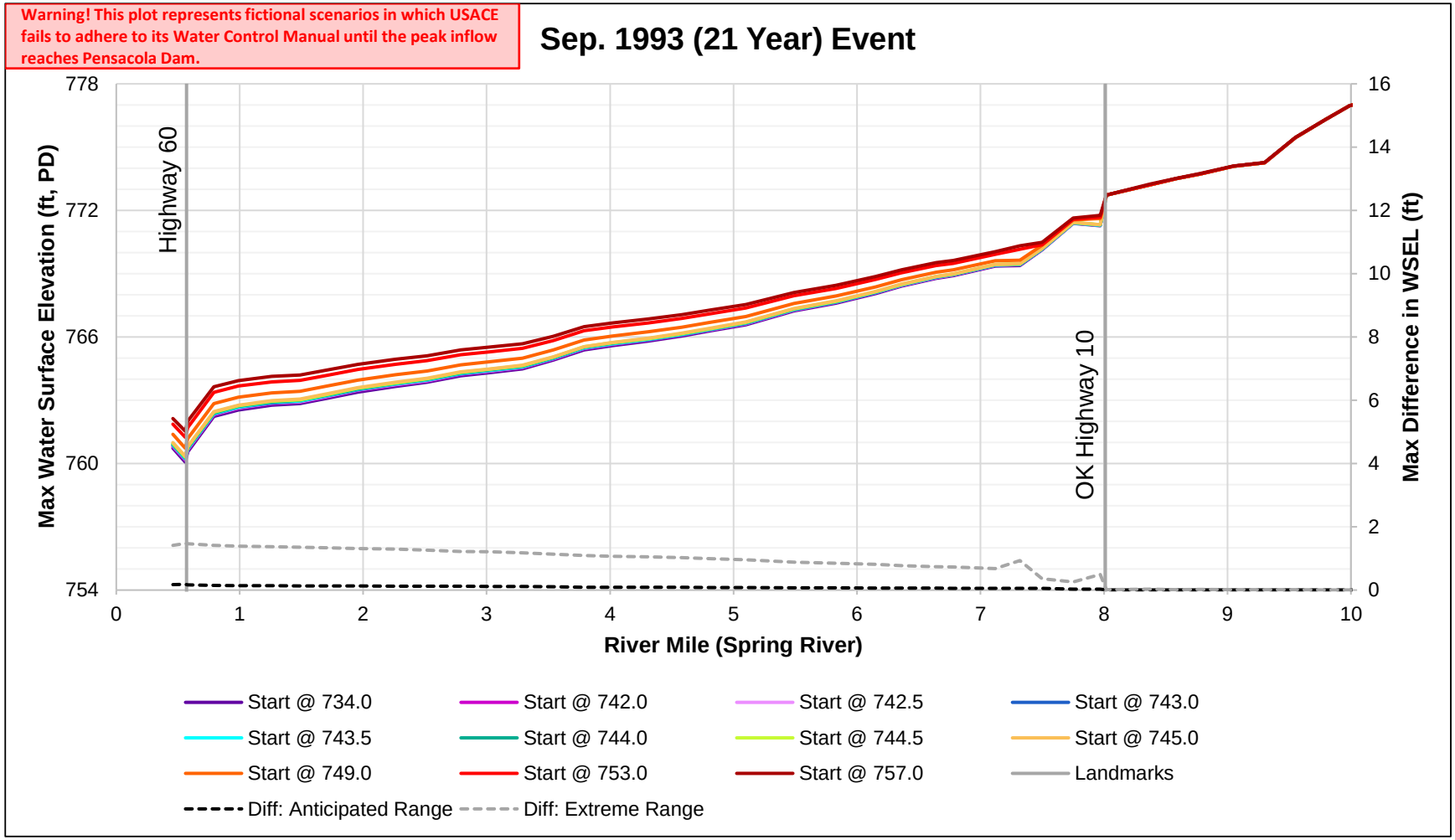


Figure C.6. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Spring River profile (1 of 2).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

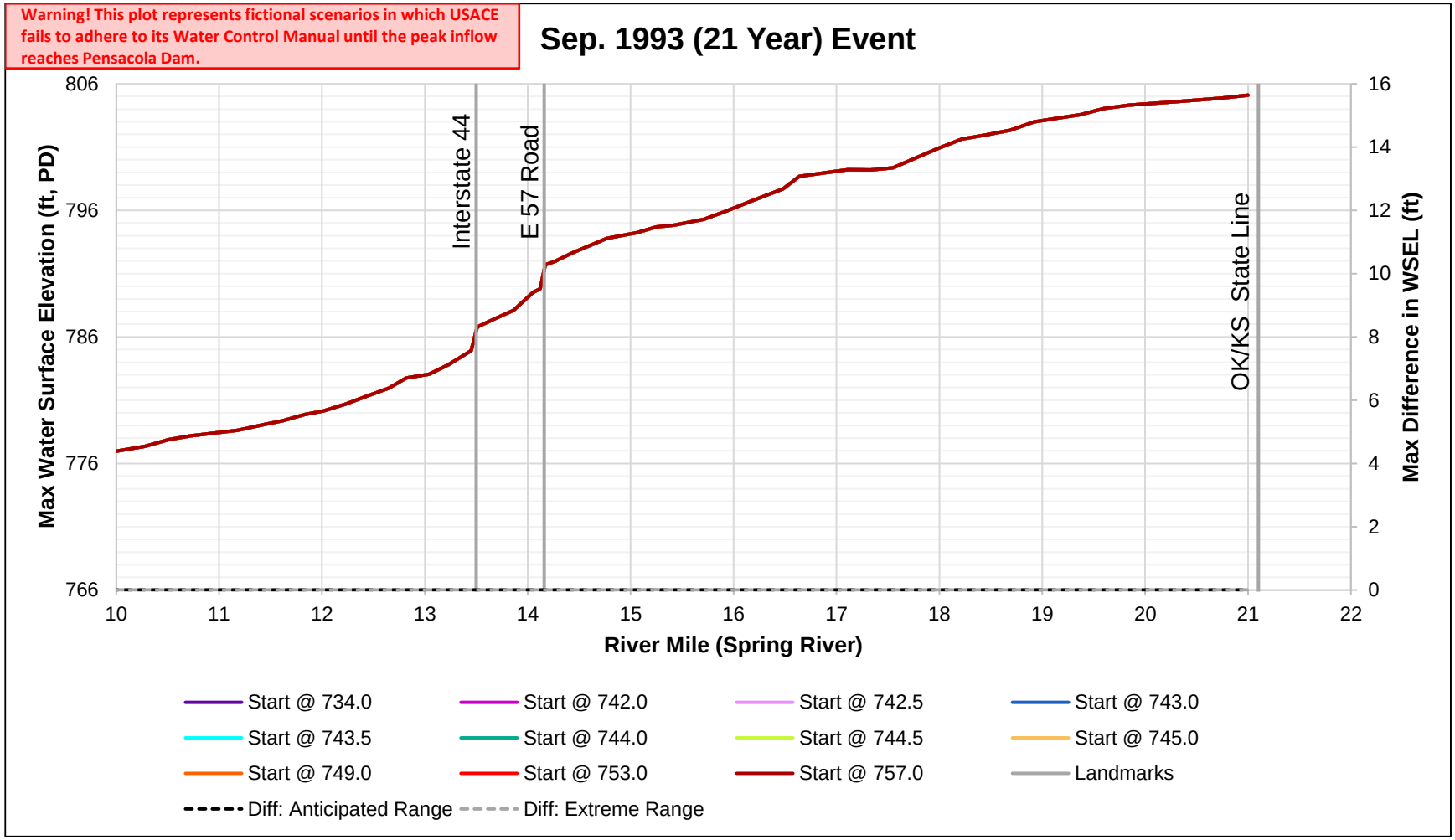


Figure C.7. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Spring River profile (2 of 2).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

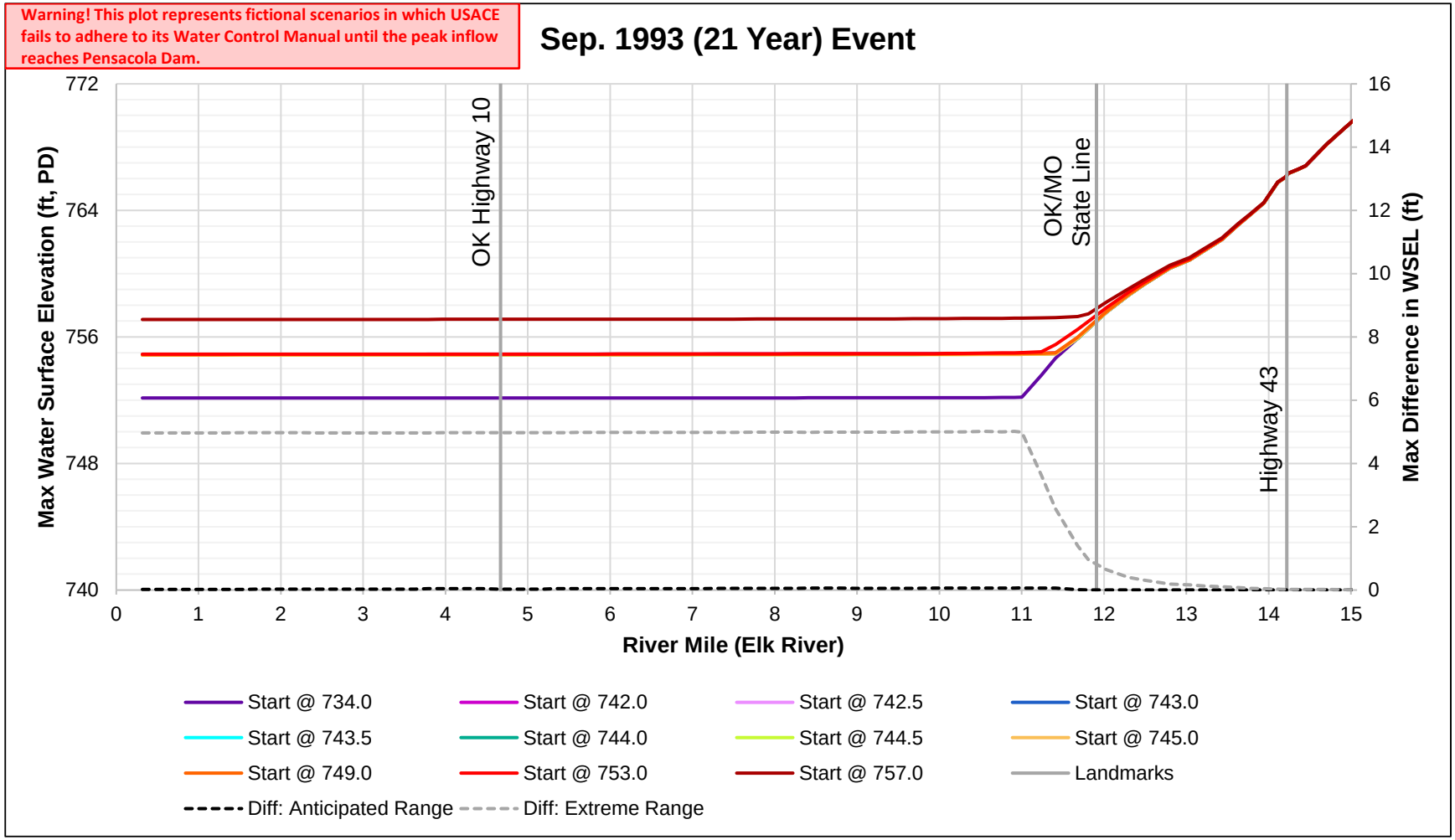


Figure C.8. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Elk River profile (1 of 2).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

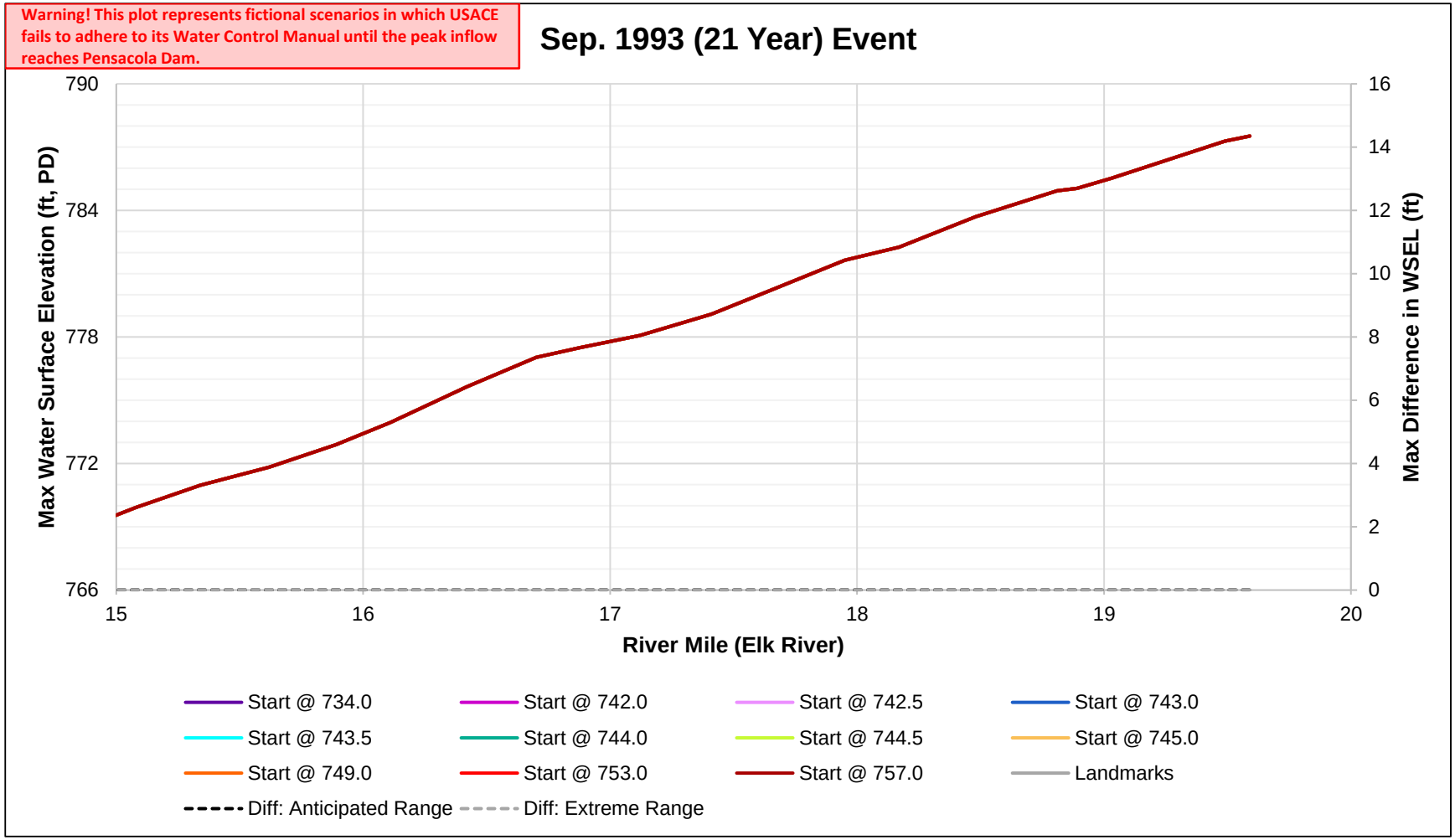


Figure C.9. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Elk River profile (2 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

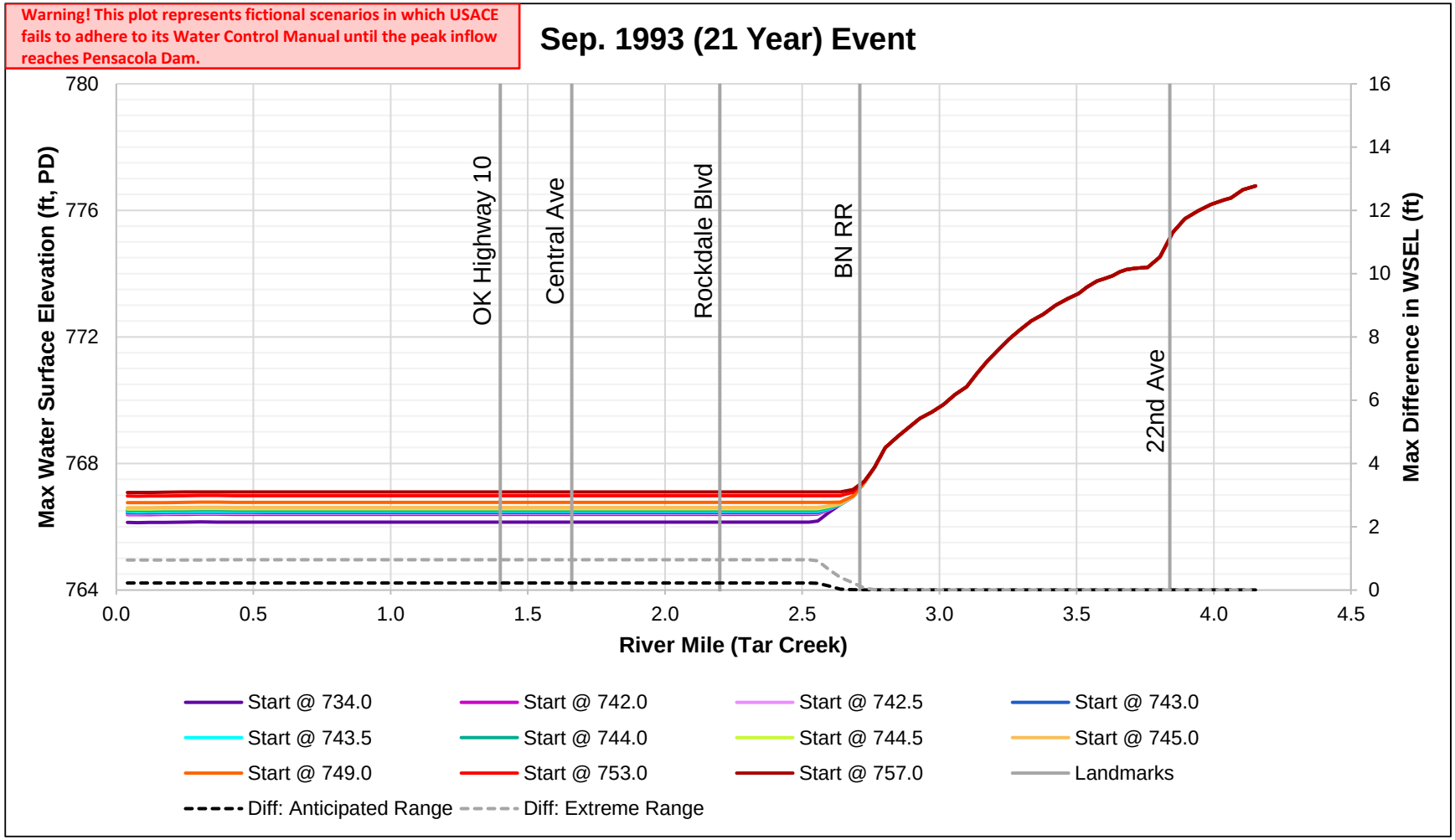


Figure C.10. Water surface elevations for the September 1993 (21 year) inflow event upstream of Pensacola Dam along the Tar Creek profile (1 of 1).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX C.2
JUNE 2004 (1 YEAR) INFLOW EVENT
WATER SURFACE ELEVATION PROFILES

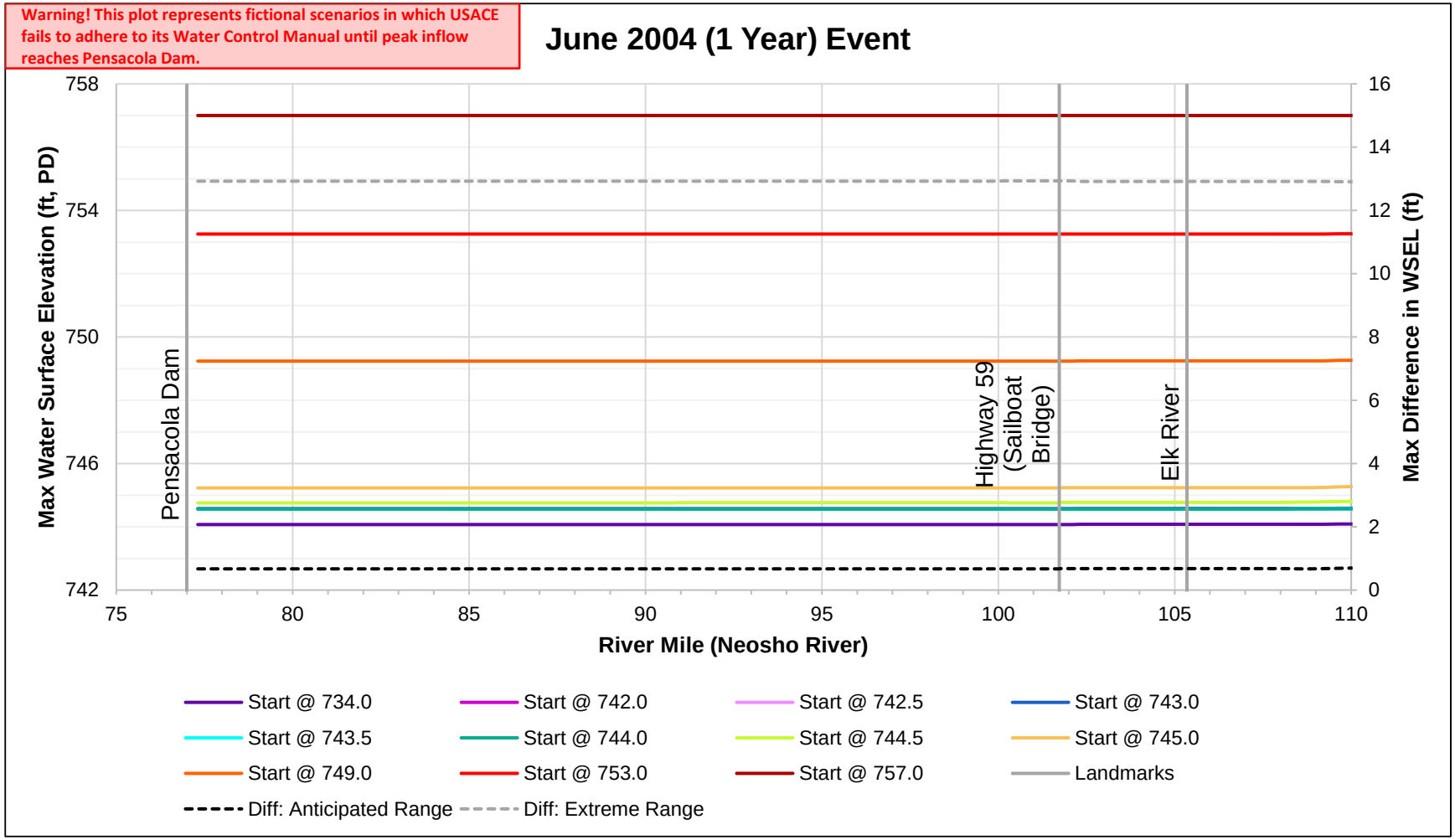


Figure C.11. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Neosho River profile (1 of 5).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

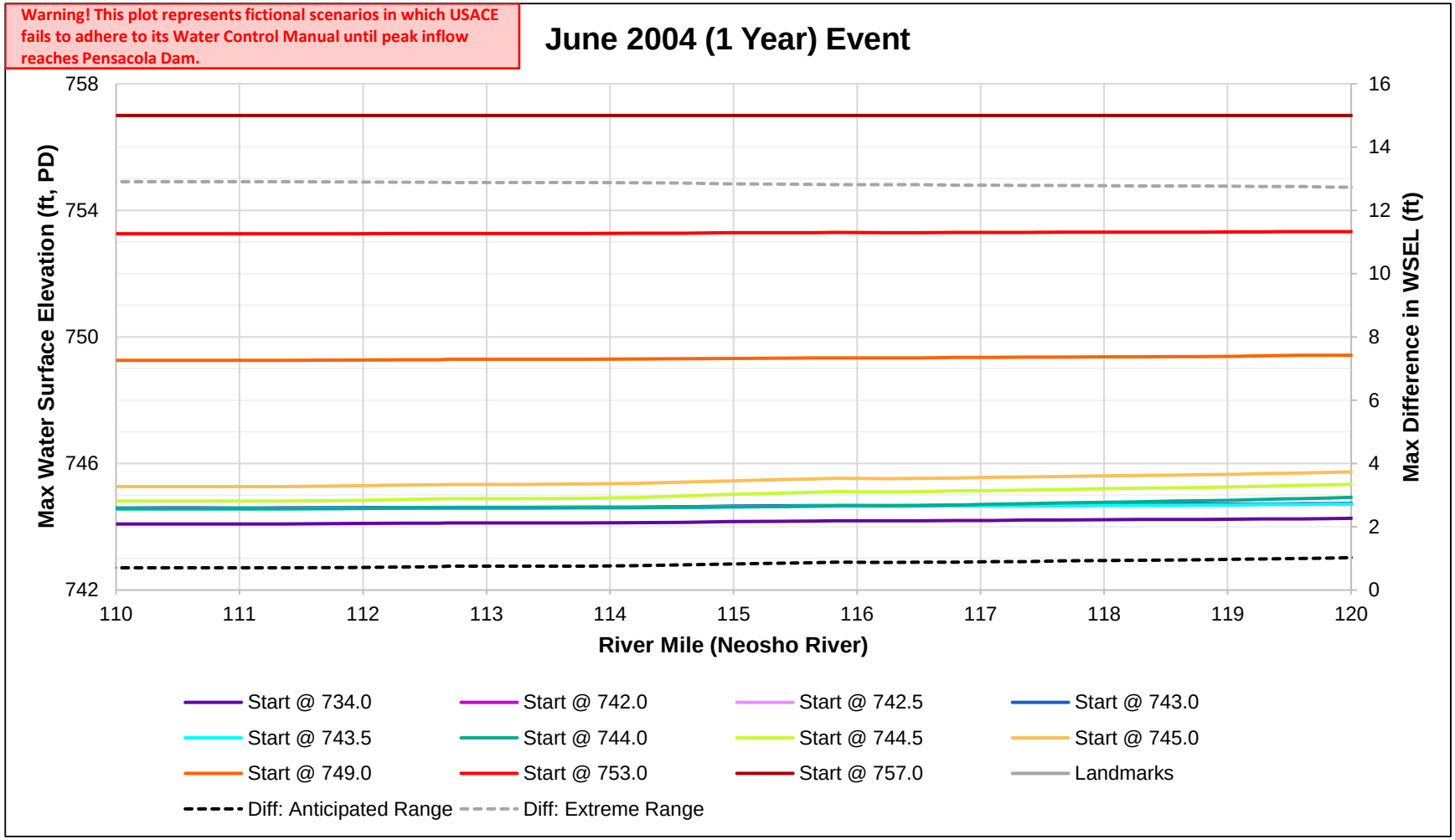


Figure C.12. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Neosho River profile (2 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

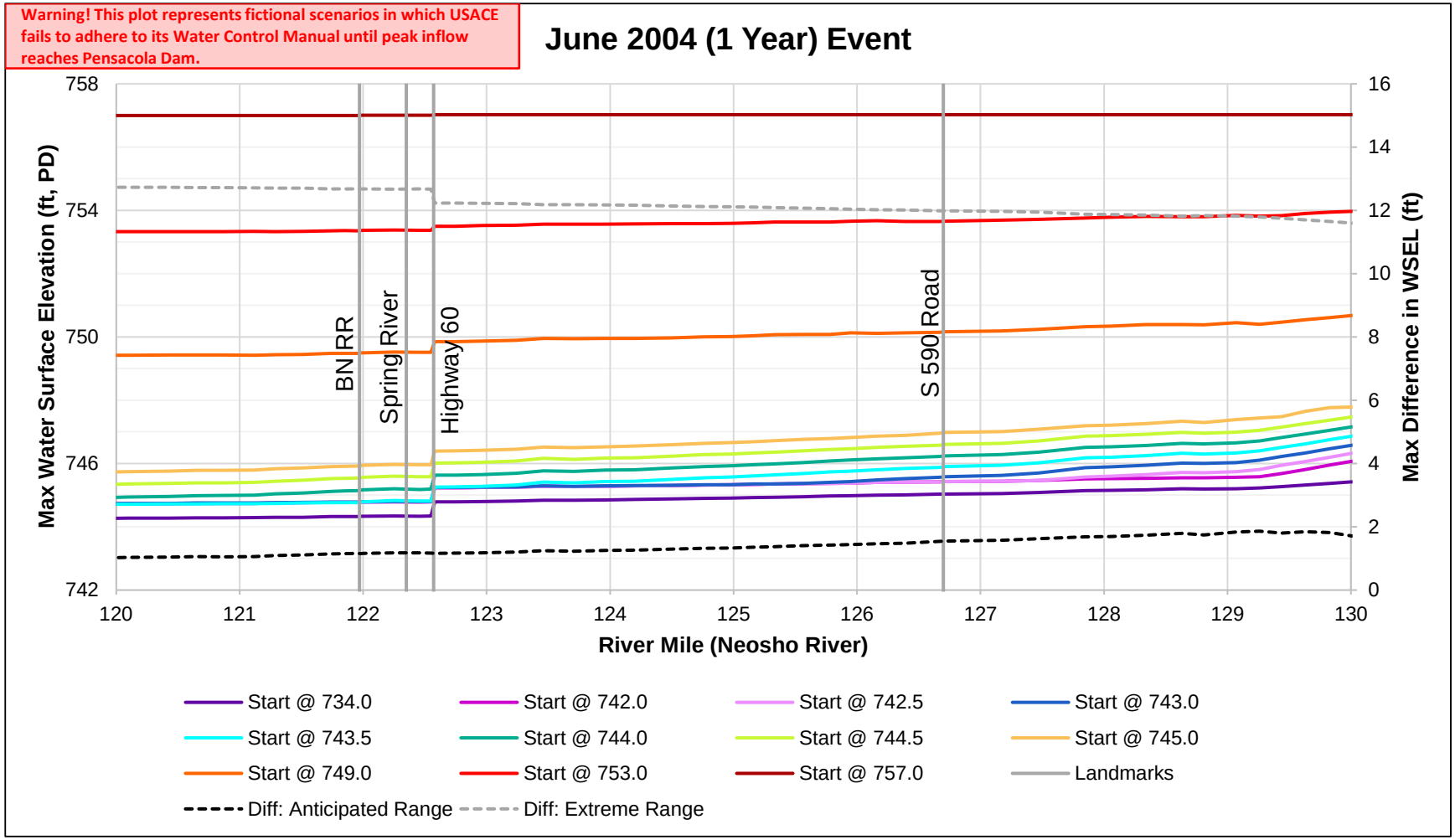


Figure C.13. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Neosho River profile (3 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

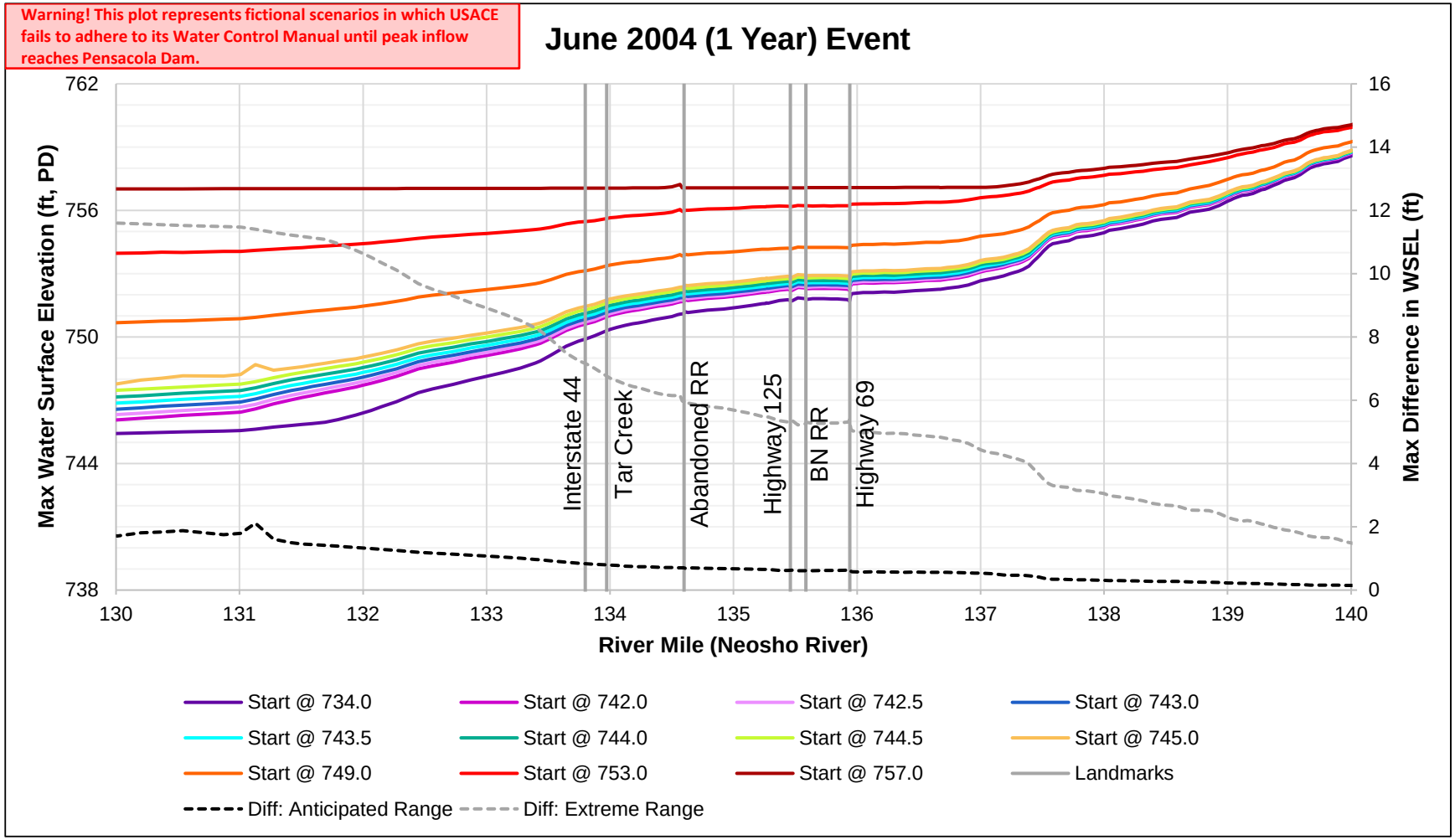


Figure C.14. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Neosho River profile (4 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

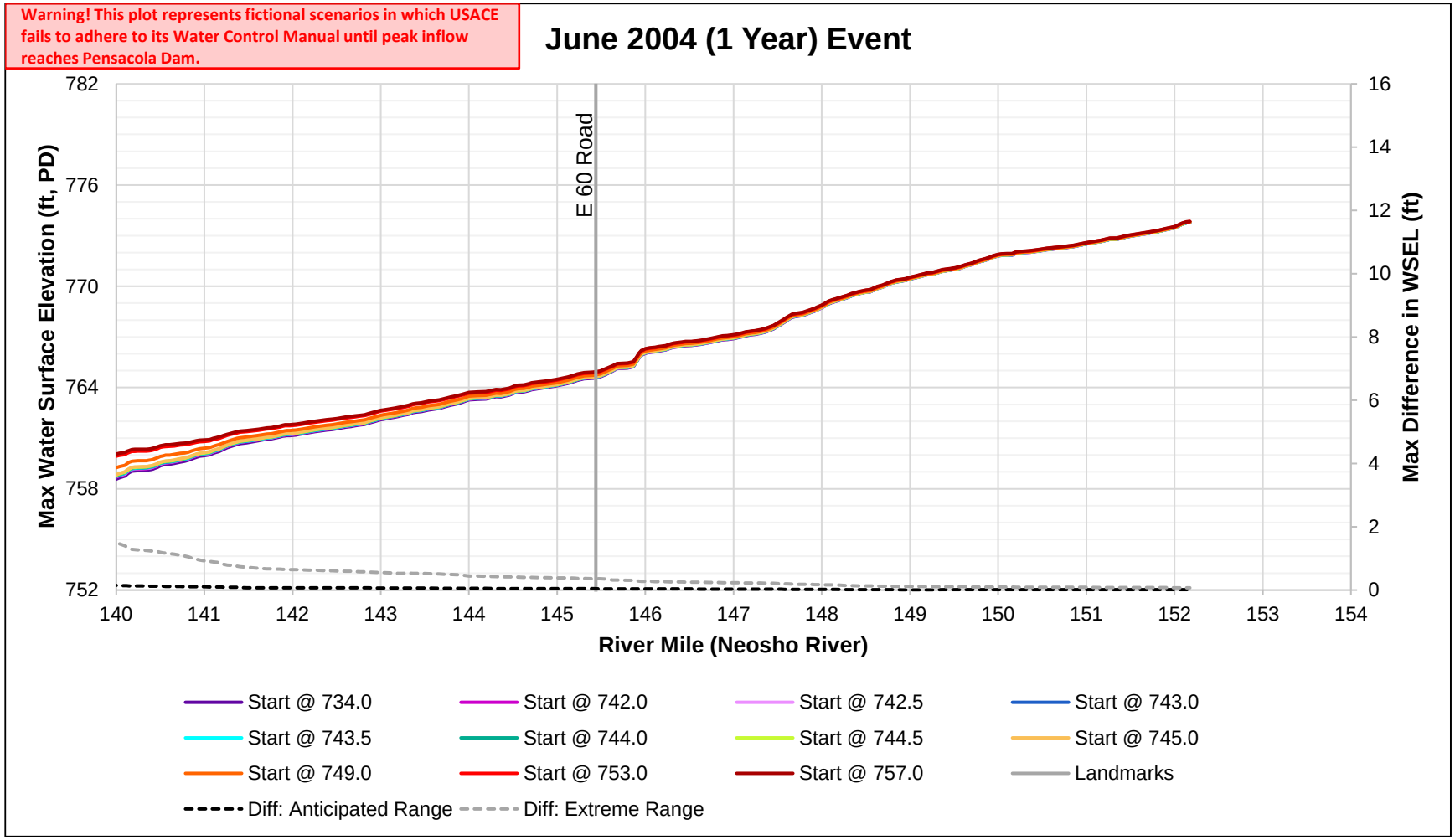


Figure C.15. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Neosho River profile (5 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

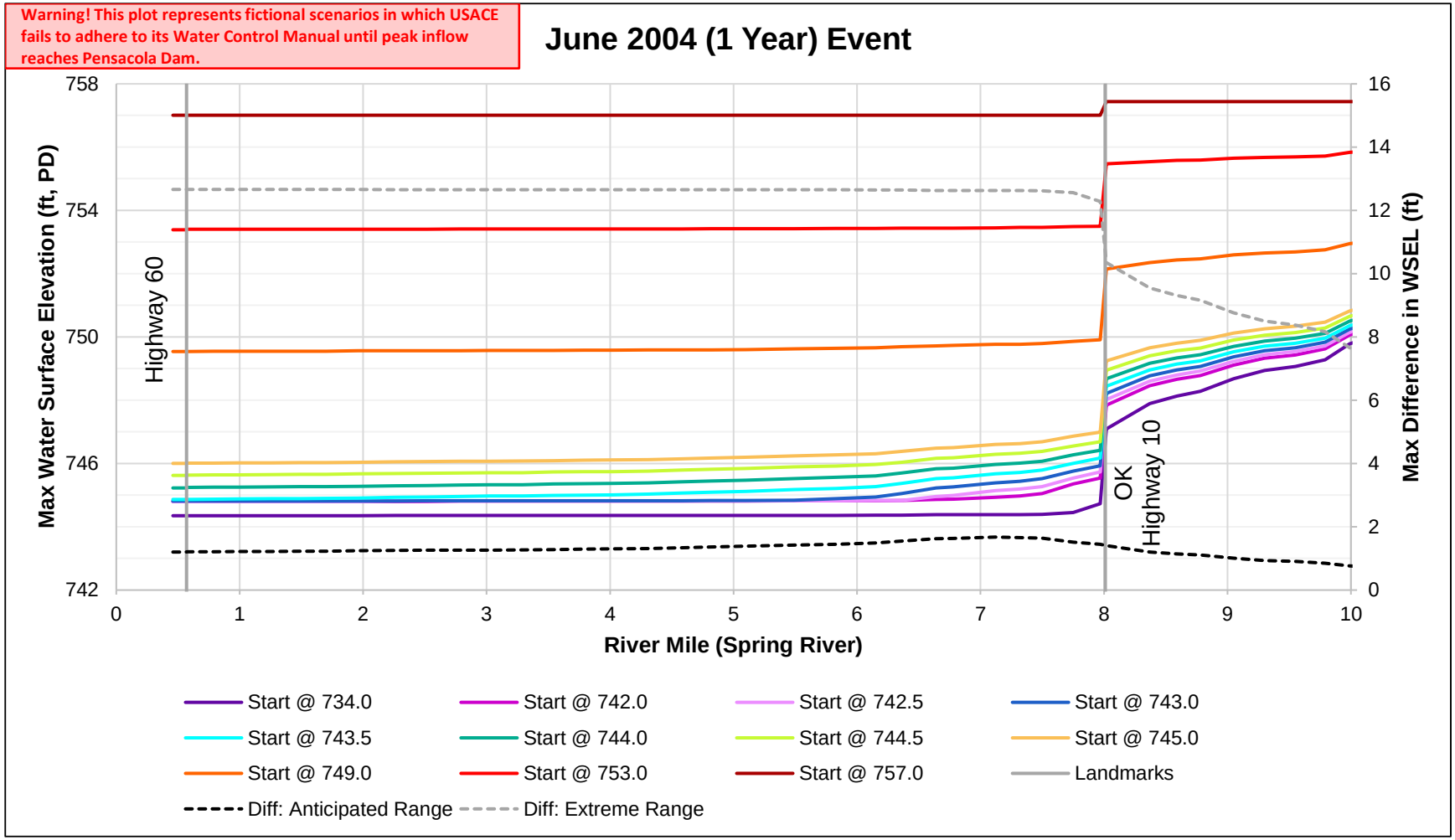


Figure C.16. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Spring River profile (1 of 2).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

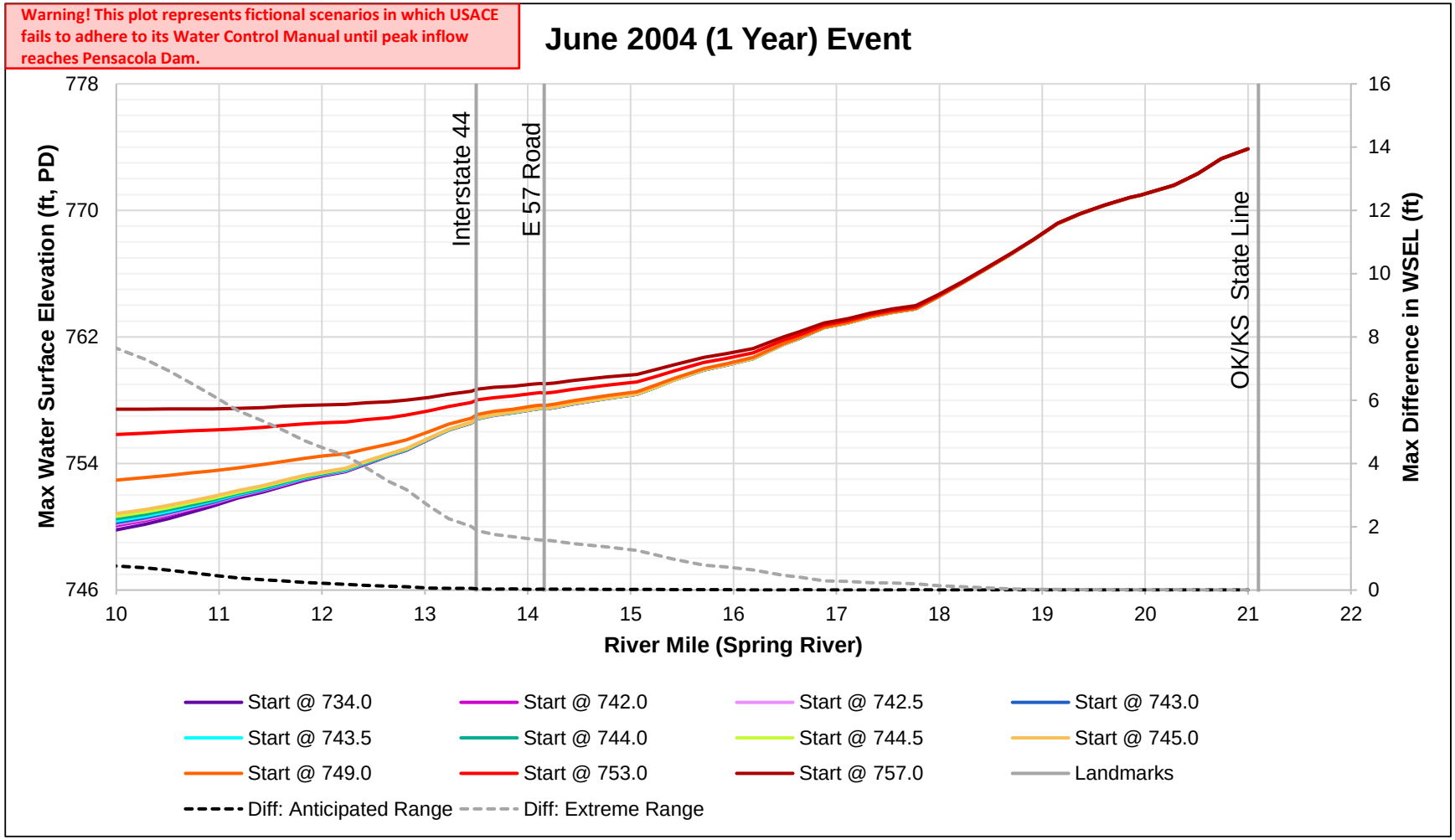


Figure C.17. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Spring River profile (2 of 2).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

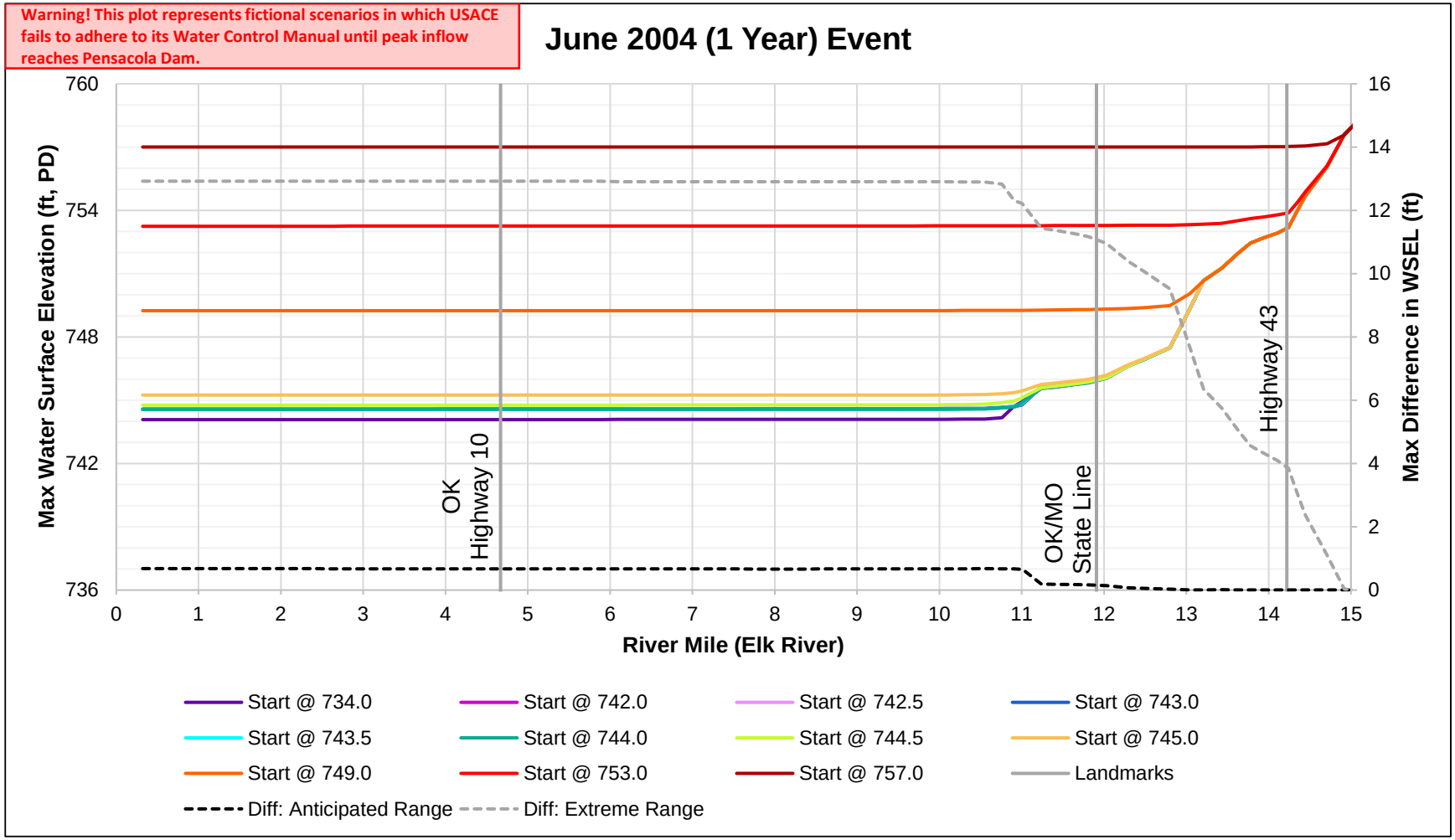


Figure C.18. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Elk River profile (1 of 2).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

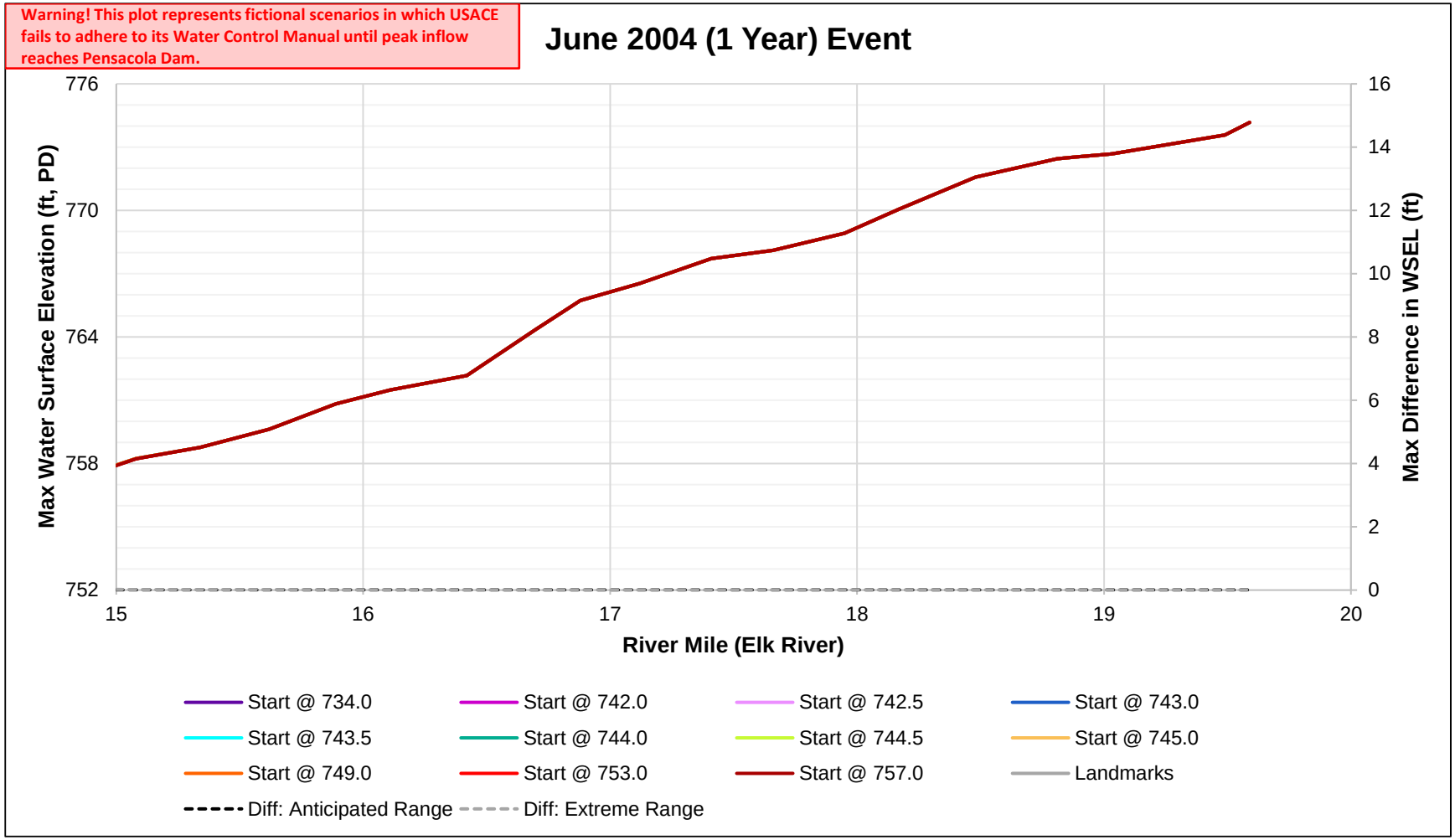


Figure C.19. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Elk River profile (2 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

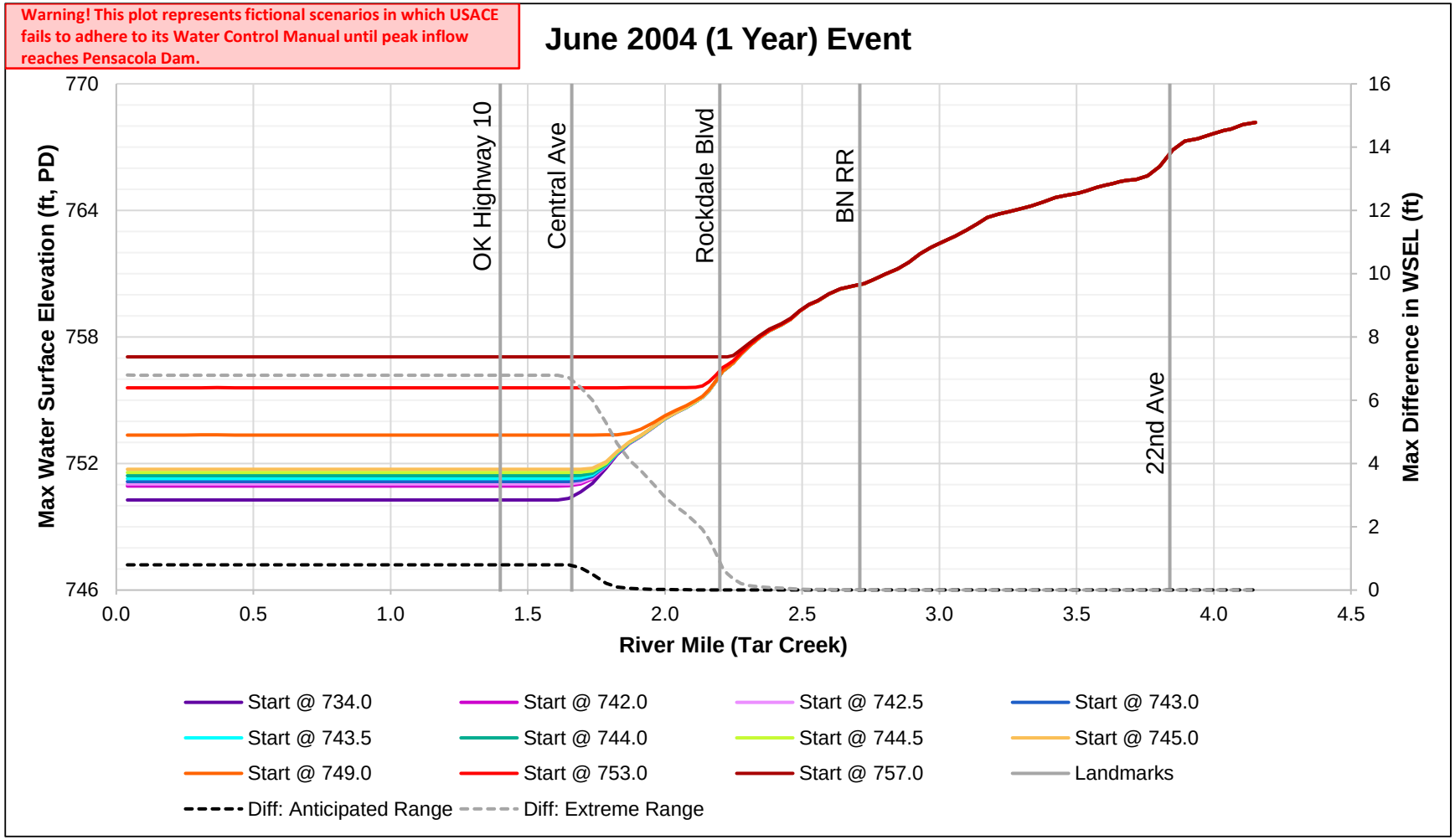


Figure C.20. Water surface elevations for the June 2004 (1 year) inflow event upstream of Pensacola Dam along the Tar Creek profile (1 of 1).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX C.3
JULY 2007 (4 YEAR) INFLOW EVENT
WATER SURFACE ELEVATION PROFILES

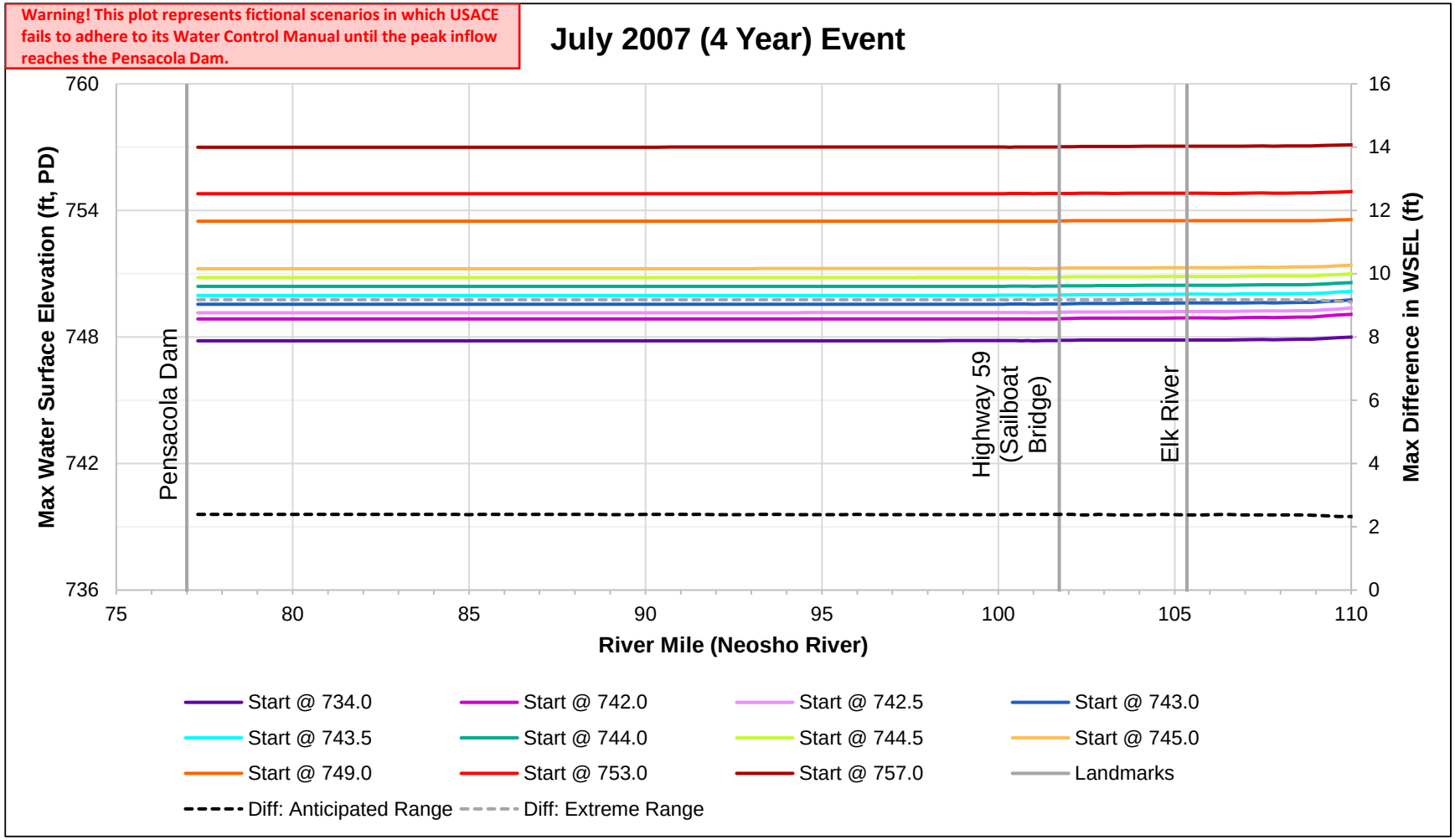


Figure C.21. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Neosho River profile (1 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

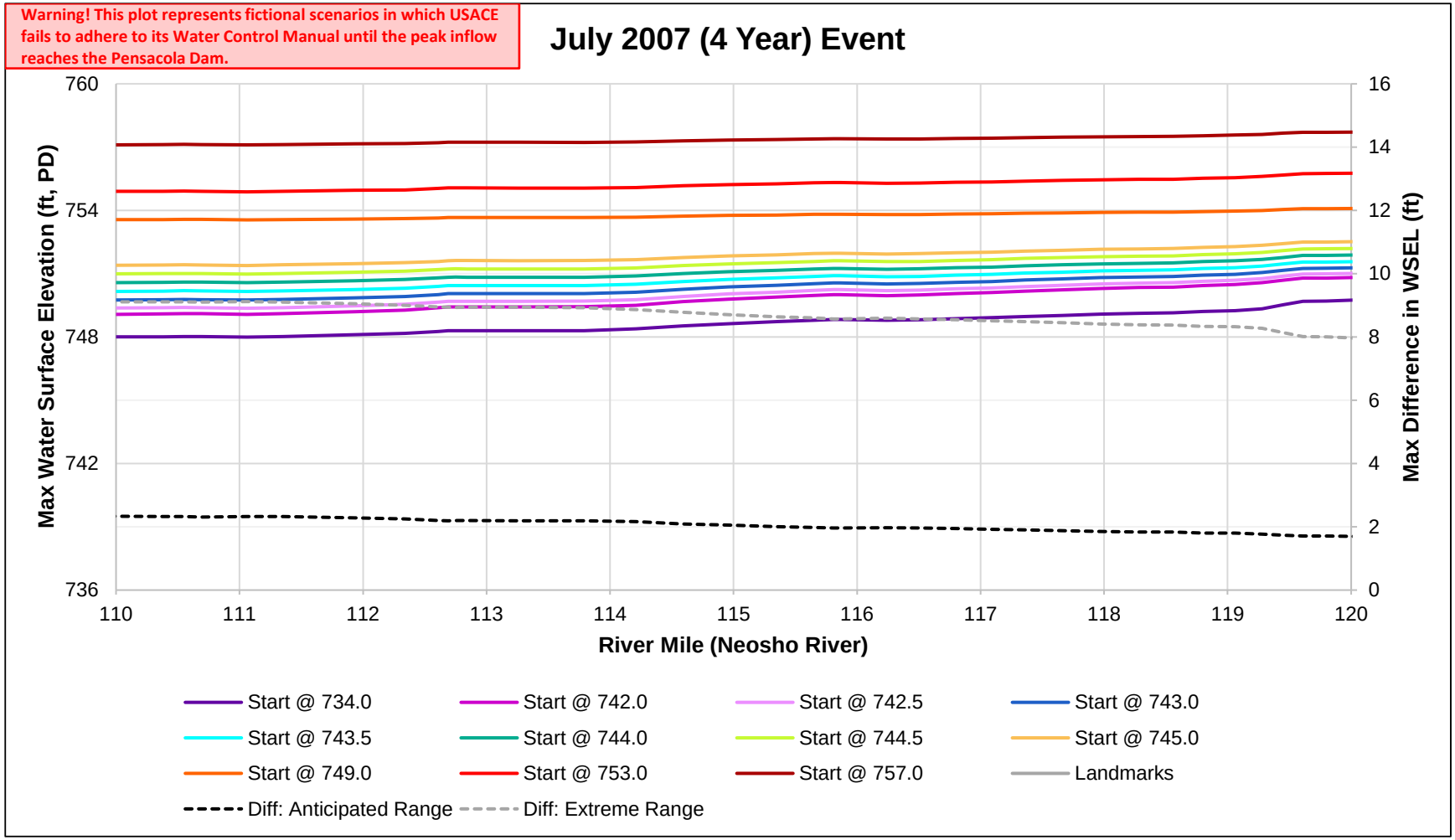


Figure C.22. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Neosho River profile (2 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

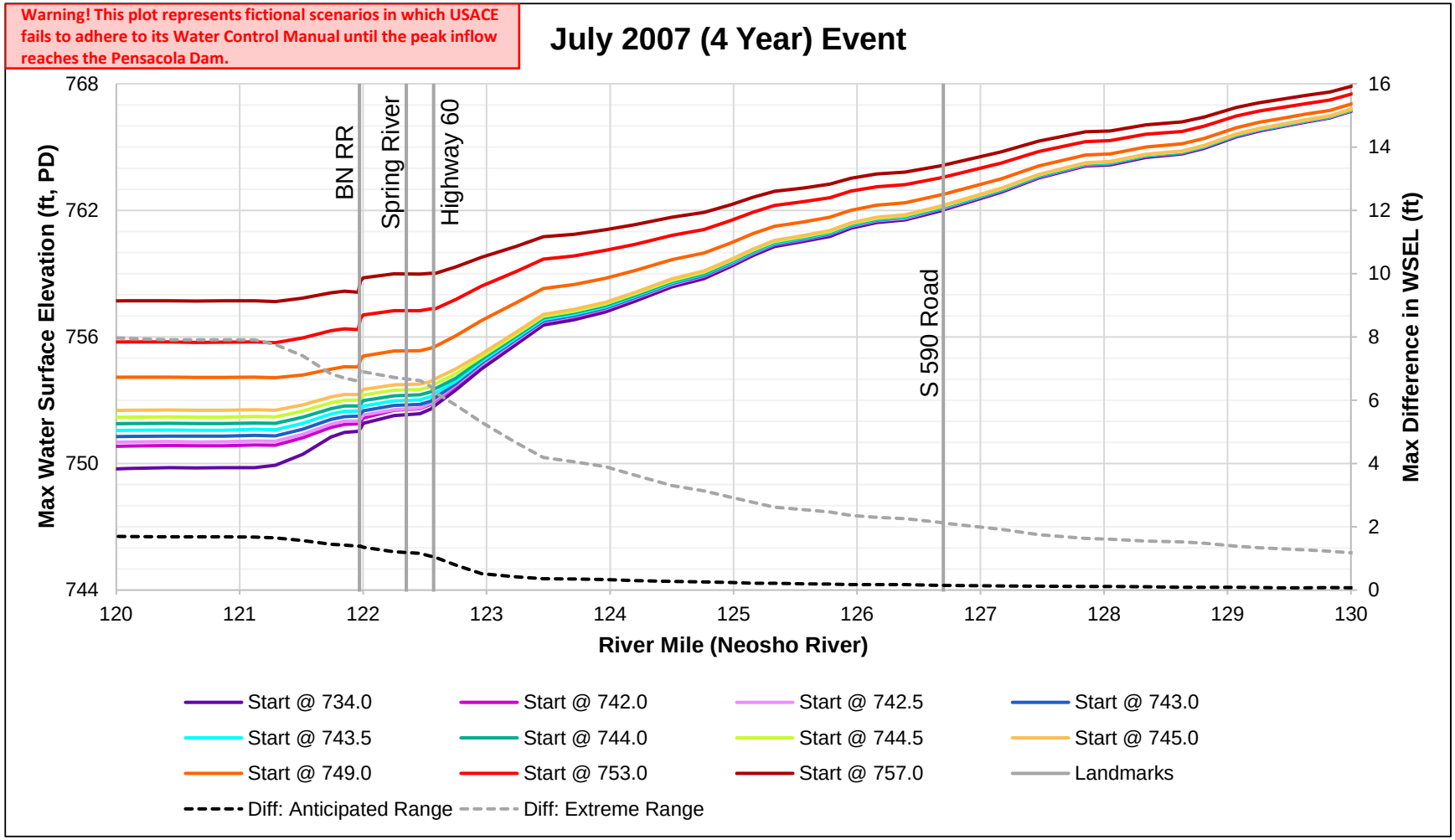


Figure C.23. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Neosho River profile (3 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

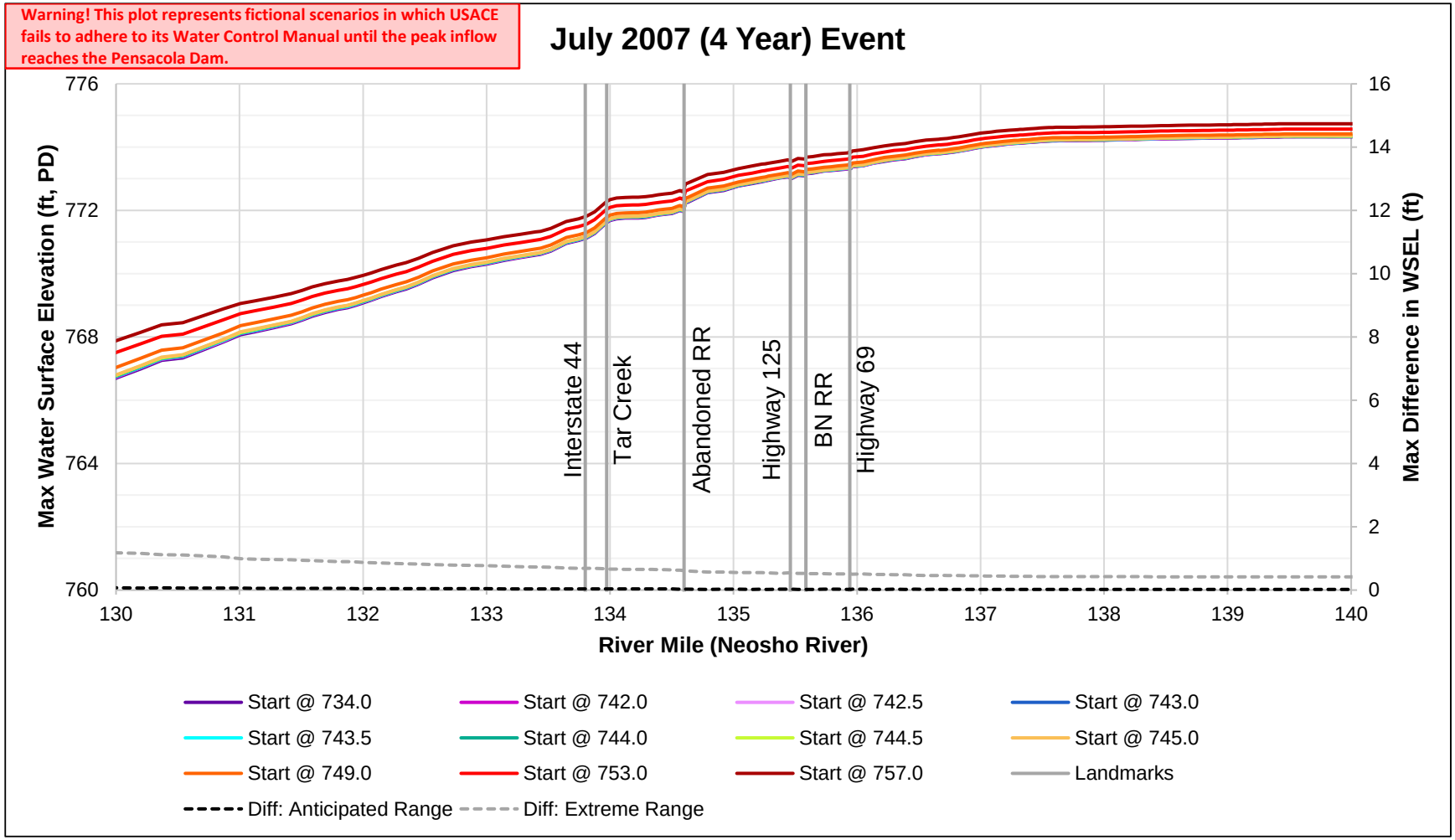


Figure C.24. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Neosho River profile (4 of 5).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

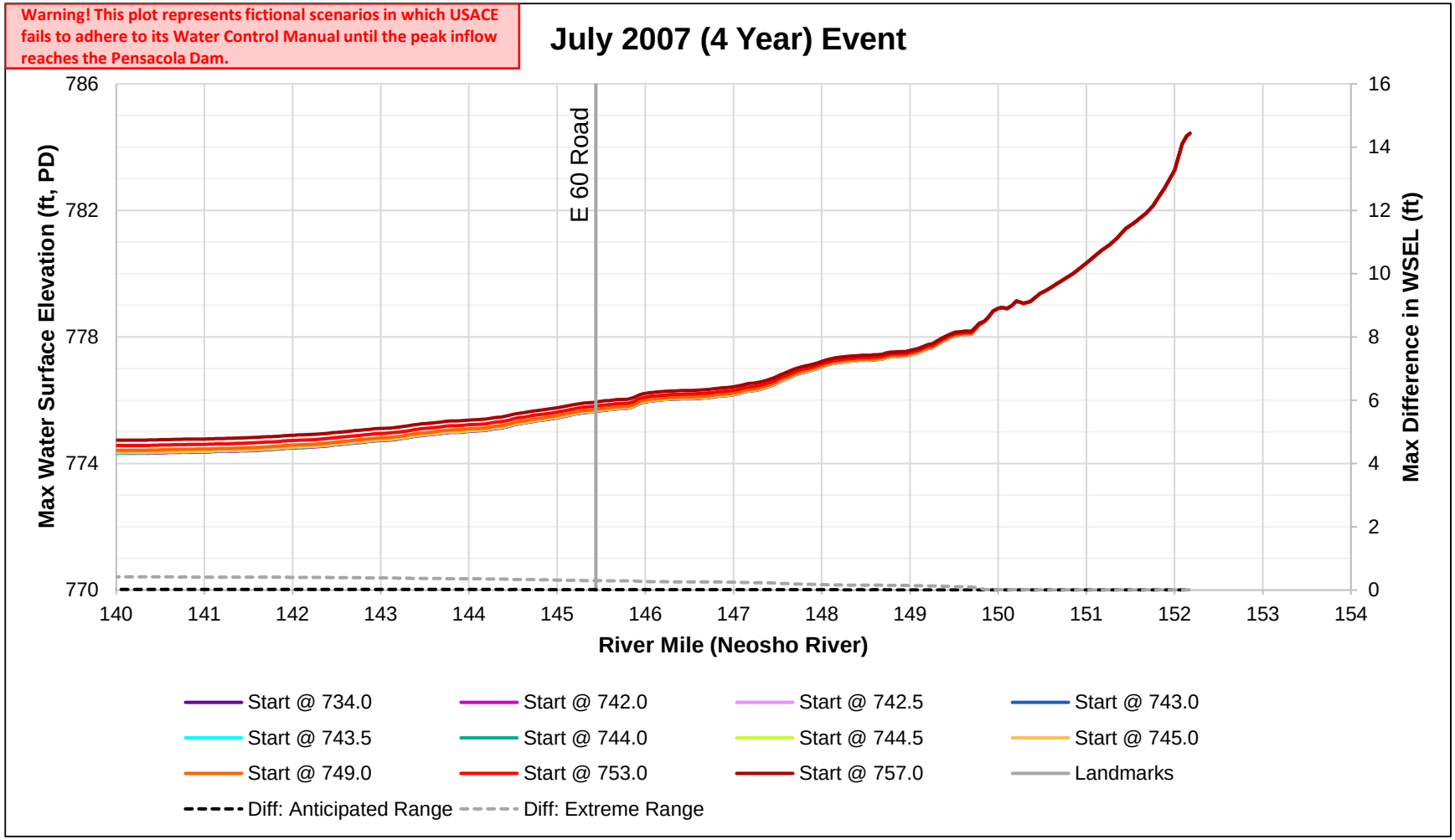


Figure C.25. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Neosho River profile (5 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

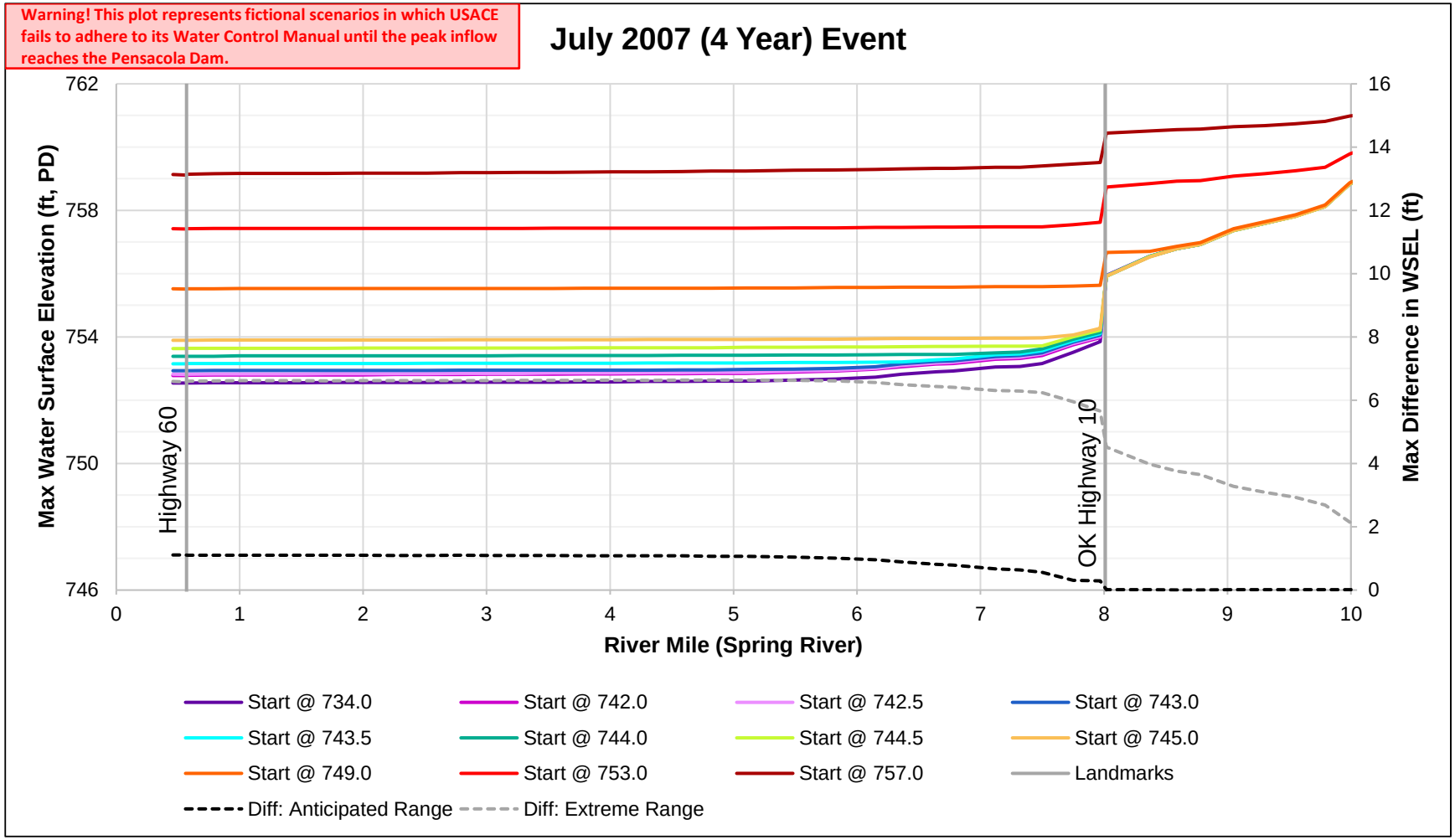


Figure C.26. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Spring River profile (1 of 2).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

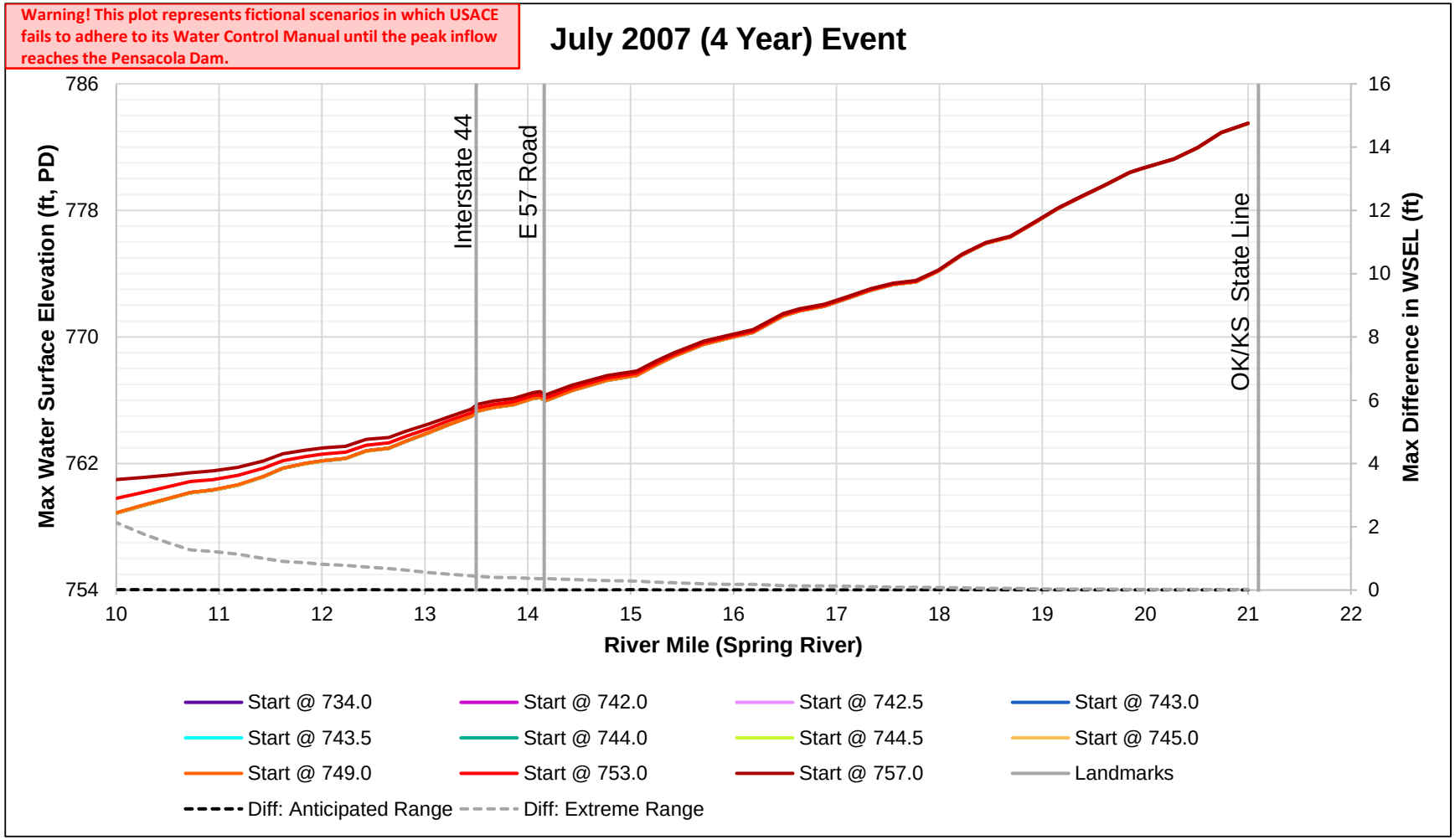


Figure C.27. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Spring River profile (2 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

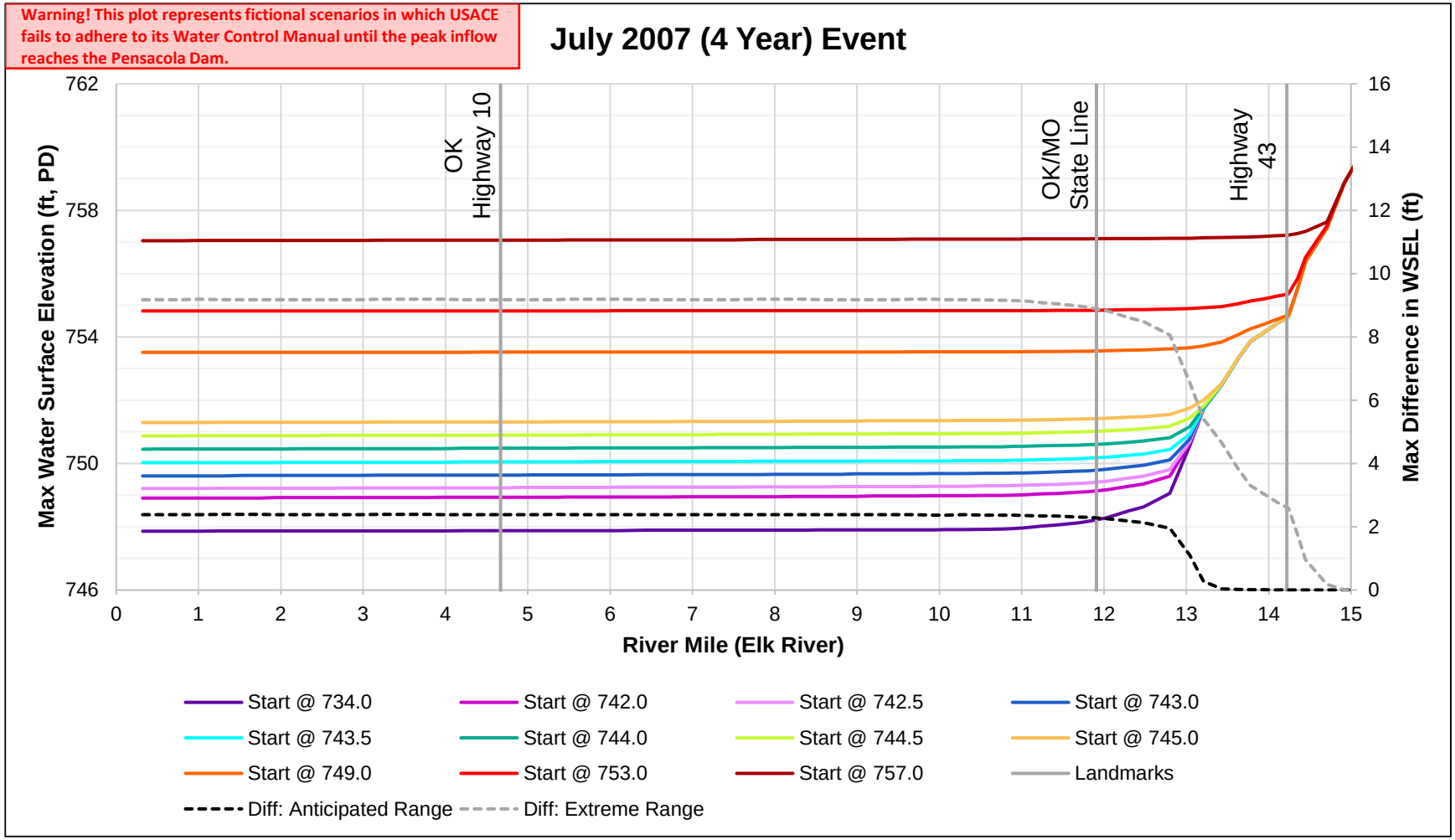


Figure C.28. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Elk River profile (1 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

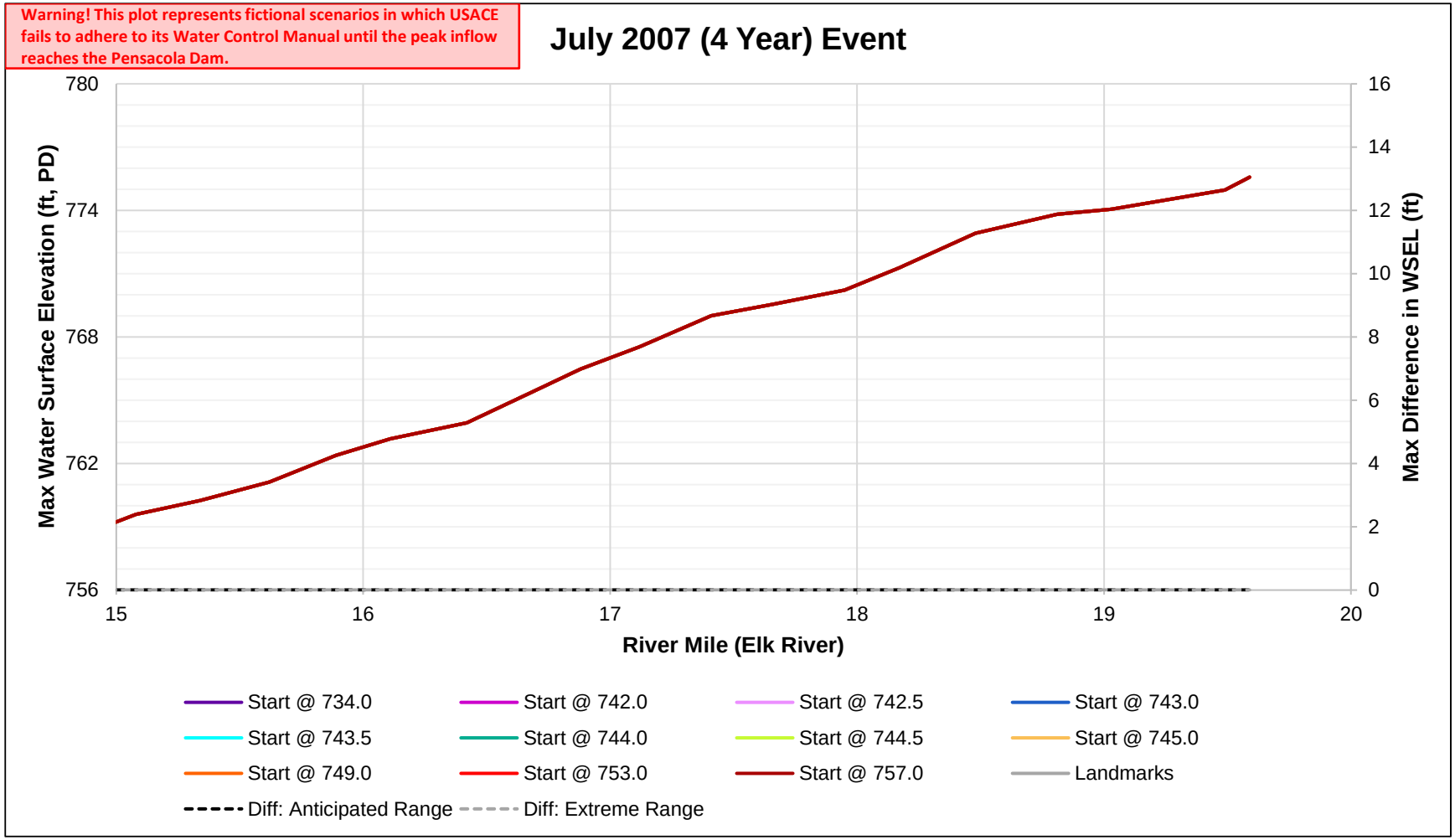


Figure C.29. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Elk River profile (2 of 2).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

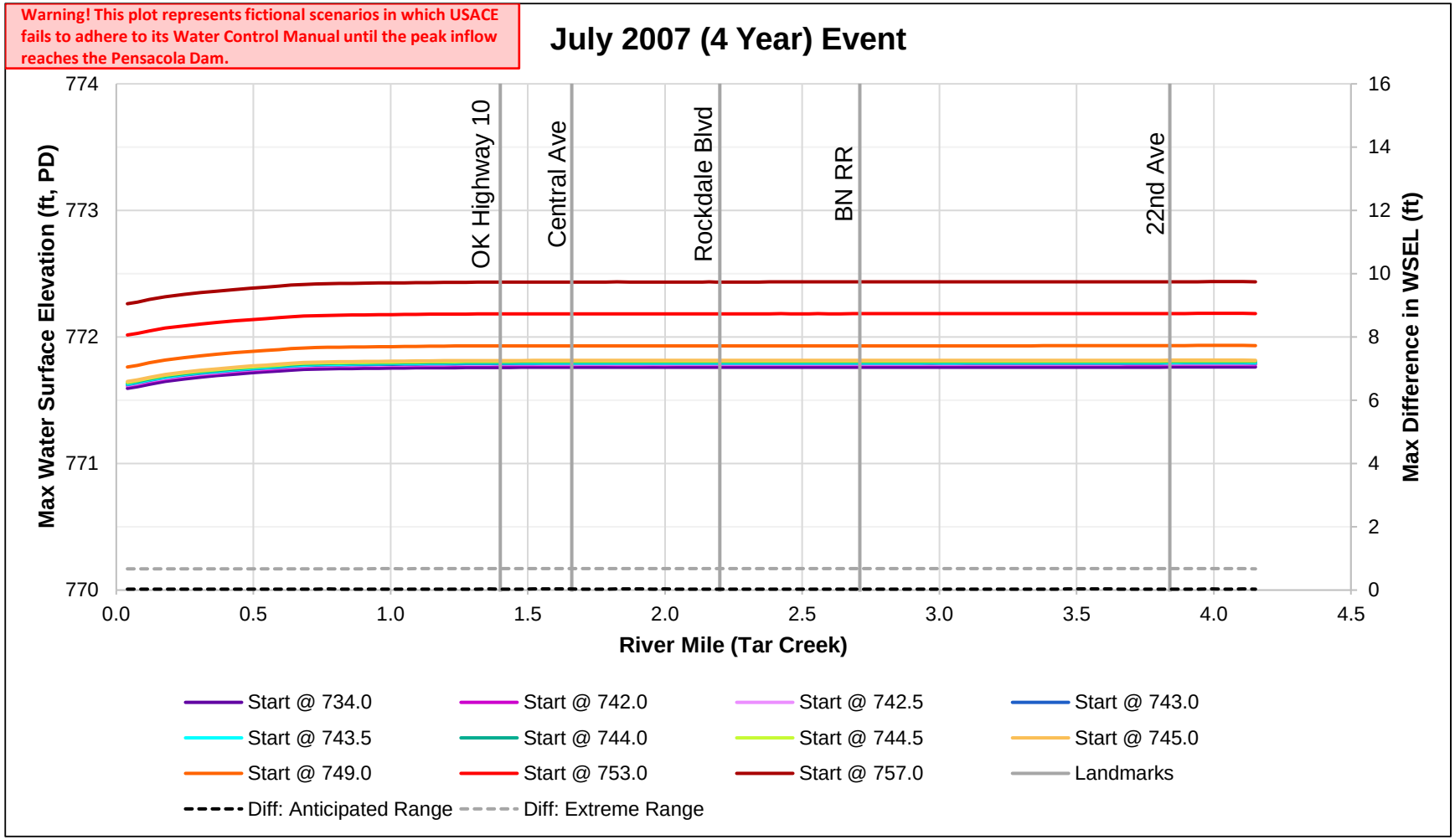


Figure C.30. Water surface elevations for the July 2007 (4 year) inflow event upstream of Pensacola Dam along the Tar Creek profile (1 of 1).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX C.4
OCTOBER 2009 (3 YEAR) INFLOW EVENT
WATER SURFACE ELEVATION PROFILES

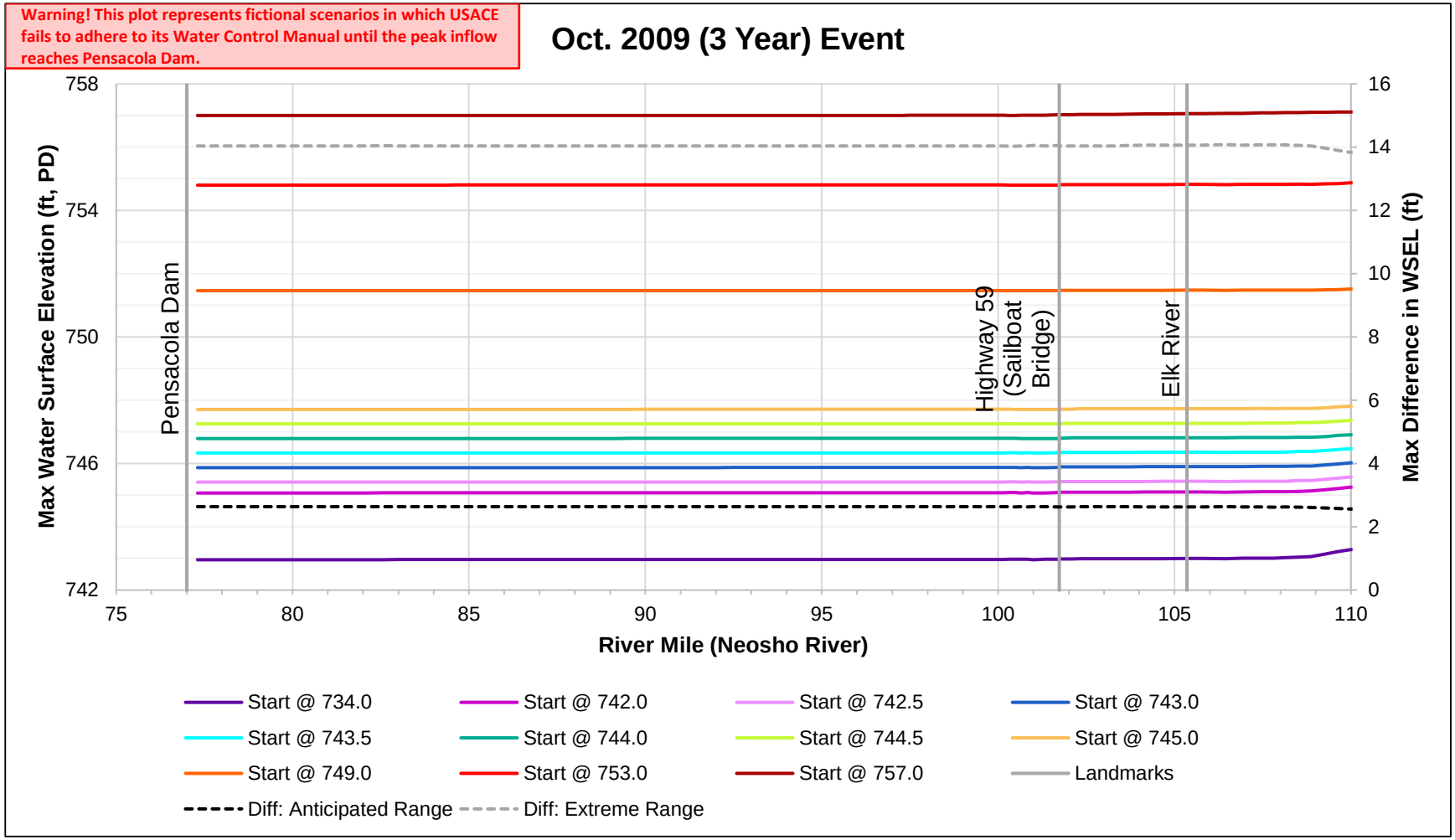


Figure C.31. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Neosho River profile (1 of 5).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

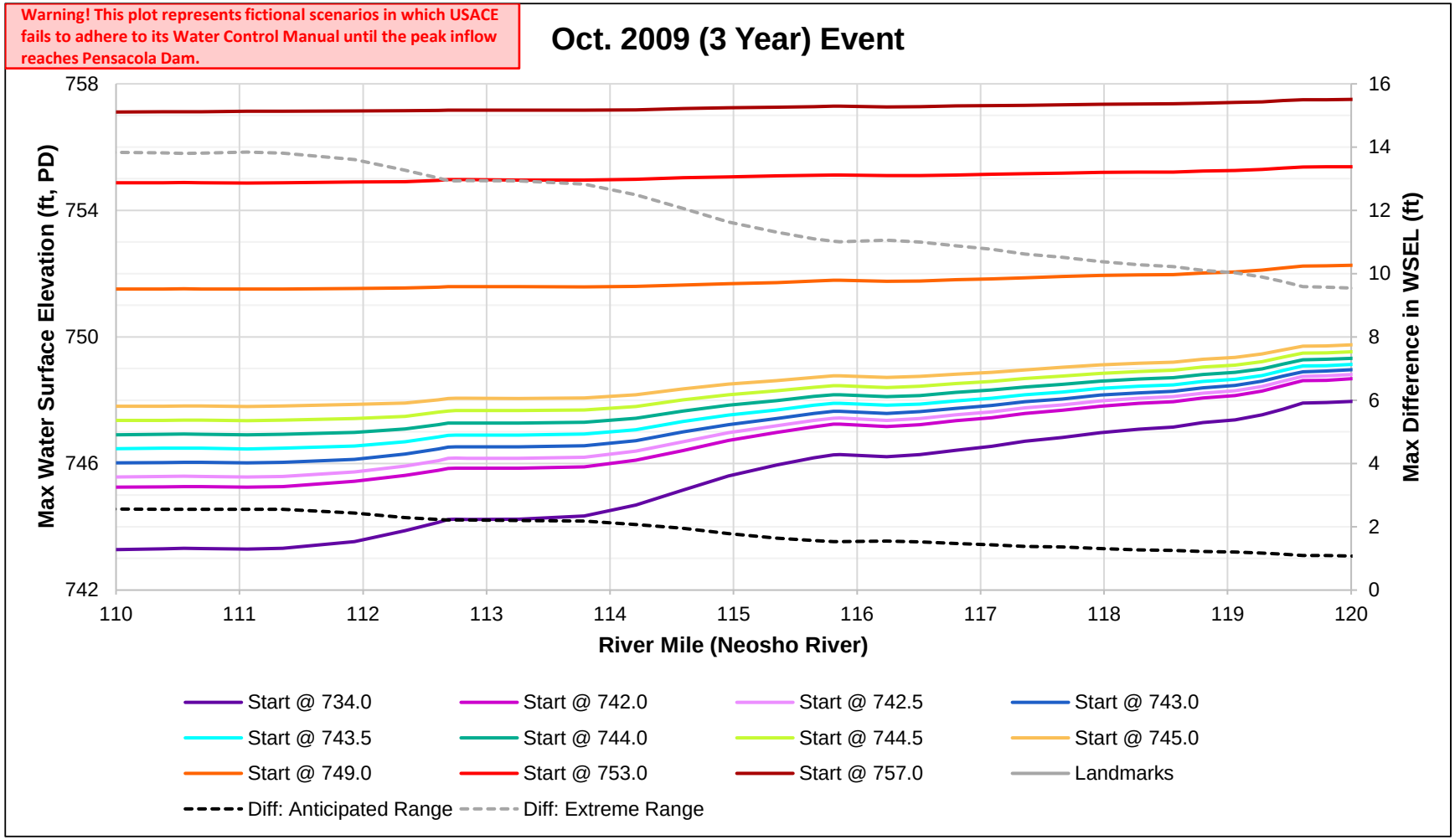


Figure C.32. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Neosho River profile (2 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

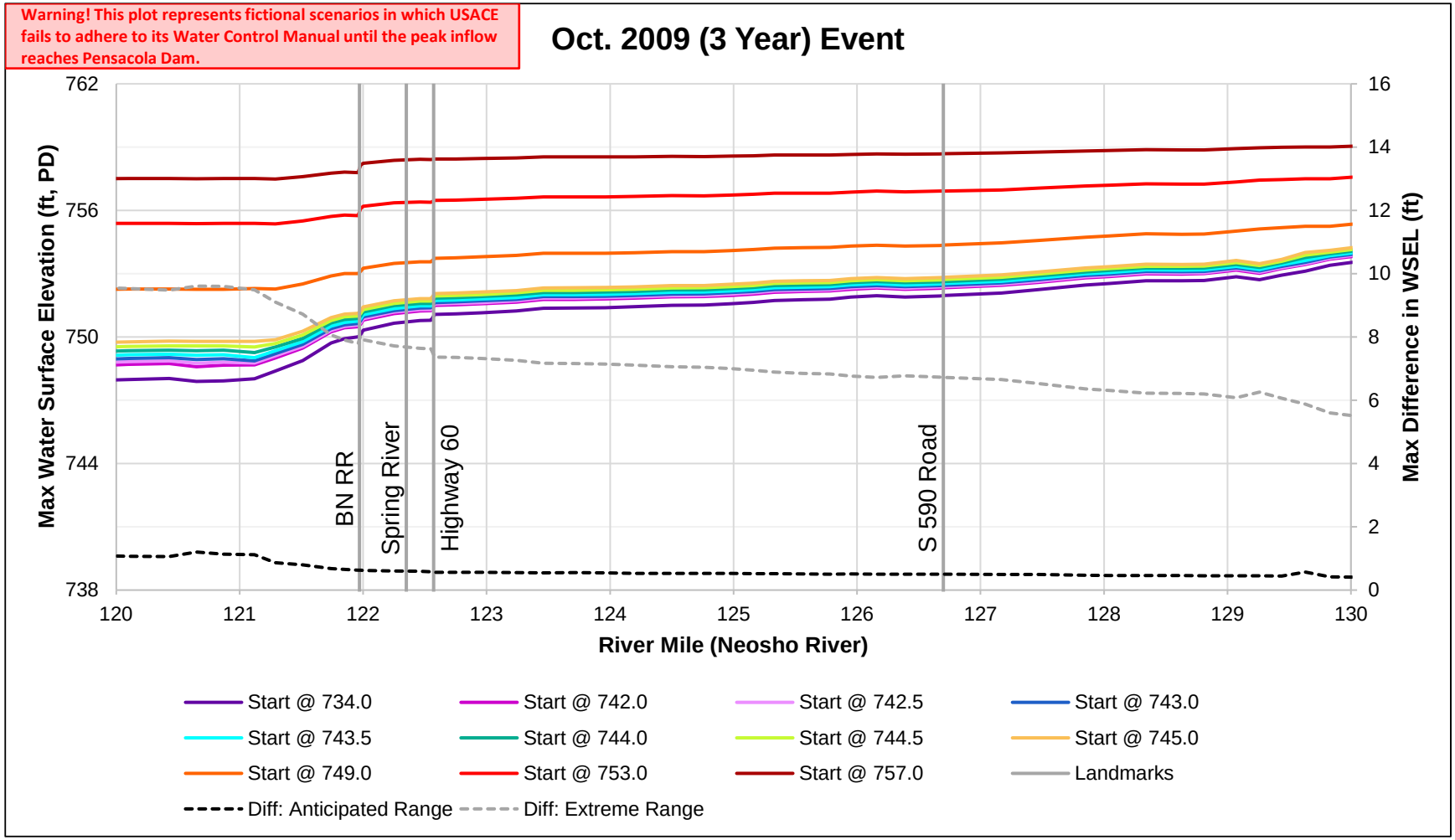


Figure C.33. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Neosho River profile (3 of 5).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

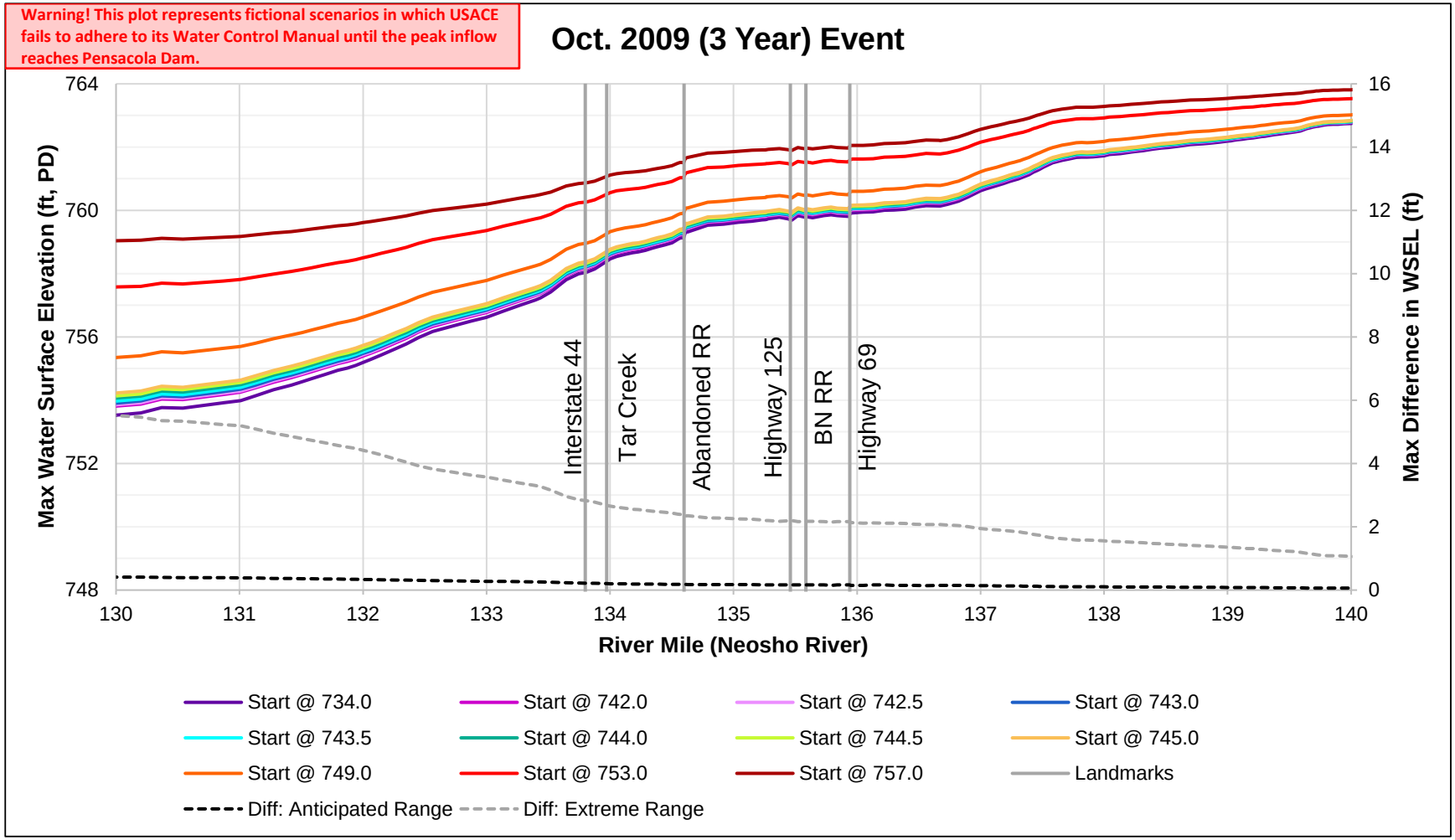


Figure C.34. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Neosho River profile (4 of 5).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

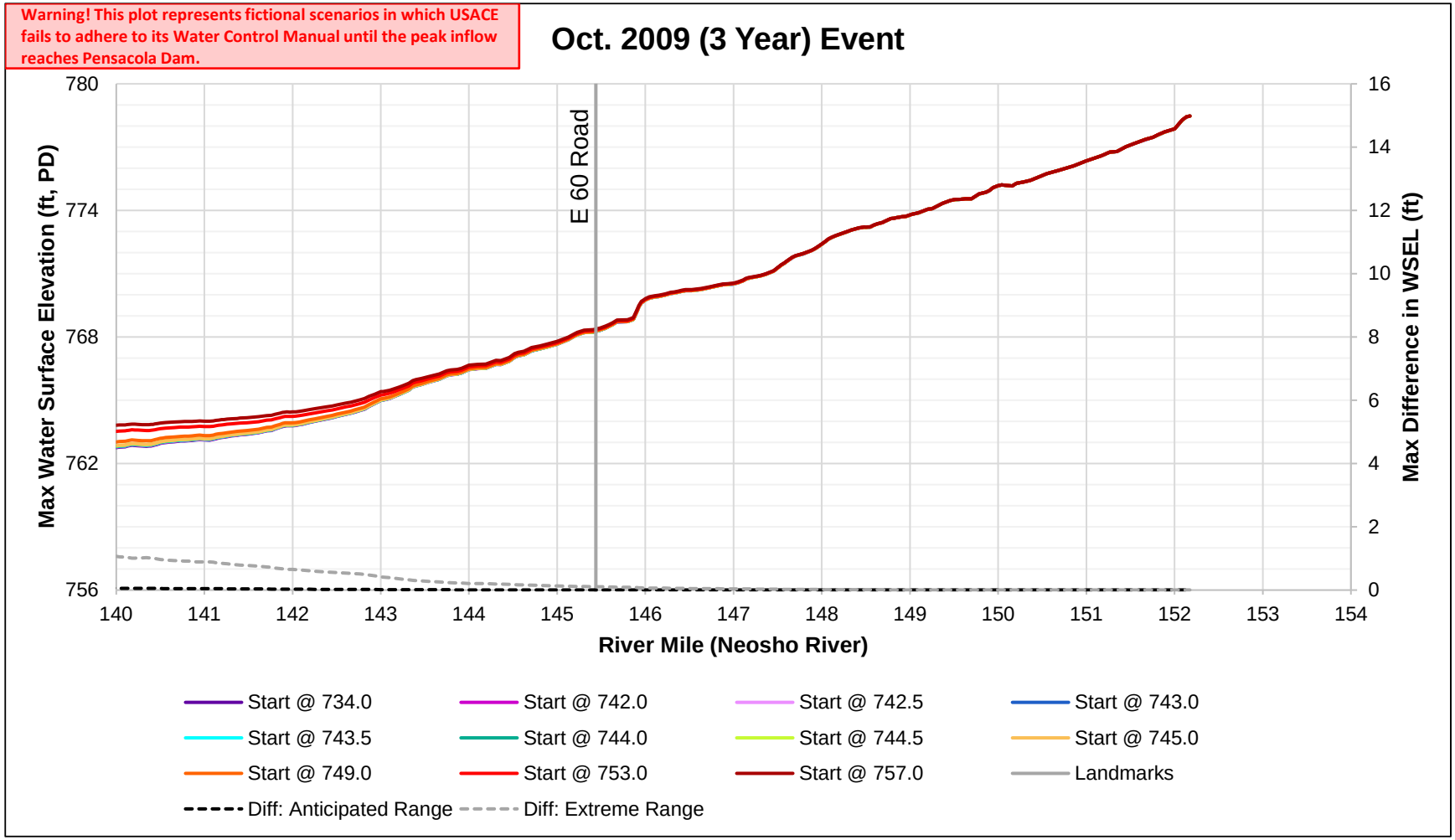


Figure C.35. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Neosho River profile (5 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

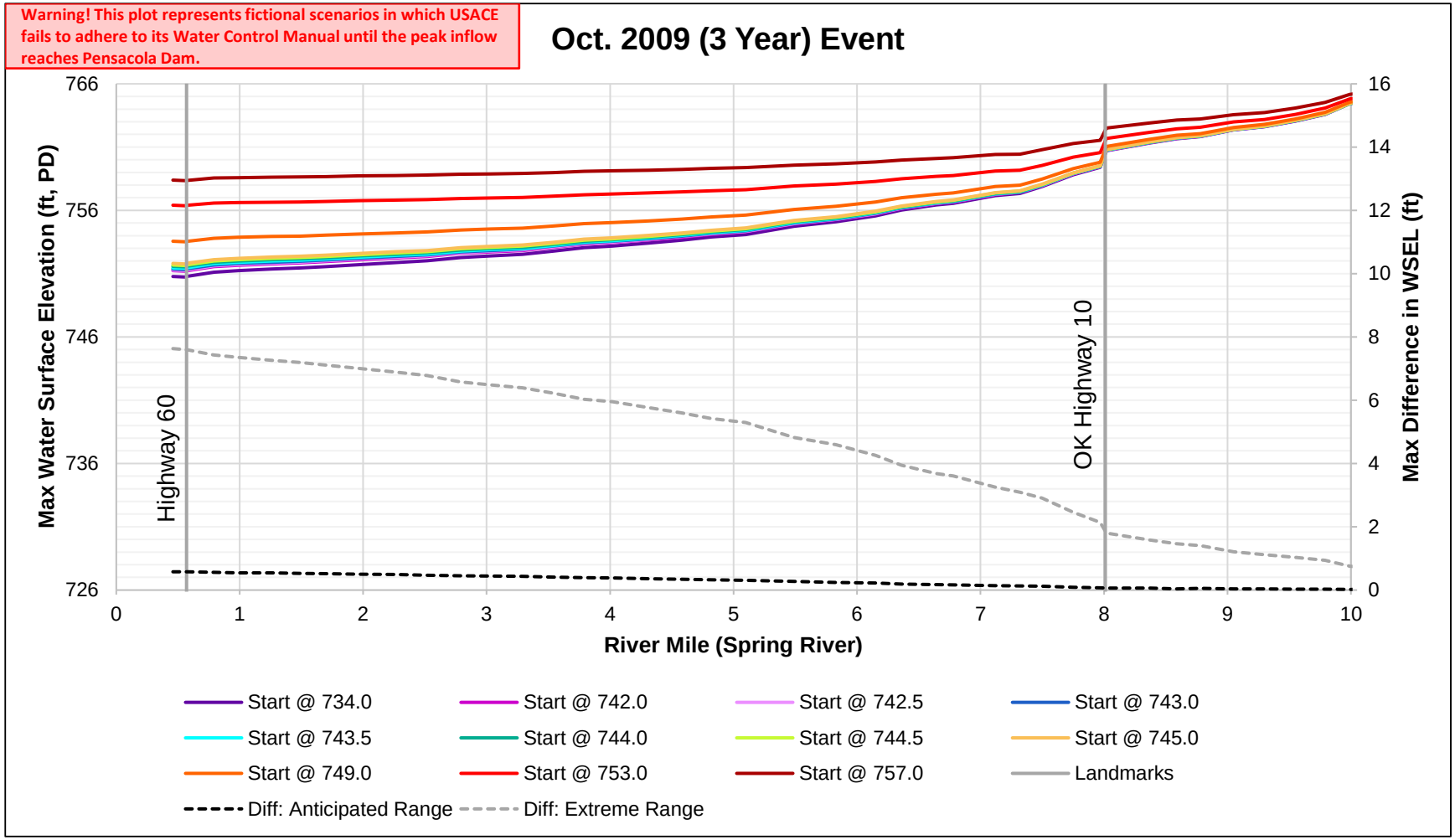


Figure C.36. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Spring River profile (1 of 2).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

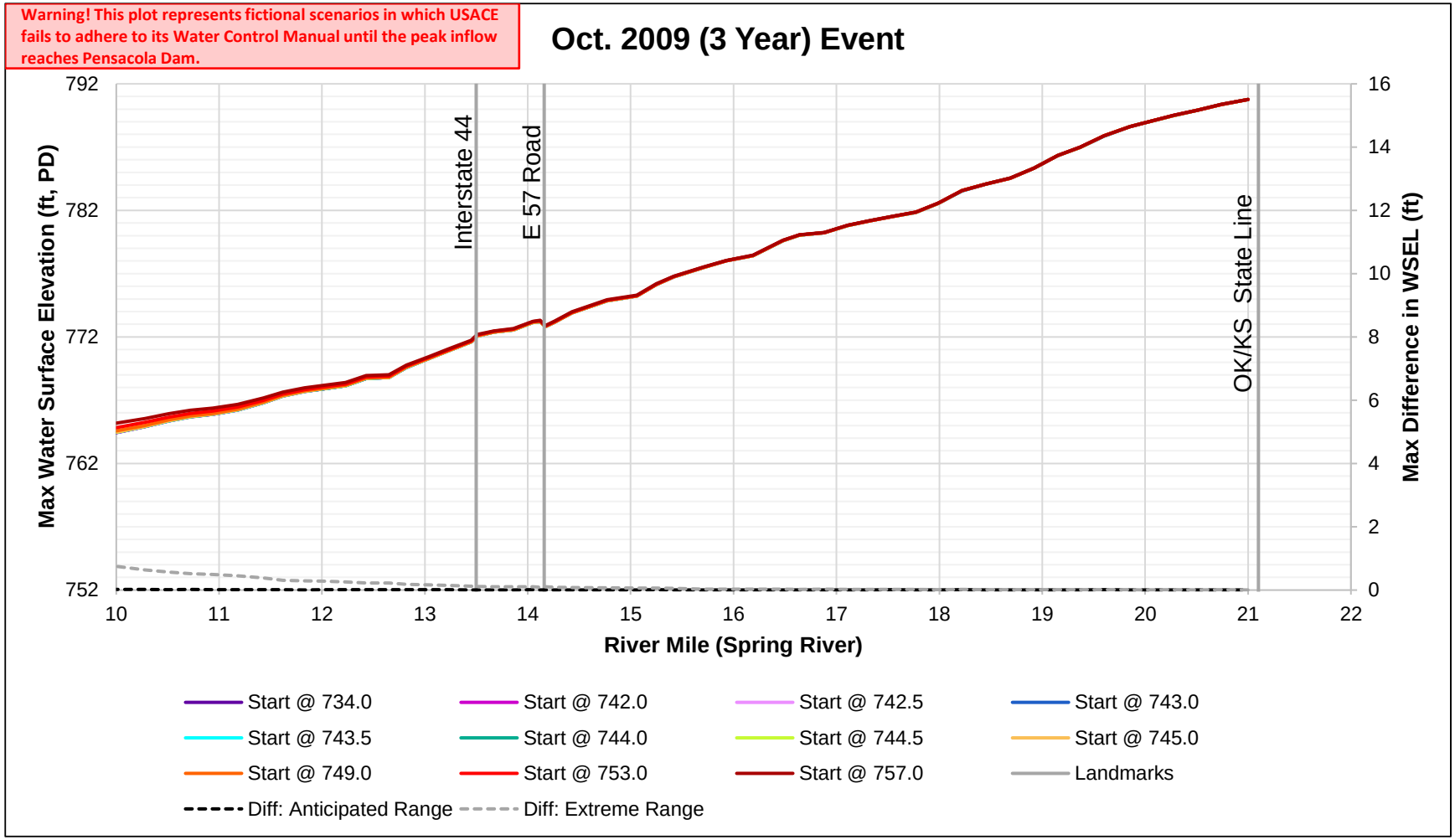


Figure C.37. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Spring River profile (2 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

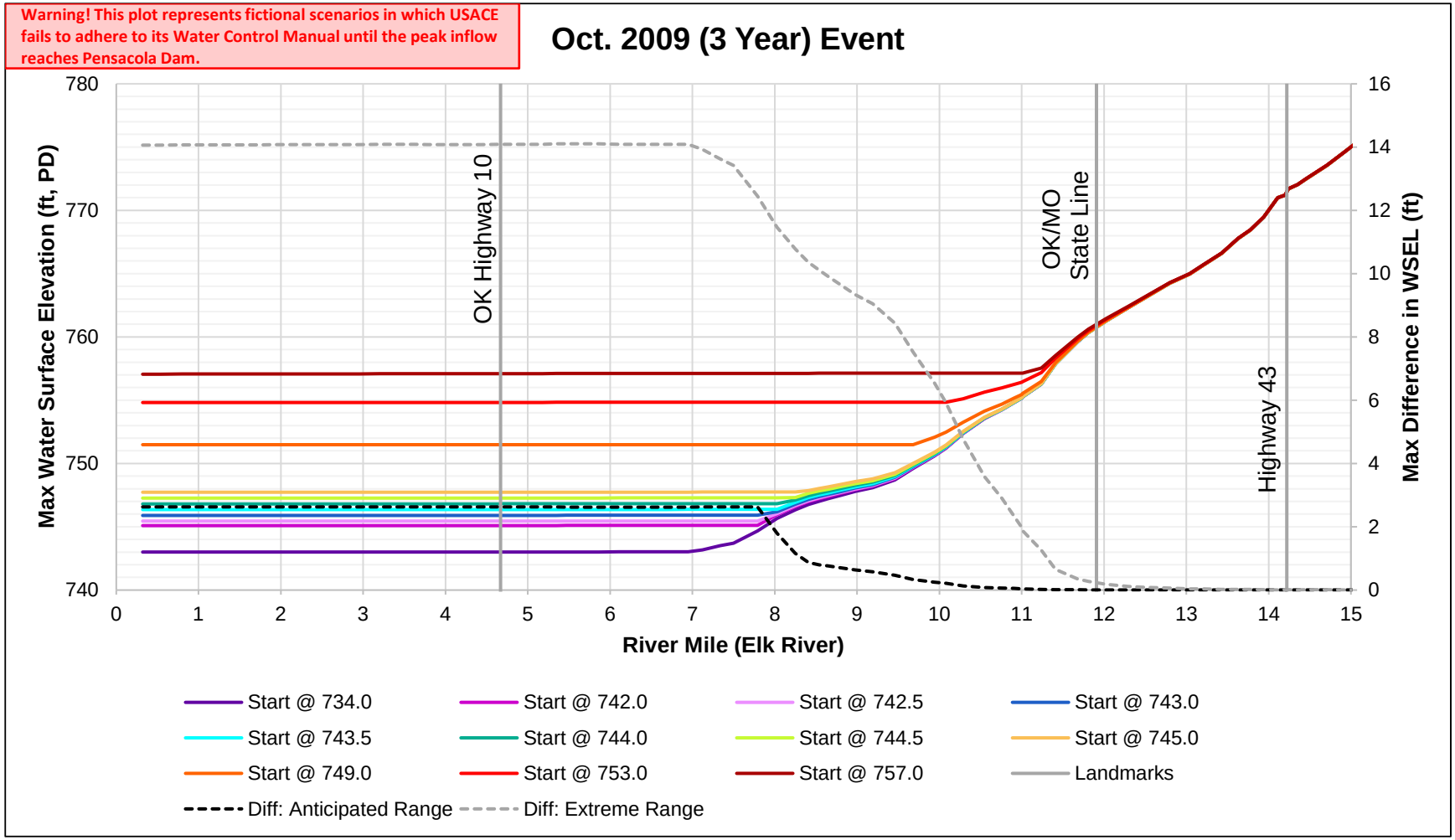


Figure C.38. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Elk River profile (1 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

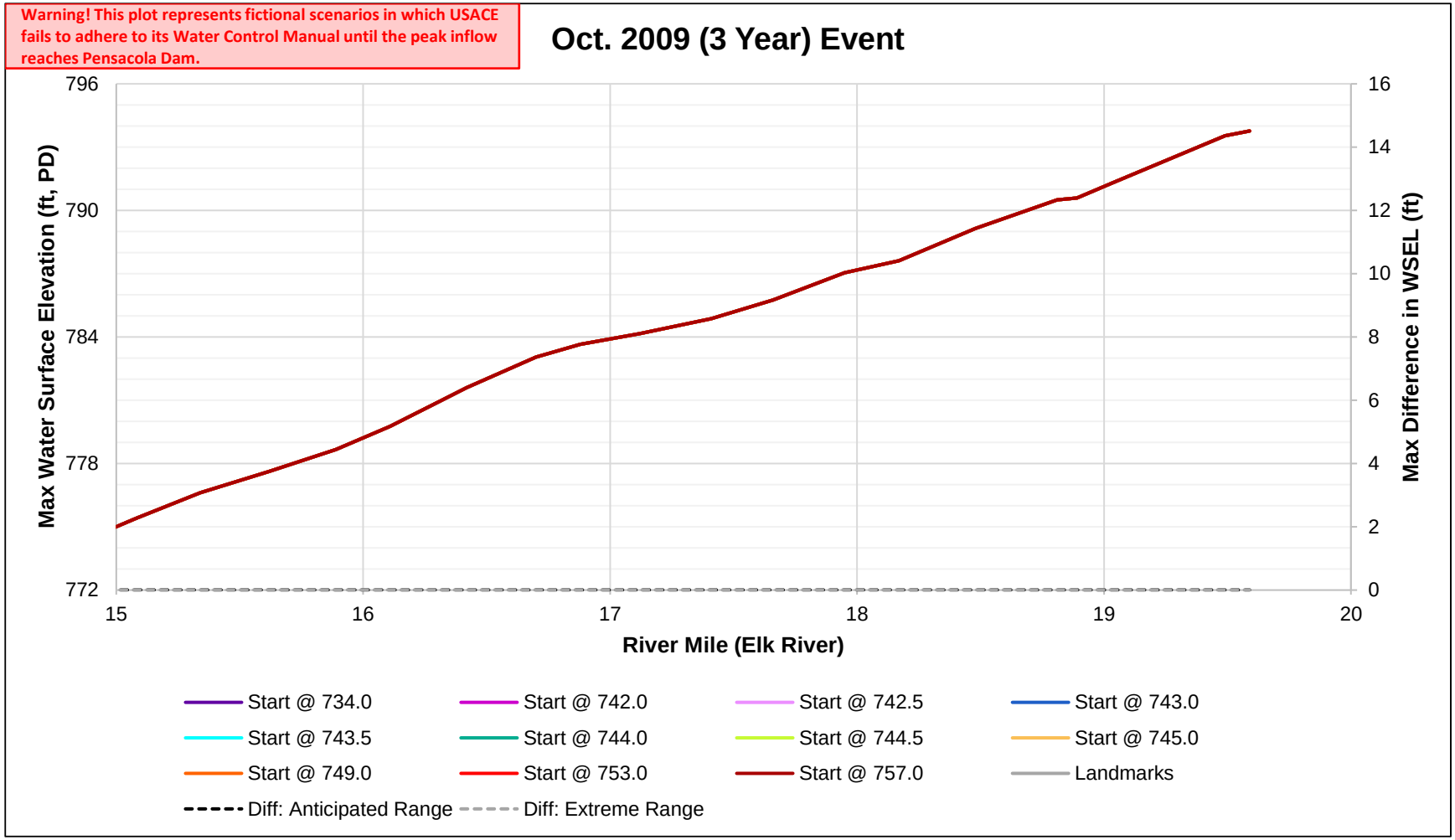


Figure C.39. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Elk River profile (2 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

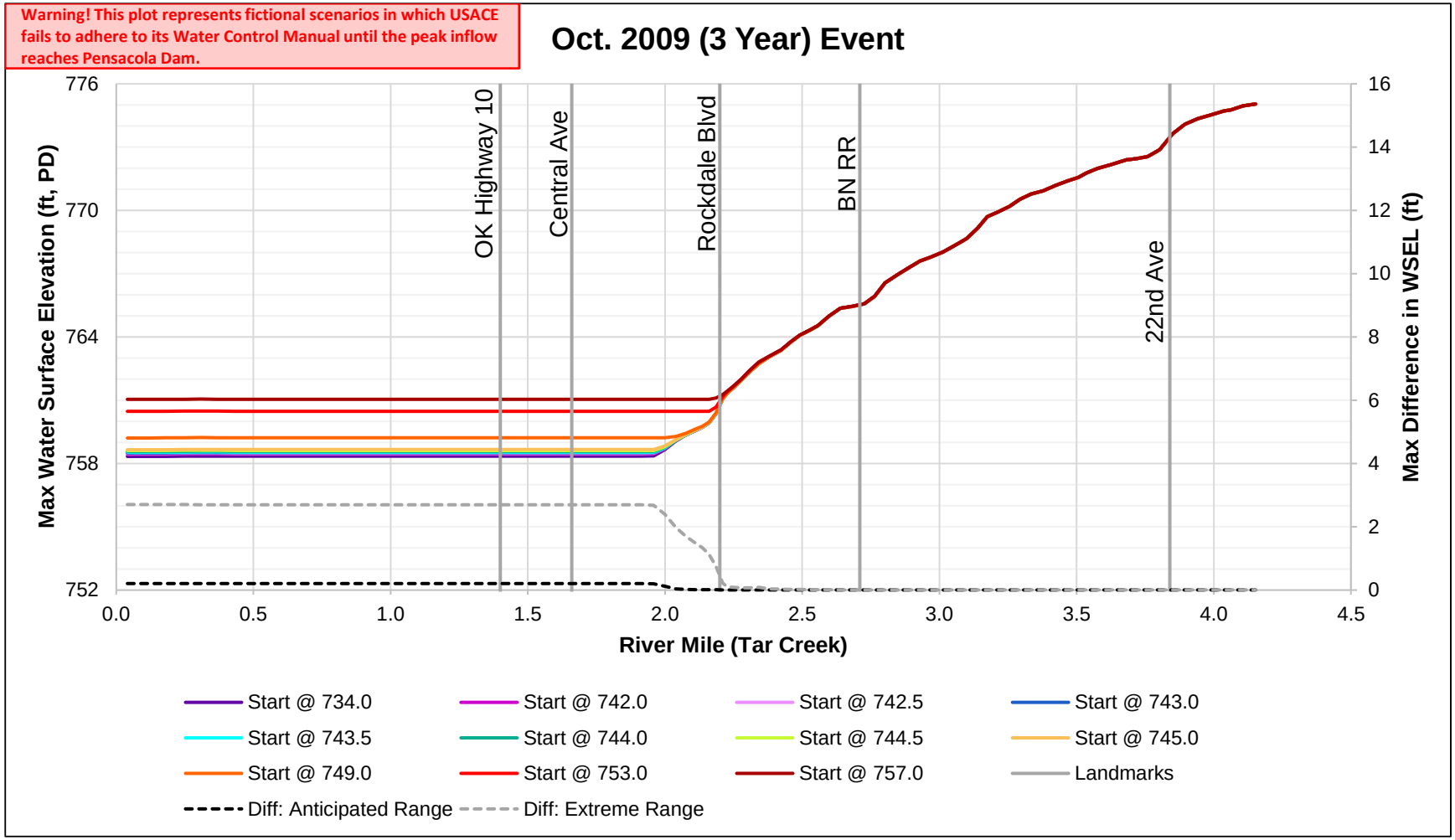


Figure C.40. Water surface elevations for the October 2009 (3 year) inflow event upstream of Pensacola Dam along the Tar Creek profile (1 of 1).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX C.5
DECEMBER 2015 (15 YEAR) INFLOW EVENT
WATER SURFACE ELEVATION PROFILES

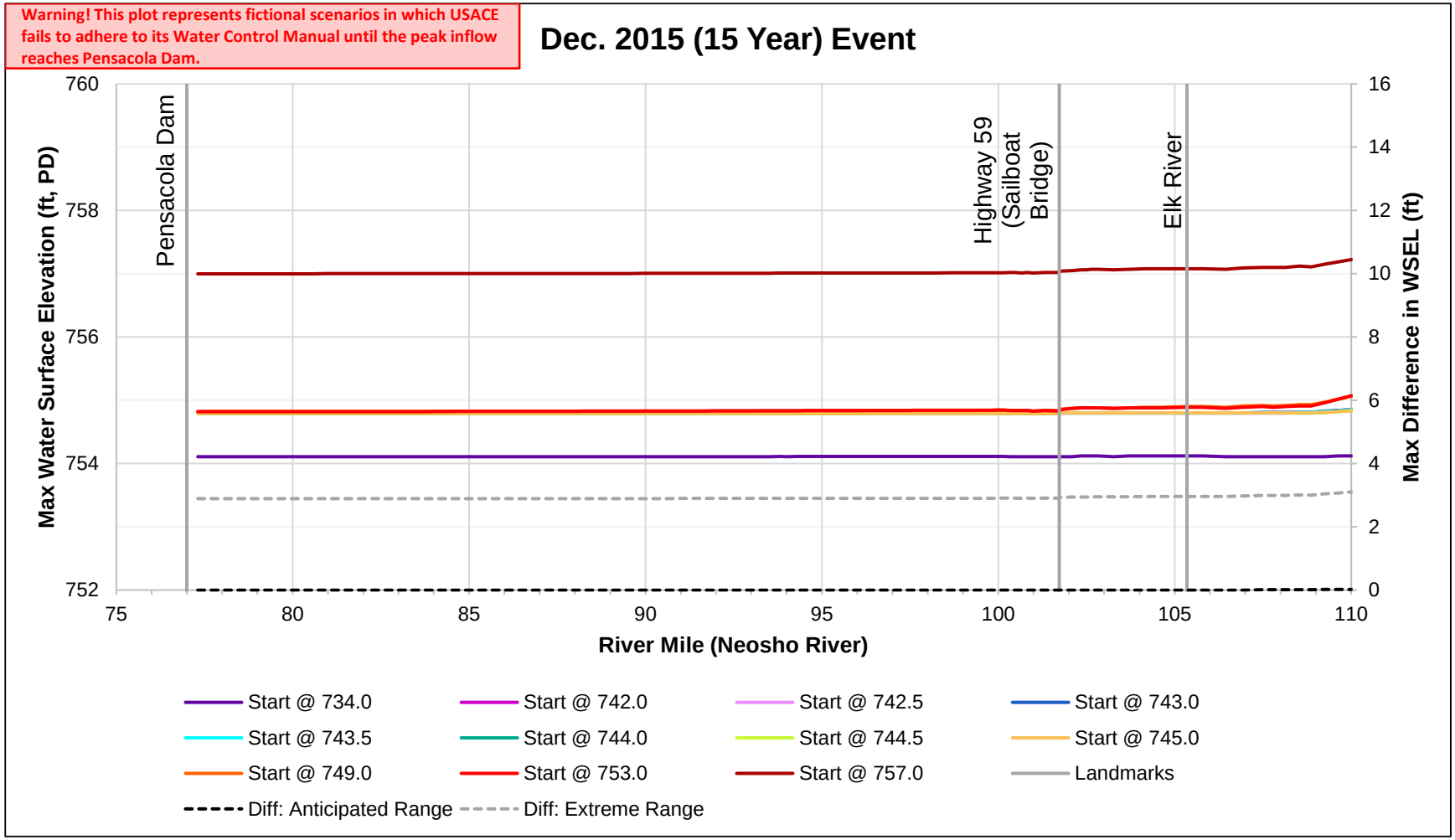


Figure C.41. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Neosho River profile (1 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

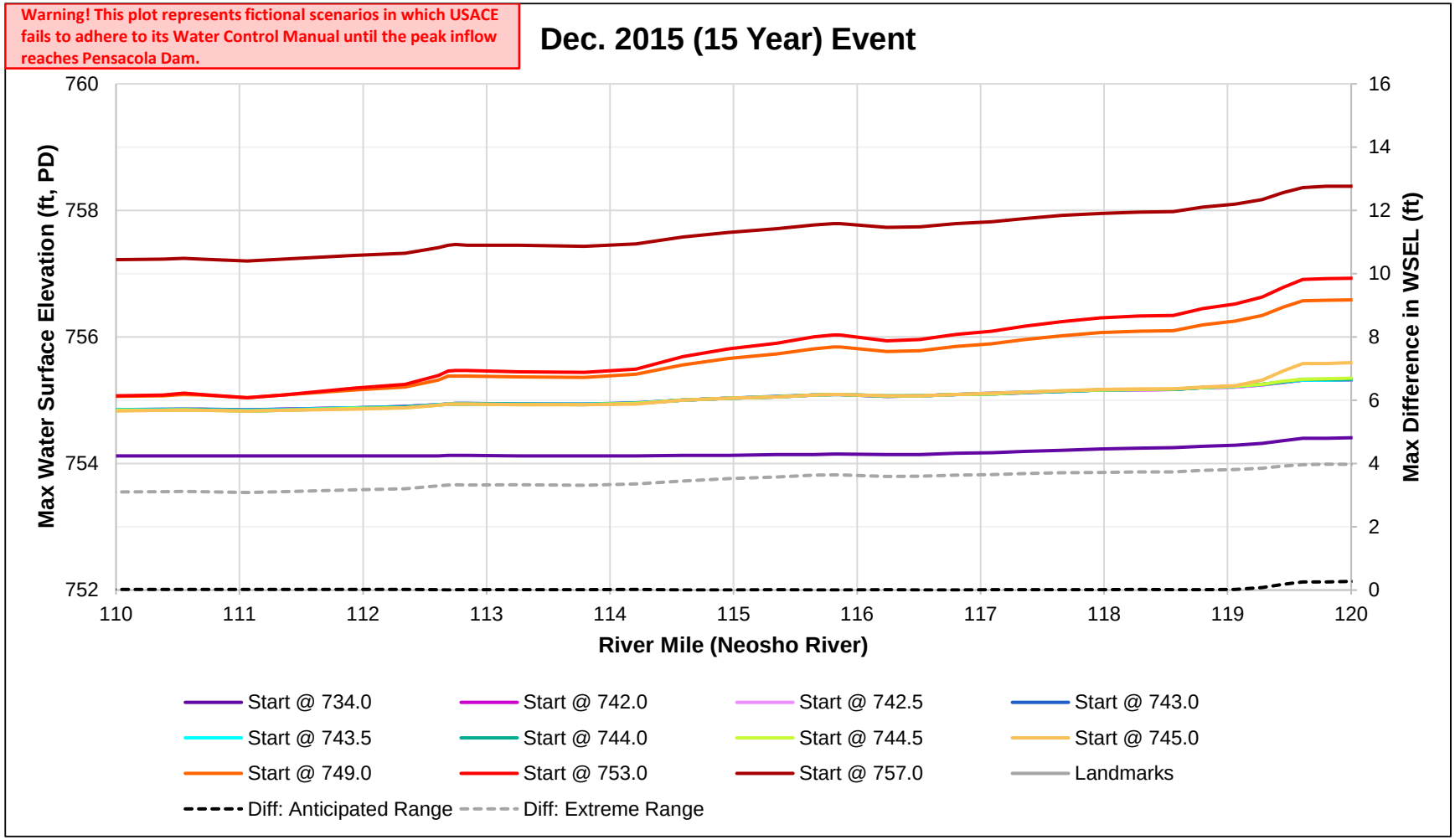


Figure C.42. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Neosho River profile (2 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

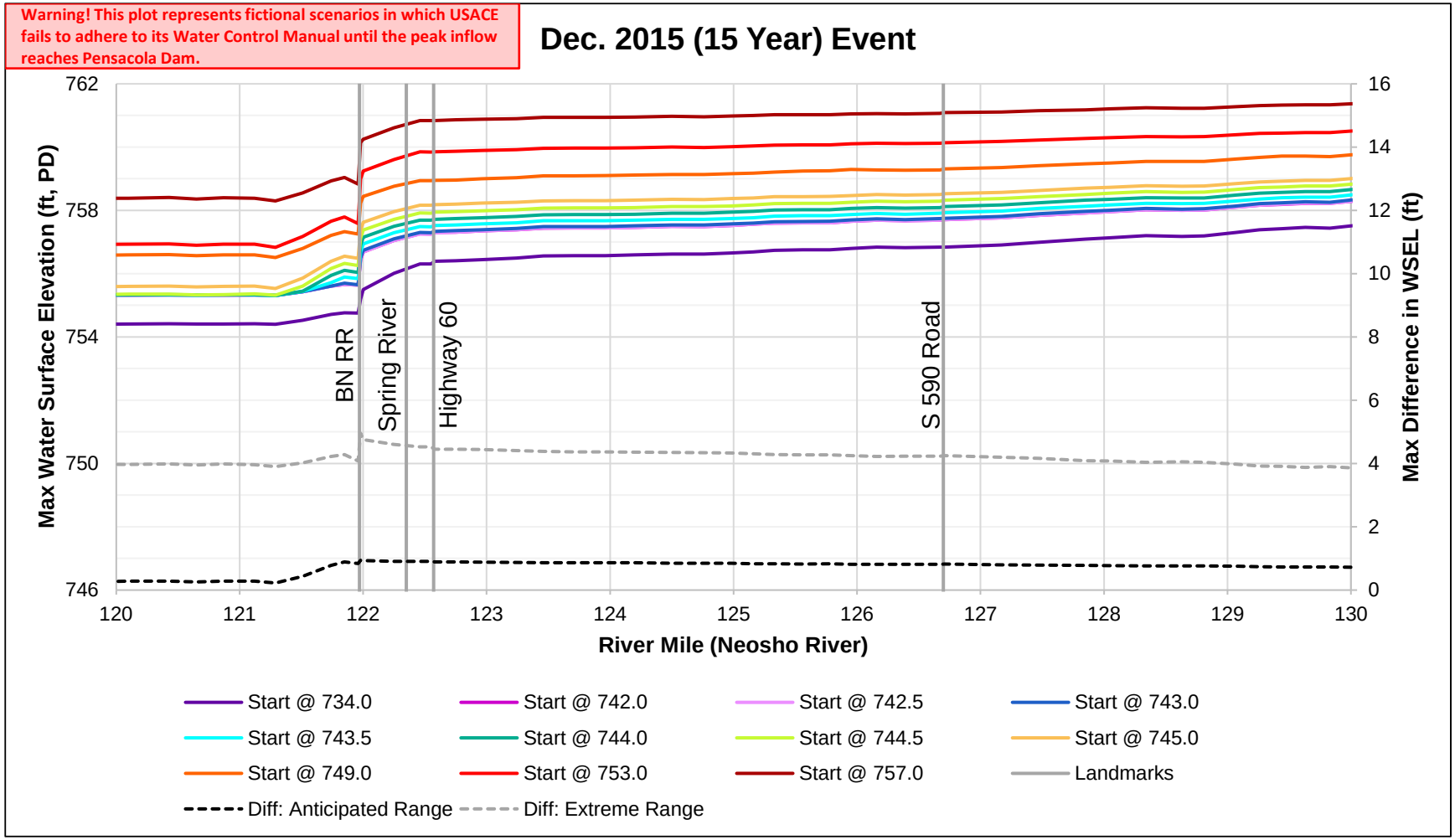


Figure C.43. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Neosho River profile (3 of 5).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

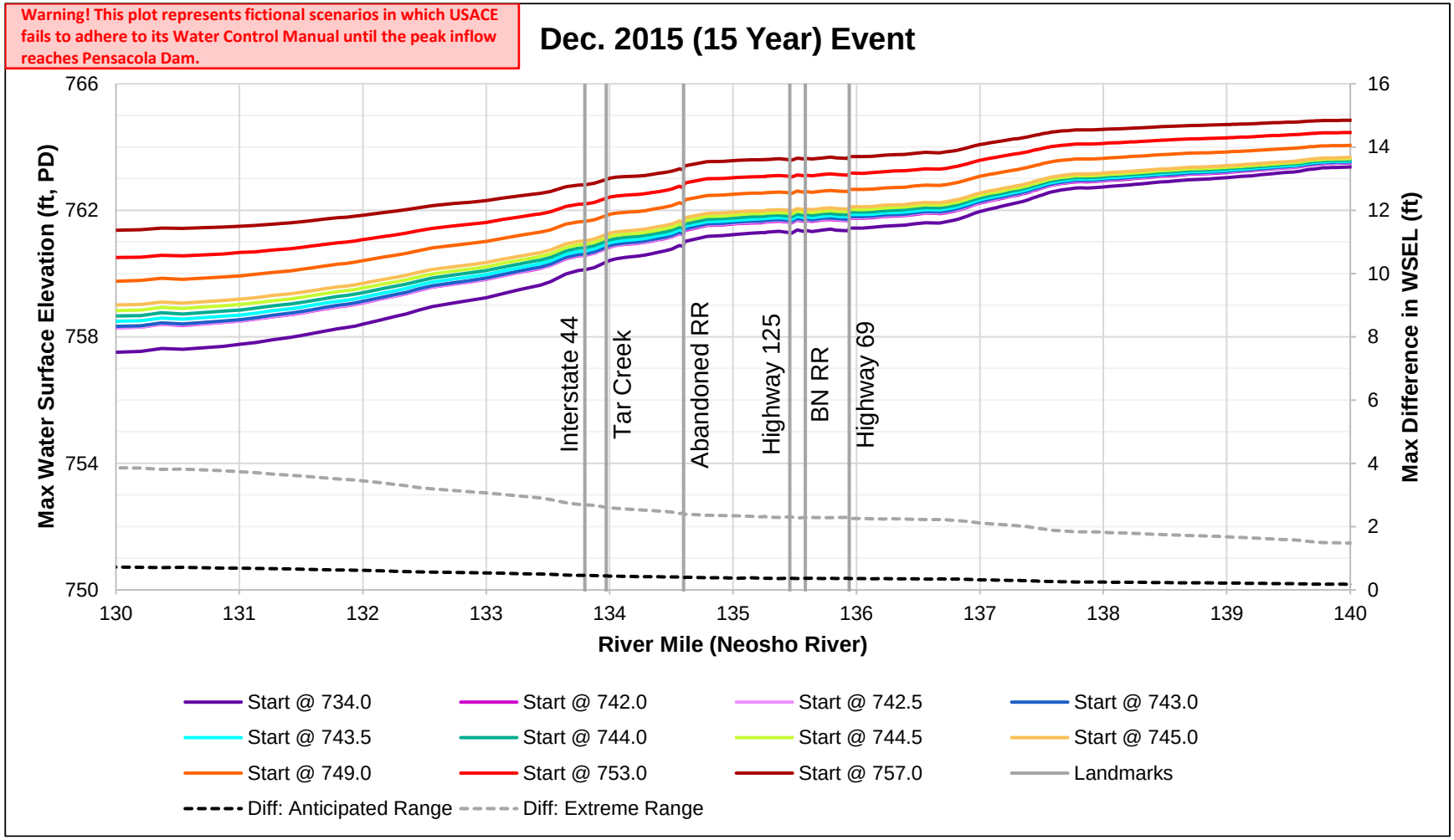


Figure C.44. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Neosho River profile (4 of 5).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

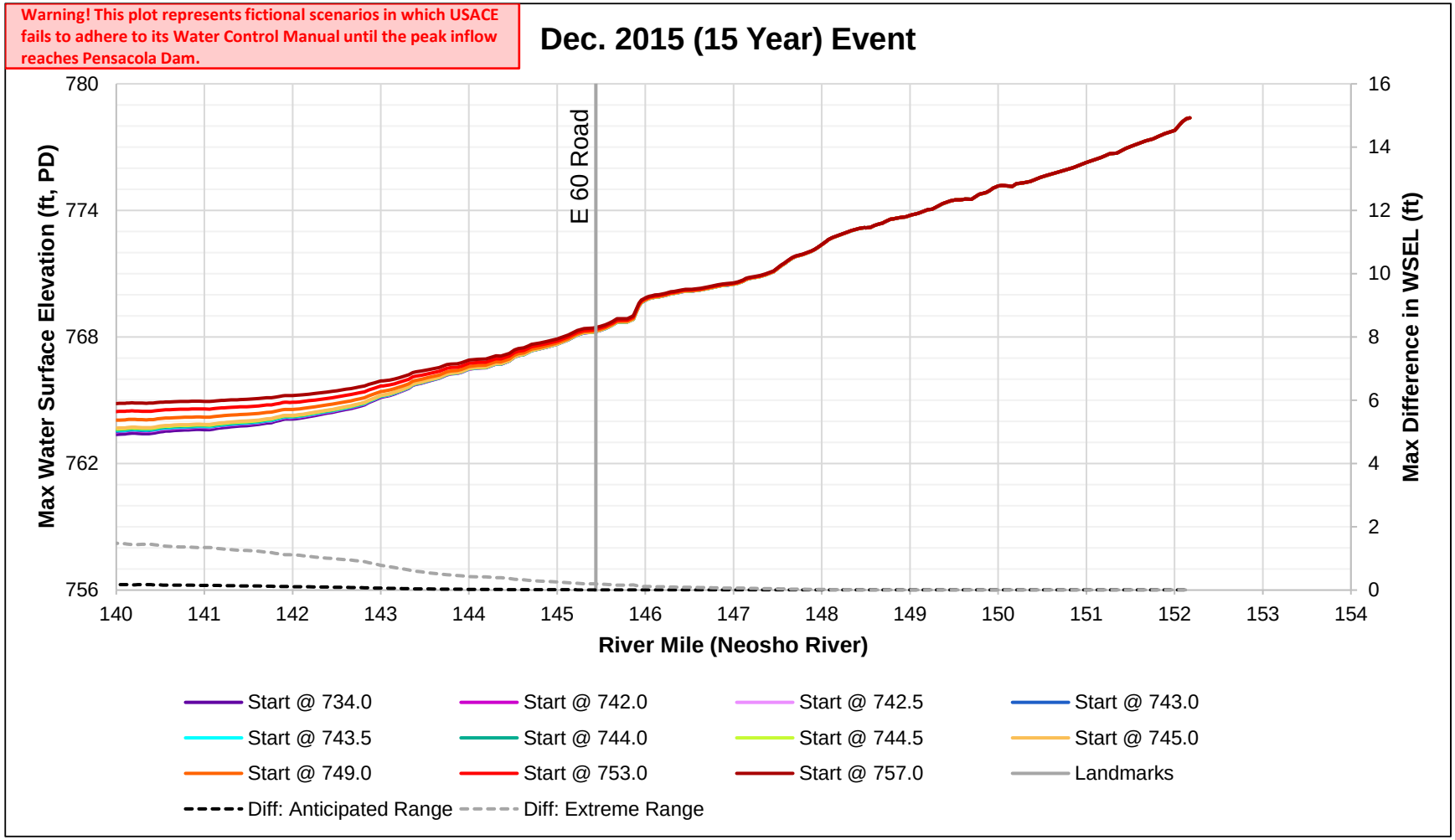


Figure C.45. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Neosho River profile (5 of 5).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

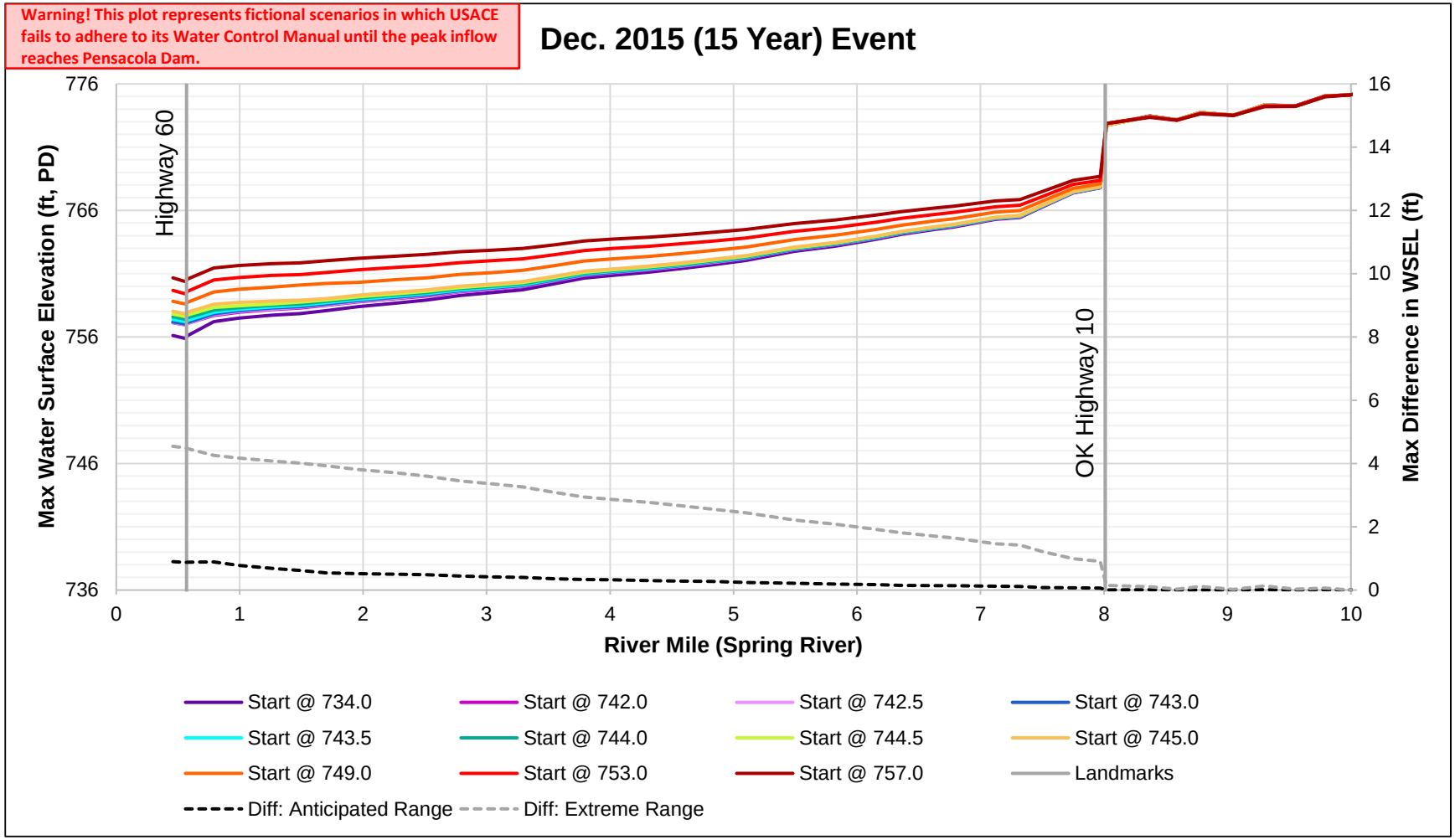


Figure C.46. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Spring River profile (1 of 2).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

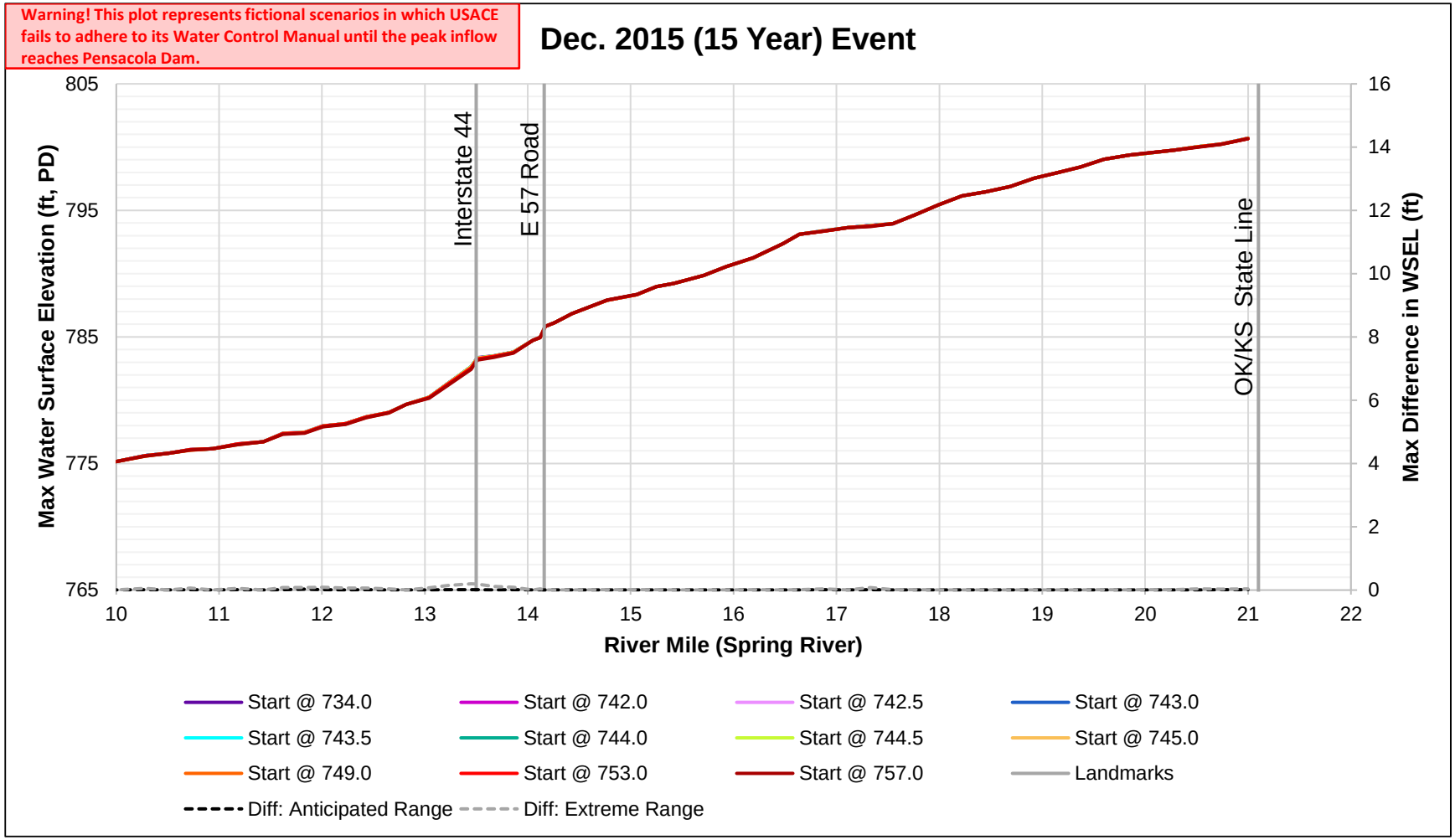


Figure C.47. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Spring River profile (2 of 2).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

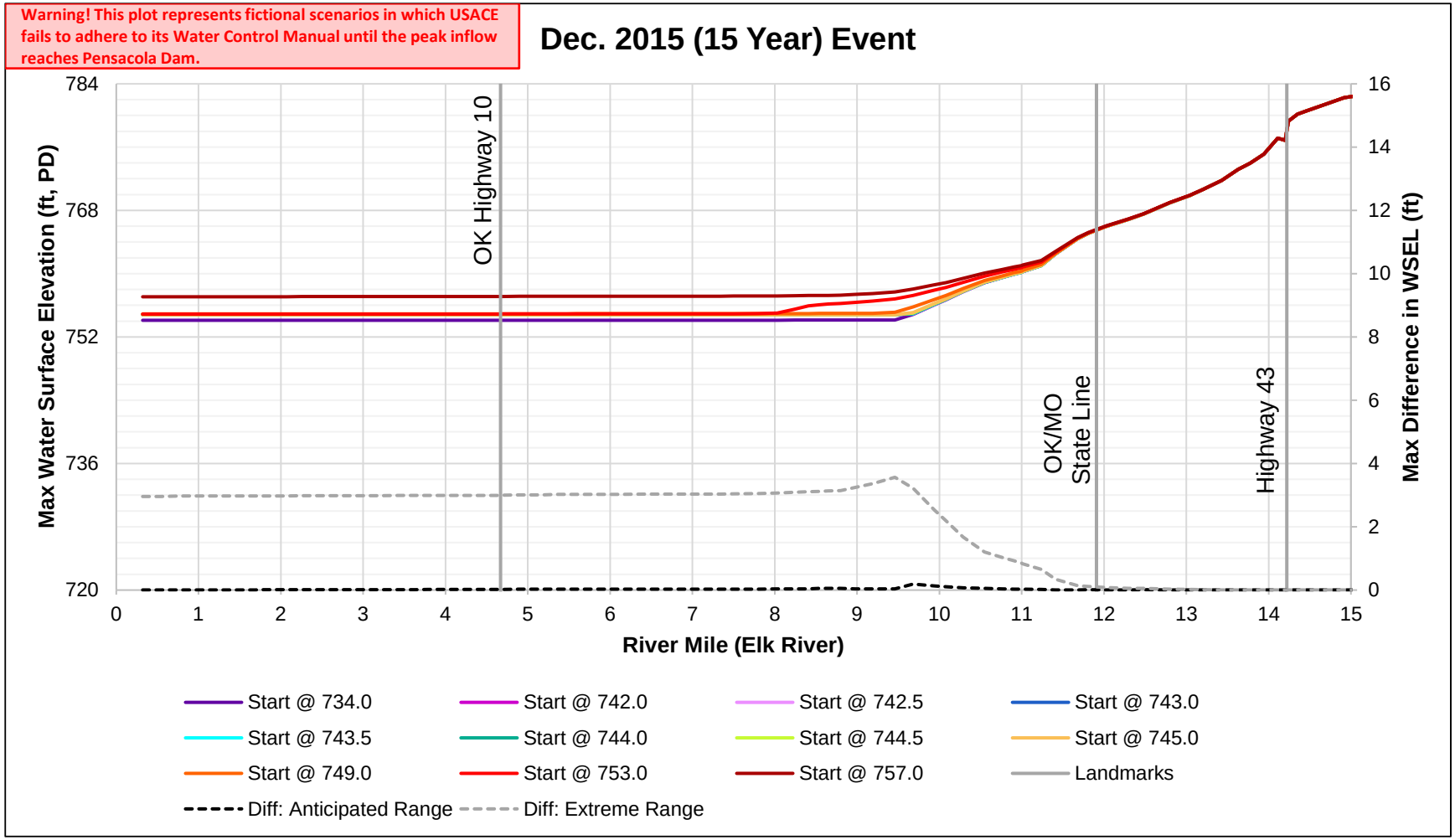


Figure C.48. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Elk River profile (1 of 2).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

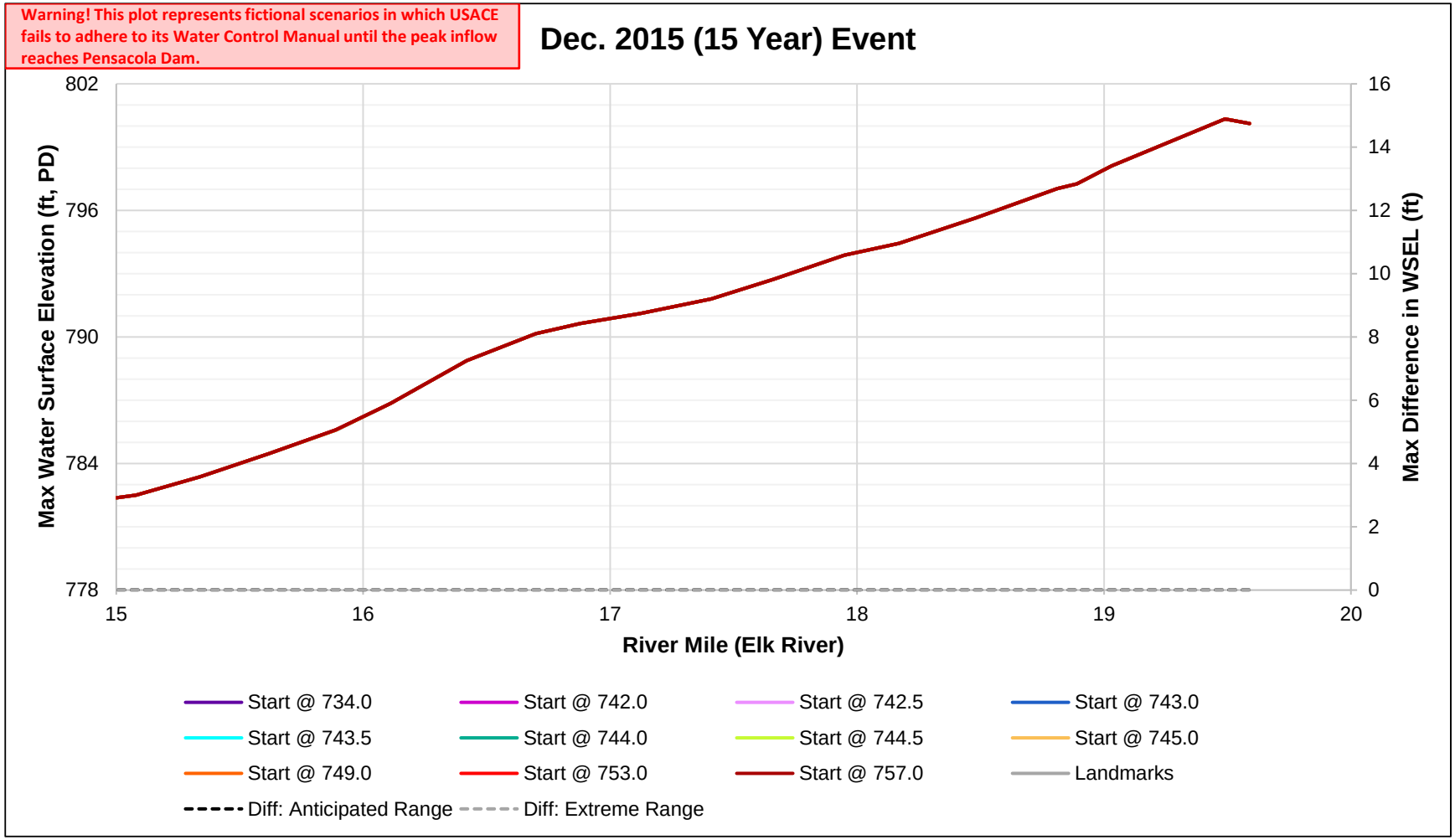


Figure C.49. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Elk River profile (2 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

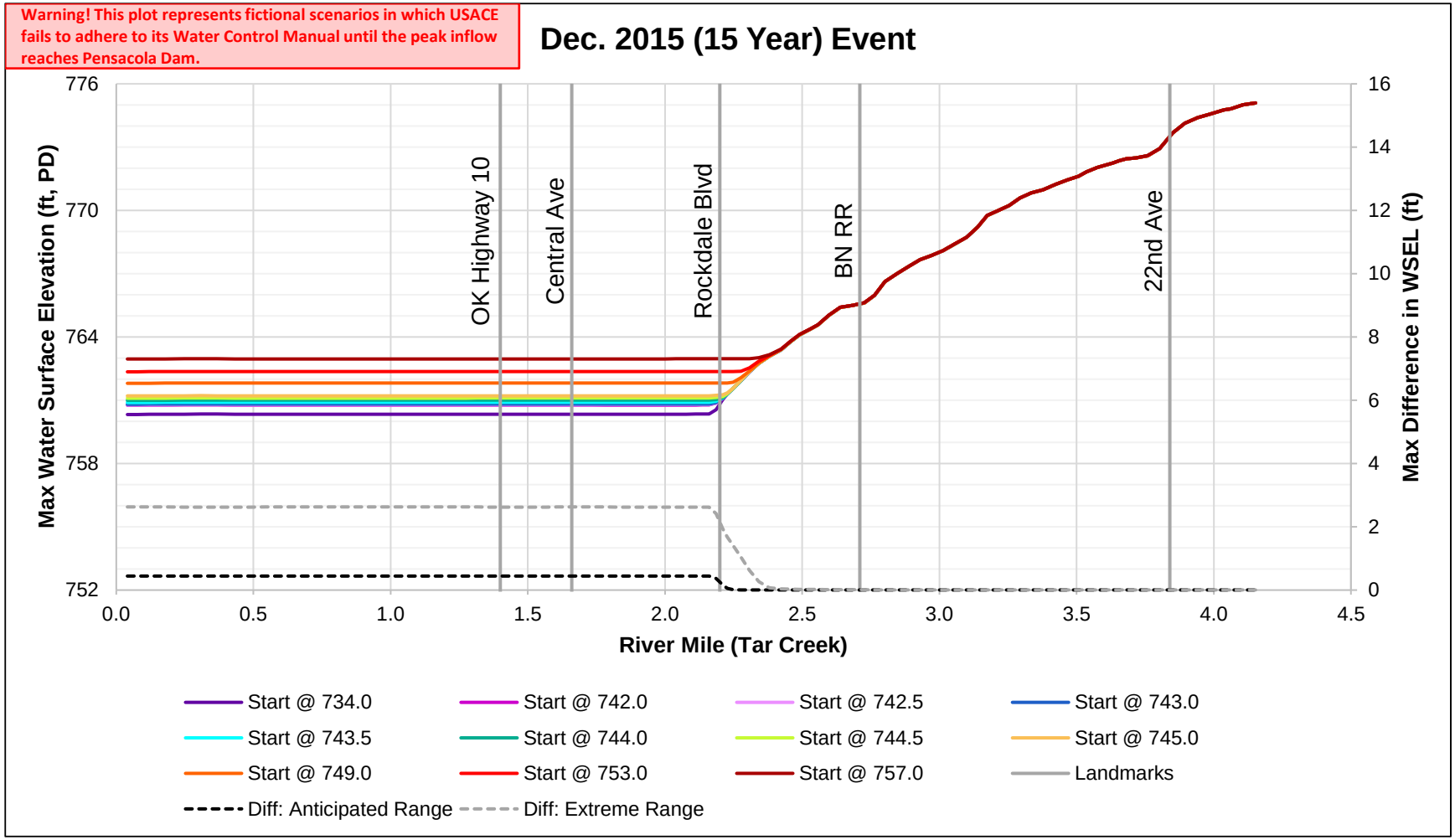


Figure C.50. Water surface elevations for the December 2015 (15 year) inflow event upstream of Pensacola Dam along the Tar Creek profile (1 of 1).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX C.6
100-YEAR INFLOW EVENT
WATER SURFACE ELEVATION PROFILES

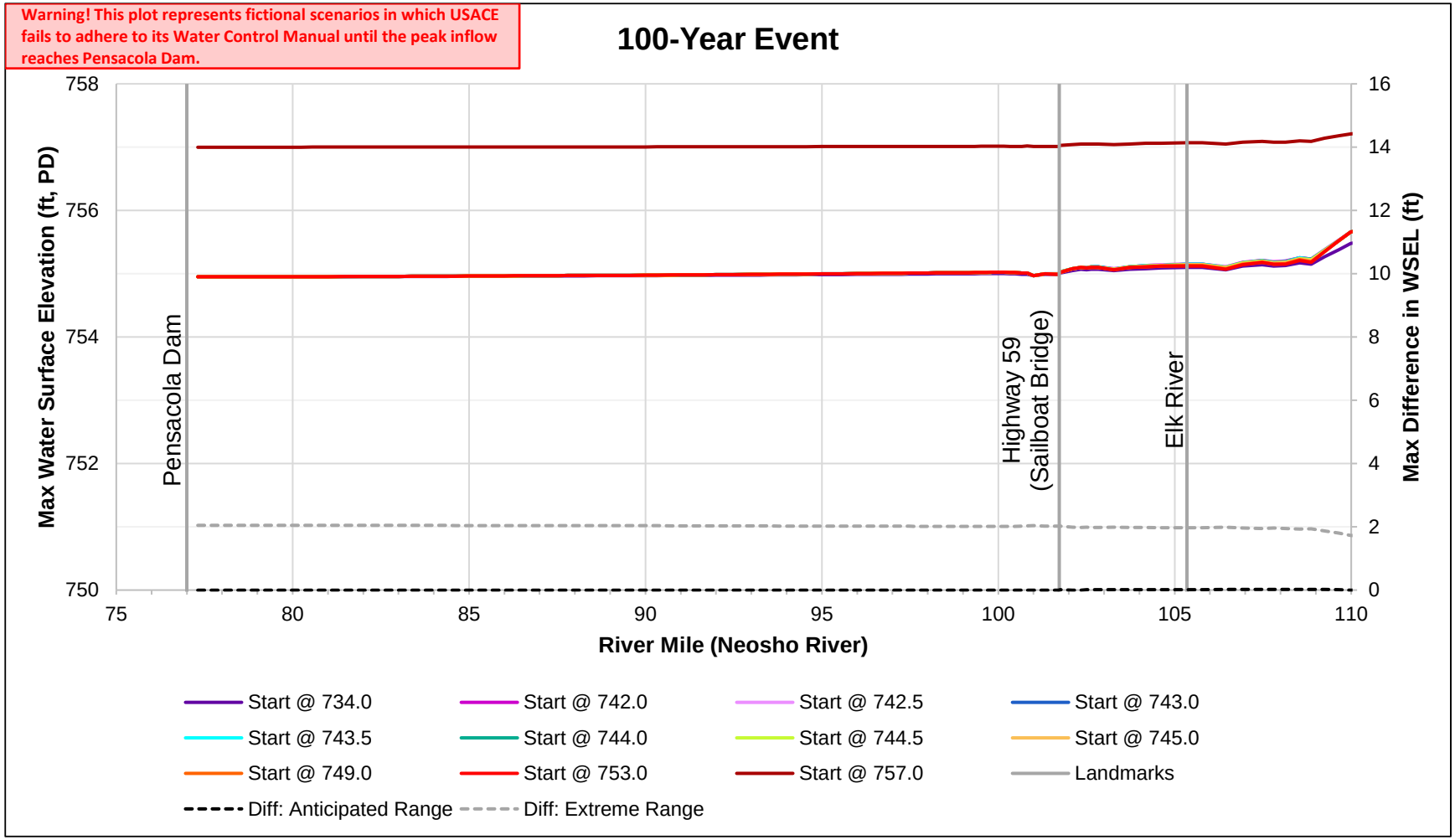


Figure C.51. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Neosho River profile (1 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

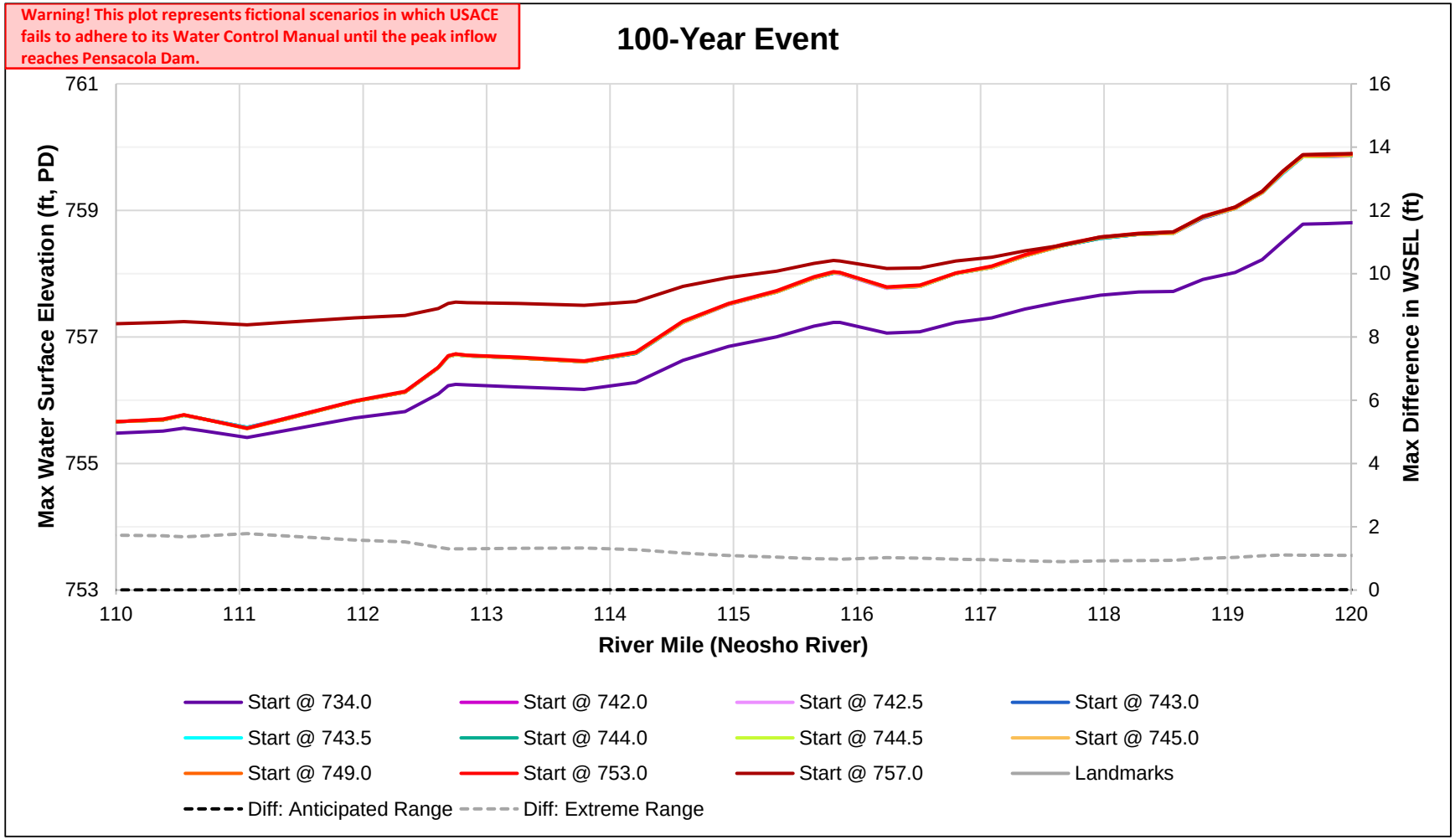


Figure C.52. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Neosho River profile (2 of 5).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

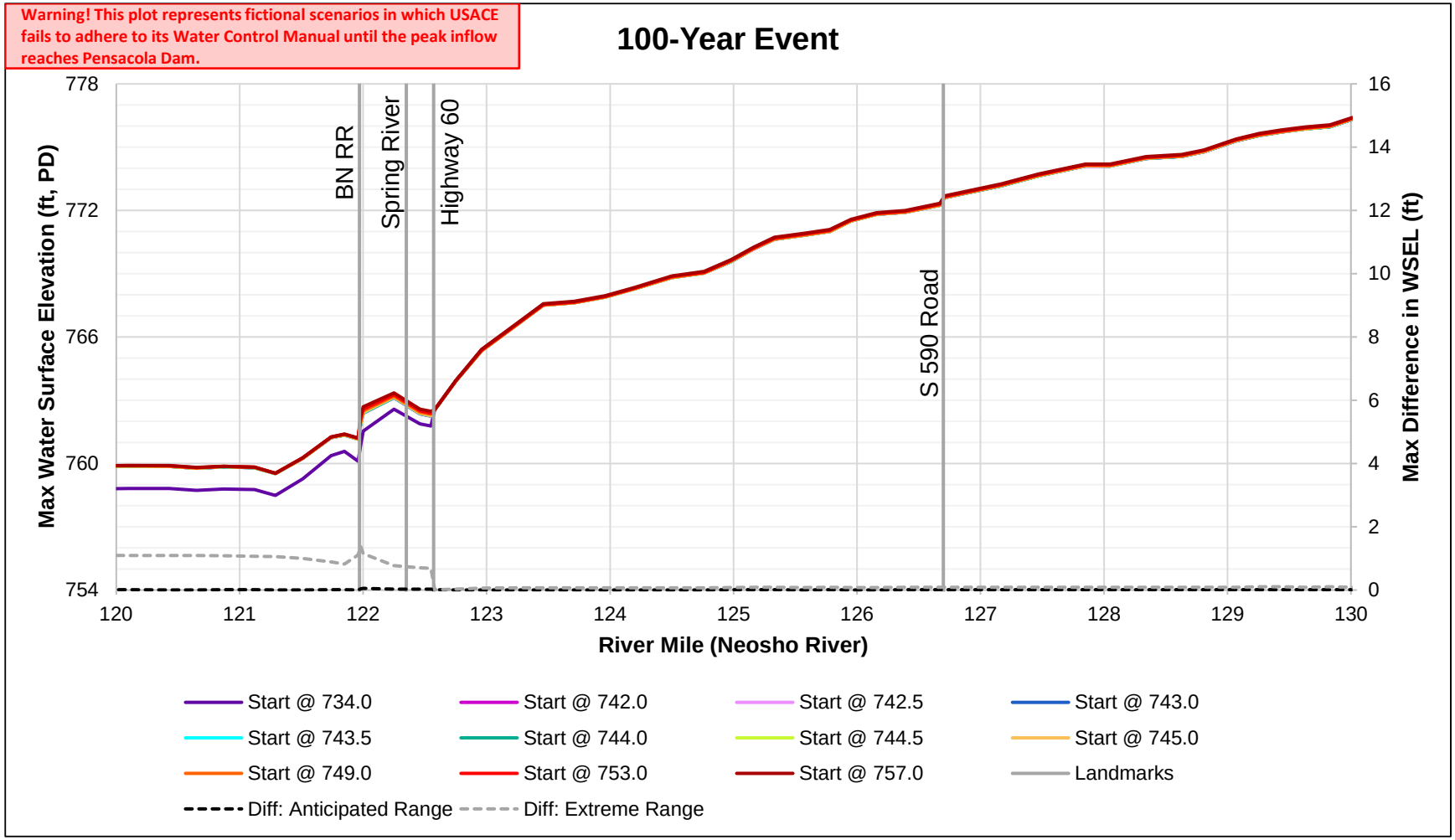


Figure C.53. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Neosho River profile (3 of 5).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

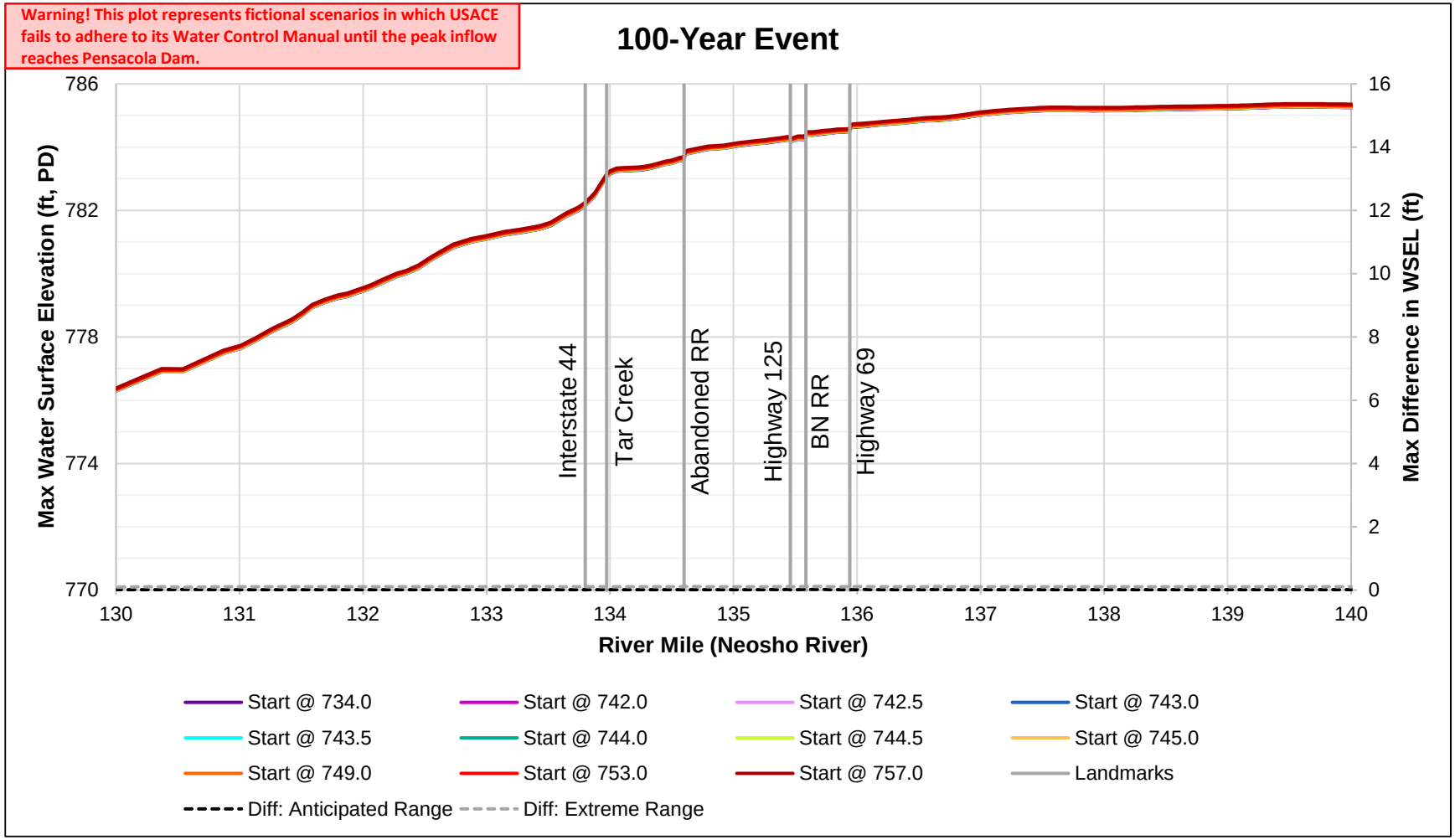


Figure C.54. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Neosho River profile (4 of 5).

Notes: *1. The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

3. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.

4. For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.

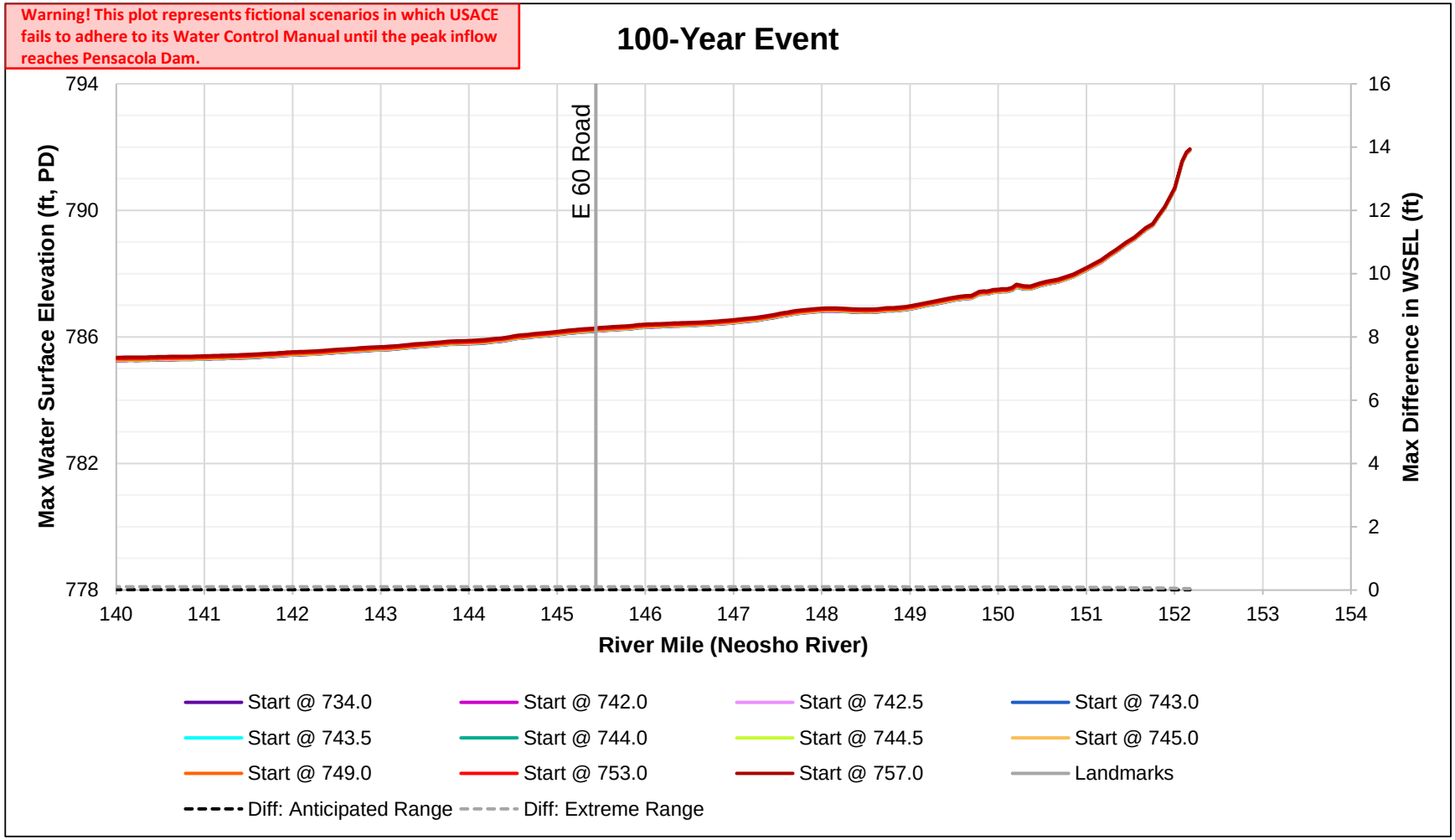


Figure C.55. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Neosho River profile (5 of 5).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

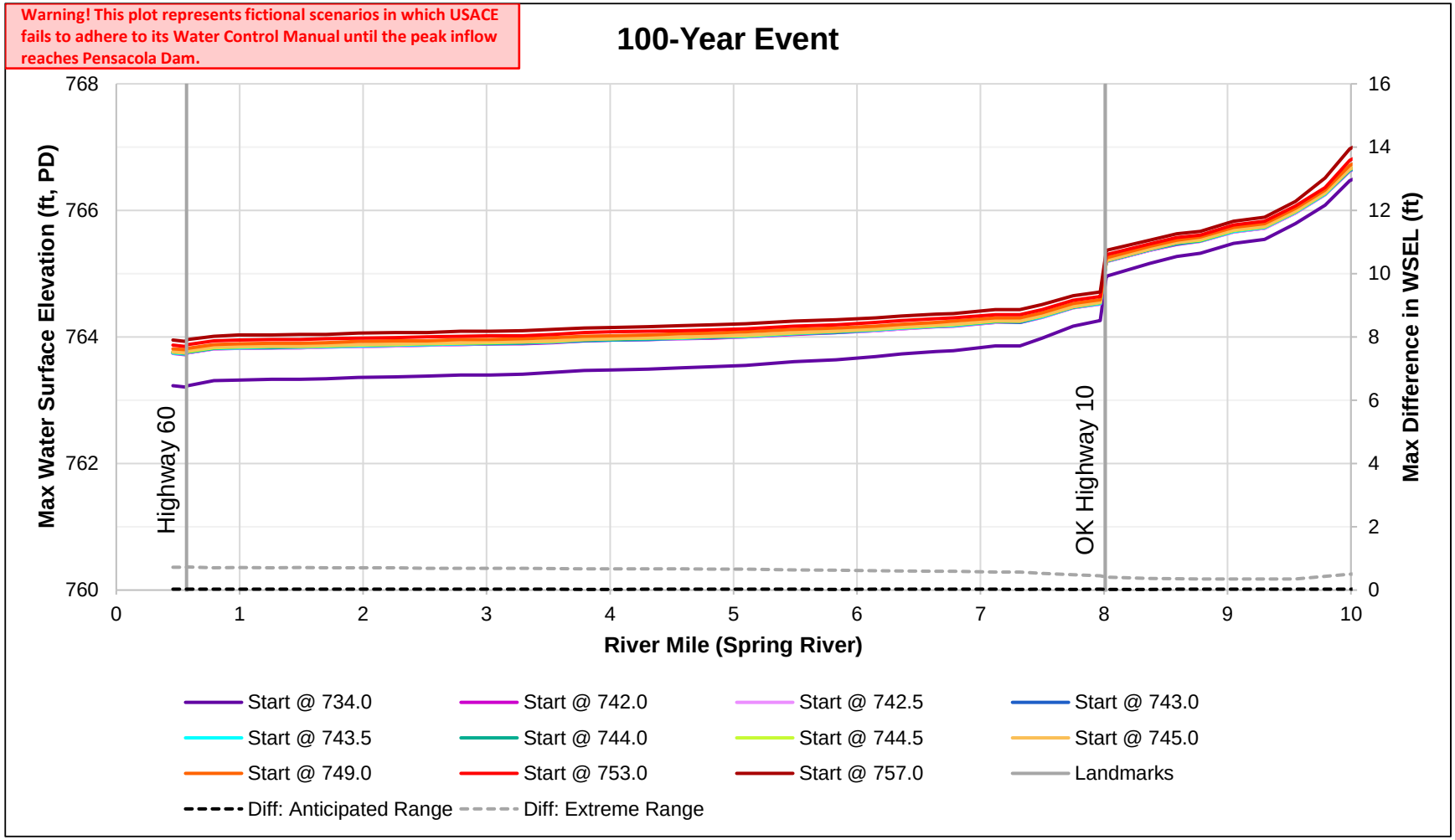


Figure C.56. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Spring River profile (1 of 2).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

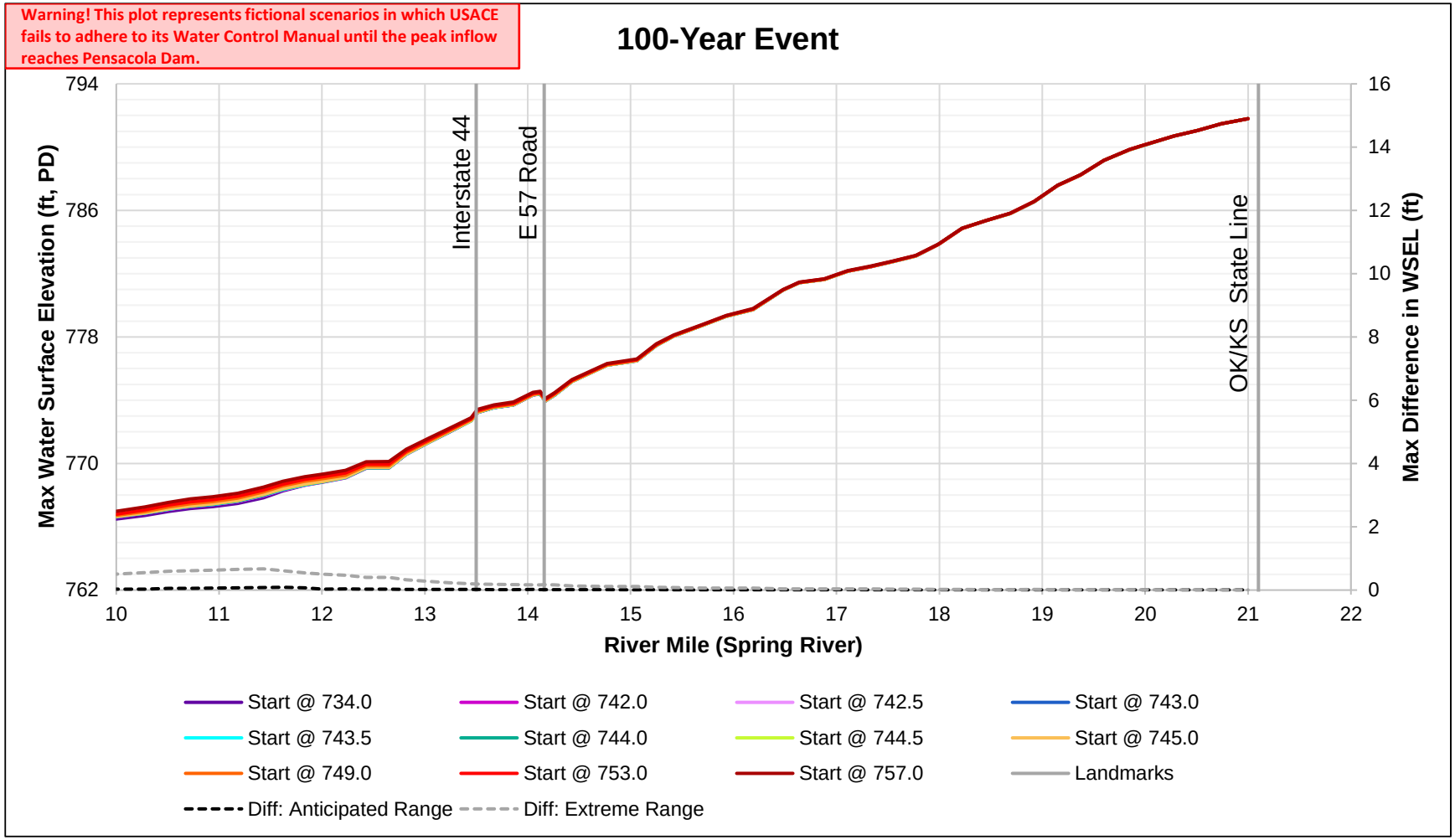


Figure C.57. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Spring River profile (2 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

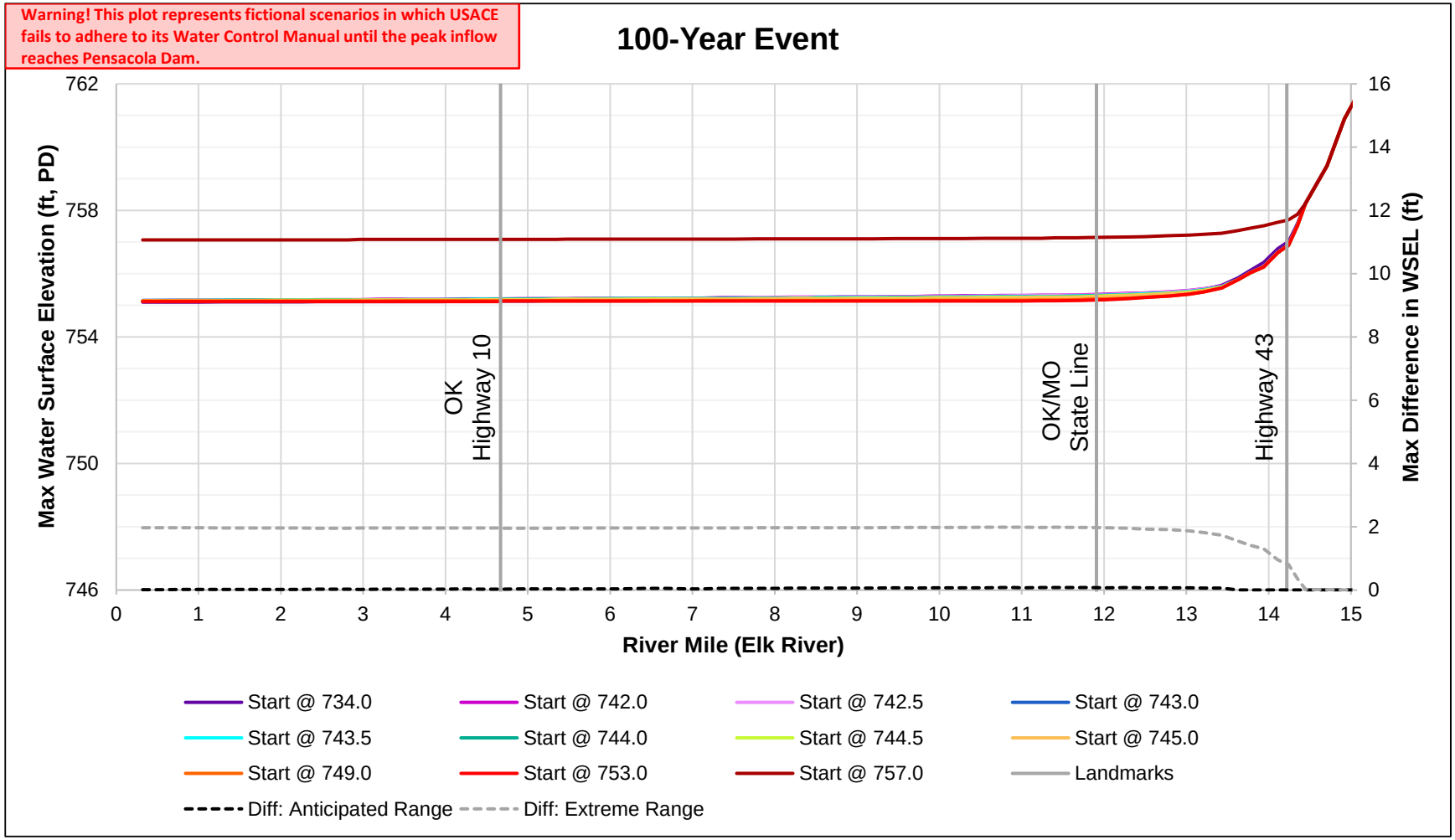


Figure C.58. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Elk River profile (1 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

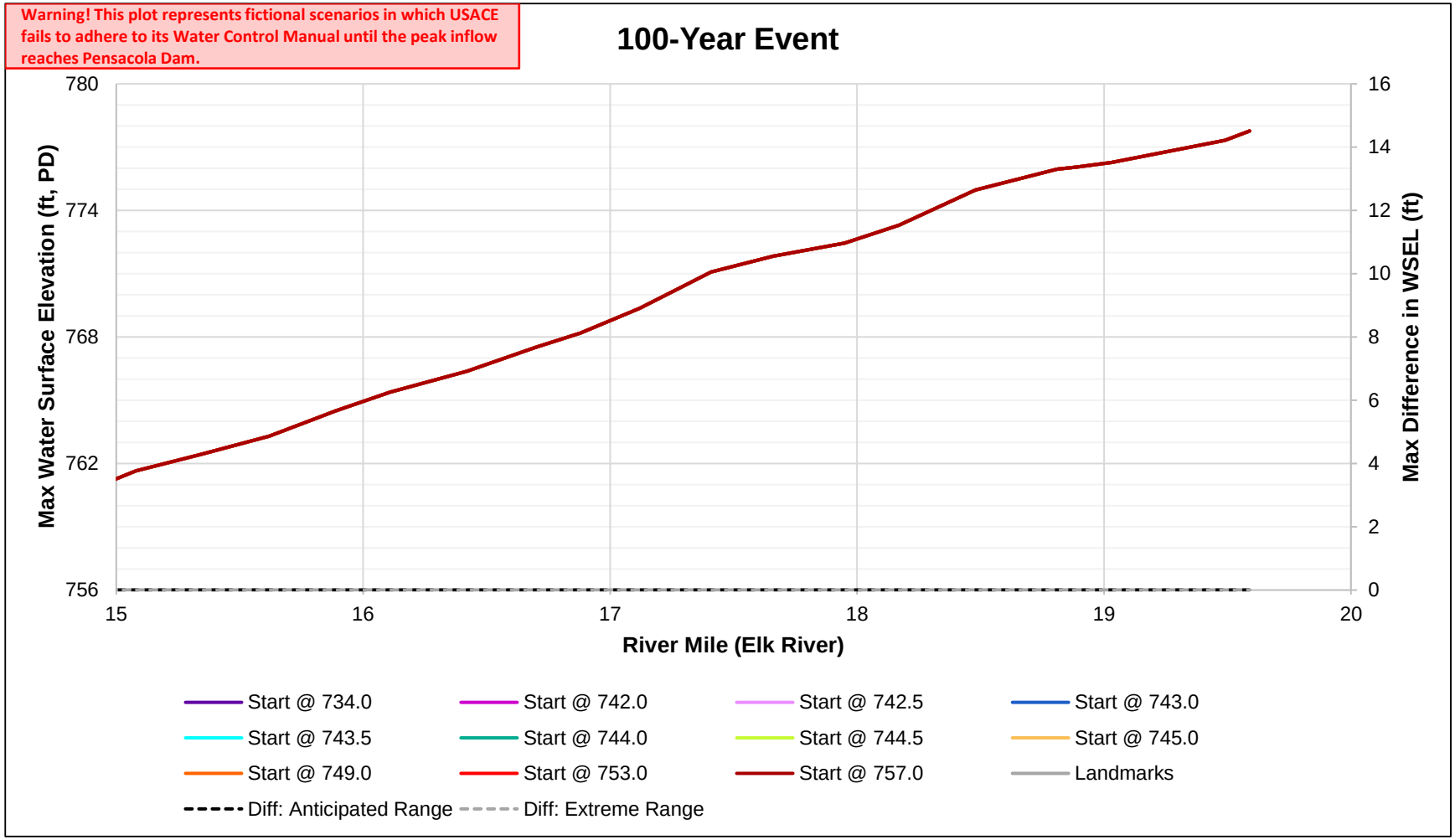


Figure C.59. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Elk River profile (2 of 2).

Notes:

1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*
2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*
4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

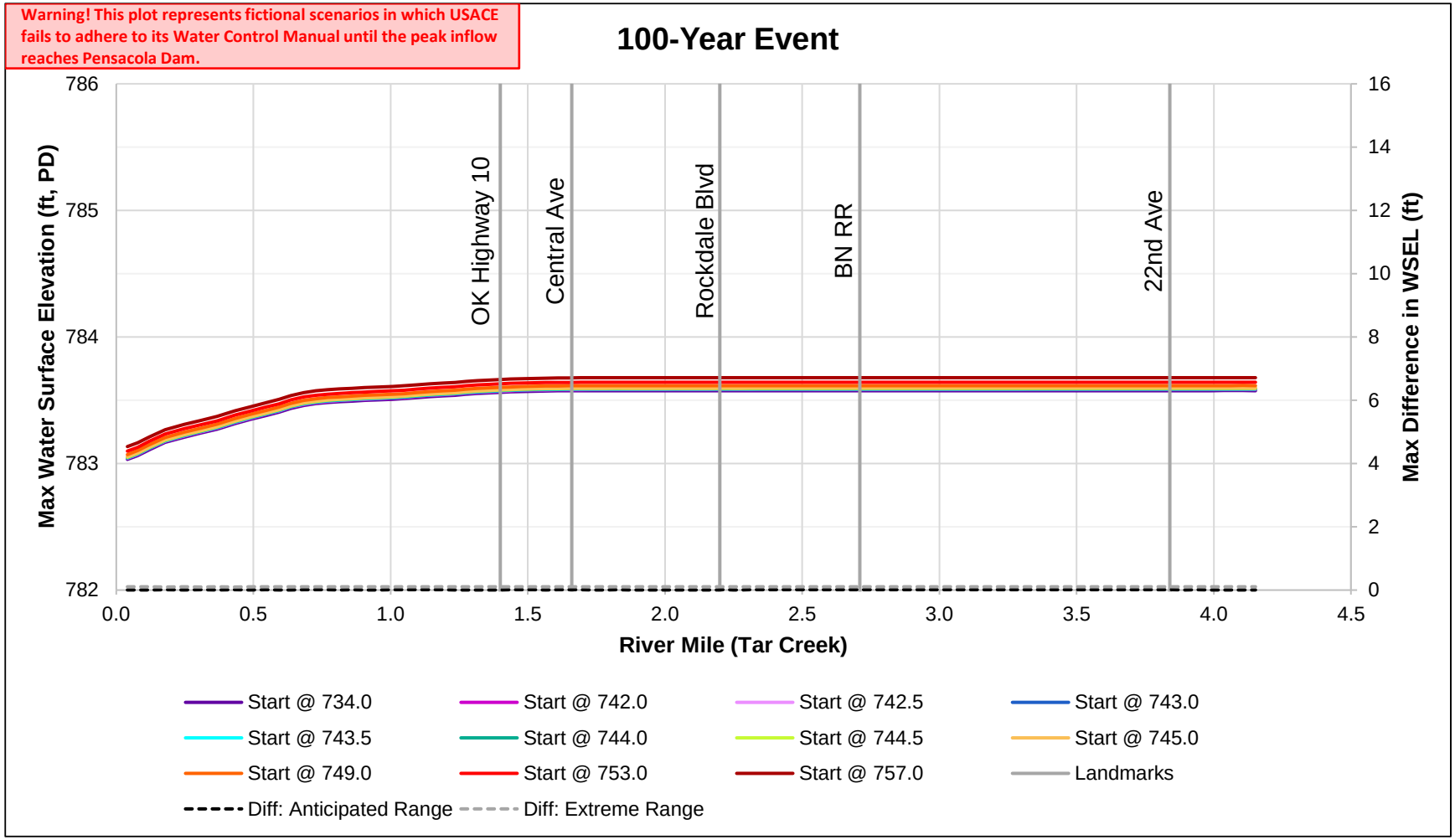


Figure C.60. Water surface elevations for the 100-year inflow event upstream of Pensacola Dam along the Tar Creek profile (1 of 1).

Notes: 1. *The first set of series' names refers to starting pool elevation at Pensacola Dam. For example, "Start @ 742" means a starting pool elevation of 742 ft PD.*

2. *The black dashed line plotted against the right y-axis represents the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range (742 to 745 feet PD). The gray dashed line represents the maximum difference in WSEL for simulations with starting stages at extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

3. *Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles and maximum differences displayed.*

4. *For portions of the reach where only the highest starting elevation WSEL profile is visible, the WSEL profiles for the other starting elevations are nearly identical.*

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX C.7
HISTORICAL STARTING STAGE
WATER SURFACE ELEVATION PROFILES

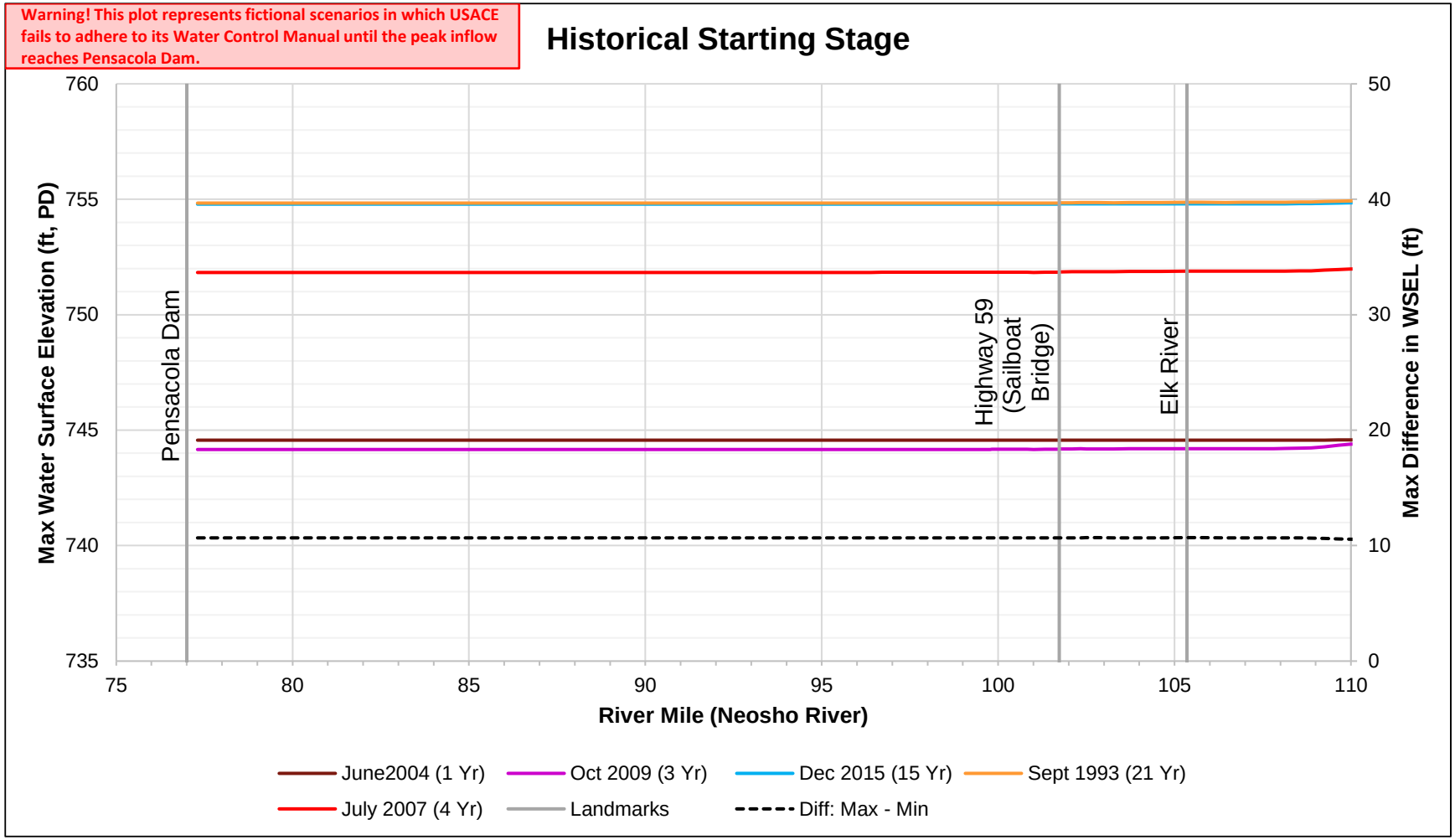


Figure C.61. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Neosho River profile (1 of 5).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

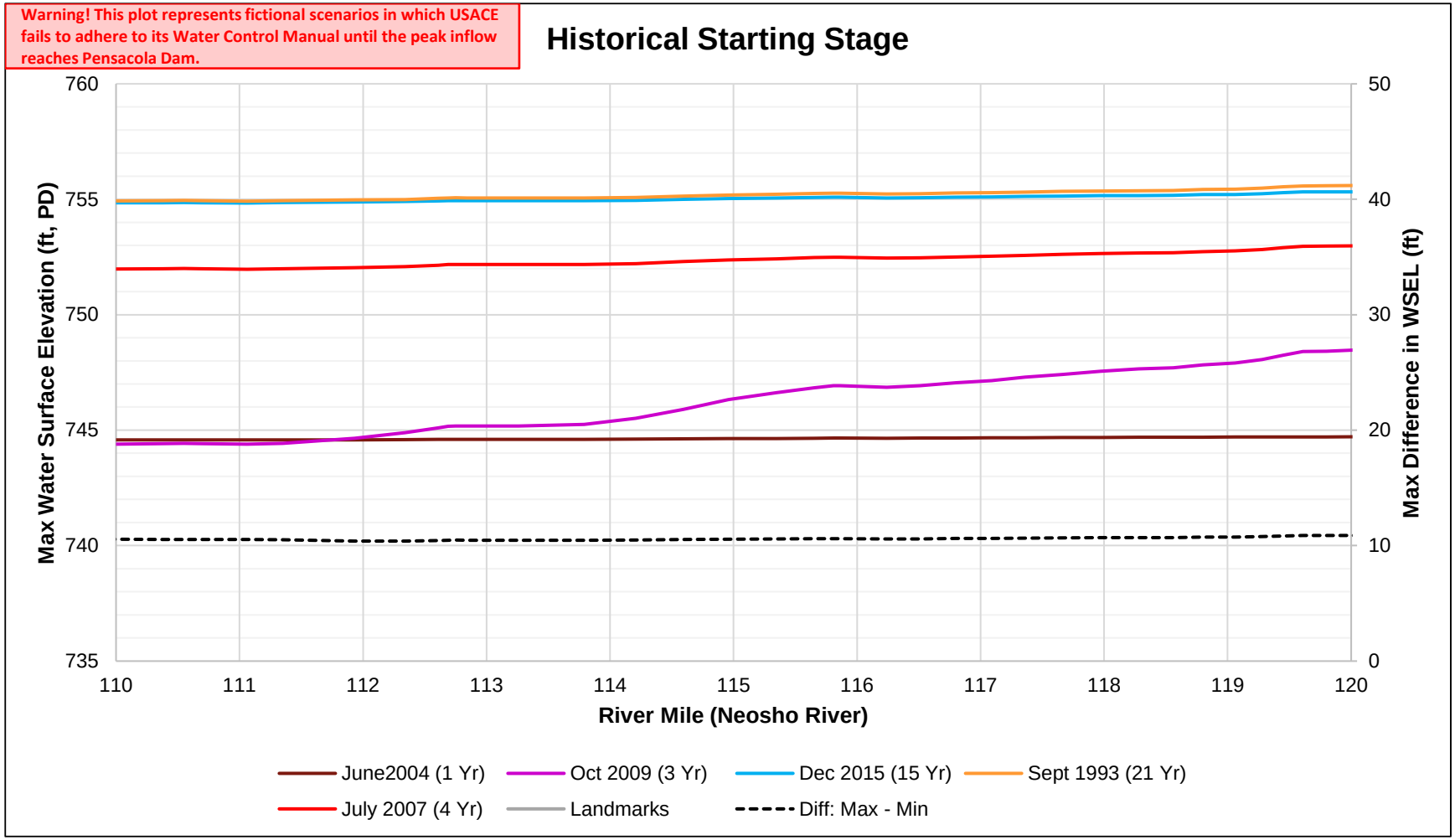


Figure C.62. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Neosho River profile (2 of 5).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

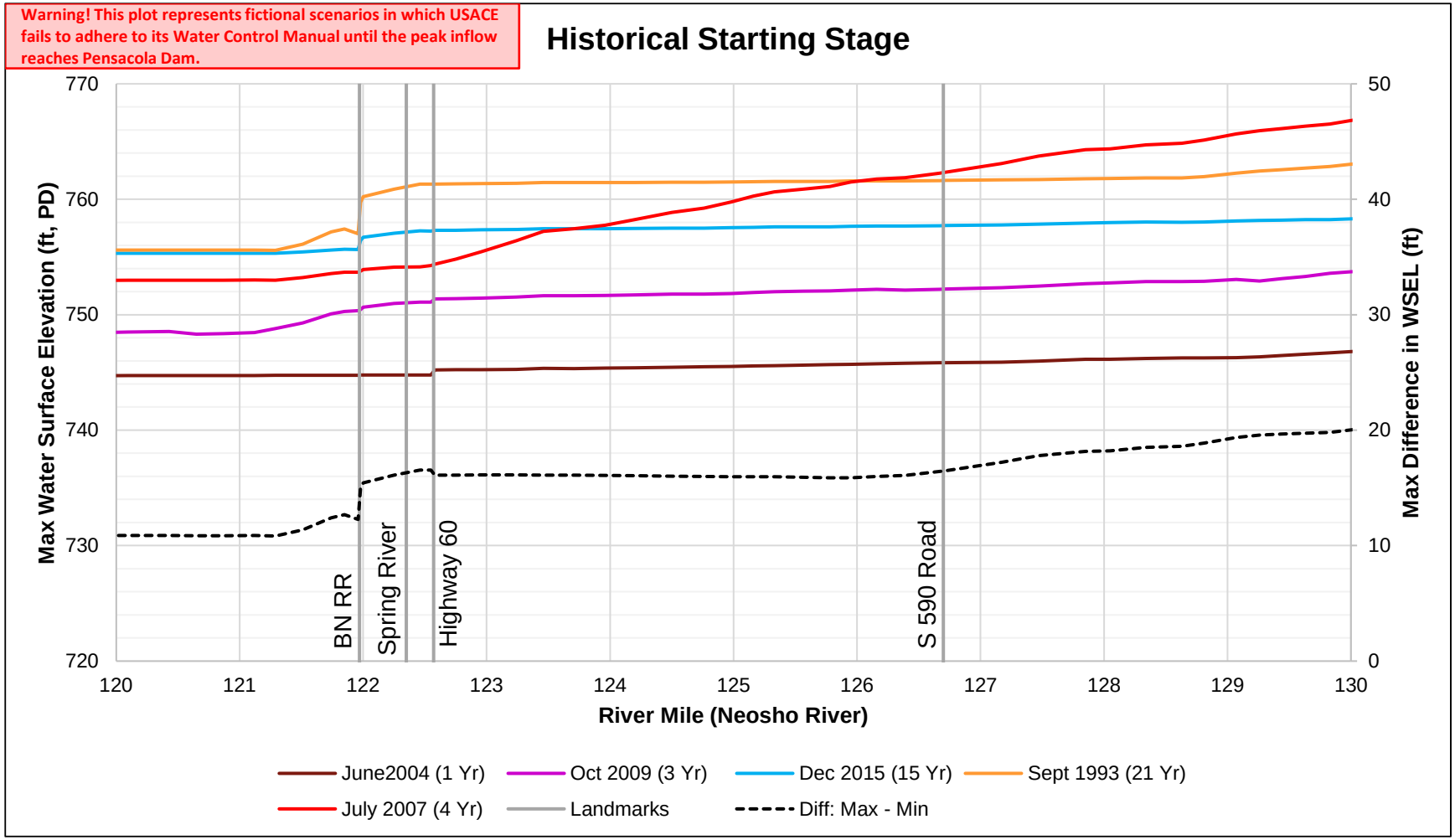


Figure C.63. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Neosho River profile (3 of 5).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

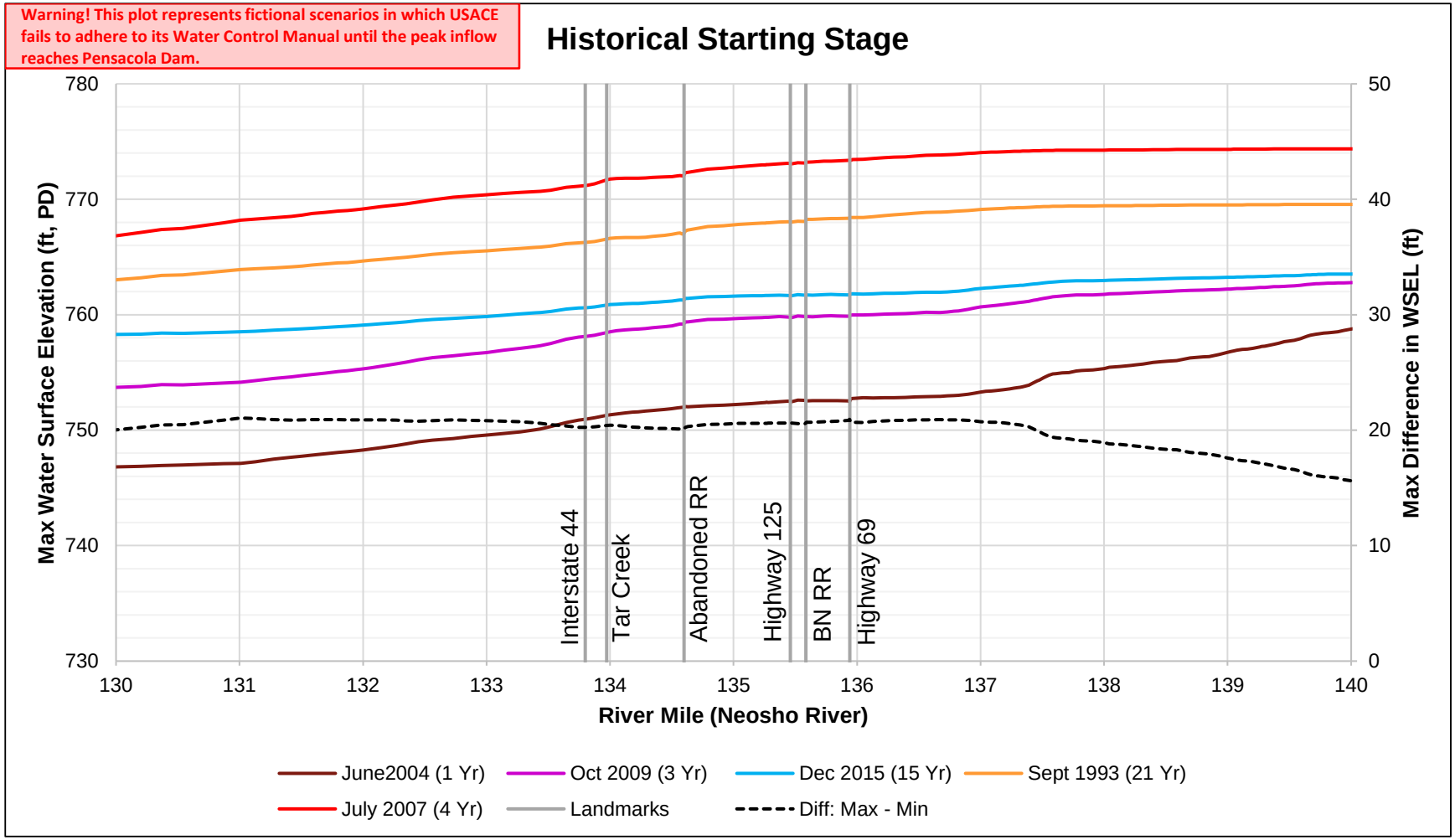


Figure C.64. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Neosho River profile (4 of 5).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

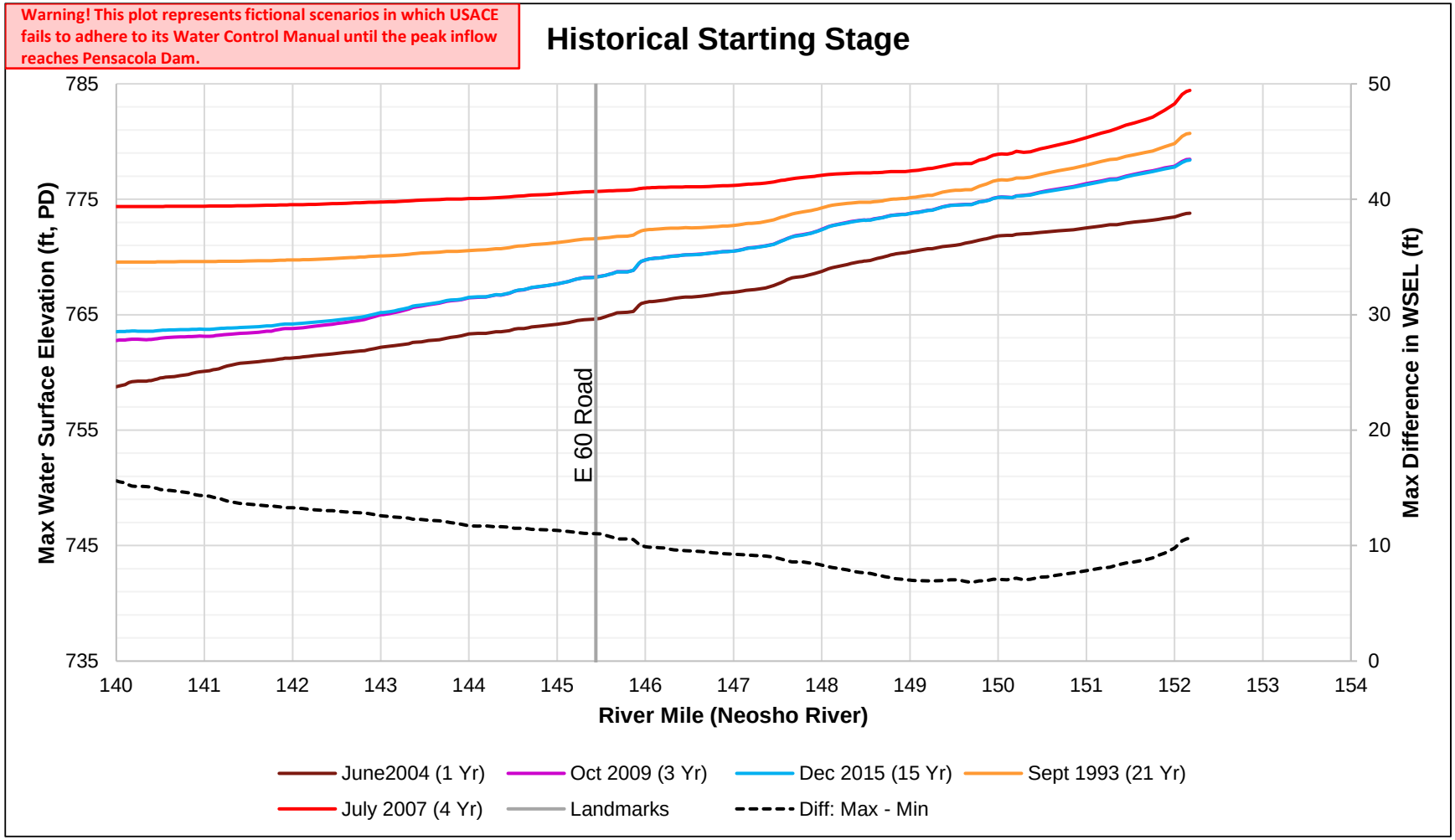


Figure C.65. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Neosho River profile (5 of 5).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

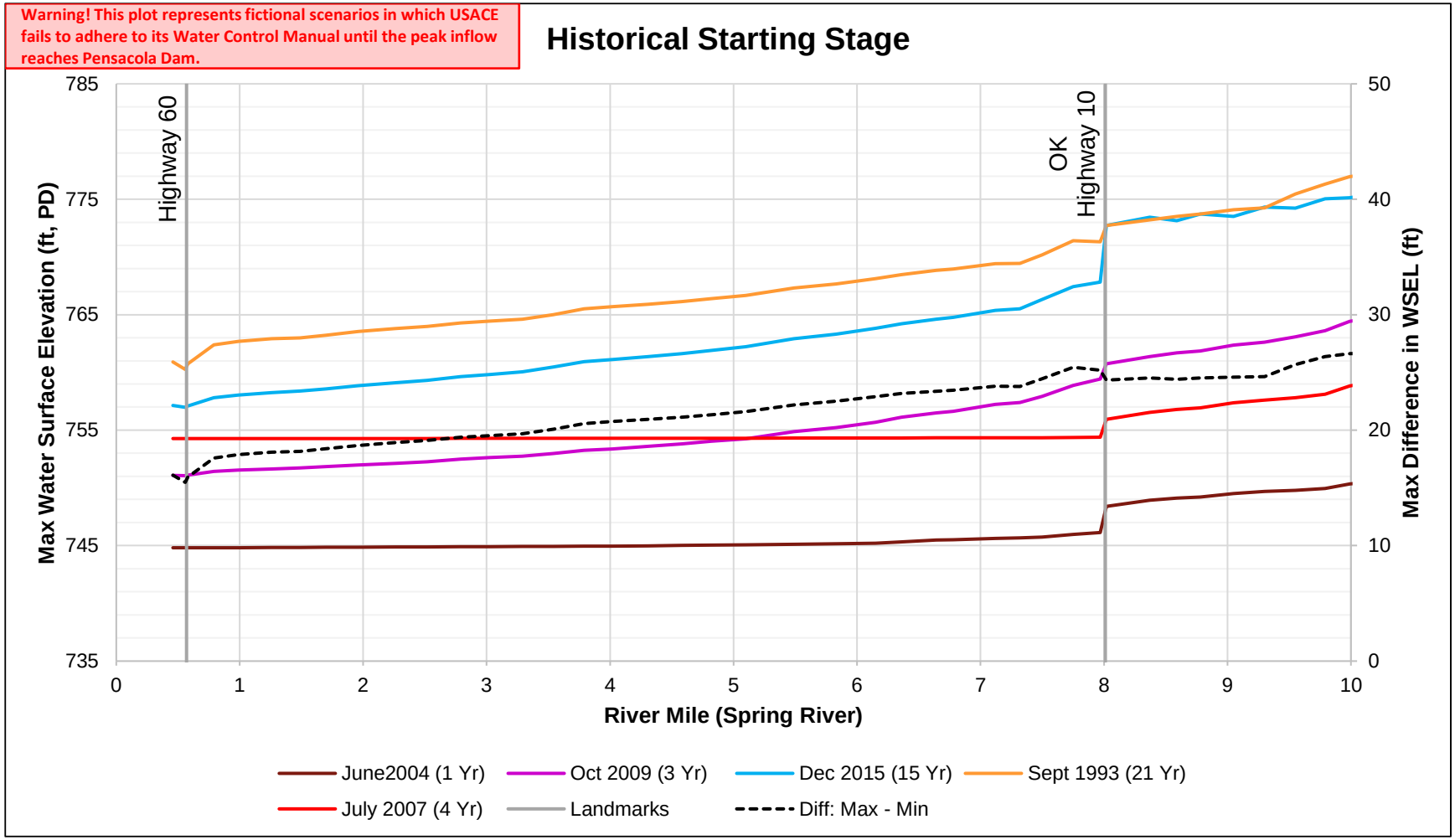


Figure C.66. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Spring River profile (1 of 2).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

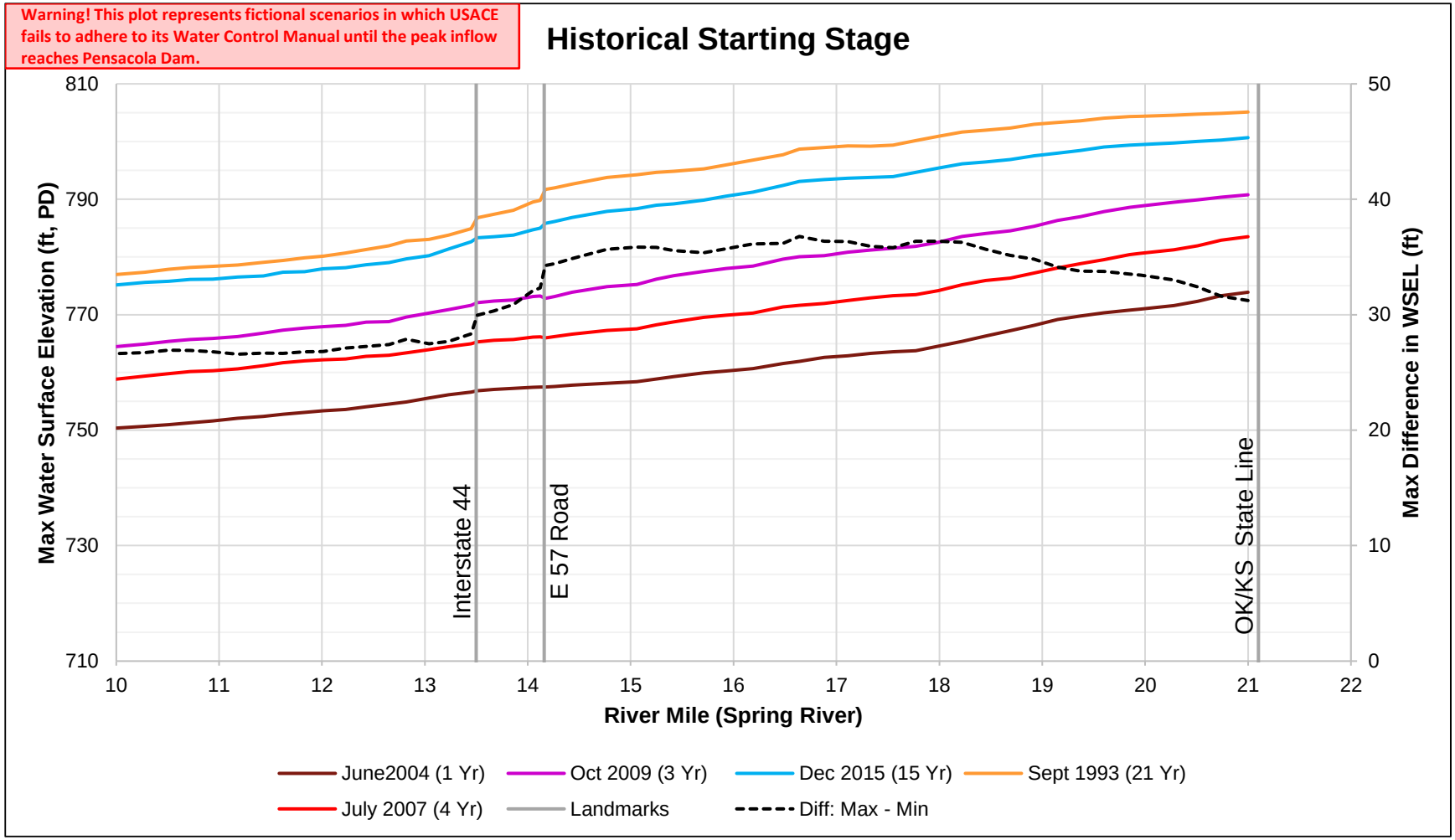


Figure C.67. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Spring River profile (2 of 2).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

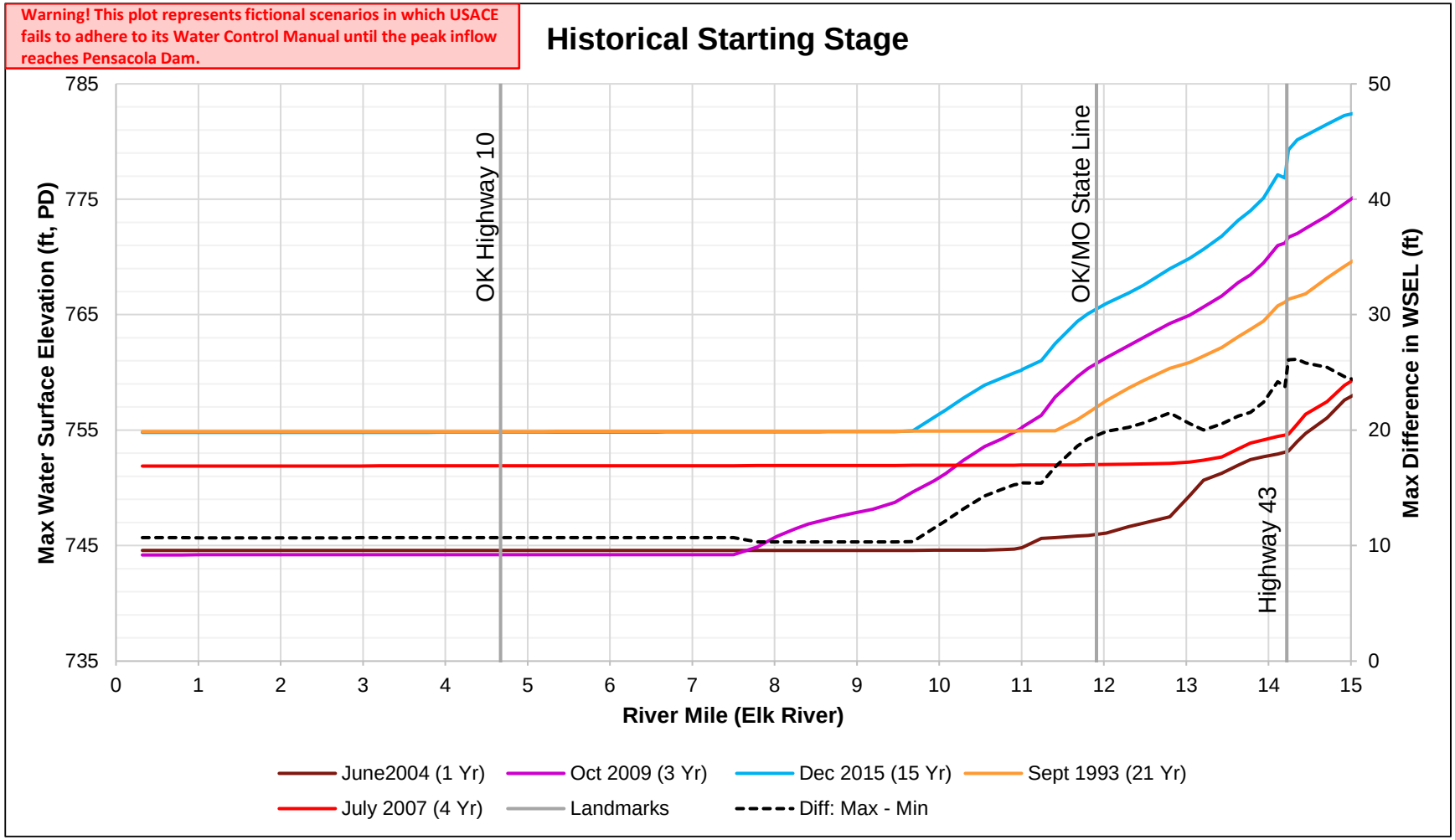


Figure C.68. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Elk River profile (1 of 2).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

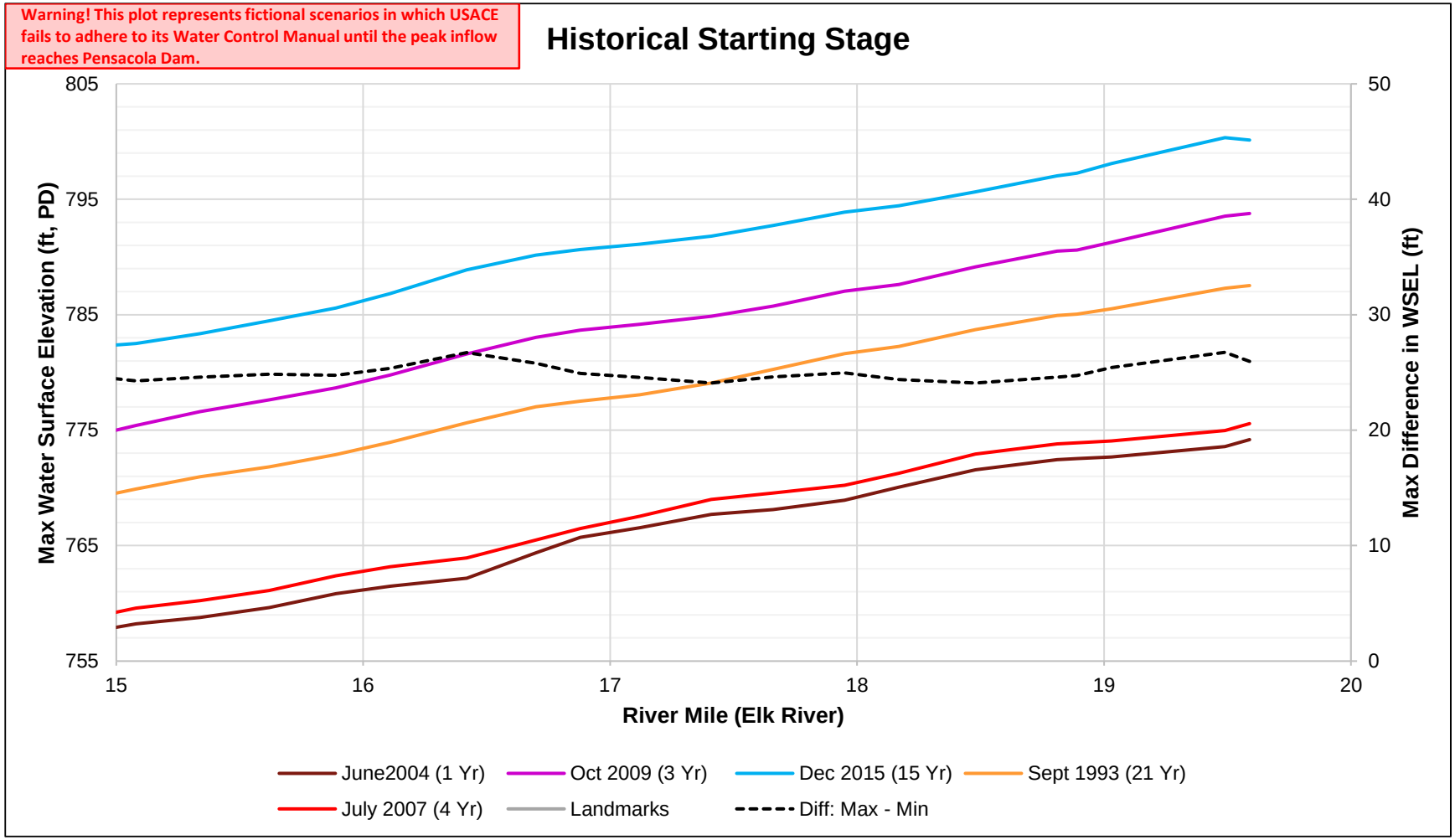


Figure C.69. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Elk River profile (2 of 2).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

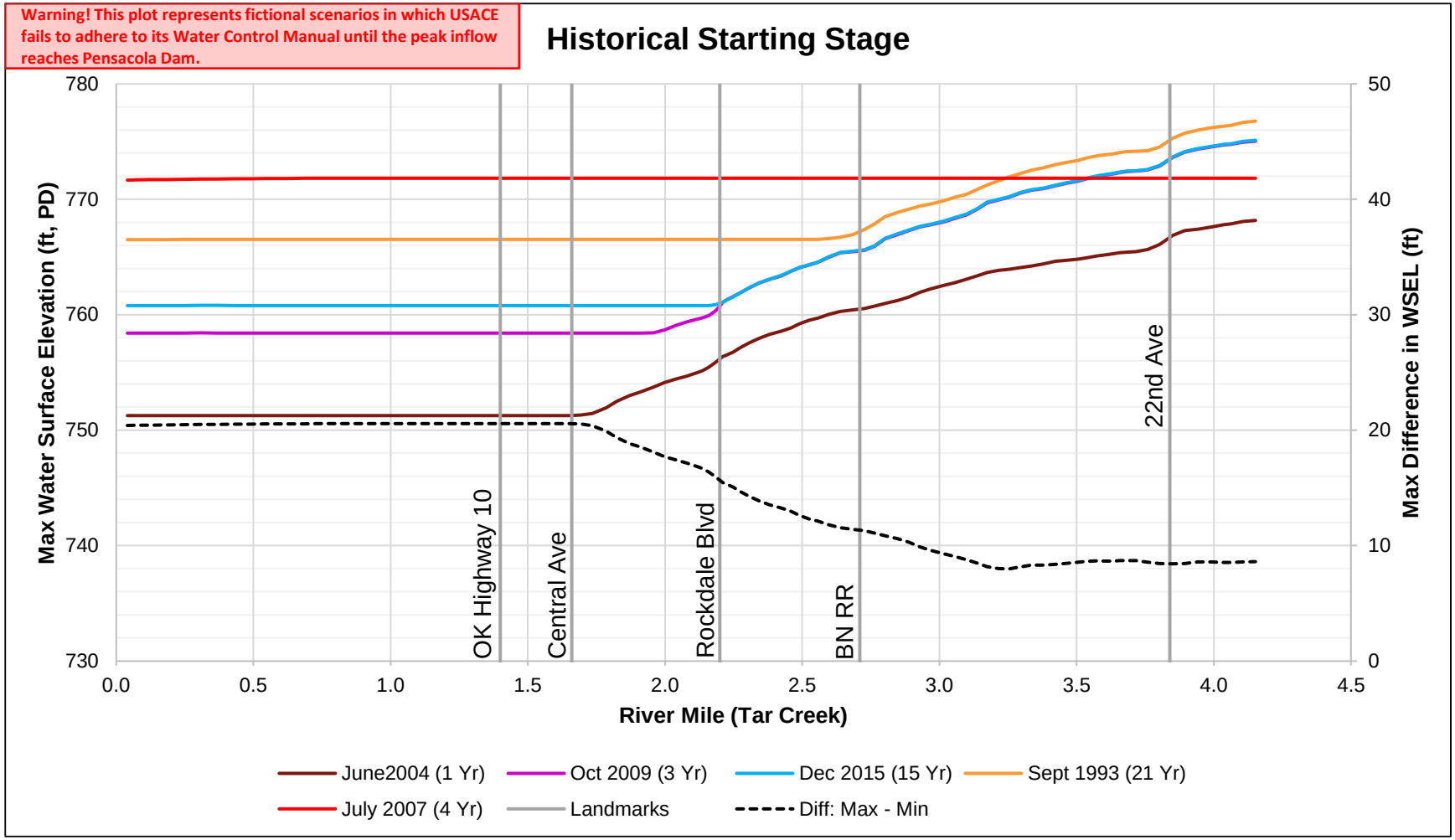


Figure C.70. Water surface elevations for events with historical starting stages upstream of Pensacola Dam along the Tar Creek profile (1 of 1).

Notes: 1. The dashed line is plotted against the right y-axis and represents the difference between the highest and lowest max WSEL displayed on the figure.

2. Vertical and horizontal scales vary between plots based on the slope of the WSEL profiles displayed.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX C.8
COMPARISON OF MAXIMUM DIFFERENCES

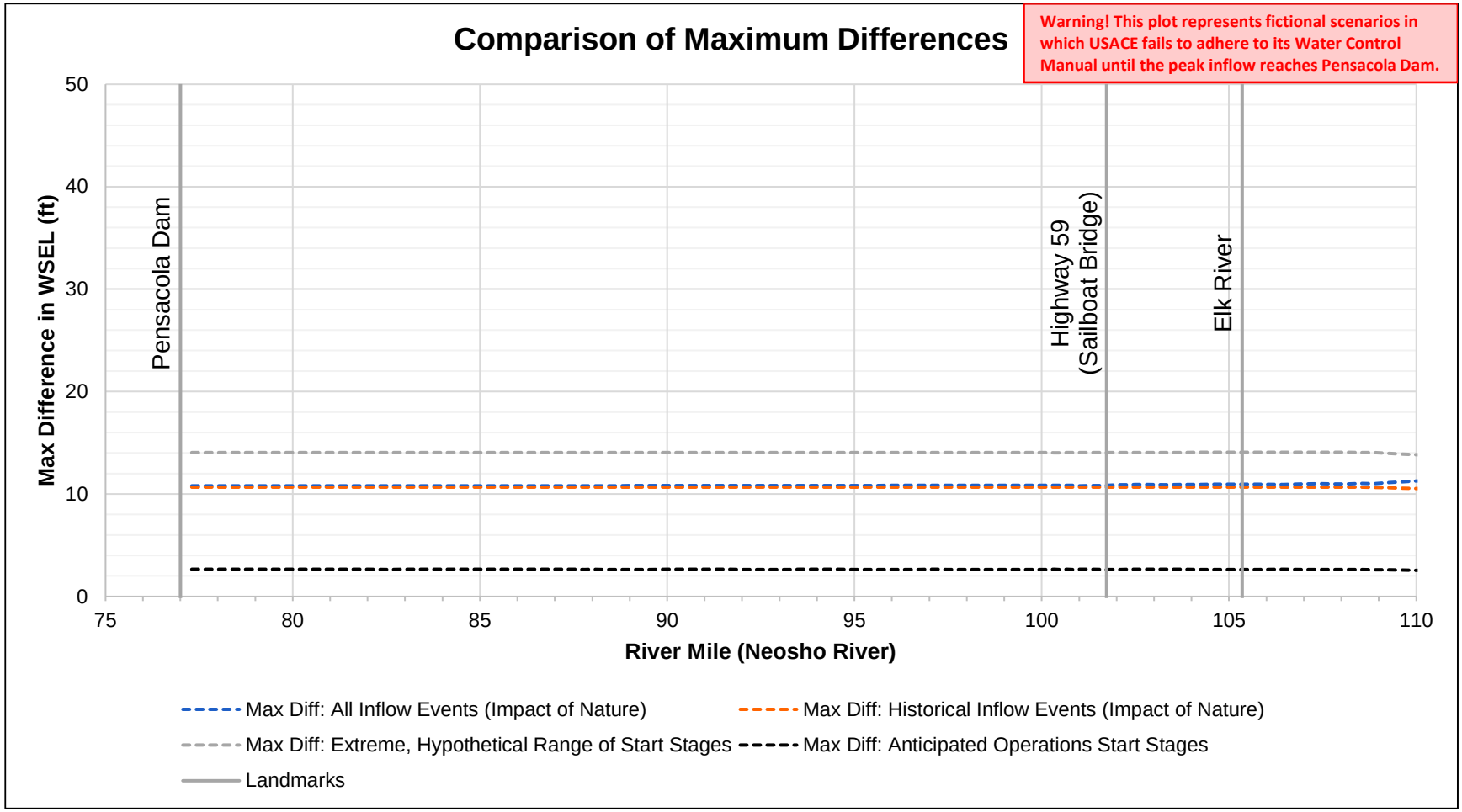


Figure C.71. Comparison of maximum water surface elevation differences along the Neosho River profile (1 of 5).

Notes: *1. The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*

2. The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.

3. The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

4. The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.

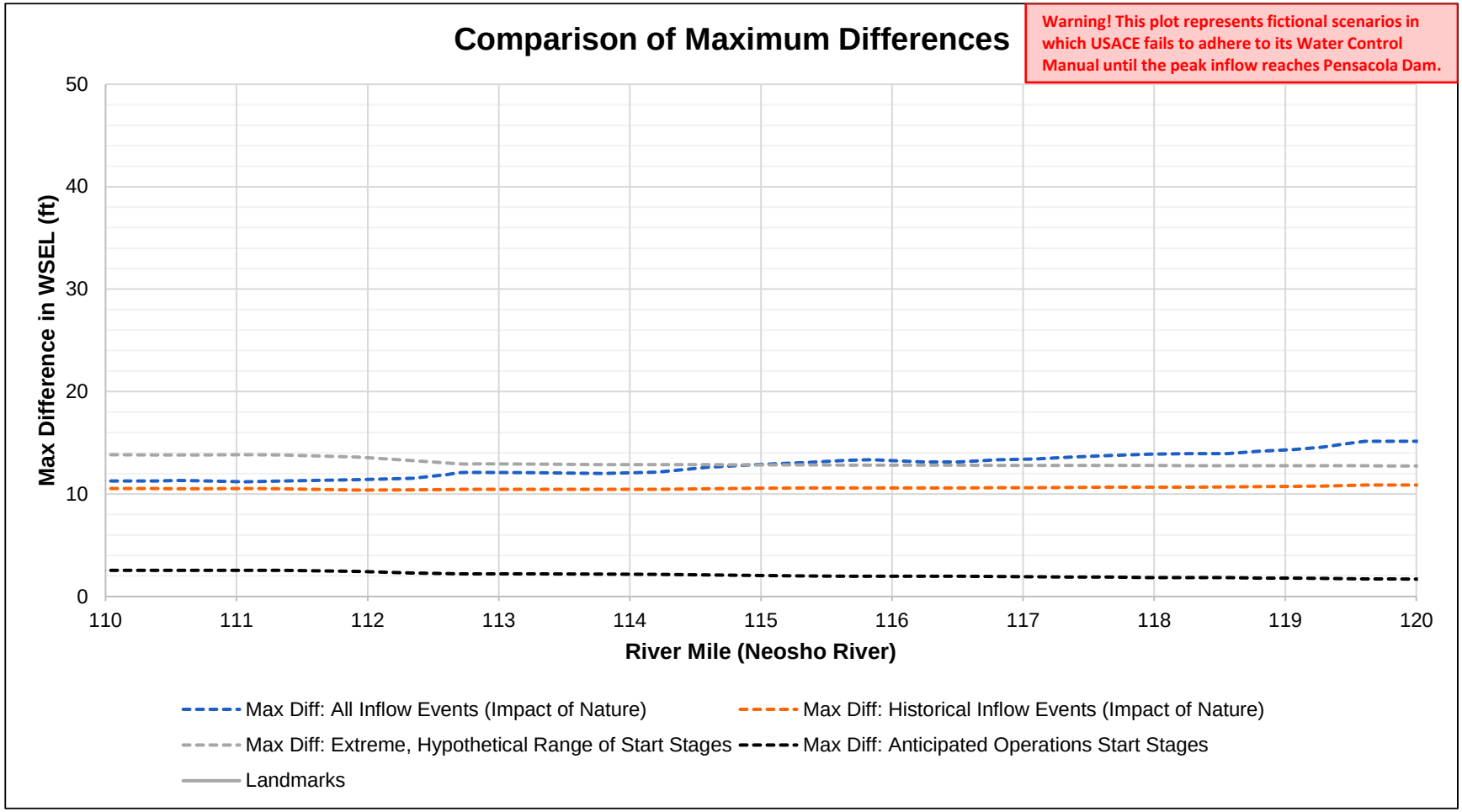


Figure C.72. Comparison of maximum water surface elevation differences along the Neosho River profile (2 of 5).

Notes: 1. *The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*
2. *The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.*
3. *The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
4. *The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.*

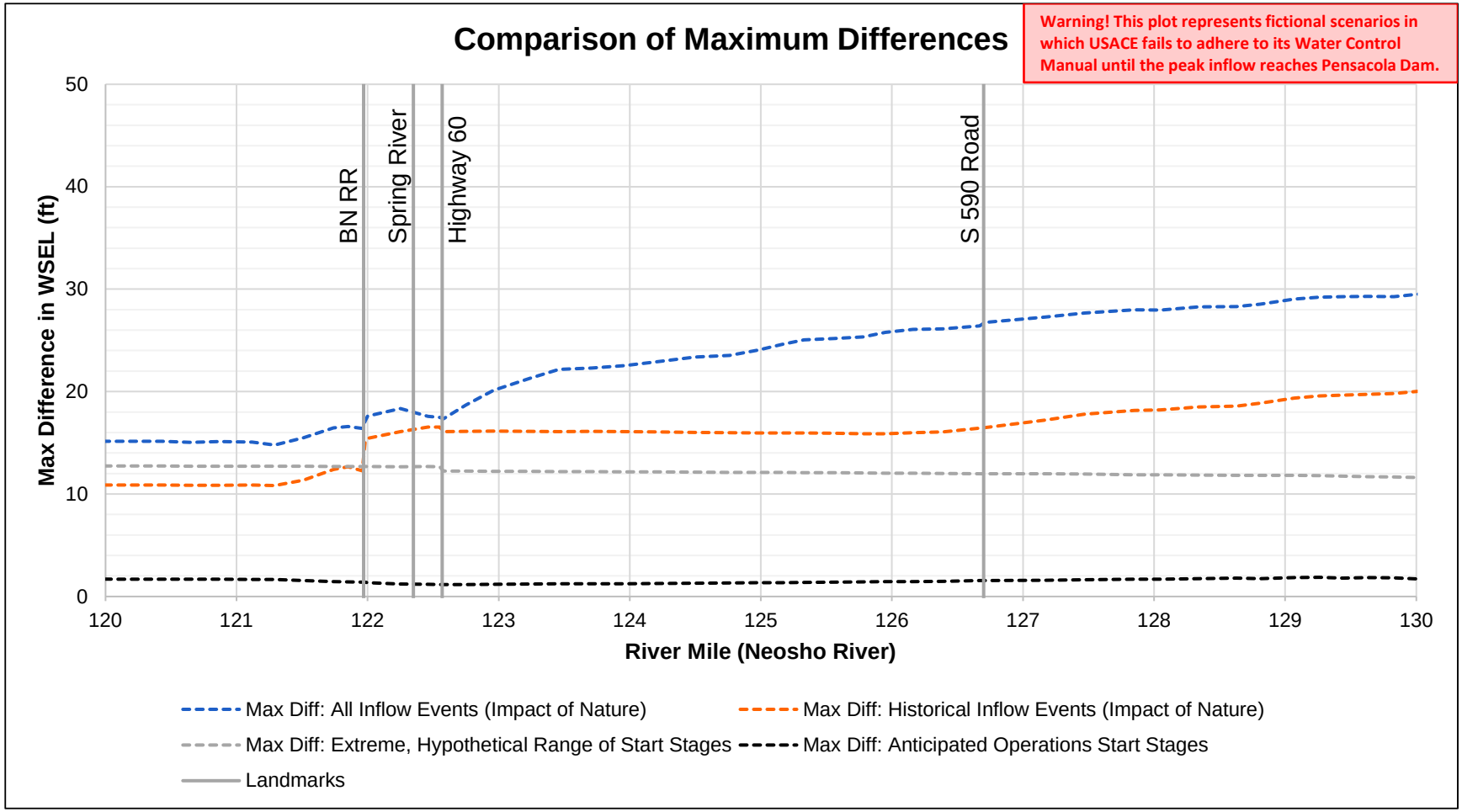


Figure C.73. Comparison of maximum water surface elevation differences along the Neosho River profile (3 of 5).

Notes:

1. *The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*
2. *The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.*
3. *The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
4. *The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.*

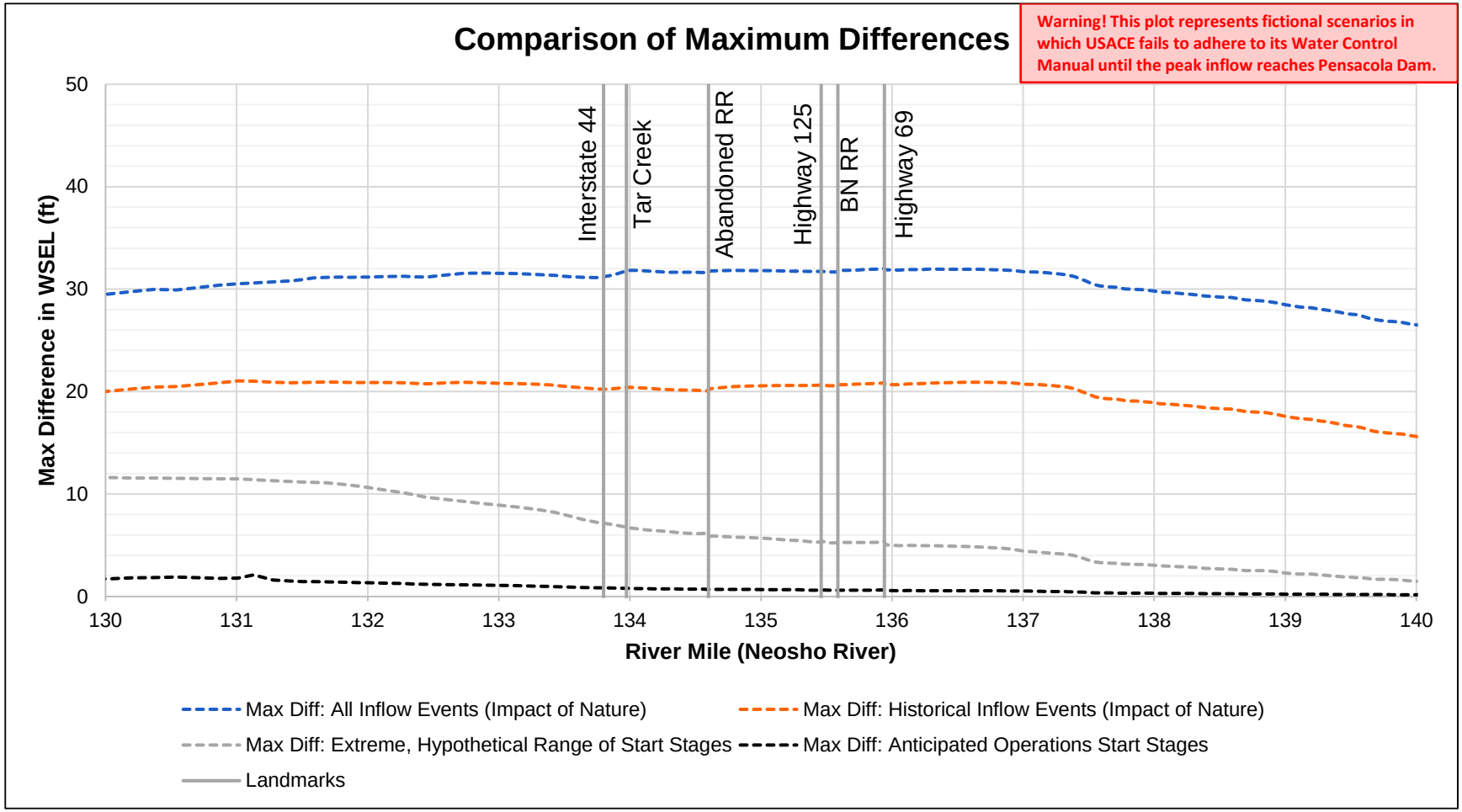


Figure C.74. Comparison of maximum water surface elevation differences along the Neosho River profile (4 of 5).

Notes: 1. *The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*

2. *The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.*

3. *The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

4. *The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.*

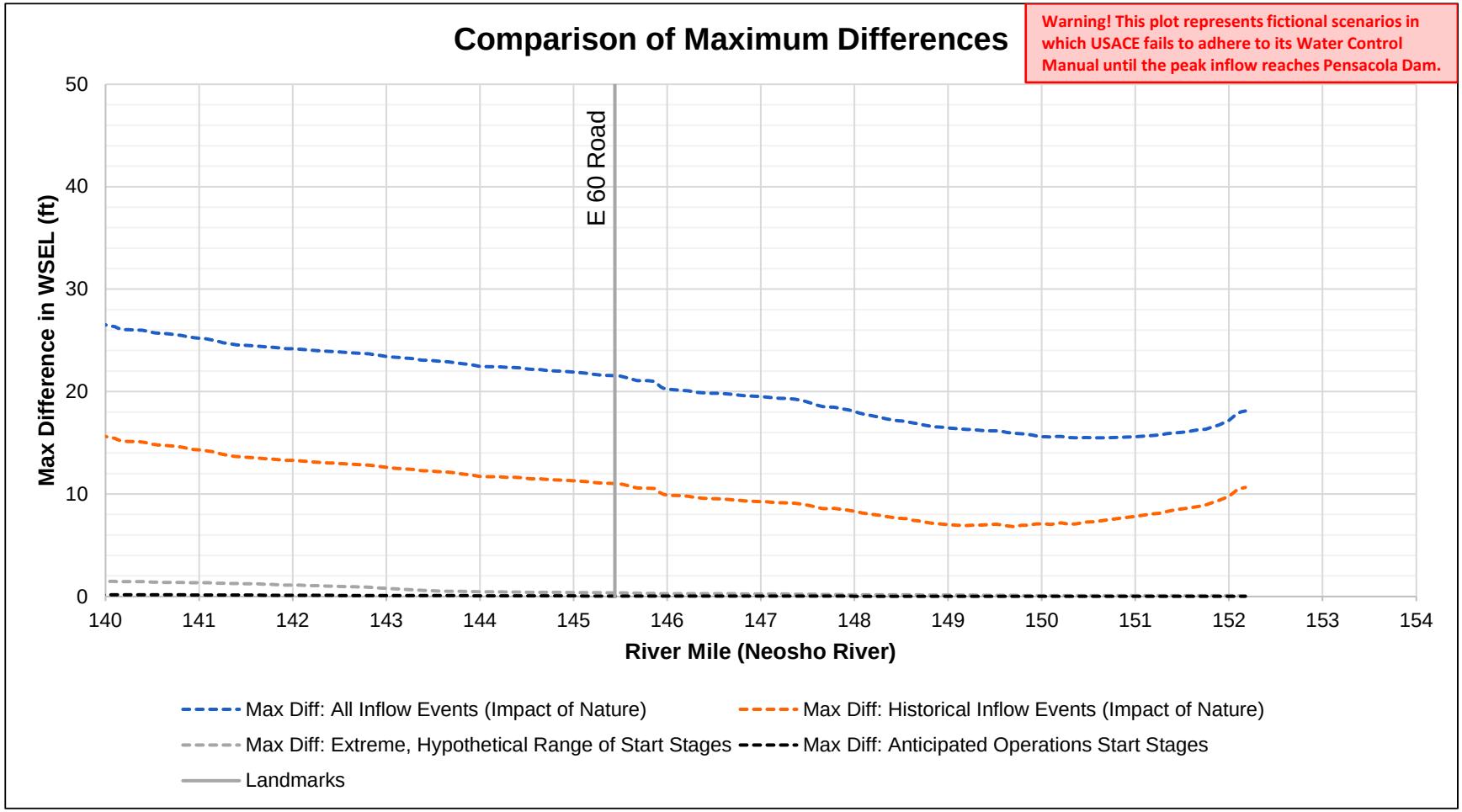


Figure C.75. Comparison of maximum water surface elevation differences along the Neosho River profile (5 of 5).

Notes: 1. *The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*
2. *The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.*
3. *The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
4. *The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.*

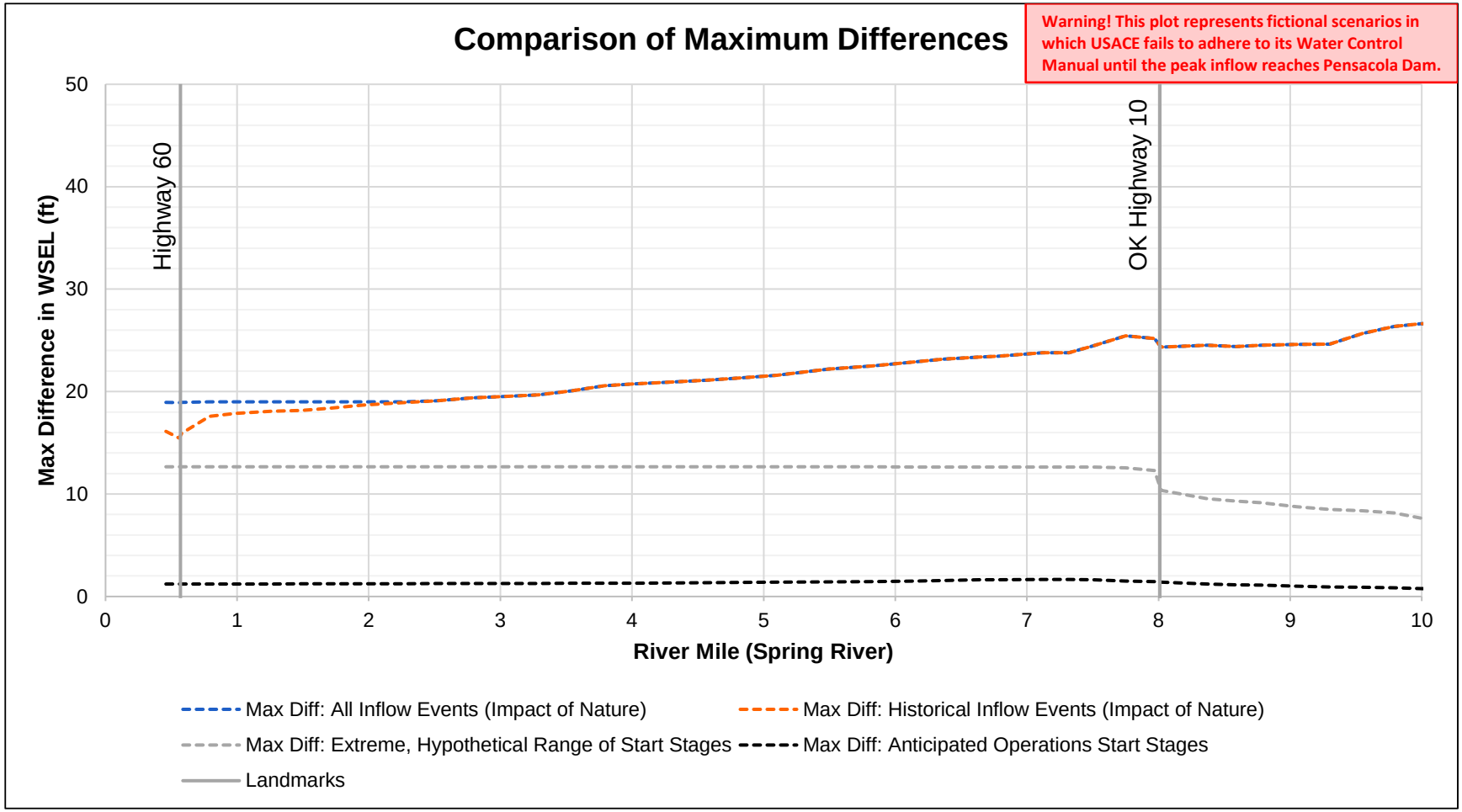


Figure C.76. Comparison of maximum water surface elevation differences along the Spring River profile (1 of 2).

Notes: 1. *The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*
2. *The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.*
3. *The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
4. *The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.*

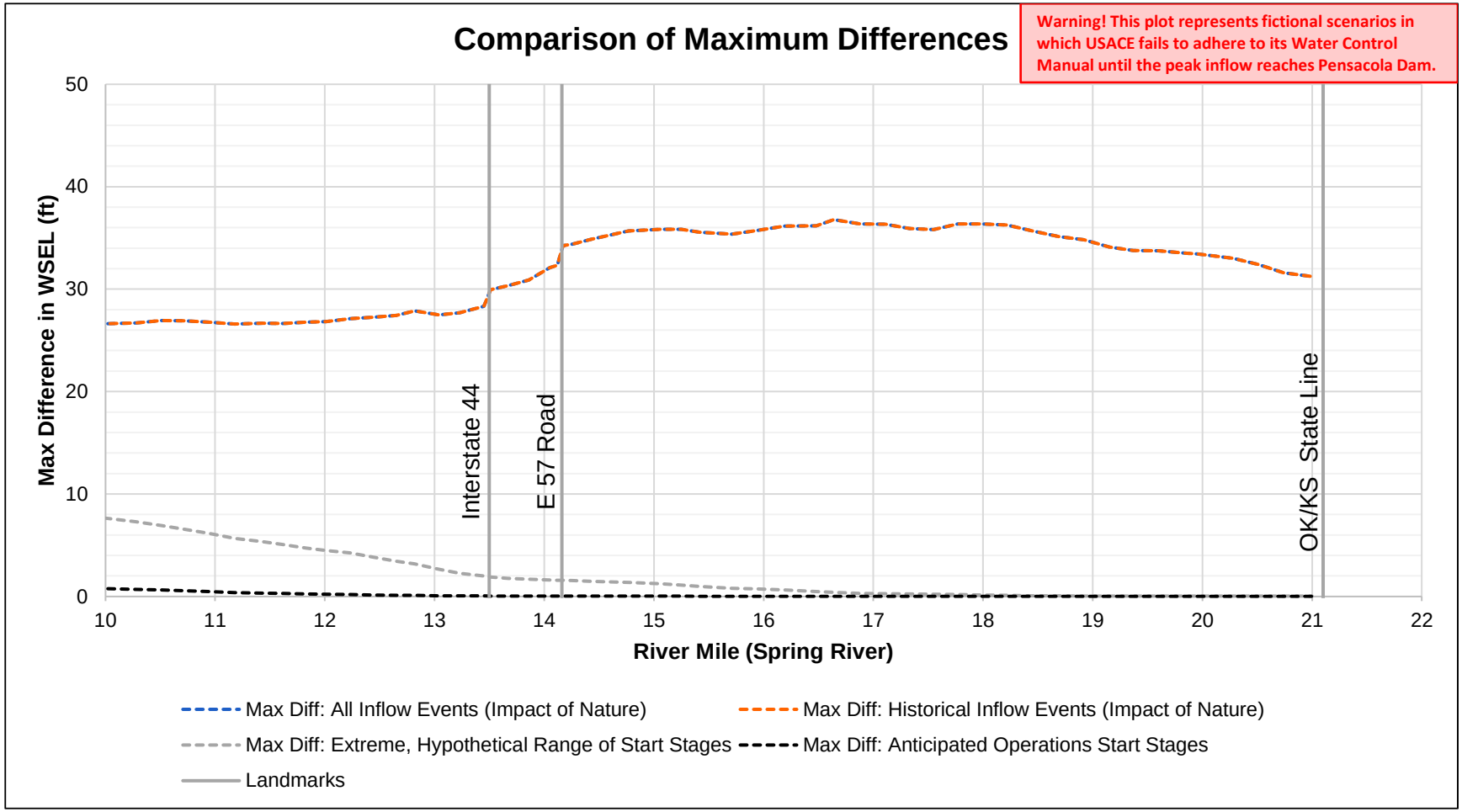


Figure C.77. Comparison of maximum water surface elevation differences along the Spring River profile (2 of 2).

Notes:

1. *The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*
2. *The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.*
3. *The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*
4. *The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.*

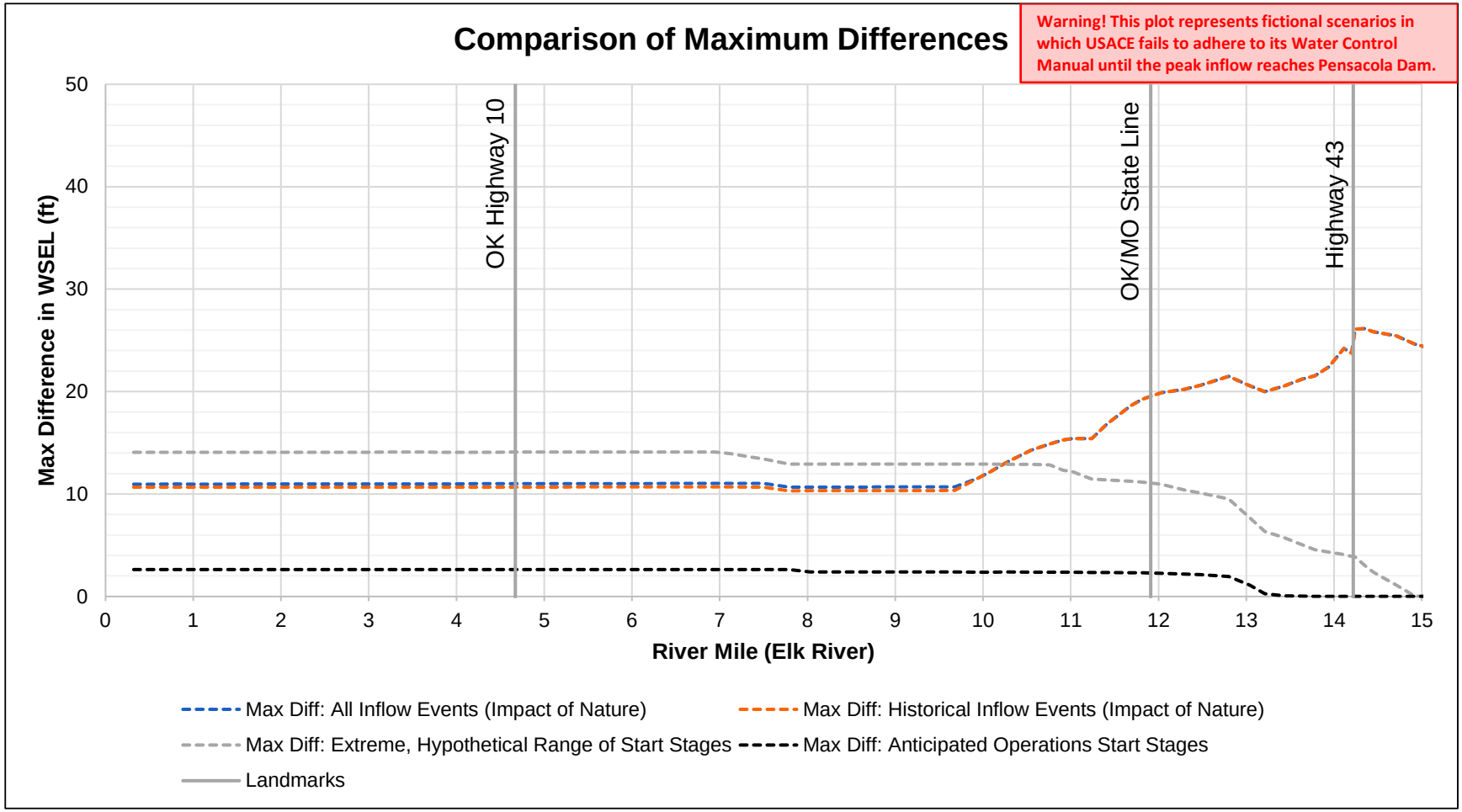


Figure C.78. Comparison of maximum water surface elevation differences along the Elk River profile (1 of 2).

Notes: *1. The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*

2. The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.

3. The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.

4. The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.

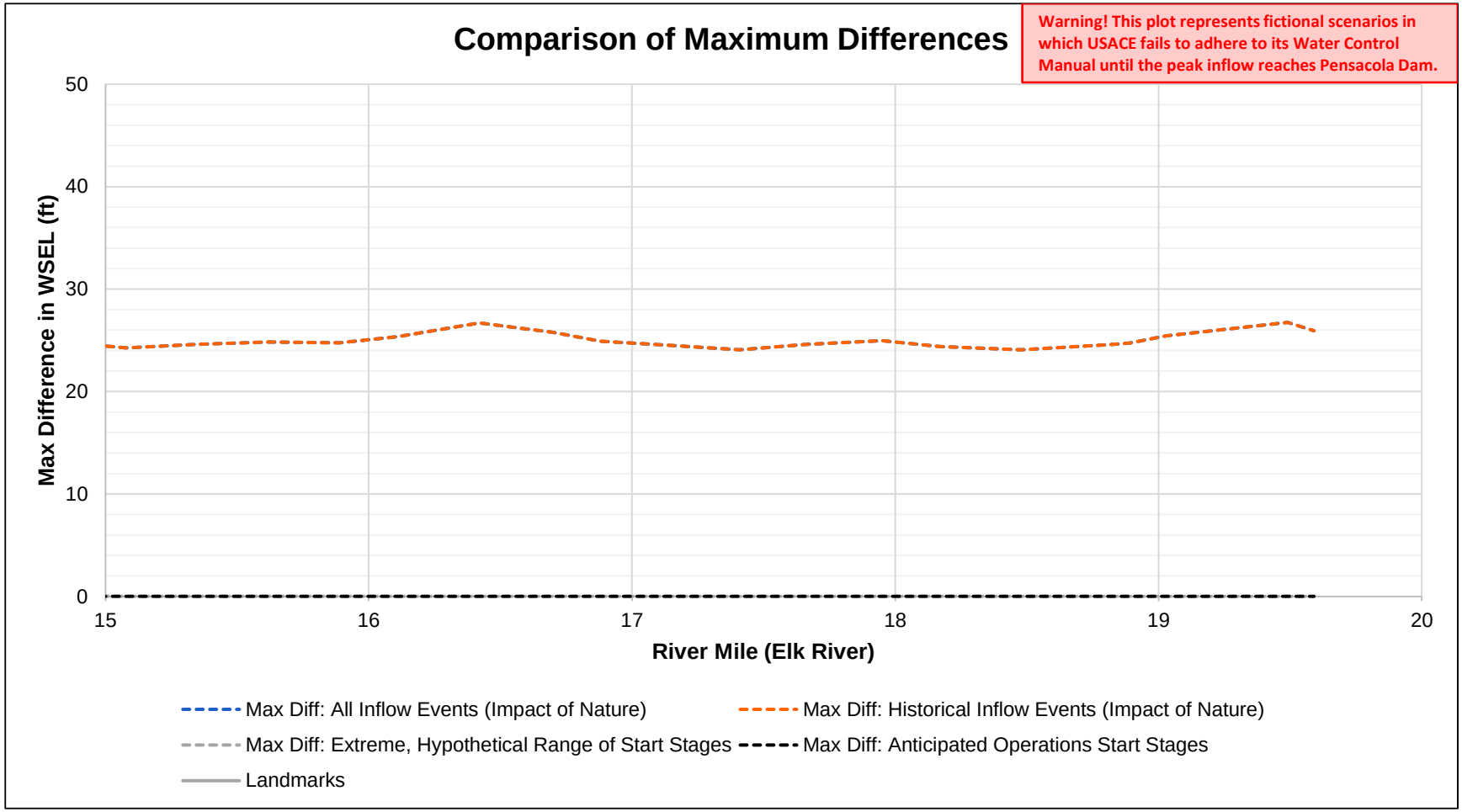


Figure C.79. Comparison of maximum water surface elevation differences along the Elk River profile (2 of 2).

Notes: *1. The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*
2. The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.
3. The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.
4. The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.

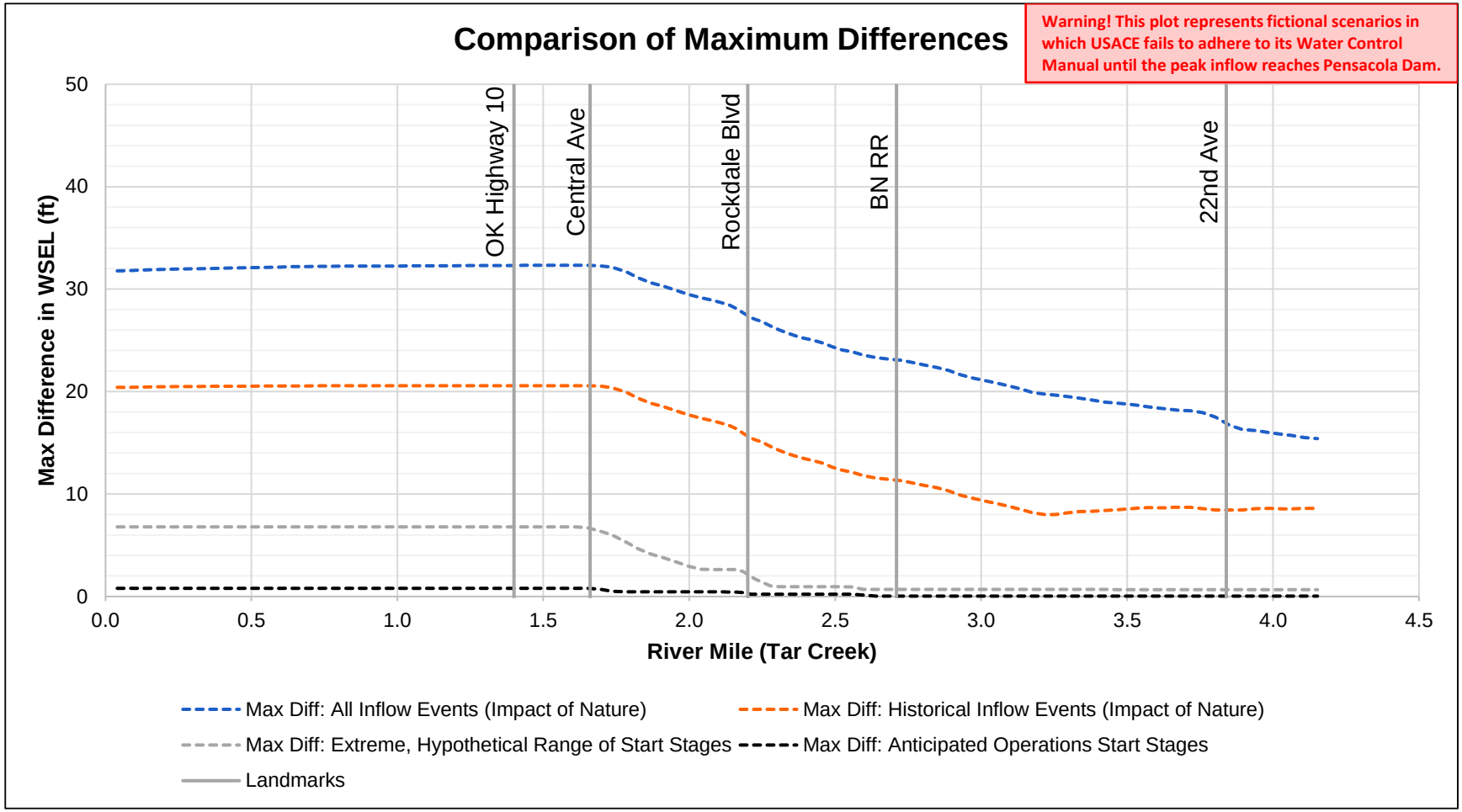


Figure C.80. Comparison of maximum water surface elevation differences along the Tar Creek profile (1 of 1).

Notes: 1. *The blue dotted line "Max Diff: All Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all inflow events (including the 100-year inflow event).*

2. *The orange dashed line "Max Diff: Historical Inflow Events (Impact of Nature)" plots the maximum difference in WSEL for all historical inflow events.*

3. *The grey dashed line "Max Diff: Extreme, Hypothetical Range of Start Stages" plots the maximum difference in WSEL for simulations with all FERC-required starting elevations, including extreme, hypothetical values (734 to 757 feet PD) outside GRDA's anticipated operational range.*

4. *The black dashed line "Max Diff: Anticipated Operations Start Stages" plots the maximum difference in WSEL for simulations with starting stages within GRDA's anticipated operational range.*

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX D
DURATION OF INUNDATION

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX D.1
SEPTEMBER 1993 (21 YEAR) INFLOW EVENT
DURATION OF INUNDATION

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.1**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - SEP 1993 (21 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
152.175	Upstream end of model												
152.175	137	137	137	137	137	137	137	137	137	137	137	0	0
151.000	117	117	117	117	117	117	117	117	117	117	117	0	0
150.000	144	145	145	145	145	145	145	145	145	144	144	0	1
149.000	142	142	142	142	142	142	142	142	142	142	142	0	0
148.000	143	144	144	144	144	144	144	144	144	143	143	0	1
147.000	138	138	138	138	138	138	138	138	138	138	138	0	0
145.500	154	155	155	155	155	155	155	155	154	154	155	0	1
145.480	E 60 Road Bridge												
145.400	153	153	153	154	154	153	153	153	154	154	154	1	1
144.000	159	160	160	160	160	160	160	160	160	160	161	0	2
143.000	152	153	153	153	153	153	153	153	153	153	154	0	2
142.000	170	172	172	172	172	172	171	171	171	171	172	1	2
141.000	168	169	169	169	169	169	169	169	169	170	170	0	2
140.000	162	164	164	164	164	163	163	164	165	166	167	1	5
139.000	148	150	150	150	150	150	151	151	152	155	156	1	8
138.000	142	145	145	145	145	145	145	144	146	150	151	1	9
137.000	135	138	138	138	138	138	139	138	140	144	145	1	10
135.950	133	135	135	135	136	136	136	136	137	142	143	1	10
135.941	Highway 69 Bridge												
135.940	133	135	135	135	135	136	136	135	137	142	143	1	10
135.590	132	135	135	135	135	135	135	135	137	142	143	0	11
135.586	BN RR Bridge												
135.580	132	135	135	135	135	135	135	135	137	142	143	0	11
135.470	131	135	135	135	135	135	134	134	137	141	141	1	10
135.460	Highway 125 Bridge												
135.440	132	135	135	135	135	135	134	135	137	141	142	1	10
135.000	131	135	135	135	135	135	134	134	137	140	141	1	10

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.1**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - SEP 1993 (21 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
134.610	130	133	133	133	133	133	133	133	135	140	141	0	11
134.599	Abandonded RR Bridge												
134.595	129	132	132	132	133	133	132	132	134	138	140	1	11
134.000	127	130	130	130	130	129	129	129	131	136	137	1	10
133.973	Tar Creek												
133.900	125	128	128	128	129	129	128	128	130	134	135	1	10
133.800	Interstate 44 Bridge												
133.700	125	128	128	128	128	128	128	128	129	133	135	0	10
133.000	120	124	124	124	124	123	123	123	124	127	128	1	8
132.000	115	119	119	119	119	119	119	118	120	121	121	1	6
131.000	110	115	115	115	115	115	115	114	115	116	114	1	6
130.000	104	113	113	113	113	112	111	110	112	110	106	3	9
129.000	96	109	109	109	109	108	107	105	106	101	97	4	13
128.000	84	102	103	103	103	102	99	97	97	94	89	6	19
126.710	45	82	83	83	84	83	82	81	82	80	75	3	39
126.700	S 590 Road Bridge												
126.670	44	82	82	82	83	82	81	80	82	79	74	3	39
126.000	37	76	76	76	77	76	76	75	77	75	70	2	40
125.000	28	35	42	47	52	58	61	63	66	65	61	28	38
124.000	23	25	25	26	27	29	43	47	52	55	56	22	33
123.000	21	22	22	22	23	24	25	25	42	48	50	3	29
122.580	20	21	21	21	21	23	23	23	36	44	47	2	27
122.570	Highway 60 Bridge												
122.550	20	21	21	21	21	21	23	23	36	44	47	2	27
122.350	Spring River												
122.000	13	13	13	13	14	15	15	15	22	40	43	2	30
121.980	10	10	11	11	11	11	12	12	18	37	42	2	32
121.970	BN RR Bridge												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.1**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - SEP 1993 (21 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)		
121.960	0	0	0	0	0	0	0	0	0	9	23	0	23
120.000	0	0	0	0	0	0	0	0	0	0	15	0	15
118.000	0	0	0	0	0	0	0	0	0	0	0	0	0
116.000	0	0	0	0	0	0	0	0	0	0	0	0	0
114.000	0	0	0	0	0	0	0	0	0	0	0	0	0
112.000	0	0	0	0	0	0	0	0	0	0	0	0	0
110.000	0	0	0	0	0	0	0	0	0	0	0	0	0
108.000	0	0	0	0	0	0	0	0	0	0	0	0	0
106.000	0	0	0	0	0	0	0	0	0	0	0	0	0
105.350	Elk River												
105.000	0	0	0	0	0	0	0	0	0	0	0	0	0
104.000	0	0	0	0	0	0	0	0	0	0	0	0	0
102.000	0	0	0	0	0	0	0	0	0	0	0	0	0
101.750	0	0	0	0	0	0	0	0	0	0	0	0	0
101.730	Highway 59 (Sailboat Bridge)												
101.710	0	0	0	0	0	0	0	0	0	0	0	0	0
100.000	0	0	0	0	0	0	0	0	0	0	0	0	0
90.000	0	0	0	0	0	0	0	0	0	0	0	0	0
80.000	0	0	0	0	0	0	0	0	0	0	0	0	0
78.000	0	0	0	0	0	0	0	0	0	0	0	0	0
77.000	Pensacola Dam												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.2**

GRAND RIVER DAM AUTHORITY SPRING RIVER DURATIONS - SEP 1993 (21 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
21.000	Upstream end of model												
21.000	54	54	54	54	54	54	54	54	54	54	54	0	0
20.000	52	52	52	52	52	52	52	52	52	52	52	0	0
19.000	70	70	70	70	70	70	70	70	70	70	70	0	0
18.000	70	70	70	70	70	70	70	70	70	70	70	0	0
17.000	72	72	72	72	72	72	72	72	72	72	72	0	0
16.000	79	79	79	79	79	79	79	79	79	79	79	0	0
15.000	74	75	75	75	75	75	75	75	75	75	75	0	1
14.170	92	92	92	92	92	92	92	92	92	92	92	0	0
14.160	E 57 Road												
14.120	93	93	93	93	93	93	93	93	93	93	94	0	1
13.510	93	93	93	93	93	93	93	93	93	94	94	0	1
13.500	Interstate 44 Bridge												
13.450	92	92	93	93	93	93	93	93	93	93	92	1	1
12.000	92	93	93	93	93	93	93	93	93	93	94	0	2
11.000	107	112	112	112	112	112	112	112	112	111	110	0	5
10.000	101	107	107	108	108	108	108	107	107	107	105	1	7
9.000	92	99	99	99	99	99	99	100	100	101	100	1	9
8.020	82	91	91	91	91	92	92	92	92	93	91	1	11
8.010	OK Highway 10 Bridge												
7.970	70	77	77	78	79	80	81	81	82	82	81	4	12
7.000	59	63	64	65	66	67	68	69	71	72	71	6	13
6.000	53	56	57	57	58	60	61	63	64	66	65	7	13
5.000	46	48	49	50	51	53	54	55	58	61	61	7	15
4.000	43	46	46	46	48	49	51	52	54	58	58	6	15
3.000	40	41	41	42	42	44	45	48	51	54	56	7	16
2.000	33	36	38	38	39	39	40	41	49	52	53	5	20
1.000	28	30	30	30	31	32	33	36	44	49	51	6	23
0.580	16	18	18	18	19	19	19	20	33	43	46	2	30
0.570	Highway 60 Bridge												
0.560	13	15	15	15	15	15	16	16	26	41	45	1	32
0.460	18	18	19	19	19	19	21	21	35	44	46	3	28
0.000	Downstream end of Spring River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.3**

GRAND RIVER DAM AUTHORITY ELK RIVER DURATIONS - SEP 1993 (21 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
19.590	Upstream end of model												
19.590	10	10	10	10	10	10	10	10	10	10	10	0	0
19.000	0	0	0	0	0	0	0	0	0	0	0	0	0
18.000	7	7	7	7	7	7	7	7	7	7	7	0	0
17.000	56	56	56	56	56	56	56	56	56	56	56	0	0
16.000	61	62	62	62	62	62	62	62	62	62	62	0	1
15.000	48	48	48	48	48	48	48	48	48	49	49	0	1
14.240	18	18	18	18	18	18	18	18	19	19	19	0	1
14.220	Highway 43 Bridge												
14.200	18	18	18	18	18	18	18	18	18	18	18	0	0
14.000	12	12	12	12	12	12	12	12	12	12	12	0	0
13.000	14	14	14	14	14	14	14	14	14	15	17	0	3
12.000	0	0	0	0	0	0	0	0	0	0	0	0	0
11.910	OK/MO State Line												
11.000	0	0	0	0	0	0	0	0	0	0	0	0	0
10.000	0	0	0	0	0	0	0	0	0	0	0	0	0
9.000	0	0	0	0	0	0	0	0	0	0	0	0	0
8.000	0	0	0	0	0	0	0	0	0	0	0	0	0
7.000	0	0	0	0	0	0	0	0	0	0	0	0	0
6.000	0	0	0	0	0	0	0	0	0	0	0	0	0
5.000	0	0	0	0	0	0	0	0	0	0	0	0	0
4.700	0	0	0	0	0	0	0	0	0	0	0	0	0
4.670	OK Highway 10 Bridge												
4.640	0	0	0	0	0	0	0	0	0	0	0	0	0
4.000	0	0	0	0	0	0	0	0	0	0	0	0	0
3.000	0	0	0	0	0	0	0	0	0	0	0	0	0
2.000	0	0	0	0	0	0	0	0	0	0	0	0	0
1.000	0	0	0	0	0	0	0	0	0	0	0	0	0
0.320	0	0	0	0	0	0	0	0	0	0	0	0	0
0.000	Downstream end of Elk River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.4**

GRAND RIVER DAM AUTHORITY TAR CREEK DURATIONS - SEP 1993 (21 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
4.152	Upstream end of model												
4.152	25	25	25	25	25	25	25	25	25	25	25	0	0
3.900	32	32	32	32	32	32	32	32	32	32	32	0	0
3.840	22nd Ave Bridge												
3.800	36	36	36	36	36	36	36	36	36	36	36	0	0
3.300	28	28	28	28	28	28	28	28	29	29	29	0	1
2.800	20	20	20	20	20	20	20	20	20	81	82	0	62
2.710	BN RR Bridge												
2.700	126	132	133	133	133	132	132	131	131	129	126	2	7
2.500	136	141	141	141	142	141	141	140	140	137	134	2	8
2.300	140	144	144	144	145	144	144	143	143	141	139	2	6
2.200	Rockdale Blvd Bridge												
2.100	156	159	159	159	159	158	158	158	157	157	156	1	3
1.900	142	146	146	146	146	145	145	145	145	146	146	1	4
1.700	128	132	132	132	132	131	131	132	135	143	143	1	15
1.660	Central Ave Bridge												
1.600	127	131	131	131	131	130	130	131	133	141	142	1	15
1.500	127	131	131	131	131	130	130	130	133	141	141	1	14
1.400	OK Highway 10 Bridge												
1.300	127	130	130	130	130	129	130	130	131	138	139	1	12
1.000	127	130	130	130	130	129	129	130	131	137	138	1	11
0.700	127	129	130	130	130	129	129	130	131	137	138	1	11
0.300	127	129	130	130	130	129	129	129	131	136	138	1	11
0.041	126	129	129	129	130	129	129	129	131	136	136	1	10
0.000	Downstream end of Tar Creek												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX D.2
JUNE 2004 (1 YEAR) INFLOW EVENT
DURATION OF INUNDATION

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.5**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - JUN 2004 (1 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)		
152.175	Upstream end of model												
152.175	0	0	0	0	0	0	0	0	0	0	0	0	0
151.000	0	0	0	0	0	0	0	0	0	0	0	0	0
150.000	0	0	0	0	0	0	0	0	0	0	0	0	0
149.000	0	0	0	0	0	0	0	0	0	0	0	0	0
148.000	0	0	0	0	0	0	0	0	0	0	0	0	0
147.000	0	0	0	0	0	0	0	0	0	0	0	0	0
145.500	0	0	0	0	0	0	0	0	0	3	8	0	8
145.480	E 60 Road Bridge												
145.400	0	0	0	0	0	0	0	0	0	0	0	0	0
144.000	17	18	18	18	18	19	20	20	23	29	31	2	14
143.000	0	0	0	0	0	0	0	0	0	0	0	0	0
142.000	42	42	42	42	42	43	43	43	46	51	53	1	11
141.000	31	32	33	33	33	34	34	34	39	46	50	2	19
140.000	0	0	0	0	0	0	0	0	18	35	43	0	43
139.000	0	0	0	0	0	0	0	0	0	0	0	0	0
138.000	0	0	0	0	0	0	0	0	0	0	0	0	0
137.000	0	0	0	0	0	0	0	0	0	0	0	0	0
135.950	0	0	0	0	0	0	0	0	0	0	0	0	0
135.941	Highway 69 Bridge												
135.940	0	0	0	0	0	0	0	0	0	0	0	0	0
135.590	0	0	0	0	0	0	0	0	0	0	0	0	0
135.586	BN RR Bridge												
135.580	0	0	0	0	0	0	0	0	0	0	0	0	0
135.470	0	0	0	0	0	0	0	0	0	0	0	0	0
135.460	Highway 125 Bridge												
135.440	0	0	0	0	0	0	0	0	0	0	0	0	0
135.000	0	0	0	0	0	0	0	0	0	0	0	0	0

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.5**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - JUN 2004 (1 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)		
134.610	0	0	0	0	0	0	0	0	0	0	0	0	0
134.599	Abandonded RR Bridge												
134.595	0	0	0	0	0	0	0	0	0	0	0	0	0
134.000	0	0	0	0	0	0	0	0	0	0	0	0	0
133.973	Tar Creek												
133.900	0	0	0	0	0	0	0	0	0	0	0	0	0
133.800	Interstate 44 Bridge												
133.700	0	0	0	0	0	0	0	0	0	0	0	0	0
133.000	0	0	0	0	0	0	0	0	0	0	0	0	0
132.000	0	0	0	0	0	0	0	0	0	0	0	0	0
131.000	0	0	0	0	0	0	0	0	0	0	0	0	0
130.000	0	0	0	0	0	0	0	0	0	0	0	0	0
129.000	0	0	0	0	0	0	0	0	0	0	0	0	0
128.000	0	0	0	0	0	0	0	0	0	0	0	0	0
126.710	0	0	0	0	0	0	0	0	0	0	0	0	0
126.700	S 590 Road Bridge												
126.670	0	0	0	0	0	0	0	0	0	0	0	0	0
126.000	0	0	0	0	0	0	0	0	0	0	0	0	0
125.000	0	0	0	0	0	0	0	0	0	0	0	0	0
124.000	0	0	0	0	0	0	0	0	0	0	0	0	0
123.000	0	0	0	0	0	0	0	0	0	0	0	0	0
122.580	0	0	0	0	0	0	0	0	0	0	0	0	0
122.570	Highway 60 Bridge												
122.550	0	0	0	0	0	0	0	0	0	0	0	0	0
122.350	Spring River												
122.000	0	0	0	0	0	0	0	0	0	0	0	0	0
121.980	0	0	0	0	0	0	0	0	0	0	0	0	0
121.970	BN RR Bridge												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.5**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - JUN 2004 (1 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)		
121.960	0	0	0	0	0	0	0	0	0	0	0	0	0
120.000	0	0	0	0	0	0	0	0	0	0	0	0	0
118.000	0	0	0	0	0	0	0	0	0	0	0	0	0
116.000	0	0	0	0	0	0	0	0	0	0	0	0	0
114.000	0	0	0	0	0	0	0	0	0	0	0	0	0
112.000	0	0	0	0	0	0	0	0	0	0	0	0	0
110.000	0	0	0	0	0	0	0	0	0	0	0	0	0
108.000	0	0	0	0	0	0	0	0	0	0	0	0	0
106.000	0	0	0	0	0	0	0	0	0	0	0	0	0
105.350	Elk River												
105.000	0	0	0	0	0	0	0	0	0	0	0	0	0
104.000	0	0	0	0	0	0	0	0	0	0	0	0	0
102.000	0	0	0	0	0	0	0	0	0	0	0	0	0
101.750	0	0	0	0	0	0	0	0	0	0	0	0	0
101.730	Highway 59 (Sailboat Bridge)												
101.710	0	0	0	0	0	0	0	0	0	0	0	0	0
100.000	0	0	0	0	0	0	0	0	0	0	0	0	0
90.000	0	0	0	0	0	0	0	0	0	0	0	0	0
80.000	0	0	0	0	0	0	0	0	0	0	0	0	0
78.000	0	0	0	0	0	0	0	0	0	0	0	0	0
77.000	Pensacola Dam												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.6**

GRAND RIVER DAM AUTHORITY SPRING RIVER DURATIONS - JUN 2004 (1 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
21.000	Upstream end of model												
21.000	0	0	0	0	0	0	0	0	0	0	0	0	0
20.000	0	0	0	0	0	0	0	0	0	0	0	0	0
19.000	0	0	0	0	0	0	0	0	0	0	0	0	0
18.000	0	0	0	0	0	0	0	0	0	0	0	0	0
17.000	0	0	0	0	0	0	0	0	0	0	0	0	0
16.000	0	0	0	0	0	0	0	0	0	0	0	0	0
15.000	0	0	0	0	0	0	0	0	0	0	0	0	0
14.170	0	0	0	0	0	0	0	0	0	0	0	0	0
14.160	E 57 Road												
14.120	0	0	0	0	0	0	0	0	0	0	0	0	0
13.510	0	0	0	0	0	0	0	0	0	0	0	0	0
13.500	Interstate 44 Bridge												
13.450	0	0	0	0	0	0	0	0	0	0	0	0	0
12.000	0	0	0	0	0	0	0	0	0	0	0	0	0
11.000	0	0	0	0	0	0	0	0	0	0	0	0	0
10.000	0	0	0	0	0	0	0	0	0	0	0	0	0
9.000	0	0	0	0	0	0	0	0	0	0	0	0	0
8.020	0	0	0	0	0	0	0	0	0	0	0	0	0
8.010	OK Highway 10 Bridge												
7.970	0	0	0	0	0	0	0	0	0	0	0	0	0
7.000	0	0	0	0	0	0	0	0	0	0	0	0	0
6.000	0	0	0	0	0	0	0	0	0	0	0	0	0
5.000	0	0	0	0	0	0	0	0	0	0	0	0	0
4.000	0	0	0	0	0	0	0	0	0	0	0	0	0
3.000	0	0	0	0	0	0	0	0	0	0	0	0	0
2.000	0	0	0	0	0	0	0	0	0	0	0	0	0
1.000	0	0	0	0	0	0	0	0	0	0	0	0	0
0.580	0	0	0	0	0	0	0	0	0	0	0	0	0
0.570	Highway 60 Bridge												
0.560	0	0	0	0	0	0	0	0	0	0	0	0	0
0.460	0	0	0	0	0	0	0	0	0	0	0	0	0
0.000	Downstream end of Spring River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.7**

GRAND RIVER DAM AUTHORITY ELK RIVER DURATIONS - JUN 2004 (1 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
19.590	Upstream end of model												
19.590	0	0	0	0	0	0	0	0	0	0	0	0	0
19.000	0	0	0	0	0	0	0	0	0	0	0	0	0
18.000	0	0	0	0	0	0	0	0	0	0	0	0	0
17.000	0	0	0	0	0	0	0	0	0	0	0	0	0
16.000	0	0	0	0	0	0	0	0	0	0	0	0	0
15.000	0	0	0	0	0	0	0	0	0	0	0	0	0
14.240	0	0	0	0	0	0	0	0	0	0	0	0	0
14.220	Highway 43 Bridge												
14.200	0	0	0	0	0	0	0	0	0	0	0	0	0
14.000	0	0	0	0	0	0	0	0	0	0	0	0	0
13.000	0	0	0	0	0	0	0	0	0	0	0	0	0
12.000	0	0	0	0	0	0	0	0	0	0	0	0	0
11.910	OK/MO State Line												
11.000	0	0	0	0	0	0	0	0	0	0	0	0	0
10.000	0	0	0	0	0	0	0	0	0	0	0	0	0
9.000	0	0	0	0	0	0	0	0	0	0	0	0	0
8.000	0	0	0	0	0	0	0	0	0	0	0	0	0
7.000	0	0	0	0	0	0	0	0	0	0	0	0	0
6.000	0	0	0	0	0	0	0	0	0	0	0	0	0
5.000	0	0	0	0	0	0	0	0	0	0	0	0	0
4.700	0	0	0	0	0	0	0	0	0	0	0	0	0
4.670	OK Highway 10 Bridge												
4.640	0	0	0	0	0	0	0	0	0	0	0	0	0
4.000	0	0	0	0	0	0	0	0	0	0	0	0	0
3.000	0	0	0	0	0	0	0	0	0	0	0	0	0
2.000	0	0	0	0	0	0	0	0	0	0	0	0	0
1.000	0	0	0	0	0	0	0	0	0	0	0	0	0
0.320	0	0	0	0	0	0	0	0	0	0	0	0	0
0.000	Downstream end of Elk River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.8**

GRAND RIVER DAM AUTHORITY TAR CREEK DURATIONS - JUN 2004 (1 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
4.152	Upstream end of model												
4.152	0	0	0	0	0	0	0	0	0	0	0	0	0
3.900	0	0	0	0	0	0	0	0	0	0	0	0	0
3.840	22nd Ave Bridge												
3.800	0	0	0	0	0	0	0	0	0	0	0	0	0
3.300	0	0	0	0	0	0	0	0	0	0	0	0	0
2.800	0	0	0	0	0	0	0	0	0	0	0	0	0
2.710	BN RR Bridge												
2.700	0	0	0	0	0	0	0	0	0	0	0	0	0
2.500	0	0	0	0	0	0	0	0	0	0	0	0	0
2.300	0	0	0	0	0	0	0	0	0	0	0	0	0
2.200	Rockdale Blvd Bridge												
2.100	0	0	0	0	0	0	0	0	0	0	0	0	0
1.900	0	0	0	0	0	0	0	0	0	0	0	0	0
1.700	0	0	0	0	0	0	0	0	0	0	0	0	0
1.660	Central Ave Bridge												
1.600	0	0	0	0	0	0	0	0	0	0	0	0	0
1.500	0	0	0	0	0	0	0	0	0	0	0	0	0
1.400	OK Highway 10 Bridge												
1.300	0	0	0	0	0	0	0	0	0	0	0	0	0
1.000	0	0	0	0	0	0	0	0	0	0	0	0	0
0.700	0	0	0	0	0	0	0	0	0	0	0	0	0
0.300	0	0	0	0	0	0	0	0	0	0	0	0	0
0.041	0	0	0	0	0	0	0	0	0	0	0	0	0
0.000	Downstream end of Tar Creek												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX D.3
JULY 2007 (4 YEAR) INFLOW EVENT
DURATION OF INUNDATION

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.9**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - JUL 2007 (4 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
152.175	Upstream end of model												
152.175	193	193	193	193	193	193	193	193	193	193	193	0	0
151.000	143	143	143	143	143	143	143	143	143	143	143	0	0
150.000	213	213	213	213	213	213	213	213	213	213	214	0	1
149.000	207	207	207	207	207	207	207	207	208	209	209	0	2
148.000	208	208	208	208	208	208	208	209	210	211	211	1	3
147.000	192	192	192	192	192	192	192	192	193	193	192	0	1
145.500	227	227	227	227	227	227	227	227	229	230	229	0	3
145.480	E 60 Road Bridge												
145.400	226	227	227	227	227	227	227	227	227	229	229	0	3
144.000	235	235	235	236	236	236	236	236	236	239	238	1	4
143.000	220	221	221	221	221	221	221	222	223	226	226	1	6
142.000	250	251	251	251	251	251	251	251	253	256	257	0	7
141.000	246	247	247	247	247	247	247	247	249	252	252	0	6
140.000	235	236	236	236	236	236	237	238	240	246	246	2	11
139.000	202	204	204	204	204	205	205	207	212	227	227	3	25
138.000	184	185	185	186	186	186	187	188	196	213	215	3	31
137.000	166	168	168	169	169	169	169	170	175	189	200	2	34
135.950	161	162	162	162	162	163	164	164	168	181	195	2	34
135.941	Highway 69 Bridge												
135.940	160	161	161	161	162	163	163	163	168	181	195	2	35
135.590	159	161	161	161	161	161	163	163	167	180	193	2	34
135.586	BN RR Bridge												
135.580	159	161	161	161	161	161	163	163	167	180	193	2	34
135.470	158	160	160	160	160	161	161	162	167	178	192	2	34
135.460	Highway 125 Bridge												
135.440	158	160	160	161	161	161	161	162	167	178	193	2	35
135.000	157	158	159	160	160	160	160	161	165	177	192	3	35

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.9**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - JUL 2007 (4 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
134.610	154	156	156	156	157	157	157	158	163	174	189	2	35
134.599	Abandonded RR Bridge												
134.595	152	153	154	154	154	155	156	156	160	172	188	3	36
134.000	145	146	146	146	147	148	148	148	154	165	181	2	36
133.973	Tar Creek												
133.900	142	143	143	143	144	145	145	145	150	162	178	2	36
133.800	Interstate 44 Bridge												
133.700	142	143	143	143	143	144	144	144	149	161	177	1	35
133.000	134	134	134	134	134	135	136	136	139	146	166	2	32
132.000	127	127	128	128	128	129	129	129	132	137	155	2	28
131.000	121	121	122	122	122	123	123	123	126	131	135	2	14
130.000	112	114	114	114	115	116	116	117	121	126	127	3	15
129.000	102	102	102	103	103	105	106	107	113	121	117	5	19
128.000	91	92	93	93	94	94	95	96	104	112	107	4	21
126.710	67	68	69	69	71	72	72	73	85	94	89	5	27
126.700	S 590 Road Bridge												
126.670	65	68	68	69	69	70	71	72	83	93	89	4	28
126.000	55	59	59	60	61	61	63	64	76	87	83	5	32
125.000	24	29	29	30	31	34	35	38	55	73	70	9	49
124.000	0	0	0	0	0	0	0	0	0	52	53	0	53
123.000	0	0	0	0	0	0	0	0	0	0	26	0	26
122.580	0	0	0	0	0	0	0	0	0	0	3	0	3
122.570	Highway 60 Bridge												
122.550	0	0	0	0	0	0	0	0	0	0	4	0	4
122.350	Spring River												
122.000	0	0	0	0	0	0	0	0	0	0	0	0	0
121.980	0	0	0	0	0	0	0	0	0	0	0	0	0
121.970	BN RR Bridge												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.9**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - JUL 2007 (4 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
121.960	0	0	0	0	0	0	0	0	0	0	0	0	0
120.000	0	0	0	0	0	0	0	0	0	0	0	0	0
118.000	0	0	0	0	0	0	0	0	0	0	0	0	0
116.000	0	0	0	0	0	0	0	0	0	0	0	0	0
114.000	0	0	0	0	0	0	0	0	0	0	0	0	0
112.000	0	0	0	0	0	0	0	0	0	0	0	0	0
110.000	0	0	0	0	0	0	0	0	0	0	0	0	0
108.000	0	0	0	0	0	0	0	0	0	0	0	0	0
106.000	0	0	0	0	0	0	0	0	0	0	0	0	0
105.350	Elk River												
105.000	0	0	0	0	0	0	0	0	0	0	0	0	0
104.000	0	0	0	0	0	0	0	0	0	0	0	0	0
102.000	0	0	0	0	0	0	0	0	0	0	0	0	0
101.750	0	0	0	0	0	0	0	0	0	0	0	0	0
101.730	Highway 59 (Sailboat Bridge)												
101.710	0	0	0	0	0	0	0	0	0	0	0	0	0
100.000	0	0	0	0	0	0	0	0	0	0	0	0	0
90.000	0	0	0	0	0	0	0	0	0	0	0	0	0
80.000	0	0	0	0	0	0	0	0	0	0	0	0	0
78.000	0	0	0	0	0	0	0	0	0	0	0	0	0
77.000	Pensacola Dam												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.10**

GRAND RIVER DAM AUTHORITY SPRING RIVER DURATIONS - JUL 2007 (4 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
21.000	Upstream end of model												
21.000	0	0	0	0	0	0	0	0	0	0	0	0	0
20.000	0	0	0	0	0	0	0	0	0	0	0	0	0
19.000	0	0	0	0	0	0	0	0	0	0	0	0	0
18.000	0	0	0	0	0	0	0	0	0	0	0	0	0
17.000	0	0	0	0	0	0	0	0	0	0	0	0	0
16.000	0	0	0	0	0	0	0	0	0	0	0	0	0
15.000	0	0	0	0	0	0	0	0	0	0	0	0	0
14.170	0	0	0	0	0	0	0	0	0	0	0	0	0
14.160	E 57 Road												
14.120	0	0	0	0	0	0	0	0	0	0	0	0	0
13.510	0	0	0	0	0	0	0	0	0	0	0	0	0
13.500	Interstate 44 Bridge												
13.450	0	0	0	0	0	0	0	0	0	0	0	0	0
12.000	0	0	0	0	0	0	0	0	0	0	0	0	0
11.000	37	38	38	38	38	38	38	38	42	64	93	0	56
10.000	0	0	0	0	0	0	0	0	0	46	86	0	86
9.000	0	0	0	0	0	0	0	0	0	11	80	0	80
8.020	0	0	0	0	0	0	0	0	0	0	74	0	74
8.010	OK Highway 10 Bridge												
7.970	0	0	0	0	0	0	0	0	0	0	15	0	15
7.000	0	0	0	0	0	0	0	0	0	0	13	0	13
6.000	0	0	0	0	0	0	0	0	0	0	11	0	11
5.000	0	0	0	0	0	0	0	0	0	0	10	0	10
4.000	0	0	0	0	0	0	0	0	0	0	9	0	9
3.000	0	0	0	0	0	0	0	0	0	0	9	0	9
2.000	0	0	0	0	0	0	0	0	0	0	9	0	9
1.000	0	0	0	0	0	0	0	0	0	0	9	0	9
0.580	0	0	0	0	0	0	0	0	0	0	8	0	8
0.570	Highway 60 Bridge												
0.560	0	0	0	0	0	0	0	0	0	0	7	0	7
0.460	0	0	0	0	0	0	0	0	0	0	7	0	7
0.000	Downstream end of Spring River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.11**

GRAND RIVER DAM AUTHORITY ELK RIVER DURATIONS - JUL 2007 (4 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
19.590	Upstream end of model												
19.590	0	0	0	0	0	0	0	0	0	0	0	0	0
19.000	0	0	0	0	0	0	0	0	0	0	0	0	0
18.000	0	0	0	0	0	0	0	0	0	0	0	0	0
17.000	0	0	0	0	0	0	0	0	0	0	0	0	0
16.000	0	0	0	0	0	0	0	0	0	0	0	0	0
15.000	0	0	0	0	0	0	0	0	0	0	0	0	0
14.240	0	0	0	0	0	0	0	0	0	0	0	0	0
14.220	Highway 43 Bridge												
14.200	0	0	0	0	0	0	0	0	0	0	0	0	0
14.000	0	0	0	0	0	0	0	0	0	0	0	0	0
13.000	0	0	0	0	0	0	0	0	0	0	0	0	0
12.000	0	0	0	0	0	0	0	0	0	0	0	0	0
11.910	OK/MO State Line												
11.000	0	0	0	0	0	0	0	0	0	0	0	0	0
10.000	0	0	0	0	0	0	0	0	0	0	0	0	0
9.000	0	0	0	0	0	0	0	0	0	0	0	0	0
8.000	0	0	0	0	0	0	0	0	0	0	0	0	0
7.000	0	0	0	0	0	0	0	0	0	0	0	0	0
6.000	0	0	0	0	0	0	0	0	0	0	0	0	0
5.000	0	0	0	0	0	0	0	0	0	0	0	0	0
4.700	0	0	0	0	0	0	0	0	0	0	0	0	0
4.670	OK Highway 10 Bridge												
4.640	0	0	0	0	0	0	0	0	0	0	0	0	0
4.000	0	0	0	0	0	0	0	0	0	0	0	0	0
3.000	0	0	0	0	0	0	0	0	0	0	0	0	0
2.000	0	0	0	0	0	0	0	0	0	0	0	0	0
1.000	0	0	0	0	0	0	0	0	0	0	0	0	0
0.320	0	0	0	0	0	0	0	0	0	0	0	0	0
0.000	Downstream end of Elk River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.12**

GRAND RIVER DAM AUTHORITY TAR CREEK DURATIONS - JUL 2007 (4 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
4.152	Upstream end of model												
4.152	0	0	0	0	0	0	0	0	0	0	0	0	0
3.900	0	0	0	0	0	0	0	0	0	0	0	0	0
3.840	22nd Ave Bridge												
3.800	30	30	30	30	30	30	30	30	33	39	42	0	12
3.300	43	44	44	44	45	45	45	45	47	51	53	1	10
2.800	78	78	78	78	78	79	79	79	81	84	85	1	7
2.710	BN RR Bridge												
2.700	105	106	106	106	106	106	107	107	109	112	111	1	7
2.500	114	114	114	115	115	115	115	116	119	122	122	2	8
2.300	123	123	123	124	124	124	124	125	127	130	133	2	10
2.200	Rockdale Blvd Bridge												
2.100	144	145	145	146	146	147	147	147	152	164	181	2	37
1.900	144	145	145	146	146	147	147	147	152	164	181	2	37
1.700	144	145	145	146	146	147	147	147	152	164	181	2	37
1.660	Central Ave Bridge												
1.600	144	145	145	146	146	147	147	147	152	164	181	2	37
1.500	144	145	145	146	146	147	147	147	152	164	181	2	37
1.400	OK Highway 10 Bridge												
1.300	144	145	145	146	146	147	147	147	152	164	181	2	37
1.000	144	145	145	146	146	147	147	147	152	164	181	2	37
0.700	144	145	145	146	146	147	147	147	152	164	181	2	37
0.300	144	145	145	146	146	147	147	147	152	164	181	2	37
0.041	144	145	145	146	146	147	147	147	152	164	181	2	37
0.000	Downstream end of Tar Creek												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX D.4
OCTOBER 2009 (3 YEAR) INFLOW EVENT
DURATION OF INUNDATION

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.13**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - OCT 2009 (3 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
152.175	Upstream end of model												
152.175	90	90	90	90	90	90	90	90	90	90	90	0	0
151.000	42	42	42	42	42	42	42	42	42	42	42	0	0
150.000	95	95	95	95	95	95	95	95	95	95	95	0	0
149.000	92	92	92	92	92	92	93	93	93	94	94	1	2
148.000	95	95	95	95	95	95	95	95	95	95	95	0	0
147.000	87	87	87	87	87	87	87	87	87	88	89	0	2
145.500	103	104	104	104	104	104	104	104	104	105	105	0	2
145.480	E 60 Road Bridge												
145.400	102	102	102	102	102	102	102	102	104	104	105	0	3
144.000	107	107	108	108	108	108	108	108	108	110	110	1	3
143.000	100	100	100	100	100	100	100	100	101	103	103	0	3
142.000	116	117	117	117	117	117	117	118	119	122	122	1	6
141.000	114	114	114	114	114	114	114	115	116	120	121	1	7
140.000	108	109	109	109	109	109	109	109	111	116	117	0	9
139.000	90	91	92	92	92	93	93	93	97	105	107	2	17
138.000	80	81	81	81	81	81	82	82	88	99	100	1	20
137.000	55	58	58	58	59	59	59	60	70	89	92	2	37
135.950	43	45	45	47	47	48	48	50	60	83	88	5	45
135.941	Highway 69 Bridge												
135.940	41	44	45	45	45	47	47	48	60	83	87	4	46
135.590	40	43	44	44	44	45	46	47	58	82	87	4	47
135.586	BN RR Bridge												
135.580	40	42	43	44	44	45	45	47	58	82	87	5	47
135.470	38	41	41	41	42	43	44	44	56	80	86	3	48
135.460	Highway 125 Bridge												
135.440	39	41	42	42	43	44	45	46	57	82	87	5	48
135.000	36	38	39	40	40	41	42	43	55	80	85	5	49

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.13**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - OCT 2009 (3 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
134.610	26	30	31	32	32	34	35	35	50	76	83	5	57
134.599	Abandonded RR Bridge												
134.595	19	24	24	26	27	28	29	31	46	74	82	7	63
134.000	0	0	0	0	0	0	0	0	28	65	73	0	73
133.973	Tar Creek												
133.900	0	0	0	0	0	0	0	0	14	60	70	0	70
133.800	Interstate 44 Bridge												
133.700	0	0	0	0	0	0	0	0	4	59	68	0	68
133.000	0	0	0	0	0	0	0	0	0	36	54	0	54
132.000	0	0	0	0	0	0	0	0	0	0	32	0	32
131.000	0	0	0	0	0	0	0	0	0	0	13	0	13
130.000	0	0	0	0	0	0	0	0	0	0	8	0	8
129.000	0	0	0	0	0	0	0	0	0	0	0	0	0
128.000	0	0	0	0	0	0	0	0	0	0	0	0	0
126.710	0	0	0	0	0	0	0	0	0	0	0	0	0
126.700	S 590 Road Bridge												
126.670	0	0	0	0	0	0	0	0	0	0	0	0	0
126.000	0	0	0	0	0	0	0	0	0	0	0	0	0
125.000	0	0	0	0	0	0	0	0	0	0	0	0	0
124.000	0	0	0	0	0	0	0	0	0	0	0	0	0
123.000	0	0	0	0	0	0	0	0	0	0	0	0	0
122.580	0	0	0	0	0	0	0	0	0	0	0	0	0
122.570	Highway 60 Bridge												
122.550	0	0	0	0	0	0	0	0	0	0	0	0	0
122.350	Spring River												
122.000	0	0	0	0	0	0	0	0	0	0	0	0	0
121.980	0	0	0	0	0	0	0	0	0	0	0	0	0
121.970	BN RR Bridge												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.13**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - OCT 2009 (3 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)		
121.960	0	0	0	0	0	0	0	0	0	0	0	0	0
120.000	0	0	0	0	0	0	0	0	0	0	0	0	0
118.000	0	0	0	0	0	0	0	0	0	0	0	0	0
116.000	0	0	0	0	0	0	0	0	0	0	0	0	0
114.000	0	0	0	0	0	0	0	0	0	0	0	0	0
112.000	0	0	0	0	0	0	0	0	0	0	0	0	0
110.000	0	0	0	0	0	0	0	0	0	0	0	0	0
108.000	0	0	0	0	0	0	0	0	0	0	0	0	0
106.000	0	0	0	0	0	0	0	0	0	0	0	0	0
105.350	Elk River												
105.000	0	0	0	0	0	0	0	0	0	0	0	0	0
104.000	0	0	0	0	0	0	0	0	0	0	0	0	0
102.000	0	0	0	0	0	0	0	0	0	0	0	0	0
101.750	0	0	0	0	0	0	0	0	0	0	0	0	0
101.730	Highway 59 (Sailboat Bridge)												
101.710	0	0	0	0	0	0	0	0	0	0	0	0	0
100.000	0	0	0	0	0	0	0	0	0	0	0	0	0
90.000	0	0	0	0	0	0	0	0	0	0	0	0	0
80.000	0	0	0	0	0	0	0	0	0	0	0	0	0
78.000	0	0	0	0	0	0	0	0	0	0	0	0	0
77.000	Pensacola Dam												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.14**

GRAND RIVER DAM AUTHORITY SPRING RIVER DURATIONS - OCT 2009 (3 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
21.000	Upstream end of model												
21.000	0	0	0	0	0	0	0	0	0	0	0	0	0
20.000	0	0	0	0	0	0	0	0	0	0	0	0	0
19.000	28	28	28	28	28	28	28	28	28	28	28	0	0
18.000	29	29	29	29	29	29	29	29	29	29	29	0	0
17.000	32	32	32	32	32	32	32	32	32	32	32	0	0
16.000	59	59	59	59	59	59	59	59	59	59	59	0	0
15.000	39	39	39	39	39	39	39	39	39	40	40	0	1
14.170	75	75	75	75	75	75	75	75	75	76	76	0	1
14.160	E 57 Road												
14.120	76	76	76	76	76	76	76	76	76	76	76	0	0
13.510	76	76	76	76	76	76	76	76	76	77	77	0	1
13.500	Interstate 44 Bridge												
13.450	74	74	74	74	74	74	74	74	74	76	76	0	2
12.000	75	75	75	75	75	75	75	75	75	76	76	0	1
11.000	87	87	87	87	87	87	87	87	89	93	93	0	6
10.000	81	81	81	81	81	81	81	81	84	88	89	0	8
9.000	73	73	73	73	73	73	73	73	76	83	84	0	11
8.020	53	55	55	55	55	56	57	57	63	75	76	2	23
8.010	OK Highway 10 Bridge												
7.970	20	21	21	22	22	22	22	22	28	44	59	1	39
7.000	0	0	0	0	0	0	0	0	0	15	33	0	33
6.000	0	0	0	0	0	0	0	0	0	0	24	0	24
5.000	0	0	0	0	0	0	0	0	0	0	14	0	14
4.000	0	0	0	0	0	0	0	0	0	0	8	0	8
3.000	0	0	0	0	0	0	0	0	0	0	0	0	0
2.000	0	0	0	0	0	0	0	0	0	0	0	0	0
1.000	0	0	0	0	0	0	0	0	0	0	0	0	0
0.580	0	0	0	0	0	0	0	0	0	0	0	0	0
0.570	Highway 60 Bridge												
0.560	0	0	0	0	0	0	0	0	0	0	0	0	0
0.460	0	0	0	0	0	0	0	0	0	0	0	0	0
0.000	Downstream end of Spring River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.15**

GRAND RIVER DAM AUTHORITY ELK RIVER DURATIONS - OCT 2009 (3 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
19.590	Upstream end of model												
19.590	24	24	24	24	24	24	24	24	24	24	24	0	0
19.000	19	19	19	19	19	19	19	19	19	19	19	0	0
18.000	22	22	22	22	22	22	22	22	22	22	22	0	0
17.000	56	56	56	56	56	56	56	56	56	56	56	0	0
16.000	58	58	58	58	58	58	58	58	58	58	58	0	0
15.000	51	51	51	51	51	51	51	51	51	51	51	0	0
14.240	31	31	31	31	31	31	31	31	31	31	31	0	0
14.220	Highway 43 Bridge												
14.200	30	30	30	30	30	30	30	30	30	30	31	0	1
14.000	25	25	25	25	25	25	25	25	25	25	25	0	0
13.000	27	27	27	27	27	27	27	27	27	28	30	0	3
12.000	15	15	15	15	15	15	15	15	15	17	17	0	2
11.910	OK/MO State Line												
11.000	0	0	0	0	0	0	0	0	0	0	0	0	0
10.000	0	0	0	0	0	0	0	0	0	0	0	0	0
9.000	0	0	0	0	0	0	0	0	0	0	0	0	0
8.000	0	0	0	0	0	0	0	0	0	0	0	0	0
7.000	0	0	0	0	0	0	0	0	0	0	0	0	0
6.000	0	0	0	0	0	0	0	0	0	0	0	0	0
5.000	0	0	0	0	0	0	0	0	0	0	0	0	0
4.700	0	0	0	0	0	0	0	0	0	0	0	0	0
4.670	OK Highway 10 Bridge												
4.640	0	0	0	0	0	0	0	0	0	0	0	0	0
4.000	0	0	0	0	0	0	0	0	0	0	0	0	0
3.000	0	0	0	0	0	0	0	0	0	0	0	0	0
2.000	0	0	0	0	0	0	0	0	0	0	0	0	0
1.000	0	0	0	0	0	0	0	0	0	0	0	0	0
0.320	0	0	0	0	0	0	0	0	0	0	0	0	0
0.000	Downstream end of Elk River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.16**

GRAND RIVER DAM AUTHORITY TAR CREEK DURATIONS - OCT 2009 (3 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
4.152	Upstream end of model												
4.152	1	1	1	1	1	1	1	1	1	1	1	0	0
3.900	12	12	12	12	12	12	12	12	12	12	12	0	0
3.840	22nd Ave Bridge												
3.800	18	18	18	18	18	18	18	18	18	18	18	0	0
3.300	7	7	7	7	7	7	7	7	7	7	7	0	0
2.800	0	0	0	0	0	0	0	0	0	0	0	0	0
2.710	BN RR Bridge												
2.700	20	20	20	20	20	20	20	20	20	20	20	0	0
2.500	14	14	14	14	14	14	14	14	14	14	14	0	0
2.300	6	6	6	6	6	6	6	6	6	7	7	0	1
2.200	Rockdale Blvd Bridge												
2.100	10	10	10	11	11	11	11	11	87	100	100	1	90
1.900	0	0	0	0	0	0	0	0	26	63	72	0	72
1.700	0	0	0	0	0	0	0	0	26	63	72	0	72
1.660	Central Ave Bridge												
1.600	0	0	0	0	0	0	0	0	26	63	72	0	72
1.500	0	0	0	0	0	0	0	0	26	63	72	0	72
1.400	OK Highway 10 Bridge												
1.300	0	0	0	0	0	0	0	0	26	63	72	0	72
1.000	0	0	0	0	0	0	0	0	26	63	72	0	72
0.700	0	0	0	0	0	0	0	0	26	63	72	0	72
0.300	0	0	0	0	0	0	0	0	26	63	72	0	72
0.041	0	0	0	0	0	0	0	0	25	63	72	0	72
0.000	Downstream end of Tar Creek												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX D.5
DECEMBER 2015 (15 YEAR) INFLOW EVENT
DURATION OF INUNDATION

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.17**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - DEC 2015 (15 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
152.175	Upstream end of model												
152.175	74	74	74	74	74	74	74	74	74	74	74	0	0
151.000	47	47	47	47	47	47	47	47	47	48	48	0	1
150.000	80	80	80	80	80	80	80	80	80	81	81	0	1
149.000	79	79	79	79	79	79	79	79	79	79	79	0	0
148.000	80	80	80	80	80	80	80	80	81	81	81	0	1
147.000	73	74	74	74	74	74	74	74	74	75	76	0	3
145.500	91	91	91	91	92	92	92	92	92	94	94	1	3
145.480	E 60 Road Bridge												
145.400	90	90	90	90	90	90	90	90	92	92	93	0	3
144.000	96	97	97	97	97	98	98	98	99	100	100	1	4
143.000	88	89	89	89	89	89	89	89	91	93	93	0	5
142.000	112	114	114	114	114	114	114	114	115	116	114	0	4
141.000	108	110	110	110	110	110	110	111	111	113	112	1	5
140.000	102	104	104	104	104	105	105	105	106	108	108	1	6
139.000	86	88	89	89	89	89	89	90	92	97	97	2	11
138.000	77	81	81	81	81	81	81	83	85	92	91	2	15
137.000	67	70	71	71	71	71	71	73	76	84	85	3	18
135.950	61	65	65	65	67	67	67	67	72	81	82	2	21
135.941	Highway 69 Bridge												
135.940	60	65	65	65	65	66	67	67	72	81	81	2	21
135.590	60	65	65	65	65	66	66	67	71	81	81	2	21
135.586	BN RR Bridge												
135.580	59	64	65	65	65	65	66	67	71	80	81	3	22
135.470	59	64	64	64	64	65	66	66	71	79	81	2	22
135.460	Highway 125 Bridge												
135.440	59	64	64	64	65	65	66	66	71	80	81	2	22
135.000	59	64	64	64	64	64	64	66	71	79	81	2	22

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.17**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - DEC 2015 (15 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
134.610	55	61	61	61	61	62	63	63	68	78	79	2	24
134.599	Abandonded RR Bridge												
134.595	54	59	59	59	61	61	61	61	67	77	79	2	25
134.000	46	53	53	53	54	55	55	57	63	73	75	4	29
133.973	Tar Creek												
133.900	41	49	49	50	50	52	52	54	60	71	72	5	31
133.800	Interstate 44 Bridge												
133.700	40	47	47	48	49	50	52	52	60	70	72	5	32
133.000	22	33	34	34	35	37	37	39	51	62	65	6	43
132.000	0	9	12	15	19	23	25	27	40	53	58	18	58
131.000	0	0	0	0	0	0	3	11	33	48	53	11	53
130.000	0	0	0	0	0	0	0	2	30	45	52	2	52
129.000	0	0	0	0	0	0	0	0	29	43	50	0	50
128.000	0	0	0	0	0	0	0	0	26	42	48	0	48
126.710	0	0	0	0	0	0	0	0	22	36	44	0	44
126.700	S 590 Road Bridge												
126.670	0	0	0	0	0	0	0	0	21	36	44	0	44
126.000	0	0	0	0	0	0	0	0	20	34	43	0	43
125.000	0	0	0	0	0	0	0	0	16	31	41	0	41
124.000	0	0	0	0	0	0	0	0	14	30	40	0	40
123.000	0	0	0	0	0	0	0	0	2	27	38	0	38
122.580	0	0	0	0	0	0	0	0	0	26	38	0	38
122.570	Highway 60 Bridge												
122.550	0	0	0	0	0	0	0	0	0	26	38	0	38
122.350	Spring River												
122.000	0	0	0	0	0	0	0	0	0	15	32	0	32
121.980	0	0	0	0	0	0	0	0	0	6	28	0	28
121.970	BN RR Bridge												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.17**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - DEC 2015 (15 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0	El. 742.0	El. 742.5	El. 743.0	El. 743.5	El. 744.0	El. 744.5	El. 745.0	El. 749.0	El. 753.0	El. 757.0		
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)		
121.960	0	0	0	0	0	0	0	0	0	0	0	0	0
120.000	0	0	0	0	0	0	0	0	0	0	0	0	0
118.000	0	0	0	0	0	0	0	0	0	0	0	0	0
116.000	0	0	0	0	0	0	0	0	0	0	0	0	0
114.000	0	0	0	0	0	0	0	0	0	0	0	0	0
112.000	0	0	0	0	0	0	0	0	0	0	0	0	0
110.000	0	0	0	0	0	0	0	0	0	0	0	0	0
108.000	0	0	0	0	0	0	0	0	0	0	0	0	0
106.000	0	0	0	0	0	0	0	0	0	0	0	0	0
105.350	Elk River												
105.000	0	0	0	0	0	0	0	0	0	0	0	0	0
104.000	0	0	0	0	0	0	0	0	0	0	0	0	0
102.000	0	0	0	0	0	0	0	0	0	0	0	0	0
101.750	0	0	0	0	0	0	0	0	0	0	0	0	0
101.730	Highway 59 (Sailboat Bridge)												
101.710	0	0	0	0	0	0	0	0	0	0	0	0	0
100.000	0	0	0	0	0	0	0	0	0	0	0	0	0
90.000	0	0	0	0	0	0	0	0	0	0	0	0	0
80.000	0	0	0	0	0	0	0	0	0	0	0	0	0
78.000	0	0	0	0	0	0	0	0	0	0	0	0	0
77.000	Pensacola Dam												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.18**

GRAND RIVER DAM AUTHORITY SPRING RIVER DURATIONS - DEC 2015 (15 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
21.000	Upstream end of model												
21.000	54	54	54	54	54	54	54	54	54	54	54	0	0
20.000	52	52	52	52	52	52	52	52	52	52	52	0	0
19.000	76	76	76	76	76	76	76	76	76	76	76	0	0
18.000	77	77	77	77	77	77	77	77	77	77	77	0	0
17.000	79	79	79	79	79	79	79	79	79	79	79	0	0
16.000	86	86	86	86	86	86	86	86	86	86	86	0	0
15.000	82	82	82	82	82	82	82	82	82	82	82	0	0
14.170	96	97	97	97	97	97	97	97	97	97	97	0	1
14.160	E 57 Road												
14.120	98	98	98	98	98	98	98	98	98	98	98	0	0
13.510	98	99	99	99	99	99	99	99	99	99	98	0	1
13.500	Interstate 44 Bridge												
13.450	97	97	97	97	97	97	97	97	97	97	97	0	0
12.000	97	97	97	97	98	98	98	98	98	98	98	1	1
11.000	111	112	113	113	113	113	113	113	112	113	111	1	2
10.000	108	109	109	109	109	109	109	109	108	109	107	0	2
9.000	100	101	101	101	101	101	101	102	102	103	101	1	3
8.020	91	93	93	93	93	93	93	93	94	96	94	0	5
8.010	OK Highway 10 Bridge												
7.970	77	80	80	80	80	80	80	80	82	85	83	0	8
7.000	59	62	62	62	63	63	64	64	67	72	71	2	13
6.000	50	53	53	53	53	54	54	55	58	63	63	2	13
5.000	39	43	44	44	45	45	46	47	51	56	57	4	18
4.000	26	31	31	31	33	34	35	35	46	51	53	4	27
3.000	14	23	23	23	24	26	28	29	38	47	49	6	35
2.000	0	0	0	0	2	8	17	20	32	43	45	20	45
1.000	0	0	0	0	0	0	0	0	27	39	42	0	42
0.580	0	0	0	0	0	0	0	0	0	24	36	0	36
0.570	Highway 60 Bridge												
0.560	0	0	0	0	0	0	0	0	0	21	34	0	34
0.460	0	0	0	0	0	0	0	0	0	24	36	0	36
0.000	Downstream end of Spring River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.19**

GRAND RIVER DAM AUTHORITY ELK RIVER DURATIONS - DEC 2015 (15 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
19.590	Upstream end of model												
19.590	58	58	58	58	58	58	58	58	58	58	58	0	0
19.000	51	51	51	51	51	51	51	51	51	51	51	0	0
18.000	55	55	55	55	55	55	55	55	55	55	55	0	0
17.000	111	111	111	111	111	111	111	111	111	111	111	0	0
16.000	118	118	118	118	118	118	118	118	118	118	118	0	0
15.000	103	104	104	104	104	104	104	104	104	104	103	0	1
14.240	68	68	68	68	68	68	68	68	68	68	68	0	0
14.220	Highway 43 Bridge												
14.200	67	67	67	67	67	67	67	67	67	67	68	0	1
14.000	59	59	59	59	59	59	59	59	59	60	60	0	1
13.000	62	62	62	62	62	62	62	62	63	65	66	0	4
12.000	46	46	46	46	46	46	46	46	46	48	50	0	4
11.910	OK/MO State Line												
11.000	21	21	21	21	21	21	21	21	21	23	23	0	2
10.000	0	0	0	0	0	0	0	0	0	0	0	0	0
9.000	0	0	0	0	0	0	0	0	0	0	0	0	0
8.000	0	0	0	0	0	0	0	0	0	0	0	0	0
7.000	0	0	0	0	0	0	0	0	0	0	0	0	0
6.000	0	0	0	0	0	0	0	0	0	0	0	0	0
5.000	0	0	0	0	0	0	0	0	0	0	0	0	0
4.700	0	0	0	0	0	0	0	0	0	0	0	0	0
4.670	OK Highway 10 Bridge												
4.640	0	0	0	0	0	0	0	0	0	0	0	0	0
4.000	0	0	0	0	0	0	0	0	0	0	0	0	0
3.000	0	0	0	0	0	0	0	0	0	0	0	0	0
2.000	0	0	0	0	0	0	0	0	0	0	0	0	0
1.000	0	0	0	0	0	0	0	0	0	0	0	0	0
0.320	0	0	0	0	0	0	0	0	0	0	0	0	0
0.000	Downstream end of Elk River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.20**

GRAND RIVER DAM AUTHORITY TAR CREEK DURATIONS - DEC 2015 (15 YEAR) EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
4.152	Upstream end of model												
4.152	4	4	4	4	4	4	4	4	4	4	4	0	0
3.900	15	15	15	15	15	15	15	15	15	15	15	0	0
3.840	22nd Ave Bridge												
3.800	21	21	21	21	21	21	21	21	21	21	21	0	0
3.300	9	9	9	9	9	9	9	9	9	9	9	0	0
2.800	0	0	0	0	0	0	0	0	0	0	0	0	0
2.710	BN RR Bridge												
2.700	24	24	24	24	24	24	24	24	24	24	24	0	0
2.500	17	17	17	17	17	17	17	17	17	18	57	0	40
2.300	8	8	8	8	8	8	8	8	8	68	71	0	63
2.200	Rockdale Blvd Bridge												
2.100	81	87	87	87	87	88	88	88	90	92	90	1	11
1.900	45	53	53	54	54	55	56	56	63	76	80	3	35
1.700	45	53	53	53	54	55	55	56	63	75	77	3	32
1.660	Central Ave Bridge												
1.600	45	53	53	53	54	55	55	56	63	74	76	3	31
1.500	45	53	53	53	54	55	55	56	63	74	76	3	31
1.400	OK Highway 10 Bridge												
1.300	45	52	53	53	53	55	55	56	62	73	75	4	30
1.000	45	52	53	53	53	55	55	56	62	73	75	4	30
0.700	45	52	53	53	53	55	55	56	62	73	75	4	30
0.300	45	52	53	53	53	55	55	56	62	73	75	4	30
0.041	44	52	52	53	53	55	55	55	62	73	74	3	30
0.000	Downstream end of Tar Creek												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX D.6
100-YEAR INFLOW EVENT
DURATION OF INUNDATION

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.21**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - 100-YEAR EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
152.175	Upstream end of model												
152.175	221	221	221	221	221	221	221	221	221	221	221	0	0
151.000	209	209	209	209	209	209	209	209	209	209	209	0	0
150.000	228	227	227	227	227	227	227	227	234	234	235	0	8
149.000	227	227	227	227	227	227	227	227	227	227	227	0	0
148.000	230	229	229	229	229	229	229	229	229	229	229	0	1
147.000	225	225	225	225	225	225	225	225	225	225	225	0	0
145.500	254	253	254	254	254	254	254	254	254	256	257	1	4
145.480	E 60 Road Bridge												
145.400	253	253	253	253	253	253	253	253	254	255	256	0	3
144.000	263	261	262	262	262	262	262	262	263	264	266	1	5
143.000	244	243	243	243	243	244	244	244	247	251	254	1	11
142.000	281	278	278	278	278	279	279	279	279	281	287	1	9
141.000	277	274	274	274	274	274	275	275	276	278	282	1	8
140.000	264	263	264	264	264	264	264	265	268	273	277	2	14
139.000	240	238	238	239	239	239	239	239	242	253	264	1	26
138.000	233	230	230	231	231	231	231	231	233	240	254	1	24
137.000	226	223	223	223	223	223	224	224	225	229	241	1	18
135.950	223	220	220	220	220	220	221	221	222	226	237	1	17
135.941	Highway 69 Bridge												
135.940	223	220	220	220	220	220	220	221	222	226	236	1	16
135.590	222	220	220	220	220	220	220	220	222	226	236	0	16
135.586	BN RR Bridge												
135.580	222	220	220	220	220	220	220	220	222	226	236	0	16
135.470	221	219	220	220	220	220	220	220	222	225	236	1	17
135.460	Highway 125 Bridge												
135.440	222	220	220	220	220	220	220	220	222	225	236	0	16
135.000	221	219	219	219	219	219	220	220	221	225	235	1	16

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.21**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - 100-YEAR EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
134.610	219	217	217	217	217	217	217	218	219	223	233	1	16
134.599	Abandonded RR Bridge												
134.595	219	216	216	216	217	217	217	217	219	222	232	1	16
134.000	213	211	211	211	211	211	211	211	213	217	227	0	16
133.973	Tar Creek												
133.900	211	210	210	210	210	210	210	210	212	216	226	0	16
133.800	Interstate 44 Bridge												
133.700	211	208	208	208	208	209	209	209	211	215	224	1	16
133.000	204	203	203	203	203	203	203	203	205	208	218	0	15
132.000	200	196	196	196	196	196	196	196	198	201	210	0	14
131.000	194	191	191	191	191	191	191	191	193	195	203	0	12
130.000	189	180	180	180	180	180	180	180	182	185	193	0	13
129.000	181	156	156	156	156	156	156	156	158	162	169	0	25
128.000	168	133	133	133	134	134	134	134	136	141	148	1	35
126.710	121	113	114	114	114	114	114	114	117	123	131	1	18
126.700	S 590 Road Bridge												
126.670	121	113	113	113	113	114	114	114	117	123	131	1	18
126.000	114	107	108	108	108	108	108	108	111	118	127	1	20
125.000	103	96	96	96	96	96	96	97	100	107	115	1	19
124.000	89	83	83	83	84	84	84	85	89	95	102	2	19
123.000	76	69	70	70	70	70	70	70	73	79	85	1	16
122.580	60	58	59	59	59	59	60	60	62	67	76	2	18
122.570	Highway 60 Bridge												
122.550	61	59	59	59	59	60	60	60	63	68	76	1	17
122.350	Spring River												
122.000	58	58	58	59	59	59	60	60	62	65	73	2	15
121.980	56	56	56	57	57	57	58	58	61	63	72	2	16
121.970	BN RR Bridge												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.21**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - 100-YEAR EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
121.960	33	36	37	37	37	38	38	38	42	46	52	2	19
120.000	0	25	25	25	25	25	26	26	29	32	42	1	42
118.000	0	0	0	0	0	0	0	0	0	0	0	0	0
116.000	0	0	0	0	0	0	0	0	0	0	0	0	0
114.000	0	0	0	0	0	0	0	0	0	0	0	0	0
112.000	0	0	0	0	0	0	0	0	0	0	0	0	0
110.000	0	0	0	0	0	0	0	0	0	0	0	0	0
108.000	0	0	0	0	0	0	0	0	0	0	0	0	0
106.000	0	0	0	0	0	0	0	0	0	0	0	0	0
105.350	Elk River												
105.000	0	0	0	0	0	0	0	0	0	0	0	0	0
104.000	0	0	0	0	0	0	0	0	0	0	0	0	0
102.000	0	0	0	0	0	0	0	0	0	0	0	0	0
101.750	0	0	0	0	0	0	0	0	0	0	0	0	0
101.730	Highway 59 (Sailboat Bridge)												
101.710	0	0	0	0	0	0	0	0	0	0	0	0	0
100.000	0	0	0	0	0	0	0	0	0	0	0	0	0
90.000	0	0	0	0	0	0	0	0	0	0	0	0	0
80.000	0	0	0	0	0	0	0	0	0	0	0	0	0
78.000	0	0	0	0	0	0	0	0	0	0	0	0	0
77.000	Pensacola Dam												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.22**

GRAND RIVER DAM AUTHORITY SPRING RIVER DURATIONS - 100-YEAR EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
21.000	Upstream end of model												
21.000	0	0	0	0	0	0	0	0	0	0	0	0	0
20.000	0	0	0	0	0	0	0	0	0	0	0	0	0
19.000	40	40	40	40	40	40	40	40	40	40	40	0	0
18.000	41	41	41	41	41	41	41	41	41	41	41	0	0
17.000	43	43	43	43	43	43	43	43	43	44	44	0	1
16.000	55	55	55	55	55	55	55	55	55	55	55	0	0
15.000	49	49	49	49	49	49	49	49	49	49	49	0	0
14.170	71	72	72	72	72	72	72	72	72	72	73	0	2
14.160	E 57 Road												
14.120	73	73	73	73	73	73	73	73	73	73	75	0	2
13.510	75	75	75	75	75	75	75	75	75	75	76	0	1
13.500	Interstate 44 Bridge												
13.450	73	73	73	73	73	73	73	73	73	73	75	0	2
12.000	84	84	84	84	84	84	84	84	84	85	87	0	3
11.000	126	115	115	115	115	115	115	115	116	117	128	0	13
10.000	121	110	110	110	110	110	110	110	111	113	123	0	13
9.000	114	103	103	103	103	103	103	103	104	108	120	0	17
8.020	103	94	94	94	94	94	94	95	97	103	117	1	23
8.010	OK Highway 10 Bridge												
7.970	87	80	80	80	80	81	81	81	83	90	100	1	20
7.000	74	69	70	70	70	71	71	72	76	82	90	3	21
6.000	70	64	65	65	65	66	66	67	72	79	85	3	21
5.000	69	63	63	63	64	64	64	65	69	76	83	2	20
4.000	67	63	63	63	63	63	64	64	68	75	81	1	18
3.000	67	63	63	63	63	63	63	63	67	74	80	0	17
2.000	67	61	62	62	62	62	62	62	66	71	79	1	18
1.000	66	61	62	62	62	62	62	62	65	70	79	1	18
0.580	66	61	61	62	62	62	62	62	65	69	78	1	17
0.570	Highway 60 Bridge												
0.560	66	61	61	61	62	62	62	62	64	69	78	1	17
0.460	66	61	61	62	62	62	62	62	65	69	78	1	17
0.000	Downstream end of Spring River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.23**

GRAND RIVER DAM AUTHORITY ELK RIVER DURATIONS - 100-YEAR EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
19.590	Upstream end of model												
19.590	0	0	0	0	0	0	0	0	0	0	0	0	0
19.000	0	0	0	0	0	0	0	0	0	0	0	0	0
18.000	0	0	0	0	0	0	0	0	0	0	0	0	0
17.000	0	0	0	0	0	0	0	0	0	0	0	0	0
16.000	0	0	0	0	0	0	0	0	0	0	0	0	0
15.000	0	0	0	0	0	0	0	0	0	0	0	0	0
14.240	0	0	0	0	0	0	0	0	0	0	0	0	0
14.220	Highway 43 Bridge												
14.200	0	0	0	0	0	0	0	0	0	0	0	0	0
14.000	0	0	0	0	0	0	0	0	0	0	0	0	0
13.000	0	0	0	0	0	0	0	0	0	0	0	0	0
12.000	0	0	0	0	0	0	0	0	0	0	0	0	0
11.910	OK/MO State Line												
11.000	0	0	0	0	0	0	0	0	0	0	0	0	0
10.000	0	0	0	0	0	0	0	0	0	0	0	0	0
9.000	0	0	0	0	0	0	0	0	0	0	0	0	0
8.000	0	0	0	0	0	0	0	0	0	0	0	0	0
7.000	0	0	0	0	0	0	0	0	0	0	0	0	0
6.000	0	0	0	0	0	0	0	0	0	0	0	0	0
5.000	0	0	0	0	0	0	0	0	0	0	0	0	0
4.700	0	0	0	0	0	0	0	0	0	0	0	0	0
4.670	OK Highway 10 Bridge												
4.640	0	0	0	0	0	0	0	0	0	0	0	0	0
4.000	0	0	0	0	0	0	0	0	0	0	0	0	0
3.000	0	0	0	0	0	0	0	0	0	0	0	0	0
2.000	0	0	0	0	0	0	0	0	0	0	0	0	0
1.000	0	0	0	0	0	0	0	0	0	0	0	0	0
0.320	0	0	0	0	0	0	0	0	0	0	0	0	0
0.000	Downstream end of Elk River												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.24**

GRAND RIVER DAM AUTHORITY TAR CREEK DURATIONS - 100-YEAR EVENT

River Mile	Pensacola Dam Starting Stage (ft, PD)											Anticipated Op Range Duration Difference[1] (hours)	Extreme, Hypothetical Range Duration Difference[2] (hours)
	El. 734.0 Duration (hours)	El. 742.0 Duration (hours)	El. 742.5 Duration (hours)	El. 743.0 Duration (hours)	El. 743.5 Duration (hours)	El. 744.0 Duration (hours)	El. 744.5 Duration (hours)	El. 745.0 Duration (hours)	El. 749.0 Duration (hours)	El. 753.0 Duration (hours)	El. 757.0 Duration (hours)		
4.152	Upstream end of model												
4.152	70	70	70	70	70	70	70	70	70	70	71	0	1
3.900	80	79	79	79	79	79	79	80	80	80	81	1	2
3.840	22nd Ave Bridge												
3.800	91	91	91	91	91	91	91	92	92	93	94	1	3
3.300	98	97	97	97	97	97	97	97	98	99	100	0	3
2.800	122	120	120	120	120	120	120	120	121	123	125	0	5
2.710	BN RR Bridge												
2.700	178	171	171	171	171	171	171	171	172	174	177	0	7
2.500	189	184	184	184	184	184	184	184	185	187	191	0	7
2.300	196	193	193	193	194	194	194	194	195	197	202	1	9
2.200	Rockdale Blvd Bridge												
2.100	213	211	211	211	211	211	211	212	214	218	227	1	16
1.900	213	210	211	211	211	211	211	211	213	217	227	1	17
1.700	213	210	210	211	211	211	211	211	213	217	227	1	17
1.660	Central Ave Bridge												
1.600	213	210	210	211	211	211	211	211	213	217	227	1	17
1.500	213	210	210	211	211	211	211	211	213	217	227	1	17
1.400	OK Highway 10 Bridge												
1.300	213	210	210	211	211	211	211	211	213	217	227	1	17
1.000	213	210	210	211	211	211	211	211	213	217	227	1	17
0.700	213	210	210	211	211	211	211	211	213	217	227	1	17
0.300	213	210	210	211	211	211	211	211	213	217	226	1	16
0.041	213	210	210	211	211	211	211	211	213	217	226	1	16
0.000	Downstream end of Tar Creek												

1 Max difference in duration from simulations with Pensacola Dam starting stages of El. 742.0 to El. 745.0 ft.
2 Max difference in duration from simulations with Pensacola Dam starting stages of El. 734.0 to El. 757.0 ft.

FICTIONAL SCENARIOS IN WHICH THE US ARMY CORPS OF ENGINEERS FAILS TO ADHERE TO ITS WATER CONTROL MANUAL UNTIL THE PEAK INFLOW REACHES PENSACOLA DAM

APPENDIX D.7
HISTORICAL STARTING STAGES
DURATION OF INUNDATION

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.25**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - HISTORICAL STARTING STAGES

River Mile	Historical Inflow Event					Max Duration Difference* (hours)
	Sept 1993 (21 year)	June 2004 (1 year)	July 2007 (4 year)	Oct 2009 (3 year)	Dec 2015 (15 year)	
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	
152.175	Upstream end of model					
152.175	137	0	193	90	74	193
151.000	117	0	143	42	47	143
150.000	145	0	213	95	80	213
149.000	142	0	207	92	79	207
148.000	144	0	209	95	80	209
147.000	138	0	192	87	73	192
145.500	155	0	227	104	91	227
145.480	E 60 Road Bridge					
145.400	153	0	227	102	90	227
144.000	160	18	236	107	97	218
143.000	153	0	222	100	89	222
142.000	172	42	251	116	114	209
141.000	169	33	248	114	110	215
140.000	163	0	238	108	104	238
139.000	150	0	207	91	89	207
138.000	145	0	189	80	81	189
137.000	138	0	171	57	71	171
135.950	136	0	164	45	65	164
135.941	Highway 69 Bridge					
135.940	136	0	164	44	65	164
135.590	135	0	163	42	65	163
135.586	BN RR Bridge					
135.580	135	0	163	42	65	163
135.470	135	0	163	40	64	163
135.460	Highway 125 Bridge					
135.440	135	0	163	41	64	163
135.000	135	0	162	38	64	162

* Max difference in duration from simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.25**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - HISTORICAL STARTING STAGES

River Mile	Historical Inflow Event					Max Duration Difference* (hours)
	Sept 1993 (21 year)	June 2004 (1 year)	July 2007 (4 year)	Oct 2009 (3 year)	Dec 2015 (15 year)	
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	
134.610	133	0	159	29	61	159
134.599	Abandonded RR Bridge					
134.595	133	0	156	22	59	156
134.000	130	0	150	0	53	150
133.973	Tar Creek					
133.900	129	0	146	0	50	146
133.800	Interstate 44 Bridge					
133.700	128	0	145	0	48	145
133.000	124	0	137	0	34	137
132.000	119	0	130	0	14	130
131.000	115	0	124	0	0	124
130.000	112	0	118	0	0	118
129.000	108	0	108	0	0	108
128.000	103	0	97	0	0	103
126.710	83	0	74	0	0	83
126.700	S 590 Road Bridge					
126.670	82	0	74	0	0	82
126.000	77	0	66	0	0	77
125.000	57	0	41	0	0	57
124.000	29	0	0	0	0	29
123.000	24	0	0	0	0	24
122.580	21	0	0	0	0	21
122.570	Highway 60 Bridge					
122.550	21	0	0	0	0	21
122.350	Spring River					
122.000	14	0	0	0	0	14
121.980	11	0	0	0	0	11
121.970	BN RR Bridge					

* Max difference in duration from simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.25**

GRAND RIVER DAM AUTHORITY NEOSHO RIVER DURATIONS - HISTORICAL STARTING STAGES

River Mile	Historical Inflow Event					Max Duration Difference* (hours)
	Sept 1993 (21 year)	June 2004 (1 year)	July 2007 (4 year)	Oct 2009 (3 year)	Dec 2015 (15 year)	
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	
121.960	0	0	0	0	0	0
120.000	0	0	0	0	0	0
118.000	0	0	0	0	0	0
116.000	0	0	0	0	0	0
114.000	0	0	0	0	0	0
112.000	0	0	0	0	0	0
110.000	0	0	0	0	0	0
108.000	0	0	0	0	0	0
106.000	0	0	0	0	0	0
105.350	Elk River					
105.000	0	0	0	0	0	0
104.000	0	0	0	0	0	0
102.000	0	0	0	0	0	0
101.750	0	0	0	0	0	0
101.730	Highway 59 (Sailboat Bridge)					
101.710	0	0	0	0	0	0
100.000	0	0	0	0	0	0
90.000	0	0	0	0	0	0
80.000	0	0	0	0	0	0
78.000	0	0	0	0	0	0
77.000	Pensacola Dam					

* Max difference in duration from simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.26**

GRAND RIVER DAM AUTHORITY SPRING RIVER DURATIONS - HISTORICAL STARTING STAGES

River Mile	Historical Inflow Event					Max Duration Difference* (hours)
	Sept 1993 (21 year)	June 2004 (1 year)	July 2007 (4 year)	Oct 2009 (3 year)	Dec 2015 (15 year)	
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	
21.000	Upstream end of model					
21.000	54	0	0	0	54	54
20.000	52	0	0	0	52	52
19.000	70	0	0	28	76	76
18.000	70	0	0	29	77	77
17.000	72	0	0	32	79	79
16.000	79	0	0	59	86	86
15.000	75	0	0	39	82	82
14.170	92	0	0	75	97	97
14.160	E 57 Road					
14.120	93	0	0	76	98	98
13.510	93	0	0	76	99	99
13.500	Interstate 44 Bridge					
13.450	93	0	0	74	97	97
12.000	93	0	0	75	97	97
11.000	112	0	39	87	113	113
10.000	108	0	0	81	109	109
9.000	99	0	0	73	101	101
8.020	92	0	0	54	93	93
8.010	OK Highway 10 Bridge					
7.970	80	0	0	20	80	80
7.000	66	0	0	0	62	66
6.000	59	0	0	0	53	59
5.000	51	0	0	0	44	51
4.000	49	0	0	0	31	49
3.000	44	0	0	0	23	44
2.000	39	0	0	0	0	39
1.000	31	0	0	0	0	31
0.580	19	0	0	0	0	19
0.570	Highway 60 Bridge					
0.560	15	0	0	0	0	15
0.460	19	0	0	0	0	19
0.000	Downstream end of Spring River					

* Max difference in duration from simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.27**

GRAND RIVER DAM AUTHORITY ELK RIVER DURATIONS - HISTORICAL STARTING STAGES

River Mile	Historical Inflow Event					Max Duration Difference* (hours)
	Sept 1993 (21 year)	June 2004 (1 year)	July 2007 (4 year)	Oct 2009 (3 year)	Dec 2015 (15 year)	
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	
19.590	Upstream end of model					
19.590	10	0	0	24	58	58
19.000	0	0	0	19	51	51
18.000	7	0	0	22	55	55
17.000	56	0	0	56	111	111
16.000	62	0	0	58	118	118
15.000	48	0	0	51	104	104
14.240	18	0	0	31	68	68
14.220	Highway 43 Bridge					
14.200	18	0	0	30	67	67
14.000	12	0	0	25	59	59
13.000	14	0	0	27	62	62
12.000	0	0	0	15	46	46
11.910	OK/MO State Line					
11.000	0	0	0	0	21	21
10.000	0	0	0	0	0	0
9.000	0	0	0	0	0	0
8.000	0	0	0	0	0	0
7.000	0	0	0	0	0	0
6.000	0	0	0	0	0	0
5.000	0	0	0	0	0	0
4.700	0	0	0	0	0	0
4.670	OK Highway 10 Bridge					
4.640	0	0	0	0	0	0
4.000	0	0	0	0	0	0
3.000	0	0	0	0	0	0
2.000	0	0	0	0	0	0
1.000	0	0	0	0	0	0
0.320	0	0	0	0	0	0
0.000	Downstream end of Elk River					

* Max difference in duration from simulations with historical starting stages.

Warning! This table represents fictional scenarios in which USACE fails to adhere to its Water Control Manual until the peak inflow reaches Pensacola Dam.

PENSACOLA DAM **TABLE D.28**

GRAND RIVER DAM AUTHORITY TAR CREEK DURATIONS - HISTORICAL STARTING STAGES

River Mile	Historical Inflow Event					Max Duration Difference* (hours)
	Sept 1993 (21 year)	June 2004 (1 year)	July 2007 (4 year)	Oct 2009 (3 year)	Dec 2015 (15 year)	
	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	Duration (hours)	
4.152	Upstream end of model					
4.152	25	0	0	1	4	25
3.900	32	0	0	12	15	32
3.840	22nd Ave Bridge					
3.800	36	0	32	18	21	36
3.300	28	0	45	7	9	45
2.800	20	0	80	0	0	80
2.710	BN RR Bridge					
2.700	132	0	107	20	24	132
2.500	141	0	117	14	17	141
2.300	144	0	125	6	8	144
2.200	Rockdale Blvd Bridge					
2.100	158	0	148	10	87	158
1.900	145	0	148	0	54	148
1.700	131	0	148	0	53	148
1.660	Central Ave Bridge					
1.600	130	0	148	0	53	148
1.500	130	0	148	0	53	148
1.400	OK Highway 10 Bridge					
1.300	129	0	148	0	53	148
1.000	129	0	148	0	53	148
0.700	129	0	148	0	53	148
0.300	129	0	148	0	53	148
0.041	129	0	148	0	53	148
0.000	Downstream end of Tar Creek					

* Max difference in duration from simulations with historical starting stages.