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October 15, 2018

Via email: *MRL-EIS-2@usace.army.mil*
Colonel Michael C. Derosier
Commander and District Engineer
Memphis District
U.S. Army Corps of Engineers
167 North Main Street, Room B-202
Memphis, TN 38103-1894

Re: Scoping Comments on Supplement II to the Final Environmental Impact Statement, Mississippi River and Tributaries Project, Mississippi River Mainline Levees and Channel Improvement

Dear Col. Derosier:

The National Wildlife Federation appreciates the opportunity to submit comments on the scope of Supplement II to the Final Environmental Impact Statement, Mississippi River and Tributaries Project, Mississippi River Mainline Levees and Channel Improvement of 1976, as amended and updated by the 1998 Supplement I.

The National Wildlife Federation (NWF) is the nation's largest conservation education and advocacy organization. NWF has almost six million members and supporters and conservation affiliate organizations in 51 states and territories. NWF has a long history of advocating for the protection, restoration, and ecologically sound management of the Mississippi River. NWF also has a long history of working to modernize federal water resources planning to protect the nation's rivers, wetlands, floodplains, and coasts and the fish and wildlife that depend on those vital resources.

General Comments

The National Wildlife Federation appreciates the decision to prepare Supplement II to the environmental impact statement for the above-referenced MR&T project. Supplement II is both necessary and required given the dramatic changes in the human and natural environment affected by the Mississippi River Mainline Levee system, the significant new scientific information related to the hydrological conditions in the Mississippi River, and the changes in law and policy since the last supplement was completed 20 years ago.

The National Wildlife Federation recognizes the importance of the Mainline Levee system and the need to address deficiencies in that system. However, we also recognize that meaningful, long-term flood damage reduction will also require addressing the underlying causes of increased flood risks and protecting and restoring the river's hydrologic processes and floodplain and delta wetlands to minimize future flood risks. Recommendations for ensuring that Supplement II can help achieve these goals are set forth below.

Given the significance of Supplement II to public safety and the environment, the National Wildlife Federation urges the U.S. Army Corps of Engineers (Corps) to have the National Academy of Sciences conduct the independent external peer review for Supplement II that is required by 33 U.S.C. § 2343. The panel should be charged with evaluating the long-term effectiveness of the alternative recommended by the Corps; whether the selected alternative will protect and restore the functions of the Mississippi River and its floodplain and coastal wetlands; and whether the selected alternative includes a detailed mitigation plan that is likely to produce ecologically successful mitigation.

To comply with longstanding environmental laws and the National Water Resources Planning Policy, the Corps should select an alternative that utilizes integrated river management to reduce flood risks while also protecting and restoring the ecologically vital Mississippi River.

Detailed Comments

The human and natural environment affect by the Mississippi River Mainline Levee system has seen dramatic changes since completion of the 1998 Supplement I. Since that time the scientific understanding of the river's hydrological conditions and the implications of those conditions has also increased dramatically, and important changes have been made to applicable laws and policies.

Supplement II must fully address these changes and new information in developing alternatives and in analyzing the direct, indirect, and cumulative impacts of those alternatives. The Corps should then select an alternative that utilizes integrated river management to reduce flood risks while also protecting and restoring the ecologically vital Mississippi River.

To help achieve these goals and comply with the National Environmental Policy Act (NEPA), the National Water Resources Planning Policy, and the civil works mitigation requirements, the National Wildlife Federation urges the Corps to follow the recommendations set forth below.

A. Utilize an Appropriate Project Purpose

It is critical that Supplement II utilize a substantively and legally appropriate project purpose, which determines the universe of alternatives that must be evaluated.[1]

All reasonable alternatives that accomplish the project purpose must be examined in an environmental impact statement (EIS), while alternatives that are not reasonably related to the project purpose do not

[1] *Citizens Against Burlington v. Busey*, 938 F.2d 190, 195 (D.C. Cir. 1991) (the project purpose and need "delimit[s] the universe of the action's reasonable alternatives.") *See also Wyoming v. U.S. Dep't of Agric.*, 661 F.3d 1209, 1244 (10th Cir. 2011) ("how the agency defines the purpose of the proposed action sets the contours for its exploration of available alternatives.").

have to be examined.[2] An overly narrow project purpose can defeat the very purpose of an EIS by eliminating consideration of highly reasonable, less environmentally damaging alternatives:

> "One obvious way for an agency to slip past the strictures of NEPA is to contrive a purpose so slender as to define competing "reasonable alternatives" out of consideration (and even out of existence). . . . If the agency constricts the definition of the project's purpose and thereby excludes what truly are reasonable alternatives, the EIS cannot fulfill its role. Nor can the agency satisfy the Act. 42 U.S.C. § 4332(2)(E)."[3]

A court "will reject an 'unreasonably narrow' definition of objectives that compels the selection of a particular alternative."[4] Agencies are also prohibited from so narrowly defining a project purpose that it "forecloses a reasonable consideration of alternatives"[5] or makes the final EIS "'a foreordained formality.'"[6]

The project purpose used in the 1998 Supplement I provides a clear example of an unreasonably narrow project purpose: "to raise and stabilize portions of the levee system to protect against the PDF."[7] This project purpose is overly narrow because it both forecloses a reasonable consideration of alternatives that do not focus solely on raising the levee system and compels selection of an alternative that does raise the levee system. Indeed, the 1998 Supplement I rejected the use of flowage easements precisely because it could not satisfy this project purpose.[8]

Supplement II should utilize a fundamentally different project purpose that, as required by law, considers "the views of Congress, expressed, to the extent that an agency can determine them, in the

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[2] *Methow Valley Citizens Council v. Regional Forester*, 833 F.2d 810, 815-16 (9th Cir. 1987).

[3] *Simmons v. United States Army Corps of Eng'rs*, 120 F.3d 664, 666 (7th Cir. 1997); *City of Carmel-by-the-Sea v. United States Dep't of Transp.*, 123 F.3d 1142, 1155 (9th Cir. 1997) ("an agency cannot define its objectives in unreasonably narrow terms"); *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 195-96 (D.C. Cir. 1991), *cert. denied*, 502 U.S. 994 (1991) ("an agency may not define the objectives of its action in terms so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action"); *City of New York v. United States Dep't of Transp.*, 715 F.2d 732, 743 (2d Cir. 1983), *cert. denied*, 456 U.S. 1005 (1984) ("an agency will not be permitted to narrow the objective of its action artificially and thereby circumvent the requirement that relevant alternatives be considered").

[4] *Theodore Roosevelt Conservation Partnership v. Salazar*, 661 F.3d 66. 73 (D.C. 2011).

[5] *Fuel Safe Washington v. Fed. Energy Regulatory Comm'n*, 389 F.3d 1313, 1324 (10th Cir. 2004) (quoting *Davis v. Mineta*, 302 F.3d 1104, 1119 (10th Cir. 2002); *Citizens' Comm. To Save Our Canyons v. U.S. Forest Serv.*, 297 F.3d 1012, 1030 (10th Cir. 2002); *Simmons v. United States Army Corps of Eng'rs*, 120 F.3d 664, 666 (7th Cir. 1997); *City of New York v. United States Dep't of Transp.*, 715 F.2d 732, 743 (2d Cir. 1983), *cert. denied*, 456 U.S. 1005 (1984) ((holding that "an agency may not narrow the objective of its action artificially and thereby circumvent the requirement that relevant alternatives be considered); *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 196 (D.C. Cir. 1991), *cert. denied* 502 U.S. 994 (1991).

[6] *City of Bridgeton v. FAA*, 212 F.3d 448, 458 (8th Cir. 2000) (quoting *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 196 (D.C. Cir. 1991), *cert. denied* 502 U.S. 994 (1991); citing *Simmons v. U.S. Army Corps of Eng'rs*, 120 F.3d 664, 666 (7th Cir. 1997)).

[7] 1998 Supplement I at 1-6.

[8] 1998 Supplement I at 34 and SEIS-v ("Nonstructural alternatives such as acquisition of flowage easements can be utilized only if they further a project purpose or there is some legal obligation for them. Flowage easements were considered as a substitute for provision of PDF protection through levee raising. Such an alternative would not accomplish the congressionally mandated project purpose to provide a prescribed level of flood protection.").

agency's statutory authorization to act, **as well as in other Congressional directives**."[9] Notably, Congress has established a multitude of directives that explicitly require and/or promote: (1) the protection and restoration of the nation's waters and fish and wildlife resources; and (2) the use of natural infrastructure and nonstructural measures as a tool for achieving those goals.[10] For example:

(1) In 2018, Congress required the Corps to "consider the use of both traditional and natural infrastructure alternatives, alone or in conjunction with each other, if those alternatives are practicable" in flood and storm damage risk reduction studies. America's Water Infrastructure Act of 2018 § 1149(c).[11] Natural infrastructure alternatives include, but are by no means limited to, actions to protect and restore floodplain wetlands.
(2) In 2016, Congress directed the Corps to "consider, as appropriate" natural and nature-based measures in flood and storm risk reduction and ecosystem restoration studies. 33 USC 2289a.
(3) In 2007, Congress directed that all water resources projects protect and restore the environment, including by protecting and restoring the functions of natural systems. 42 USC 1962–3.
(4) In 1974, Congress directed the Corps to consider nonstructural alternatives when planning flood damage reduction projects. 33 USC 701b-11. Nonstructural alternatives avoid damage to natural systems, including floodplain wetlands.
(5) In 1973, Congress passed the Endangered Species Act to conserve endangered and threatened species and "the ecosystems upon which endangered species and threatened species depend." The Endangered Species Act also declares a Congressional policy "that Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species." Endangered Species Act, 16 USC 1531.
(6) In 1972, Congress passed the Clean Water Act "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Clean Water Act § 101, 33 USC § 1251. The Clean Water Act also directed the development of the 404(b)(1) Guidelines which establish clear policies and procedures for protecting wetlands and other special aquatic sites.
(7) In 1970, Congress directed the "Federal Government to use all practicable means" to "fulfill the responsibilities of each generation as trustee of the environment for succeeding generations." National Environmental Policy Act, 42 U.S.C. § 4331(b).
(8) In 1958 Congress directed that "wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development" and that water resources development is to prevent loss and damage to fish and wildlife and improve the health of fish and wildlife resources. Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661, 662.

To account for these many directives focused on protecting and restoring natural systems, including floodplain wetlands, and to ensure that the alternatives analysis does not inappropriately limit the analysis of alternatives, the National Wildlife Federation urges adoption of the following statement of project purpose:

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[9] *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 196 (D.C. Cir. 1991) (emphasis added).
[10] Post-project authorization directives, which include those outlined above, should be incorporated into the project purpose. According to Supplement I, "Project authority is the Flood Control Act of 1928, as amended, including, but not limited to, the Flood Control Acts of 1936, 1938, 1941, 1946, 1950, 1954, 1962, 1965, and 1968 and the Water Resources Development Act of 1986." Supplement I, Project Report at 1.
[11] This bill, which was passed with overwhelming support in both the House and Senate, was awaiting the President's signature as of the date of these comments.

The purpose of the proposed action is to reduce flood risks to Mississippi River communities while protecting and restoring the ecological health of the Mississippi River and its floodplain and delta wetlands.

B. Rigorously Evaluate All Reasonable Alternatives, Including Integrated River Management

To satisfy the requirements of NEPA, Supplement II must "[r]igorously explore and objectively evaluate all reasonable alternatives."[12] "[T]he existence of reasonable but unexamined alternatives renders an EIS inadequate."[13] "Reasonable alternatives include those that are practical or feasible from a technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant."[14] Merely evaluating alternative approaches to levee and seepage control construction cannot satisfy the requirement to evaluate all reasonable alternatives because each alternative would have the same end result – raising the levees.[15]

Notably, Supplement II must evaluate alternatives that would protect and restore the natural functions of the Mississippi River, and must ultimately select an alternative that achieves these objectives. This is required by the National Water Resources Planning Policy established by Congress in 2007, which requires that "all water resources projects" are to protect the environment by "protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems."[16]

The National Wildlife Federation urges the Corps to develop and adopt an alternative that utilizes a combination of low impact flood damage reduction measures, ecosystem restoration actions, and improved navigation management to reduce flood risks and restore the environment. Key activities that should be examined in depth for inclusion in this integrated river management alternative include at least the following:

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[12] 40 C.F.R. § 1502.14.

[13] *Ctr. for Biological Diversity v. United States Dep't of the Interior*, 623 F.3d 633, 642 (9th Cir. 2010); *Westlands Water Dist. v. U.S. Dep't of Interior*, 376 F.3d 853, 868 (9th Cir. 2004); *Morongo Band of Mission Indians v. Fed. Aviation Admin*., 161 F.3d 569, 575 (9th Cir. 1998); *Oregon Natural Desert Ass'n v. Bureau of Land Management*, 531 F.3d 1114, 1121 (9th Cir. 2008).

[14] *Forty Most asked Questions Concerning CEQ's NEPA Regulations*, 46 Fed. Reg. 18,026 (March 23, 1981).

[15] *State of California v. Block*, 690 F.2d 753, 767 (9th Cir. 1982) (holding that an inadequate range of alternatives was considered where the end result of all eight alternatives evaluated was development of a substantial portion of wilderness).

[16] 42 U.S.C 1962-3 (established by § 2031(a) of the Water Resources Development Act of 2007, and immediately applicable to all water resources projects). Enhancement of the environment has been an important federal objective for water resources programs for decades. Corps regulations in place since 1980 state that: "Laws, executive orders, and national policies promulgated in the past decade require that the quality of the environment be protected and, where possible, enhanced as the nation grows. . . . Enhancement of the environment is an objective of Federal water resource programs to be considered in the planning, design, construction, and operation and maintenance of projects. Opportunities for enhancement of the environment are sought through each of the above phases of project development. Specific considerations may include, but are not limited to, **actions to preserve or enhance critical habitat for fish and wildlife; maintain or enhance water quality; improve streamflow**; preservation and restoration of certain cultural resources, **and the preservation or creation of wetlands."** 33 C.F.R. § 236.4. (emphasis added).

(1) Obtaining <u>all</u> levee construction material from non-wetland locations. This should be a fundamental component of every alternative evaluated in Supplement II and should be included in the final alternative recommended in Supplement II.

As the Corps is aware, Supplement I approved the utilization of wetlands as construction material for levee enlargements and seepage control structures (through the placement of borrow pits in wetlands). Use of wetlands for construction material was strongly opposed by the conservation community, the public, and other federal agencies during the 1998 Supplement I process.

The value of the nation's wetlands—and the unacceptability of destroying wetlands so that wetland soils can be used for construction—is even more evident today. The nation's wetlands are far too valuable for flood damage reduction, fish and wildlife habitat, clean water, ecosystem services, recreation, and the economy to be used in this manner.

For example, wetlands account for more than 90% of the $330 billion to $1.3 trillion estimated present value of the ecosystem goods and services provided by Mississippi Delta.[17] Coastal wetlands reduced storm surge in some New Orleans neighborhoods by two to three feet during Hurricane Katrina, and levees with wetland buffers had a much greater chance of surviving Katrina's fury than levees without wetland buffers. Wetlands prevented $625 million in flood damages in the 12 coastal states affected by Hurricane Sandy and reduced damages by 20% to 30% in the four states with the greatest wetland coverage.[18] During Tropical Storm Irene, a network of wetlands and protected floodplain saved Middlebury Vermont $1.8 million in flood damages. Wetlands in California provide nearly $10 billion each year in flood damage reduction, groundwater recharge, and water purification benefits.

Wetlands are some of the most biologically productive natural ecosystems in the world, and support an incredibly diverse and extensive array of fish and wildlife. America's wetlands support millions of migratory birds and waterfowl. Up to one-half of all North American bird species rely on wetlands. Although wetlands account for just about five percent of land area in the lower 48 states, those wetlands are the only habitat for more than one third of the nation's threatened and endangered species and support an additional 20 percent of the nation's threatened and endangered at some time in their life. These same wetlands are home to 31 percent of the nation's plant species.[19]

Wetlands are also a critical economic driver. For example, 90 percent of fish caught by America's recreational anglers are wetland dependent, as are hundreds of species of birds, waterfowl, and wildlife. The U.S Fish and Wildlife Service estimates that in 2011, anglers spent "$41.8 billion on trips, equipment, licenses, and other items to support their fishing activities." That same year, nearly 71.8 million people "fed, photographed, and observed wildlife," spending $55 billion on those activities. In all, nearly 90.1 million Americans participated in

[17] Earth Economics, *Gaining Ground, Wetlands, Hurricanes and the Economy: The Value of Restoring the Mississippi River Delta*, at 11.
[18] Narayan, S., Beck, M.B., Wilson, P., et al., The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA. Scientific Reports 7, Article number 9463 (2017), doi:10.1038/s41598-017-09269-z (available at https://www.nature.com/articles/s41598-017-09269-z).
[19] Environmental Protection Agency, Economic Benefits of Wetlands, EPA843-F-06-004 (May, 2006) (factsheet).

some form of fishing, hunting or wildlife-associated recreation in 2011, contributing $145 billion to the national economy. "This equates to 1% of gross domestic product; meaning one out of every one hundred dollars of all goods and services produced in the U.S." [20]

There is no legitimate justification for digging up wetlands to use the soil for construction purposes, and Supplement II should ensure that no wetlands are destroyed for this purpose by explicitly prohibiting the use of wetlands (including the location of borrow pits in wetlands) as a source of construction material. Adverse impacts to wetlands from other activities must be avoided to the maximum extent possible, as required by law.

(2) Realigning segments of the levee system farther away from the river. Levee setbacks give the river more room to spread out during flood events. Such setbacks have been used extensively along the Mississippi River. Indeed, at the Corps acknowledged in the 1998 Supplement I:

> "Numerous levee setbacks have been required through the years because of the evermoving Mississippi River. Since 1915, levee setbacks have continually increased acreages to lands between the Mississippi River mainline levees. To date, the approximate cumulative total is 50,000 acres of land added between the levees. A 1996 study of levees in the Vicksburg District indicated that 17 major levee setbacks since 1915 have resulted in 43,000 acres being added to the riverside flood plain." [21]

(3) Modifying management of the MR&T floodways to reduce flood risks. Supplement II should examine whether the Corps should recommend to Congress a different ratio than the current 70/30 split between the Mississippi and Atchafalaya rivers or whether other modifications to managing the Atchafalaya floodway system can be made to reduce flood risks. Supplement II should also evaluate whether other floodways could be used more regularly to reduce flood risk and create fish and wildlife habitat. NEPA requires review of alternatives that are currently outside the authority of the Corps to implement.

(4) Utilizing sediment diversions to both reduce flood risks and advance coastal wetland restoration. Supplement II should examine whether new sediment and freshwater diversions could be implemented in the future, and whether existing and planned structures could be better utilized to reduce flood risks and advance coastal wetland restoration. Supplement II should also examine other methods to transport sediment from the stretch below the Old River Control Structure to use in rebuilding coastal wetlands.

Sediment and freshwater diversions have long been identified as keystone restoration project types for building new land and maintaining existing wetlands in Louisiana. Integrated into the levee system, these gated structures can be opened and closed to allow water, sediment and nutrients from the river to flow into open water and degraded wetlands, mimicking the natural system that existed before levees were built. As much as possible, management of sediment diversions should mimic the natural flood cycles of the Mississippi River, so that the ecosystem, vegetation and species can self-organize around pulses of freshwater, sediment, and nutrients.

[20] U.S. Fish and Wildlife Service, 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: National Overview, Issued August 2012. This study is the source for all quotes and data in this paragraph.
[21] 1998 Supplement I, Project Report at 10.

(5) Modifying and/or removing targeted river training structures to reduce flood risks. Supplement II should carefully examine modification and/or removal of targeted river training structures to reduce flood risks (*see* Section C of these comments for a discussion of these flood risks). The Corps has acknowledged that modification and/or removal of at least some structures will be required for mitigation purposes for the Regulating Works Project, and that such actions will not create problems for navigation.

C. Fully Analyze the Causes of Increased Flood Risks and Levee Deficiencies to Assist in Developing Meaningful, Long-Term Solutions

The National Wildlife Federation recognizes the importance of the Mainline Levee system and the need to address deficiencies in that system. However, we also recognize that meaningful, long-term flood damage reduction will also require addressing the underlying causes of increased flood risks and ensuring that any recommended alternative will protect and restore the river's floodplain and delta wetlands and hydrologic processes to minimize future flood risks.

The short-term nature of relying solely on levee enlargement and seepage control measures is exemplified by the extensive deficiencies that have arisen since finalization of the 1998 Supplement I. The 1998 Supplement I identified 128 needed construction items that included **263 miles of levee enlargements** and **132 miles of seepage control features**. Construction was estimated to cost $911 million fully funded, and with appropriate funding could have been completed in 2020.[22] However, in February 2017, the Mississippi River Commission reported that the Mississippi River Mainline Levees now require **370 miles of levee enlargements** (at 138 levees and floodwalls) and **395 miles of seepage control features** (at 97 levees).[23] Construction is estimated to cost $3.1 billion, with $2.0 billion of that work deemed to be critical.

According to the map of the proposed work items provided by the Memphis District, most of the proposed new construction is in areas **not** identified in the 1998 Supplement I. For example, an extensive amount of the proposed new construction would take place in the New Orleans District, which the 1998 Supplement I identified as requiring just over 14 miles of upgrades.[24]

1998 Supplement I			
Corps District	**Work Items**	**Levee Enlargements**	**Seepage Control**
Memphis	31	31.8	74.3
Vicksburg	85	216.8	57.4
New Orleans	12	14.2	0.1
Total	**128**	**262.8**	**131.8**

Additional materials provided to NWF by the Corps state that approximately 150 miles of Mainline Mississippi River Levee in the New Orleans District are currently deficient, with deficiencies ranging from a few inches to 6.5 feet. These 150 miles are currently broken out into 77 Work Items. Each work item will also include a seepage analysis to determine whether seepage control measures are required.

[22] 1998 Supplement I, Project Report at summary page, 1, 41.
[23] Mississippi River Commission, Fact Sheet, Mississippi River & Tributaries Project Authorized Work Remaining Necessary to Convey the Project Design Flood FEBRUARY 2017, available at http://www.mvd.usace.army.mil/Portals/52/docs/MRC/MRT_Work_Remaining.pdf.
[24] 1998 Supplement I, Project Report at summary page and 41.

Clearly, then, the situation on the river has changed significantly in the past 20 years (or the 1998 Supplement II did not adequately evaluate the conditions on the ground). These changes include increased flood levels, channel aggradation, channel narrowing, subsidence, and sea level rise. Unless these problems are addressed, the Mainline Levee system will continue to degrade and the risk to the public will continue to increase.

To develop meaningful, long-term solutions that address these problems, Supplement II should fully evaluate the key factors that have affected the integrity and sufficiency of the Mainline Levee system, including those outlined below.

(1) Supplement II should fully evaluate the role of channelization, channel aggradation, and river operations on flood levels and the integrity of the Mainline Levee system.

For example, a 2018 study concludes that "artificial channelization of the lower Mississippi River, and its effects on the river's gradient, channel area and flow velocity" have "significantly increased the discharge of a given flood event relative to pre-engineering conditions."[25] This study shows that flooding on the lower Mississippi has increased by 20 percent over that past 500 years, with "75 per cent of this increase attributed to river engineering" and concludes that "the interaction of human alterations to the Mississippi River system with dynamical modes of climate variability has elevated the current flood hazard to levels that are unprecedented within the past five centuries."[26] This study further concludes:

> "Our main finding—that river engineering has elevated flood hazard on the lower Mississippi to levels that are unprecedented within the past five centuries—adds to a growing list of externalized costs associated with conventional flood mitigation and navigation projects, including a reduction in a river's ability to convey flood flows, the acceleration of coastal land loss and hypoxia. Despite the societal benefits that these major infrastructure projects convey, the costs associated with maintaining current levels of flood protection and navigability will continue to grow at the expense of communities and industries situated in the river's floodplain and its delta. For those interested in improving seasonal and longer-term forecasts of flood hazard or management strategies that reconnect the river with its floodplain, the Mississippi River's discharge of freshwater—and by extension the flux of sediment, nutrients and pollutants—to its outlet should be viewed as highly sensitive both to anthropogenic modifications to the basin and to variability of the global climate system."[27]

Another 2018 study, that utilizes Corps data, demonstrates "significant changes in cross-sectional area, river stage, and river surface slope in specific discharge regimes along the first 140 km downstream of the LMR's diversion to the Atchafalaya River at the Old River Control Structure (ORCS)" since 1992.[28]

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[25] Munoz, S.E, Goisan L, Therrell M.D, Remo J.W.F, et al, Climatic control of Mississippi River flood hazard amplified by river engineering, Nature, Vol. 556, 95, 97 April 5, 2018 Letter doi:10.1038/nature26145.
[26] Id. at 95.
[27] Id. at 98 (internal footnotes omitted).
[28] Sanjeev Joshi & Xu Y. Jun (2018) *Recent changes in channel morphology of a highly engineered alluvial river – the Lower Mississippi River*, Physical Geography, 39:2, 140-165, DOI: 10.1080/02723646.2017.1340027

> "This study used the hydrographic survey measurements conducted in 1992, 2004, and 2013 as well as daily river discharge and stage records over the past three decades to assess long-term channel morphological changes at seven locations along a 327-km reach of the Lower Mississippi River (LMR), one of the most regulated alluvial rivers in the world. We found significant changes in cross-sectional area, river stage, and river surface slope in specific discharge regimes along the first 140 km downstream of the LMR's diversion to the Atchafalaya River at the Old River Control Structure (ORCS), covering Tarbert Landing, Red River Landing, Bayou Sara, and Baton Rouge. Specifically, the first 20–25 km reach (reach 1) and the reach further downstream from 80 to 140 km (reach 3) showed continuous decreases in cross-sectional area and increases in river stage and river slope under all flow conditions. However, the 55–60 km reach in between (from 20–25 km to 80 km below ORCS) (reach 2) experienced exactly opposite trends, i.e. increase in cross-sectional area and decrease in river stages. Furthermore, the remaining 187 km reach (from 140 to 327 km; reach 4) had insignificant changes in its cross-sectional area, river stage, and river surface slope. We link these changes to channel bed adjustment pertaining to sediment deposition and erosion partially and propose that reaches 1 and 3 have probably experienced sediment deposition, reach 2 has probably experienced bed erosion, and reach 4 is probably approaching dynamic equilibrium over the past three to four decades. Therefore, substantial amount of sediment, potentially useful for land-building purposes, appears to be trapped along the first 140 km LMR reach below ORCS, while sediment flow seems higher along the next 187-km reach. These findings suggest that large alluvial rivers with intensive human interventions go through noticeable spatial and temporal changes in their corresponding bed adjustment processes. Such information can have relevant implications for riverine sediment management, channel engineering, and coastal land restoration in the world's sinking deltas fed by regulated alluvial rivers."[29]

Copies of both of these 2018 studies are provided at Attachment A to these comments.

(2) Supplement II should fully evaluate the extensive body of peer reviewed science which shows that river training structures have significantly increased flood levels in the Middle Mississippi River, including in locations targeted for construction as identified in the project map.

As the Corps is aware,[30] extensive peer-reviewed science demonstrates that river training structures have increased flood levels by up to 15 feet in some locations and 6 to 10 feet in broad stretches of the Middle Mississippi River where these structures are prevalent.[31] The

[29] Id.

[30] The National Wildlife Federation recognizes that the Corps disagrees with these findings. However, the Corps' conclusion that river training structures do not affect flood heights has been conclusively disproved by research led by Nicholas Pinter, Ph.D., currently the Shlemon Chair in Applied Geology at the University of California Davis. Dr. Pinter has specifically rebutted the arguments used by the Corps to reject these findings in a series of exchanges published in the Journal of Hydraulic Engineering and in sworn affidavits submitted to the District Court for the Southern District of Illinois. These materials are provided at Attachment B to these comments.

[31] *See, e.g.,* Pinter, N., A.A. Jemberie, J.W.F. Remo, R.A. Heine, and B.A. Ickes, 2010. Empirical modeling of hydrologic response to river engineering, Mississippi and Lower Missouri Rivers. River Research and Applications, 26: 546-571; Remo, J.W.F., N. Pinter, and R.A. Heine, 2009. The use of retro- and scenario- modeling to assess effects of 100+ years river engineering and land cover change on Middle and Lower Mississippi River flood stages.

impacts of river training structures are cumulative; the more structures placed in the river, the higher the flood stages. Flood stages increase more than 4 inches for each 3,281 feet of wing dike built within 20 river miles downstream:

> "[O]ur analyses demonstrate that wing dikes constructed downstream of a location were associated with increases in flood height ("stage"), consistent with backwater effects upstream of these structures. Backwater effects are the rise in surface elevation of flowing water upstream from, and as a result of, an obstruction to water flow. These backwater effects were clearly distinguishable from the effects of upstream dikes, which triggered simultaneous incision and conveyance loss at sites downstream. On the Upper Mississippi River, for example, stages increased more than four inches for each 3,281 feet of wing dike built within 20 RM (river miles) downstream. These values represent parameter estimates and associated uncertainties for relationships significant at the 95 percent confidence level in each reach-scale model. The 95-percent level indicates at least a 95% level of certainty in correlation or other statistical benchmark presented, and is considered by scientists to represent a statistically verified standard. Our study demonstrated that the presence of river training structures can cause large increases in flood stage. For example, at Dubuque, Iowa, roughly 8.7 linear miles of downstream wing dikes were constructed between 1892 and 1928, and were associated with a nearly five-foot increase in stage. In the area affected by the 2008 Upper Mississippi flood, more than six feet of the flood crest is linked to navigational and flood-control engineering."[32]

Additional science shows that the Middle Mississippi River has been so constricted by river training structures and levees that it is now exhibiting "the flashy response" to flooding "typical of a much smaller river,"[33] with extremely troubling implications for public safety. In recent comments submitted on the Corps' Regulating Works Project Grand Tower Amended Environmental Assessment, Robert E. Criss, Ph.D., a professor in the Department of Earth and Planetary Sciences at Washington University in St. Louis, concludes:

> "The consequences of current management strategy on floodwater levels are clearly shown by data from multiple gauging stations on the Middle Mississippi River (Figures). The Chester and Thebes stations were selected as they are the closest stations to the project area that have long, readily available historical records (USGS, 2016). **These figures conclusively document that floodwater levels have been greatly magnified along the Middle Mississippi River, in the timeframe when most of the in-channel navigational structures were constructed. If these structures are not the cause, then we are left with no explanation for this profound, predictable effect.** That USACE proposes more in-channel construction activities only two months after another "200-

Journal of Hydrology, 376: 403-416; Numerous other studies and analyses provided to the Corps through public comments on the scope of the SEIS and on the Draft SEIS.

[32] Reply Declaration of Nicholas Pinter, Ph.D. in Support of Plaintiffs' Motion for Preliminary Injunction, NWF et al v. Corps of Engineers, Case No. 14-00590-DRH-DGW, (S.D. ILL), 2014; Declaration of Nicholas Pinter, Ph.D. in Support of Plaintiffs' Motion for Preliminary Injunction, Case No. 14-00590-DRH-DGW, (S.D. ILL), 2014. See Attachment B to these comments for copies of these declarations.

[33] Robert E. Criss, Mingming Luo, *River Management and Flooding: The Lesson of December 2015–January 2016, Central USA*, Journal of Earth Science, Vol. 27, No. 1, p. 117–122, February 2016 ISSN 1674-487X (DOI: 10.1007/s12583-016-0639-y).

> year" flood (as defined by USACE, 2004, 2016) occurred in this area proves that their structures and opinions are not beneficial, but harmful."[34]

Dr. Criss adds that measurements at the Mississippi River at St. Louis and the Missouri River at Herman "document similar damaging and incontestable trends for other river reaches managed in the same manner."[35]

A 2016 Journal of Earth Science study co-authored by Dr. Criss ("Criss and Luo 2016") highlights the cumulative impact of the Corps' excessive channelization of the Middle Mississippi River.[36] As noted above, that study concludes that the Middle Mississippi River has been so constricted by river training structures and levees that it is now exhibiting "the flashy response" to flooding "typical of a much smaller river":[37]

> "Ehlmann and Criss (2006) proved that the lower Missouri and middle Mississippi Rivers are becoming more chaotic and unpredictable in their time of flooding, height of flooding, and magnitude of their daily changes in stage. This chaotic behavior is primarily the result of extreme channelization of the river, and its isolation from its floodplain by levees (e.g., Criss and Shock, 2001; GAO, 1995; Belt, 1975). The channels of the lower Missouri and middle Mississippi Rivers are only half as wide as they were historically, along a combined reach exceeding 1 500 km, as clearly shown by comparison of modern and historical maps (e.g., Funk and Robinson, 1974)."

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[34] Comments on Draft Environmental Assessment by Robert E Criss, Washington University, March 3, 2016 (emphasis added).

[35] Id.

[36] The National Wildlife Federation recognizes that the Corps has disputed the findings of this study. However, the Corps' critique of this study as provided in Appendix A to the May 2017 Regulating Works Project Final Environmental Impact Statement is fundamentally flawed. That critique does not address the content of the study, and instead focuses on a single locality (Chester) that was scarcely mentioned in the study. The discussion of this single locality (Chester) inappropriately compares the recent winter flood with prior, warm weather floods, and rising limb data with falling limb data. In addition, the critique, does not—and cannot—explain away critical findings in Criss and Luo 2016, including the findings related to: (1) The record high stages set during this recent flood just downstream at Cape Girardeau and Thebes, which as Criss and Luo point out would have been far higher but for the catastrophic failure of the Len Small levee; (2) Why the recent peak stage at Chester was nearly 3 feet higher than it was on April 30, 1973, which at that time was the highest water level ever recorded at that site; (3) The unusual winter timing of this recent flood and its short duration, both of which would not have caused a flood of this magnitude without constriction of the river; and (4) Why the site showing the greatest increase in stage over previous floods occurred adjacent to the Valley Park levee, built by the Corps in 2005. Moreover, contrary to the assertions in the critique, the Criss and Luo 2016 synopsis of weather conditions clearly acknowledges antecedent ground saturation, and all data used by Criss and Luo are identical to values reported by the cited federal agencies at the time of writing. Each of those values remains identical to the values reported today with the single exception that the 1982 stage at Pacific was revised subsequently by the National Weather Service. However, this change has no effect on the Criss and Luo 2016 conclusions.

[37] Robert E. Criss, Mingming Luo, *River Management and Flooding: The Lesson of December 2015–January 2016, Central USA*, Journal of Earth Science, Vol. 27, No. 1, p. 117–122, February 2016 ISSN 1674-487X (DOI: 10.1007/s12583-016-0639-y). A copy of this study is provided at Attachment C to these comments.

"The aftermath of storm Goliath [which led to the December 2015 floods] provides another example in an accelerating succession of record floods, whose tragic effects have been greatly magnified by man. The heavy rainfall was probably related to El Nino, and possibly intensified by global warming. . . . The Mississippi River flood at St. Louis was the third highest ever, yet it occurred at the wrong time of year, and its brief, 11-day duration was truly anomalous. Basically, this great but highly channelized and leveed river exhibited the flashy response of a small river, and indeed resembled the response of Meramec River, whose watershed is smaller by 160×. Yet, only a few percent of the watershed above St. Louis received truly heavy rainfall during this event; the river rose sharply because the water simply had nowhere else to go."

"Further downstream, new record stages on the middle Mississippi River were set. Those record stages would have been even higher, probably by as much as 0.25 m, had levees not failed and been overtopped. The sudden drop of the water level near the flood crest at Thebes clearly demonstrates how levees magnify floodwater levels. In this vein, it is very significant that the water levels on the lower Meramec River were highest, relative to prior floods, proximal to a new levee and other recent developments."

"Forthcoming calls for more river management, including higher levees and other structures, must be rejected. Additional "remediations" to this overbuilt system will only aggravate flooding in the middle Mississippi Valley (see Walker, 2016)."

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"In contrast, Goliath's extraordinary rainfall impacted only a tiny fraction of the huge, 1.8 million km2 Mississippi River Basin above St. Louis, yet flooding occurred which was truly remarkable for the high water level, time of year, and brief duration."

"This continental-scale river exhibited the flashy response typical of a much smaller river such as the Meramec. This unnatural response is clearly consistent with the dramatic channelization of the middle Mississippi River and its isolation from its floodplain by levees, as clearly pointed out by Charles Belt more than 40 years ago. It is time for this effect to be accepted and for flood risk and river management to be reassessed."[38]

(3) Supplement II should fully evaluate the role of levee construction and levee enlargements on increased flood levels, along with the potential of the proposed work items to also increase flood levels.

It is of course well recognized that new and/or higher levees increase flood heights. Indeed, the Corps recognized this in the 1998 Supplement I, when it concluded that two private levees were key factors in higher water surface elevations during the Mississippi River flood of 1995:

"The 1993 and 1995 floods on the upper Mississippi River revealed significant upward changes in stage-discharge relationships on the upper Mississippi River. The higher than expected water surface elevations experienced during the flood of 1995 on the reach of

[38] Id.

the Mississippi River above Cairo, Illinois, indicated that significant changes in the flood plain have occurred from the conditions used to develop the 1956 PDF flowline. Therefore, the MR&T Project design flowline from Cairo to Cape Girardeau was revised in 1996. The revision was based on available data and analyses of river hydraulic and hydrologic parameters. Two private levees (Powers Island levee and the Miller City levee) located in the Upper Mississippi River Commerce to Birds Pt. reach are factors in the changed flood plain conditions. Earlier, these private levees have tended to fail during floods, permitting partial conveyance of flow through the flood plain. In recent years, these levees have demonstrated greater resistance to failure, resulting in higher than expected flowlines against the project levee."[39]

(4) Supplement II should fully evaluate the role of sea level rise and subsidence on the deficiencies in the Mainline Levee system.

As the Corps is aware, subsidence is a critical problem exacerbated by a lack of land building sediments reaching the river's lower reaches combined with sea level rise. A recent study concludes that the Mississippi River downstream of New Orleans—where most of the New Orleans District work items would occur—is subsiding at a higher rate than the already high average rate of subsidence across coastal Louisiana:

> "While spatial variability between our discrete monitoring sites is high, the map shows that the expected average subsidence rate is relatively uniform across coastal Louisiana, with a mean rate of 9 mm yr−1 and a standard error of the mean of 1 mm yr−1. . . . The map predicts slightly higher than average subsidence rates in the eastern Chenier Plain, the Atchafalaya and Wax Lake Deltas, and along the Mississippi River downstream of New Orleans."[40]

(5) Supplement II should fully evaluate the implications of climate change, and climate change-induced sea level rise and more extreme weather events.

An extensive body of science demonstrates that the earth's climate is changing and that this change is causing significant increases in sea level rise and more frequent and extreme weather events. Supplement II should fully analyze and account for this information and changed conditions that have significant implications for the long-term effectiveness of flood damage reduction measures and the long term health and viability of coastal and riverine wetlands and the fish and wildlife that rely on those resources.

For example, climate change is implicated in significant changes in precipitation in the Mississippi River basin. In March 2005, the U.S. Geological Survey reported upward trends in rainfall and stream flow for the Mississippi River.[41] In 2009, the U.S. Global Change Research Program issued a report showing that the Midwest experienced a 31% increase in very heavy

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[39] 1998 Supplement I, Project Report at 10.

[40] Nienhuis, J.H., Törnqvist, T.E., Jankowski, K.L., et al, *A New Subsidence Map for Coastal Louisiana*, GSA Today, v. 27, doi: 10.1130/GSATG337GW.1.,(available at https://www.geosociety.org/gsatoday/groundwork/G337GW/GSATG337GW.pdf). A copy of this study is provided at Attachment D to these comments.

[41] USGS Fact Sheet 2005-3020, Trends in the Water Budget of the Mississippi River Basin, 1949-1997.

precipitation events (defined as the heaviest 1% of all daily events) between 1958 and 2007.[42] That study also reports that during the past 50 years, "the greatest increases in heavy precipitation occurred in the Northeast and the Midwest." [43] Models predict that heavy downfalls will continue to increase:

> Climate models project continued increases in the heaviest downpours during this century, while the lightest precipitation is projected to decrease. Heavy downpours that are now 1-in-20-year occurrences are projected to occur about every 4 to 15 years by the end of this century, depending on location, and the intensity of heavy downpours is also expected to increase. The 1-in-20-year heavy downpour is expected to be between 10 and 25 percent heavier by the end of the century than it is now. . . . Changes in these kinds of extreme weather and climate events are among the most serious challenges to our nation in coping with a changing climate.[44]

In March 2012, Midwest regional assessments were issued that provide important technical input into the National Climate Assessment.[45] In 2013, Regional Climate Trends and Scenarios were issued for the Midwest U.S. showing that for the Midwest region, annual and summer trends for precipitation in the 20th century are upward and statistically significant; the frequency and intensity of extreme precipitation in the region has increased, as indicated by multiple metrics; and models predict increases in the number of wet days (defined as precipitation exceeding 1 inch) for the entire Midwest region, with increases of up to 60%.[46]

(6) Supplement II should fully evaluate whether the current flowline is appropriate.

Supplement II should utilize the findings from the analyses identified above and the numerous sources of new data and extensive new modeling capacity developed over the last 20 years to establish a more accurate and nuanced assessment of the dynamic baseline conditions and flowlines affecting the river reaches covered by the MR&T.

Relevant studies that are currently ongoing include the Mississippi River Hydrodynamic and Delta Management Study, which will address the Mississippi River from Vicksburg, Mississippi to the Gulf of Mexico. This study is highly relevant to Supplement II, as the Corps' website makes clear:

> "This study will identify and evaluate a combination of large-scale management and restoration features to address the long-term sustainability of the lower Mississippi

[42] Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009, at page 32 (available at http://nca2009.globalchange.gov/).
[43] *Id*.
[44] *Id*.
[45] The Midwest regional assessment can be accessed at http://glisa.msu.edu/great_lakes_climate/nca.php (visited January 22, 2014).
[46] Kunkel, K.E, L.E. Stevens, S.E. Stevens, L. Sun, E. Janssen, D. Wuebbles, S.D. Hilberg, M.S. Timlin, L. Stoecker, N.E. Westcott, and J.G. Dobson, 2013: Regional Climate Trends and Scenarios for the U.S. National Climate Assessment. Part 3. Climate of the Midwest U.S., NOAA Technical Report NESDIS 142-3, 95 pp. (available at http://scenarios.globalchange.gov/regions/midwest).

River Deltaic Plain, and will balance the interests of ecosystem restoration, flood risk reduction and navigation."[47]

Assessment of the new flowline should also utilize the recently released new *Guidelines for determining flood flow frequency—Bulletin 17C.*[48] This long-awaited Bulletin, which was released by the U.S. Geological Survey on March 29, 2018, updates guidelines that were last updated in 1982. "Federal agencies are requested to use these Guidelines in all planning activities involving water and related land resources."[49]

The National Wildlife Federation notes that the PDF flowline was updated for the 1998 Supplement I,[50] but is not clear from the materials provided by the Memphis District whether an update has been carried out in advance of this scoping process.[51] Updating the flowline would appear to be an essential component for developing an adequate Supplement II.

(7) Supplement II should fully evaluate the role that sediment and freshwater diversions could play in minimizing future deficiencies in the Mainline Levee system.

Important efforts are underway to build and re-operate Mississippi River diversion projects to move more sediment into the Mississippi River delta to rebuild the delta's wetlands. For example, the Mid-Barataria Sediment Diversion, which is one of the most studied and modeled projects in Louisiana's history, will bring sediments and nutrients into the Barataria Basin building land and spurring growth of wetland plants. Supplement II should carefully evaluate the role of sediment diversions in increasing the resiliency of the MR&T and in reducing flood risks for the region.

Diversions have been recognized as critical projects for the future of Louisiana's coastal in every Louisiana Coastal plan issued over the past 40 years precisely because the Mississippi River is the region's greatest force for building land.[52] Most of the areas of Louisiana's coast that have

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[47] USACE, New Orleans District Website (available at http://www.mvn.usace.army.mil/Missions/Environmental/Louisiana-Coastal-Area/Mississippi-River-Hydrodynamic-and-Delta-Managemen/) (visited October 15, 2018).

[48] England, J.F., Jr., Cohn, T.A., Faber, B.A., Stedinger, J.R., Thomas, W.O., Jr., Veilleux, A.G., Kiang, J.E., and Mason, R.R., Jr., 2018, Guidelines for determining flood flow frequency—Bulletin 17C: U.S. Geological Survey Techniques and Methods, book 4, chap. B5, 148 p., https://doi.org/10.3133/tm4B5.

[49] https://pubs.er.usgs.gov/publication/tm4B5

[50] 1998 Supplement I, Project Report at 10 ("The 1993 and 1995 floods on the upper Mississippi River revealed significant upward changes in stage-discharge relationships on the upper Mississippi River. The higher than expected water surface elevations experienced during the flood of 1995 on the reach of the Mississippi River above Cairo,· Illinois; indicated that significant changes in the flood plain have occurred from the conditions used to develop the 1956 PDF flowline. Therefore, the MR&T Project design flowline from Cairo to Cape Girardeau was revised in 1996. The revision was based on available data and analyses of river hydraulic and hydrologic parameters. Two private levees (Powers Island levee and the Miller City levee) located in the Upper Mississippi River Commerce to Birds Pt. reach are factors in the changed flood plain conditions. Earlier, these private levees have tended to fail during floods, permitting partial conveyance of flow through the flood plain. In recent years, these levees have demonstrated greater resistance to failure, resulting in higher than expected flowlines against the project levee.")

[51] *See* 83 Fed. Reg. 32642, 32643 (July 13, 2018) ("October of 2017, USACE completed an engineering risk assessment and programmatic review of the MRL based on the 1973 Refined MR&T Flowline Study.").

[52] http://mississippiriverdelta.org/coastal-restoration-and-louisiana-more-than-40-years-of-planning/

been maintaining or even gaining land instead of losing it are doing so because of regular sediment input from the Mississippi River.[53] For example, the Wax Lake Delta, located in Atchafalaya Bay, has been impacted by storm surge over the years, but this delta quickly recovers and continues to grow and push out into the Atchafalaya Bay because of the steady supply of sediment. As a result, it is one of the few areas of the Louisiana coast that is gaining land.[54]

(8) Supplement II should fully evaluate whether the proposed deepening of the lower Mississippi River navigation channel could create additional stressors on the Mainline Levee system.

The Corps is currently considering a proposal to deepen the navigation channel in portions of the lower Mississippi River. Among other impacts, this proposed deepening could increase hurricane-induced storm surge height and distance of storm surge propagation upstream. This would significantly intensify pressure on river levees, particularly those in Louisiana's Plaquemines Parish. During Hurricanes Katrina and Isaac, storm surge increased river stage at the Corps' Carrollton gage in New Orleans by at least 10-ft and 6-ft, respectively.

These analysis should be used to properly assess current and potential future conditions; analyze direct, indirect, and cumulative impacts; and critically, to develop meaningful and long-term solutions to reducing flood damages while improving the health of the environment.

D. Comprehensively Evaluate the Full Suite of Direct, Indirect, and Cumulative Impacts

In addition to the investigations outlined in Section C of these comments, Supplement II also must examine the direct, indirect, and cumulative environmental impacts of all reasonable alternatives, the conservation potential of those alternatives, and the means to mitigate adverse environmental impacts that cannot be avoided.[55] These assessments are critical for determining whether less environmentally damaging alternatives are available.

Supplement II should ensure a full assessment of the direct, indirect, and cumulative impacts on at least the resources outlined below.

(1) Impacts on hydrology, including the impacts on flood heights, channel morphology, and sedimentation. Depending on the alternatives considered, the project could have significant adverse impacts to these process or could help return these processes to more natural conditions with significant positive benefits. In light of the vital importance of sediment transport for coastal Louisiana restoration, Supplement II should carefully evaluate and quantify the impacts on sediment transport downstream, including any resulting impacts on

[53] Gagliano, S.M., P. Culley, D.W. Earle, Jr., P. King, c. Latiolais, P. Light, A. Rowland, R. Shlemon and J.L. van Beek. 1973. Environmental Atlas and Multiuse Management Plan for South-Central Louisiana. Center for Wetland Resources, Louisiana State University. Baton Rouge, LA; Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands. Conservation and Restoration Authority. 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. Louisiana Department of Natural Resources. Baton Rouge, La. 161 p.

[54] Couvillion, B.R., Beck, Holly, Schoolmaster, Donald, and Fischer, Michelle, 2017, Land area change in coastal Louisiana 1932 to 2016: U.S. Geological Survey Scientific Investigations Map 3381, 16 p. pamphlet, https://doi.org/10.3133/ sim3381.

[55] 40 C.F.R. § 1502.16.

coastal wetland losses and/or coastal wetland restoration.

(2) Impacts on special aquatic habitats – including riverine, floodplain, and coastal wetlands. The Mississippi River and its floodplain have suffered astounding wetland losses. The loss of these vital habitats has cascading negative impacts on fish and wildlife, public safety, recreation, and economies that rely on healthy river and floodplain systems. Supplement II must carefully evaluate and quantify the potential for additional losses – or gains – of wetlands and other special aquatic sites. The cumulative impacts of historical losses to these key habitats must also be fully evaluated and accounted for in any final recommended alternative.

Notably, "[t]he single most important factor affecting wetlands has been the construction of levees to reduce the frequency and duration of flooding throughout much of the lower Mississippi River Valley."[56] This includes significant losses to bottomland hardwood wetlands, which are recognized as being "among the Nation's most important wetlands."[57] When the U.S. Fish and Wildlife Service was providing input for the 1998 Supplement I, it concluded that "any further loss of forested wetlands within the project area should be considered significant considering the cumulative losses."[58] Recognizing the true importance and value of wetlands, and the role of projects such as this one in causing the losses of these wetlands, is critical for making an informed decision that avoids additional wetland impacts.

As noted above, the National Wildlife Federation urges the Corps to prohibit the use of wetlands (including through placement of borrow pits in wetland areas) for construction material. Such use is anathema to sound water resources management and is contrary to the clear directives in law and policy to protect the nation's wetland resources and avoid and minimize damage to the nation's wetlands.

(3) Impacts on fish and wildlife. Supplement II must examine the impacts of the alternatives on the species that utilize the Mississippi River, including the impacts to fish, waterfowl, birds, mammals, reptiles, amphibians, and mussels. The Mississippi River is used by an astounding array of wildlife, including 360 species of birds, 260 species of fish, 145 species of amphibians and reptiles, 98 species of mussels, and 50 species of mammals.

Forty percent of North America's waterfowl migrate through the Mississippi River flyway. The impacts on the critical array of migratory species that utilize the Mississippi River and Mississippi River flyway must also be analyzed, including the cumulative impacts of climate change on these species. As discussed below, migratory wildlife are particularly vulnerable to the impacts of climate change.

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[56] Report to Congress by the Secretary of the Interior, *Impact of Federal Programs on Wetlands,* Volume II, at 145 (1994).

[57] Report to Congress by the Secretary of the Interior, *Impact of Federal Programs on Wetlands*, Volume I, at 39 (1988). Indeed, bottomland hardwood wetlands are so important that they Congress has determined that in any Corps project proposed to Congress, losses of bottomland hardwoods must be mitigated in kind whenever possible. 33 U.S.C. § 2283(d)(2).

[58] November 30, 1995 letter from Allan J. Mueller to Colonel Gary W. Wright. A copy of this letter is found at Appendix 11 of the DSEIS for Supplement I.

An accurate assessment of fish and wildlife impacts will require an accurate assessment of impacts to the full range of habitats that these species rely on. A meaningful assessment would also include an evaluation of the impacts of each alternative on the ability of the fish and wildlife that utilize the river and flyway to withstand the adverse impacts of climate change (*i.e.*, the species' resiliency to climate change).

(9) Impacts on endangered species. Supplement II should pay particular attention to the impacts on threatened and endangered species and any critical habitat.

(10) Impacts on water quality, including nutrient composition. The Mississippi River remains plagued by water quality problems, including excess nutrients that have both local and ecosystem wide impacts (including, for example, yearly development of the Gulf of Mexico dead zone). Supplement II must carefully evaluate and quantify the impacts of each alternative on water quality in the river, including the potential water quality impacts caused by loss of wetlands and increased sedimentation.

(11) Impacts on vegetation, including wetland vegetation and threatened, endangered and at risk plant species. Impacts to plant species, which of course are a critical component of the environment, must be evaluated in Supplement II. Moreover, without this analysis it is not possible to accurately assess impact to fish and wildlife or water quality.

(12) Cumulative impacts of climate change. Supplement II must assess the cumulative impacts of climate change, including climate-change induced increases in precipitation, extreme weather events, and sea level rise. Of critical concern are the additive and magnifying effect of climate change on increased flood risks, wetland losses, and fish and wildlife.

Climate change may significantly exacerbate the impacts on the many migratory species that utilize the Mississippi River, Mississippi River Flyway, and the project area. As recognized by the United Nations Environment Program and the Convention on the Conservation of Migratory Species of Wild Animals, migratory wildlife is particularly vulnerable to the impacts of climate change:

> "As a group, migratory wildlife appears to be particularly vulnerable to the impacts of Climate Change because it uses multiple habitats and sites and use a wide range of resources at different points of their migratory cycle. They are also subject to a wide range of physical conditions and often rely on predictable weather patterns, such as winds and ocean currents, which might change under the influence of Climate Change. Finally, they face a wide range of biological influences, such as predators, competitors and diseases that could be affected by Climate Change. While some of this is also true for more sedentary species, migrants have the potential to be affected by Climate Change not only on their breeding and non-breeding grounds but also while on migration."
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> "Apart from such direct impacts, factors that affect the migratory journey itself may affect other parts of a species' life cycle. Changes in the timing of migration may affect breeding or hibernation, for example if a species has to take longer than normal on migration, due to changes in conditions *en route*, then it may arrive late, obtain poorer quality breeding resources (such as

territory) and be less productive as a result. If migration consumes more resources than normal, then individuals may have fewer resources to put into breeding . . . ."

* * *

"Key factors that are likely to affect all species, regardless of migratory tendency, are changes in prey distributions and changes or loss of habitat. Changes in prey may occur in terms of their distributions or in timing. The latter may occur though differential changes in developmental rates and can lead to a mismatch in timing between predators and prey ("phenological disjunction"). Changes in habitat quality (leading ultimately to habitat loss) may be important for migratory species that need a coherent network of sites to facilitate their migratory journeys. Habitat quality is especially important on staging or stop-over sites, as individuals need to consume large amounts of resource rapidly to continue their onward journey. Such high quality sites may [be] crucial to allow migrants to cross large ecological barriers, such as oceans or deserts."[59]

Migratory birds are at particular risk from climate change. Migratory birds are affected by changes in water regime, mismatches with food supply, sea level rise, and habitat shifts, changes in prey range, and increased storm frequency.[60]

(13) Impacts on restoration efforts. The Corps, other federal agencies, states, non-governmental organizations, and members of the public are engaged in significant efforts to restore the Mississippi River, Mississippi River floodplain, and Mississippi River delta. Supplement II should carefully assess the impacts of each alternative on these other vital efforts, including any implications for timely issuance of Section 408 permits for sediment diversion projects. Supplement II should also evaluate the ability of each alternative to comply with the National Water Policy which requires that all water resources projects protect and restore the functions of natural systems and mitigate any unavoidable damage to natural systems.[61]

(14) Impacts on ecosystem services provided by a healthy Mississippi River and floodplain. "Ecosystem services" are the goods and services produced by ecosystems that benefit humankind. These services include (but are by no means limited to) such things as carbon sequestration, wildlife habitat, nutrient retention, and erosion reduction. While these services have traditionally been undervalued because they often fall outside of conventional markets and pricing, society is increasingly recognizing the essential link between healthy ecosystems and human welfare and significant progress has been made in the science of ecosystem services evaluation. Supplement II should carefully assess the impacts of each alternative on ecosystem services [62]

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[59] UNEP/CMS Secretariat, Bonn, Germany, *Migratory Species and Climate Change: Impacts of a Changing Environment on Wild Animals* (2006) at 40-41 (available at http://www.cms.int/publications/pdf/CMS_CimateChange.pdf).

[60] *Id*. at 42-43.

[61] 42 U.S.C 1962-3.

[62] *See, e.g.*, Earth Economics, *Gaining Ground, Wetlands, Hurricanes and the Economy: The Value of Restoring the Mississippi River Delta*.

(15) Impacts on recreational fishing and tourism industries that rely on a healthy Mississippi River and floodplain. Mississippi River tourism generates approximately $2 billion annually. Recreational opportunities, including recreational fishing, are vitally important to the public. The SEIS should fully evaluate the impacts of each alternative on these important activities.

(16) Disproportionate impacts on low income and minority communities (i.e., environmental justice). Supplement II must examine whether the proposed project would cause disproportionate impacts to low income and minority communities. Particular concerns include: exposing such communities to increased flood risks (including by raising levees in locations upstream); releasing or re-suspending contaminated sediments including in or near borrow pits; adversely affecting subsidence fishing including through increases toxic contamination of fish; the potential for re-exposure to toxic materials resulting from disturbance of borrow pits and disposal sites during floods and storms; significant noise, air pollution or other construction impacts; and the cumulative impacts of any such activities.

As noted above, Supplement II must assess the direct, indirect, and cumulative impacts on these resources and natural and human communities. Direct impacts are caused by the action and occur at the same time and place as the action. Indirect impacts are also caused by the action, but are later in time or farther removed from the location of the action.[63] Cumulative impacts are:

> "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."[64]

The cumulative impacts analysis ensures that the agency will not "treat the identified environmental concern in a vacuum."[65] The cumulative impacts analysis must examine the cumulative effects of federal, state, and private projects and actions.[66] The cumulative impacts analysis must also evaluate the cumulative impacts of climate change.[67]

These direct, indirect, and cumulative impacts must be assessed at the site specific level. If the Corps intends Supplement II to be a programmatic EIS, the Corps must commit to preparing tiered site-specific

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[63] 40 C.F.R. § 1508.8.
[64] 40 C.F.R. § 1508.7.
[65] *Grand Canyon Trust v. FAA*, 290 F.3d 339, 346 (D.C. Cir. 2002).
[66] The requirement to assess non-Federal actions is not "impossible to implement, unreasonable or oppressive: one does not need control over private land to be able to assess the impact that activities on private land may have" on the project area. *Resources Ltd., Inc. v. Robertson*, 35 F.3d 1300, 1306 (9th Cir. 1993).
[67] *See Center for Biological Diversity v. Nat'l Hwy Traffic Safety Administration*, 538 F.3d 1172, 1217 (9th Cir. 2008) (holding that analyzing the impacts of climate change is "precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct" and that NEPA requires analysis of the cumulative impact of greenhouse gas emissions when deciding not to set certain CAFE standards); *Center for Biological Diversity v. Kempthorne*, 588 F.3d 701, 711 (9th Cir. 2009) (NEPA analysis properly included analysis of the effects of climate change on polar bears, including "increased use of coastal environments, increased bear/human encounters, changes in polar bear body condition, decline in cub survival, and increased potential for stress and mortality, and energetic needs in hunting for seals, as well as traveling and swimming to denning sites and feeding areas.").

NEPA analyses for each work item.[68] "The critical inquiry in considering the adequacy of an EIS prepared for a large scale, multi-step project is not whether the project's site-specific impact should be evaluated in detail, but when such evaluation should occur."[69]

Supplement II must also conduct site-specific Clean Water Act Section 404 reviews, including to establish that the Corps is not locating a non-water dependent activity (for example, obtaining construction material) in wetlands without making the requisite showings. The Corps is prohibited from discharging dredged and fill materials unless it demonstrates compliance with Section 404.

Supplement II must provide "quantified or detailed information" on the impacts, including the cumulative impacts, so that the courts and the public can be assured that the Corps has taken the mandated hard look at the environmental consequences of the Project.[70] **If information that is essential for making a reasoned choice among alternatives is not available, the Corps must obtain that information unless the costs of doing so would be "exorbitant."[71]**

Importantly, as the Council on Environmental Quality has made clear, in situations like those in the Mississippi River where the environment has already been greatly modified by human activities, it is **not** sufficient to compare the impacts of the proposed alternative against the current conditions. Instead, the baseline must include a clear description of how the health of the resource has changed over time to determine whether additional stresses will push it over the edge.[72]

E. Fully Analyze Mitigation and Include a Detailed Mitigation Plan

To comply with NEPA, Supplement II must analyze mitigation measures with "sufficient detail to ensure that environmental consequences have been fairly evaluated."[73] To comply with the Water Resources Development Acts, Supplement II must meet the mitigation requirements established by 33 U.S.C. § 2283(d), including the requirement to develop a detailed mitigation plan.

Supplement II must discuss mitigation measures "in sufficient detail to ensure that environmental consequences have been fairly evaluated."[74] A "perfunctory description" of the mitigating measures is not sufficient.[75] As the Supreme Court has noted, this is because:

> omission of a reasonably complete discussion of possible mitigation measures would undermine the 'action-forcing' function of NEPA. Without such a discussion, neither the agency nor other interested groups and individuals can properly evaluate the severity of

[68] If the Corps opts to conduct tiered site-specific NEPA analyses, it must prepare a full scale site-specific Environmental Impact Statement, an Environmental Assessment and FONSI, or an Environmental Assessment and Mitigated FONSI for each Work Item before the Corps may proceed with construction. The Corps will also be required to conduct a Clean Water Act Section 404 review for each item of construction.
[69] *State of California v. Block*, 690 F.2d 753, 761 (9th Cir. 1982)
[70] *Neighbors of Cuddy Mountain v. U. S. Forest Service*, 137 F.3d 1372, 1379 (9th Cir. 1998); *Natural Resources Defense Council v. Callaway*, 524 F.2d 79, 87 (2d Cir. 1975).
[71] 40 C.F.R. § 1502.22 (emphasis added).
[72] Council on Environmental Quality, Considering Cumulative Effects Under the National Environmental Policy Act at 41 (January 1997).
[73] *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989).
[74] Id.
[75] *Neighbors of Cuddy Mountain v. U.S. Forest Service*, 137 F.3d 1372, 1380 (9th Cir.1998).

> the adverse effects. An adverse effect than can be fully remedied by, for example, an inconsequential public expenditure is certainly not as serious as a similar effect that can only be modestly ameliorated through the commitment of vast public and private resources.[76]

Supplement II also must discuss the effectiveness of the proposed mitigation:

> "An essential component of a reasonably complete mitigation discussion is an assessment of whether the proposed mitigation measures can be effective. The Supreme Court has required a mitigation discussion precisely for the purpose of evaluating whether anticipated environmental impacts can be avoided. A mitigation discussion without at least *some* evaluation of effectiveness is useless in making that determination."[77]

This should include a discussion of how the mitigation will effectively address temporal losses (i.e., it takes many years to restore a fully functioning, mature wetland and many decades to restore a fully functioning mature bottomland hardwood wetland forest). A bald assertion that mitigation will be successful is not sufficient. The effectiveness must instead be supported by "substantial evidence in the record."[78]

A discussion of the effectiveness is particularly critical because, despite progress in this area, wetland and stream mitigation often fails or does not fully replace lost ecological values. For example, the National Research Council has concluded:

> "Attempts to restore forested wetlands of the Southeast (e.g., bottomland hardwoods and cypress swamps) have encountered difficulties related to the time required to replace mature trees, the lack of material to transplant, the lack of knowledge of how and when to carry out seeding or transplantation, (Clewell and Lea, 1989) and altered hydrology (drainage for conversion to agriculture) of the wetland area. Natural forested wetlands may support hundreds of plant species, many of which thrive in the understory (91 percent of 409 species in one riverine forest were understory species). Old-growth forests are dominated by trees that gradually achieve a dominant role in the canopy and that are self-sustaining through their ability to reproduce in their own shade. It is not clear that such climax species can be successfully established in open sites, or whether their introduction must await development of seral (intermediate successional stage) plant communities. Clewell and Lea (1989) noted the need for intensive site preparation to reduce competition between weeds and transplanted tree seedlings. Their review was the first to mention insect herbivory and fire as potential problems. In many cases, restoration of suitable hydrologic conditions will be necessary. The short time period within which forest restoration attempts have been monitored precludes an evaluation of their functional equivalency with natural reference systems."[79]

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[76] Id.

[77] *South Fork Band Council v. Dept. of Interior*, 588 F.3d 718, 727 (9th Cir. 2009) (internal citations omitted).

[78] *Wyoming Outdoor Council v. U.S. Army Corps of Eng'rs*, 351 F. Supp. 2d 1232, 1252 (D. Wyo. 2005).

[79] National Research Council, Restoration of Aquatic Ecosystems: Science, Technology, and Public Policy (1992) at 311-12.

Absent a meaningful discussion of the effectiveness of the proposed mitigation, Supplement II will not have taken the mandated "hard look" at the environmental impacts of the proposed action and alternatives to the action, and will fail to provide "a clear basis for choice among options by the decisionmaker."[80]

The Water Resources Development Acts require the Corps to mitigate the adverse impacts of the Project.[81] The Corps is required to mitigate all losses to fish and wildlife created by a project unless the Secretary determines that the adverse impacts to fish and wildlife would be "negligible." 33 U.S.C. § 2283(d)(1). To ensure that this happens, the Corps is prohibited from selecting a "project alternative in any report" unless that report includes a "specific plan to mitigate fish and wildlife losses." *Id*. Accordingly, the DSEIS must include a specific mitigation plan.

Corps mitigation plans must ensure that "impacts to bottomland hardwood forests are mitigated in-kind and harm to other habitat types are mitigated to not less than in-kind conditions, to the extent possible." 33 U.S.C. § 2283(d)(1). Mitigation plans "shall include, at a minimum:"

(1) The type, amount, and characteristics of the habitat being restored, a description of the physical actions to be taken to carry out the restoration, and the functions and values that will be achieved;
(2) The ecological success criteria, based on replacement of lost functions and values, that will be evaluated and used to determine mitigation success;
(3) A description of the lands and interest in lands to be acquired for mitigation, and the basis for determining that those lands will be available;
(4) A mitigation monitoring plan that includes the cost and duration of monitoring, and identifies the entities responsible for monitoring if it is practicable to do so (if the responsible entity is not identified in the monitoring plan it must be identified in the project partnership agreement that is required for all Corps projects). Corps mitigation must be monitored until the monitoring demonstrates that the ecological success criteria established in the mitigation plan have been met; and
(5) A contingency plan for taking corrective action in cases where monitoring shows that mitigation is not achieving ecological success as defined in the plan. 33 U.S.C. § 2283(d).

Corps mitigation plans must also comply with "the mitigation standards and policies established pursuant to the regulatory programs" administered by the Corps. 33 U.S.C. § 2283(d).

Corps mitigation must be monitored until the monitoring demonstrates that the ecological success criteria established in the mitigation plan have been met. The Corps is also required to consult yearly on each project with the appropriate Federal agencies and the states on the status of the mitigation efforts. The consultation must address the status of ecological success on the date of the consultation, the likelihood that the ecological success criteria will be met, the projected timeline for achieving that success, and any recommendations for improving the likelihood of success. 33 U.S.C. § 2283(d).

[80] 40 C.F.R. § 1502.14.

[81] The Water Resources Development Act of 2007 requires the Corps to implement mitigation, and comply with mitigation planning requirements, for any project for which the Corps "select[s] a project alternative in any report." 33 U.S.C. § 2283(d). Thus, mitigation will be required for the Project as a matter of law upon issuance of the final SEIS, and mitigation is required as a matter of law for components of the Regulating Works Project that are proceeding under environmental assessments.

In addition, mitigation lands for Corps civil works projects must be purchased before any construction begins. 33 U.S.C. § 2283(a). Any physical construction required for purposes of mitigation should also be undertaken prior to project construction but must, at the latest, be undertaken "concurrently with the physical construction of such project." *Id*.

Conclusion

The National Wildlife Federation appreciates the opportunity to provide these comments and looks forward to working with the Corps to ensure that Supplement II fully evaluates environmental impacts and complies with NEPA and the nation's other vitally important environmental laws. We urge the Corps to assess and address the underlying causes of increased flood risks and to develop and adopt an alternative that utilizes a combination of low impact flood damage reduction measures, ecosystem restoration actions, and improved navigation management to reduce flood risks and protect and restore the ecologically vital Mississippi River.

Sincerely,

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