USEPA PROPOSED SECOND FIVE YEAR REVIEW OF THE HUDSON RIVER PCBS SUPERFUND SITE

COMMENTS OF HUDSON RIVER FISHERMEN'S ASSOCIATION, HUDSON RIVER SLOOP CLEARWATER, NATURAL RESOURCES DEFENSE COUNCIL, RIVERKEEPER, SCENIC HUDSON AND SIERRA CLUB – ATLANTIC CHAPTER

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I. Introduction

Substantial amounts of General Electric's ("GE") toxic polychlorinated biphenyls ("PCBs") are still present in the Hudson River—including in sediments, water, and fish—and there is a significant possibility that the river will remain excessively contaminated for decades. Furthermore, EPA's remedy for Hudson River sediment removal ("OU2 Remedy") to date is on track to fail to achieve rapid reductions of PCBs within the specific timeframes established to protect human health and the environment. Therefore, the U.S. Environmental Protection Agency ("EPA") must issue a "not protective" determination in the Proposed Second Five Year Review of the Hudson River PCBs Superfund Site (the "Proposed Second FYR").[1]

A "not protective" determination is the only appropriate conclusion consistent with EPA's own Five-Year Review Guidance.[2] In addition, this determination is supported by (1) independent analyses of the Site project data; (2) current and expected environmental conditions as compared to the goals and objectives (remedial action objectives or "RAOs") laid out in the 2002 Record of Decision (the "2002 ROD") for the Hudson River PCBs Superfund Site (the "Site"); and (3) provisions in relevant statutes and regulations, including the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA" or the "Superfund Act")[3] and the National Contingency Plan,[4] and in operable documents that govern the remediation project.

II. Background

A. General Electric Discharged Toxic PCBs into the Hudson River for Decades, Creating Unacceptable Risks to Human Health and the Environment.

From 1947 to 1977, GE discharged untold amounts of highly toxic PCB waste from two capacitor plants into the waters of the Upper Hudson River near Fort Edward and Glens Falls.[5] PCBs are extremely resistant to decay—destruction by chemical, thermal, and biochemical processes is incredibly difficult and costly. Once in the environment, PCBs travel among soil,

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[1] *See generally* U.S. Envtl. Prot. Agency, *Proposed Second Five-Year Review Report for Hudson River PCBs Superfund Site* (May 31, 2017) ["hereinafter 2017 FYR"] *available at* https://www.epa.gov/sites/production/files/2017-06/documents/hudson_second_five-year_review_report.pdf. (Attachment A)

[2] *See generally* U.S. Envtl. Prot. Agency, *Comprehensive Five-Year Review Guidance* (June 2001) [hereinafter "EPA FYR Guidance"] *available at* http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000IRKW.TXT; U.S. Envtl. Prot. Agency, *Supplement to the "Comprehensive Five-Year Review Guidance* (Sept. 2011) [hereinafter EPA FYR Guidance Supplement"] *available at* https://semspub.epa.gov/work/HQ/175441.pdf.

[3] 42 U.S.C. §§ 9601-9628.

[4] 40 C.F.R. Part 300

[5] *See* Brendan Lyons, *Dredging Up the Truth*, Albany Times Union (March 8, 2014) *available at* http://www.timesunion.com/local/article/Dredging-up-the-truth-5294643.php; *see also id.* (providing documents, including a 1968 internal GE memo on misleading regulators) *direct link to memo available at* http://web.timesunion.com/ge_dredging/graphics/1968_memo_on_misleading_regulators.pdf ("No one can accurately say how many pounds of PCBs ended up in the Hudson River or the bedrock under GE's capacitor plants. A GE spokesman said the company 'has not issued an estimate of the volume of PCBs that were discharged to the river.'"). (Attachment B)

water, and air. Through these "exposure pathways," animals and humans bio-accumulate PCB toxins in their bodies, especially in fatty tissues.[6]

The cumulative impacts of PCB contamination on public health and the environmental wellbeing of the riverine ecosystem have been ongoing for 70 years. Since PCBs are bio-accumulative and slow to metabolize, exposure to even low amounts of PCB toxins can cause people and animals to accumulate a much higher body-burden concentration of PCBs than exist in the immediate environment.[7]

For people, PCBs are known carcinogens,[8] endocrine disrupters, and can damage the skin, liver, pancreas, and cardiovascular system. PCBs can also impair the development of the brain and neurological system.[9] Prenatal PCB exposure has been linked to low birth weight babies and, as these children age, to reproductive, developmental, and neurobehavioral disorders that continue for several years.[10] For animals—fish, invertebrates, birds, and mammals—PCB exposure can bring about reproductive failures, developmental impairments, and mortality, causing declines in wildlife populations.[11]

B. The 2002 Record of Decision for the Hudson River Superfund Site Contains Remedial Action Objectives Necessary to Protect Human Health and the Environment.

Because of the threat posed to human health and the environment, in September 1983, much of the Hudson River—nearly 200 miles between Hudson Falls and the Battery in New York City—was recommended for placement on EPA's National Priorities List ("NPL"). In 1984, a record of decision was issued for the Hudson Superfund Site with an "Interim No-Action" decision for PCB-contaminated sediment in the river bottom, and a limited "in-place capping, containment and monitoring of exposed Remnant Deposits" remedy for areas of former river bottom in the Upper Hudson that had been exposed by removal of the Fort Edward Dam.[12] In 1989, as part of the subsequent five-year review of the 1984 record of decision (as required by CERCLA), EPA ordered a reassessment of the no-action remedy. In 2002, the agency issued the another record of decision—the 2002 ROD—for sediment removal (the "remedy" or "remedial action"), requiring GE to dredge PCB-contaminated sediment in the most heavily polluted areas of the Upper

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[6] U.S. Dep't of Health and Human Servs. Agency for Toxic Substances and Disease Registry, *ATDSR Case Studies in Environmental Medicine Polychlorinated Biphenyls (PCBs) Toxicity*,22 (May 14, 2014) [hereinafter "ATDSR PCBs Case Study"] *available at* https://www.atsdr.cdc.gov/csem/pcb/docs/pcb.pdf. (Attachment C)

[7] *Id.*

[8] *See generally* World Health Org. Int'l Agency for Research on Cancer, *Polychlorinated biphenyls and polybrominated biphenyls*, IARC Monograpohs on the Evaluation of Carcinogenic Risks to Humans Vol. 107 (June 29, 2015) *available at* http://monographs.iarc.fr/ENG/Monographs/vol107/mono107.pdf. (Attachment D)

[9] Johnathan Chevrier, et al., *Associations Between Prenatal Exposure to Polychlorinated Biphenyls and Neonatal Thyroid-Stimulating Hormone Levels in a Mexican-American Population, Salinas Valley, California*, Envtl. Health Perspectives Vol. 115, 10 (Oct. 2007) *available at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2022659/. (Attachment E)

[10] *Id.*

[11] Hudson River Natural Res. Trustees, *Hudson River Natural Resource Damage Assessment* at 1 (Jan. 2013) [hereinafter "NRDA"] *available at* https://darrp.noaa.gov/sites/default/files/case-documents/PCBContamincationOfTheHudsonRiverEcosystem.pdf.

[12] U.S. Envtl. Prot. Agency, *Superfund Record of Decision: Hudson River PCBs Site, NY* (Sept. 25, 1984) [hereinafter "1984 ROD"] *available at* http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=9100PYDY.TXT.

Hudson. Contaminated sediments in these hot spots posed a serious, ongoing, and unacceptable risk to human health and the environment.[13]

EPA divided the Hudson River Superfund Site into separate parts or "operable units" for the purpose of developing a remedial plan for each distinct part. The focus of the Proposed Second FYR is the remedial plan for Operable Unit 2 ("OU2"), which targets contaminated sediments located in the Upper Hudson River.[14] EPA concluded that active remediation in the Hudson River was "necessary to protect the public health or welfare and the environment" due to the "health hazards associated with human ingestion of fish, as well as the ecological risks associated with ingestion of [Hudson River] fish by birds, fish and mammals."[15]

The 2002 ROD includes five remedial action objectives for the protection of human health and the environment:

1) Reduce the cancer risks and non-cancer health hazards for people eating fish from the Hudson River by reducing the concentration of PCBs in fish;[16]
2) Reduce PCB levels in sediment in order to meet the applicable or relevant and appropriate requirements for surface water;[17]
3) Reduce the inventory (mass) of PCBs in sediments that are or may be bioavailable;[18]
4) Minimize the long-term flow of PCBs that run over the Federal Dam and downstream through the Lower Hudson River;[19] and
5) Reduce the risks to ecological receptors by reducing the concentration of PCBs in fish.[20]

EPA also set specific numeric PCB concentration targets to assure protectiveness, as discussed in detail below.[21]

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[13] *See generally* U.S. Envtl. Prot. Agency, *Hudson River PCBs Site New York Record of Decision* (Feb. 20, 2002) [hereinafter "2002 ROD"] *available at* https://www3.epa.gov/hudson/RecordofDecision-text.pdf.

[14] Other operable units include: Operable Unit 1 (1984 ROD remedy for Remnant Deposits 2-5); Operable Unit 3 (1999 EPA removal of 4,400 tons of contaminated sediments from Rodger's Island); and Operable Unit 4 (yet to be determined remedy for remediation of floodplains). U.S. Envtl. Prot. Agency, *First Five-Year Review Report for Hudson River PCBs Superfund Site*, 1 (Jun. 1, 2012) [hereinafter "2012 FYR"] *available at* http://www3.epa.gov/hudson/pdf/Hudson-River-FYR-6-2012.pdf.

[15] 2002 ROD at 49.

[16] *Id.* at 50.

[17] *Id.* at 50-51. For the Hudson River Superfund Site, the federal Applicable Requirements are: 0.5 µg/L total PCBs for drinking water (maximum contaminant level under the Safe Drinking Water Act); 1 ng/L for the Ambient Water Quality Criterion; and 0.014 µg/L for the criteria continuous concentration Federal Water Quality Criterion in freshwater and 0.03 µg/L in saltwater. 2002 ROD at 50-51. The New York State Applicable Requirements are: 0.09 µg/L total PCBs for protection of human health and drinking water sources; and 0.12 ng/L for protection of wildlife; 0.001 ng/L for the protection of the health of human consumers of fish. *Id.*

[18] 2002 ROD at 51.

[19] *Id.* at 51.

[20] *Id.* at 50. The selected remedy in the ROD will achieve this in three ways: by (1) a "relative reduction in toxicity quotients for the river otter and the mink," measured in the same manner as was done for reduction in risk to human health; (2) reducing the "time that it would take . . . to reach the Remediation Goal for protection of ecological receptors, which is a range of PCB concentrations in largemouth bass based on the river otter, and a target range of PCB concentrations in spottail shiner based on the mink"; and (3) "[r]educ[ing] PCB loading from the Upper Hudson into the Lower Hudson [to] ultimately reduce the concentrations of PCBs in sediment, water and fish and thereby reduce risk to . . . ecological receptors in the Lower Hudson." *Id.* at 73-75.

[21] *Id.* at 71.

C. *EPA Selected the Remedy for the Hudson River Superfund Site Primarily Due to the Expedited Timeframe to Meet Interim and Final Remedial Targets.*

In order to accomplish the RAOs, the 2002 ROD evaluated five remedial alternatives—three active remedies and two non-active remedies.[22] The three active remedies involved capping and/or dredging of contaminated sediments, followed by natural attenuation,[23] but only as applied to the northernmost forty miles of the Superfund Site—from the plant sites to the Federal Dam (the "Upper Hudson River"). The roughly 150 miles of the Hudson Superfund Site below the Federal Dam (the "Lower Hudson River") was "not . . . identified for active remediation" on the assumption that active remediation in the Upper Hudson River would sufficiently "reduce[] risks to humans and ecological receptors living in and near the Lower Hudson River."[24]

All three active remedial alternatives outlined in the 2002 ROD divided the Upper Hudson into three distinct sections of unequal length with varying cleanup standards based on the amount of "Tri+ PCBs"[25] found in surface sediment.[26] The major animating principle behind all three active alternatives was simple: remove or sequester enough PCBs in surface sediments so that PCBs would no longer get into the water column or the food chain where they would harm people and wildlife.[27] By contrast, the non-active remedies included a "no action" alternative and a "monitored natural attenuation" ("natural attenuation" or "MNA" or "MNR") alternative.[28]

The time to reach the interim and final RAOs and targets for fish tissue concentrations were the "*primary factor*" in EPA's decision to select an active remedy, and reject the non-active alternatives as not sufficiently protective of human health and the environment.[29] To understand and compare the remedial timeframes, EPA relied on computer modeling designed to predict the short-and-long-term concentrations of PCBs in Hudson River sediment, water, and fish.[30] The

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[22] 2002 ROD at 54-66.
[23] *Id.* at 56-62.
[24] *Id.* at 2.
[25] The remedial alternatives discussed in the ROD target "Tri+ PCBs" defined as PCB molecules with 3 to 10 chlorine atoms based upon the finding that "that the Tri+ PCB concentration ranged from 98 to 100 percent of the total PCB concentration in fish collected." 2002 ROD at 24 n.1. Total PCB levels in the Upper Hudson, however, were roughly 2-4 times higher than the Tri+ PCBs levels. *See* Jay Field et al., *Hudson River Remedy: Unremediated PCBs and the Implications for Restoration* (2011) [hereinafter "Unremediated PCBs Trustee Poster"] *available at* https://www.fws.gov/northeast/ecologicalservices/HudsonRiver/docs/HRES%20Hudson%20River%20PCBs%20Remedy%20Implications.pdf.
[26] For example, the "REM 3/10/Select" alternative—which EPA ultimately selected—called for the dredging and removal of contaminated sediments: in areas in River Section 1 with a surface concentration of greater than 3 g/m^2 of "Tri+" PCBs; in areas in River Section 2 with a surface concentration more than 10 g/m^2 of Tri+ PCBs; and in select "hot spots" in River Section 3. 2002 ROD at 58, 94. Similarly, the "CAP 3/10/Select" remedy called for capping of those same sediments respectively, and the "REM 0/0/3" remedy called for removal of contaminated sediments in River Sections 1, 2, and 3 in areas with surface concentrations of Tri+ PCBs of greater than 0 g/m^2, 0 g/m^2, and 3 g/m^2, respectively. *Id.*
[27] *See id.* at 50-51 (discussing remedial action objectives).
[28] The MNA alternative assumed some future control of the PCBs, which at the time were still entering the Hudson ecosystem from the contaminated plant sites (i.e., source control). *Id.* at ii.
[29] *Id.* at 66 (emphasis added).
[30] *Id.*at 26. EPA predictions for PCB fish tissue reduction timeframes were the product of a series of interconnected modeling efforts. The "backbone" of these efforts was the Upper Hudson River Toxic Chemical Model ("HUDTOX"), which "forecasted PCB concentrations in water and sediment" in the Upper Hudson River. U.S. Envtl. Prot. Agency, *Revised Baseline Modeling Report*, ES-2 (Jan. 2000) *available at*

modeling results led EPA to conclude that the No Action and Natural Attenuation remedial alternatives were "*not sufficiently protective* of human health and the environment" because: (1) the Natural Attenuation alternative would "*take at least twenty years longer than the selected remedy* to reach target levels in fish tissue in River Sections 1 and 2;" and (2) both non-active alternatives would not sufficiently remedy the "unacceptably elevated" levels of PCBs in the Upper Hudson as well as "the continued degradation of the sediments and surface water quality . . . *for at least several decades longer* than any of the active remedial alternatives."[31] EPA also predicted that it would "take *at least 10 additional years* for MNA to reach the 0.2 mg/kg and 0.4 mg/kg PCB target levels, as compared to the active remediation alternatives."[32] In short, EPA determined that "the unacceptable risk will continue for many decades without active remediation of the PCB-contaminated sediments and control of the upstream sources."[33]

EPA acknowledged the limited interim protection provided by longstanding New York State Department of Health ("NYSDOH") fish consumption advisories.[34] However, the EPA also found that these "controls do not protect ecological receptors, and [that] human health risk reduction relies on *knowledge of and voluntary compliance with* the consumption advisories and fishing restrictions," citing evidence that "fish consumption advisories are not fully protective of human health due to gaps in compliance." [35] Accordingly, expeditious reduction of PCBs in fish was critical to selection of the remedy and in ensuring the protection of human health and the environment.

D. The OU2 Remedy Must Meet the Specific Targets Set in the 2002 Record of Decision.

In the 2002 ROD, while EPA found all three active remedies to be sufficiently protective, it ultimately selected the REM 3/10/Select alternative. The selected remedy involved removal of sediments with PCB surface concentrations of greater than 3 g/m^2 and10 g/m^2 in River Sections 1 and 2, respectively, and select hot spots in River Section 3.[36]

Although EPA recognized that the REM-0/0/3 Alternative would be *more* protective than the selected REM 3/10/Select option, other considerations including cost and feasibility weighed in favor of the lesser protective 3/10/Select remedy.[37] The fact that the 2002 ROD set a low bar with a remedial goal of 0.05 mg/kg (allowing consumption of one half-pound fish meal a week by men), which will purportedly be met only at some unknown point more than 55 years in the

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http://www3.epa.gov/hudson/rbmr-bk1&2-chpt1-5.pdf. Outputs from HUDTOX were used as inputs in a number of bioaccumulation models, including the FISHRAND model, which ultimately predicted long-term trends in PCB fish tissue concentrations under the various remedial alternatives. *Id.* at ES-2 to ES-3.

[31] 2002 ROD at 102, 108 (emphases added).

[32] *Id.* at 103 (emphasis added).

[33] *Id.* at 102.

[34] The New York State Department of Health advisories caution that all children under 15 and women under 50 should never eat any fish from any section of the river, and that no one should ever eat fish from the Upper Hudson. *See* New York State Dep't of Health, *Hudson River Health Advice on Eating Fish You Catch* (Oct. 2016) *available at* https://www.health.ny.gov/publications/2794.pdf. Men over 15 and women over 50 are advised that they may safely eat some select species of fish in the Mid and Lower Hudson on a occasional basis. *Id.* (Attachment F)

[35] 2002 ROD at 104 (emphasis added); *see also* U.S. Envtl. Prot. Agency, *Hudson River PCBs Reassessment RI/FS Phase 3 Report: Feasibility Study* (Dec. 2000) *available at* http://www3.epa.gov/hudson/fs000001.pdf.

[36] 2002 ROD at 94.

[37] *Id.* at 104.

future, makes it even more important for EPA to ensure that the remedy is on track to meet the interim and final remedial goals that were actually projected in the 2002 ROD.

The 2002 ROD includes the following specific fish tissue and sediment targets:

Fish Tissue Target PCB Concentrations

For human exposure through consumption:

- 0.05 mg/kg in fish fillet for a person eating one-half pound meal per week
- 0.2 mg/kg in fish fillet for a person eating one half-pound meal per month
- 0.4mg/kg in fish fillet for a person eating one-half pound meal every two months

The 2002 ROD provided specific timeframes for achieving these fish tissue targets, although it is worth noting that the document itself is not entirely consistent.[38] The 2002 ROD assumed that fish tissue concentrations would meet the first interim target of 0.4 mg/kg within five years of the completion of dredging and the second interim target of 0.2 mg/kg within sixteen years of the completion of dredging.[39] While EPA did not expect the entire Upper Hudson River to meet the final remedial goal of 0.05 mg/kg within the time period modeled by GE and EPA, it did expect River Section 3 to meet that goal within 43 years of the completion of dredging.[40] Consequently EPA also expected the majority of the Lower Hudson River to meet that goal within the same timeframe "due to the lower initial concentration of Site-related PCBs in the Lower Hudson compared to the Upper Hudson."[41]

The short-term targets already allow for some variation from the modeling projections used as the basis for the 2002 ROD targets. According to that modeling, EPA actually anticipated that the REM 3/10/Select Remedy would meet the 0.4 mg/kg fish tissue target within two years of the completion of dredging and the 0.2 mg/kg target within 14 years of the completion of dredging.[42] Furthermore, EPA anticipated that River Section 3 would meet the 0.05 mg/kg target within 41 years of the completion of dredging.

For wildlife exposure through consumption: [43]

- A range of 0.3 to 0.03 mg/kg in largemouth bass (whole body) for river otter
- A range of 0.7 to 0.07 mg/kg in spottail shiner (whole body) for mink

[38] As discussed herein, the 2002 ROD includes timeframes for meeting the short- and long-term targets, as well as model projections. These timelines have slight differences of up to three years. For example, the 2002 ROD expects the remedy to meet the 0.4 mg/kg within five years of the completion of dredging; *id.* at 103, whereas the model projection indicates that the remedy would meet the 0.4 mg/kg target within two years of the completion of dredging. *See* 2002 ROD, Table 11-2. For the purposes of these comments, it is assumed that EPA used 2010 as the year that dredging would be completed in the model projections.
[39] *Id.* at 50.
[40] *Id.* at 103.
[41] *Id.* at 103.
[42] *Id.* at 73.
[43] *Id.* at 50. EPA recalculated the ranges in the Second Five Year Review to 0.2 mg/kg to 0.07 mg/kg for river otter and 0.34 mg/kg to 0.11 mg/kg for mink, both of which lie within the original ranges. 2017 FYR at 65.

EPA expected an active remedy (i.e., one including dredging) to meet the remediation goal range for river otter 30 to 40 years earlier than the No Action or MNA alternatives.[44] Similarly, the agency expected to meet the target range for mink 60 years earlier with an active remedy.[45] Using the dredging period to measure the timelines in the 2002 ROD, the cleanup was expected to achieve the range for river otter within approximately 23 years of the completion of dredging, whereas the range for mink would be met during the dredging period.[46]

Sediment Target PCB Levels

To achieve fish tissue remediation goals, target cleanup levels for sediment were established based on model results relating fish tissue PCB concentrations to sediment PCB concentrations.[47] Under this process, the 2002 ROD set standards for sediment removal including an overall target of "removal of approximately 2.65 million cubic yards of PCB-contaminated sediment from the Upper Hudson River, which was estimated to contain 70,000 kg (about 150,000 lbs) of total PCBs or roughly 65% of the then-estimated total PCB mass present in the Upper Hudson River.[48]

River Section 1 (Thompson Island Pool) ~ 6 miles

- 3 g/m2 Tri+ PCBs MPA
- 10 mg/kg Tri+ PCBs in surface sediment (~ 25-30 mg/kg total PCBs in top 12 inches)

River Sections 2 & 3 (multiple reaches/pools) ~ 35 miles

- 10 g/m2 Tri+ PCBs MPA
- 30 mg/kg Tri+ PCBs in surface sediment (~ 60-90 mg/kg total PCBs in top 12 inches)

The sediment removal targets were set on a mass per unit area ("MPA") basis predicated on the model-estimated reduction necessary to achieve target fish tissue concentrations.[49] However, the operative fact that will drive protectiveness is the *residual* PCBs left in sediment after dredging, not how much PCB was removed.

III. The Hudson River Five Year Review Process.

EPA is statutorily required to conduct a five-year review of a Superfund site whenever "contamination remains on site at a level that does not allow for unlimited use and unrestricted exposure after cleanup."[50] For communities along the nearly 200 miles of the Hudson River contaminated by PCBs, these conditions will exists for the foreseeable future.

[44] 2002 ROD at 74.
[45] *Id.*
[46] *Id.* at 75.
[47] *Id.*
[48] *Id.* at ii, 94.
[49] Id. at 64, 94.
[50] 42 U.S.C. § 9621(c) ("If the President [or his delegate, in this case the EPA Administrator] selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall

Five-year reviews are intended to evaluate the implementation and performance of remedial actions. Through this process, EPA must determine whether the selected remedy is "protective of human health and the environment"—or, whether the cleanup is working and activities to date will achieve the RAOs. In a five-year review report, EPA should consider the human health and ecological risks as well as the general performance of the selected remedy in order to assess the protectiveness of the cleanup. EPA must then make a "protectiveness determination."

Because remedial construction is complete at the Hudson River Superfund Site, as discussed below, EPA must make a site-wide protectiveness determination, which should " generally be the same protectiveness determination as the least protective Operable Unit at the site."[51] In addition, because the OU2 remedy here includes the use of institutional controls by way of the NYSDOH fish consumption advisories, EPA must also evaluate the "current and long-term effectiveness" of the fish consumption advisories and include "relevant information" about the advisories as "part of the protectiveness determination."[52]

In a five-year review, EPA is directed to answer three questions "based on and sufficiently supported by data and observations" and then make the most appropriate protectiveness determination as guided by the condition of the river and the best available data analysis. The questions and the topics to be included under each question include (but are not limited to) the following:[53]

Question A: Is the remedy functioning as intended by the decision documents? Topics include remedial action performance and monitoring results; system operations/operations and maintenance; costs of system operations/operations and maintenance; opportunities for optimization; early indicators of potential remedy problems; and implementation of institutional controls and other measures.

Question B: Are the exposure assumptions, toxicity data, and Remedial Action Objectives (RAOs) used at the time of the remedy still valid? Topics include changes in exposure pathways; changes in land use; new contaminants and/or contaminant sources; remedy byproducts; changes in standards, newly promulgated standards, and TBCs [To Be Considereds]; changes in toxicity and other contaminant characteristics; expected progress towards meeting RAOs; and risk recalculation/assessment (as applicable).

Question C: Has any other new information come to light that could call into question the protectiveness of the remedy? Topics include ecological risks; natural disaster impacts; and any other information that could call into question the protectiveness of the remedy.

The first five-year review ("First FYR") for the Hudson River Superfund Site—which EPA started and completed in only 60 days—was released on June 1, 2012 with a conclusion that the

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review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.").

[51] EPA FYR Guidance Supplement at 2.

[52] *Id.*

[53] EPA FYR Guidance at 3-7 (Exhibit 3-3); *see also id.* at 4-1 to 4-2 (Exhibit 4-1).

OU2 remedial action "will be protective."[54] As noted to EPA in comments on the First FYR by some of our organizations,[55] the "will be protective" statement was erroneous and not supported by a critical review of the project as intended by both statute and EPA's own guidance.[56] While the First FYR acknowledged that high levels of contamination in areas outside of the dredging footprint would delay reaching the 2002 ROD goals within the expected timeframes,[57] EPA offered no recommendations for appropriate action to achieve the protectiveness goals.

Due to EPA's failure to recognize and adaptively manage the predicted shortcomings of the remedy, and following the EPA's de facto approval of the termination of the GE dredging program,[58] some of our organizations filed a petition (the "Petition") in December 2015. The Petition demanded that EPA conduct an immediate five year review of the remedy's protectiveness and take all additional necessary actions to ensure human health and environmental RAOs are in fact being achieved.[59] We note that EPA ignored all of the recommendations and concerns expressed in the Petition in the Proposed Second FYR and only gave a cursory written response.[60]

EPA incredibly repeats its erroneous "will be protective" conclusion in its Proposed Second FYR, issued on June 1, 2017. EPA does so despite acknowledging that remedy is currently not protective of human health and the environment. As discussed further below, the only appropriate determination that EPA can make for the OU2 remedial action in the Proposed Second FYR is "not protective."

IV. EPA Has a Duty to Ensure the Remedial Objectives Are Met.

A. EPA Has a Non-Discretionary Duty to Ensure the Remedy Protects Human Health and the Environment.

CERCLA charges EPA with ensuring that toxic pollution in our nation's most contaminated areas is prevented from harming people or the natural environment. Specifically, at Superfund sites like the Hudson River, where EPA identifies pollution that "may present an imminent and substantial danger to the public health and welfare,"[61] the agency must select an appropriate remedy that will "attain a degree of cleanup [that] . . . *at a minimum assures protection of human health and the environment*."[62]

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[54] 2012 FYR at vi.
[55] *See* Attachment G.
[56] EPA FYR Guidance at 3-7.
[57] *See* 2012 FYR at 33-34 ("River Sediment Evaluation"); *id.* at 39 ("Issues, Recommendations and Follow-Up Actions").
[58] In November 2015, EPA approved of the decommissioning of GE's dewatering facility and other critical infrastructure that supported the active construction of the OU2 remedy.
[59] *See* Petition to US EPA for Evaluation and Expansion of Remedial Action Selected in the 2002 Record of Decision for the Hudson River PCBs Site (hereinafter, "*Petition to USEPA*"), Riverkeeper, Scenic Hudson, *et. al.*, December 17, 2015 (Attachment H).
[60] Letter from Judith Enck to Petitioners (Mar. 16, 2016) (Attachment I).
[61] 42 U.S.C. § 9604(a)(1).
[62] *Id.* at § 9621(d) (emphasis added).

This protectiveness standard is further defined through CERCLA and its implementing regulations, which mandate that EPA develop quantifiable cleanup goals designed to eliminate quantifiable risks. In order to identify and implement "remedies that are protective of human health and the environment," CERCLA requires that EPA establish site-specific remedial action objectives, including concrete and quantifiable remediation goals.[63] All remedial actions selected by the agency must "assure[] protection of human health and the environment."[64] Whether a remedy succeeds or fails under this standard is measured by its ability to meet the remedial action objectives and the remediation goals.[65]

Specifically, for EPA-led cleanups, the agency must establish "remedial action objectives specifying . . . remediation goals" which "establish acceptable exposure levels that are protective of human health and the environment."[66] These exposure levels are numeric, taking into account any federal and state maximums as well as levels associated with quantifiable cancer and non-cancer risks.[67] Indeed, as EPA sediment cleanup guidance provides, it is "important that [remedial action objectives], remediation goals, and cleanup levels are based on site-specific data *and are clearly defined*."[68]

These clearly defined goals—memorialized in a record of decision—are the heart of CERCLA. Without them, there is no measurable standard by which EPA can demonstrate satisfaction of its duty to protect human health and the environment—or, alternately, one by which the public can hold the agency accountable.

Quantifiable remediation goals are also the heart of the five-year review process, where "EPA . . . is legally responsible for making [a] protectiveness determination" for ongoing or completed remedies.[69] The first and most significant question asked in a five-year review is whether the remedy is "functioning as intended," determined primarily by whether the relevant "performance standards (e.g., cleanup levels, plume containment, pumping rates) are or will likely be met."[70]

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[63] *See* 40 C.F.R. §§ 300.430(a)(1)(i), (e)(2)(i); *see also* 42 U.S.C. § 9621(b)(1).
[64] *Id*. § 9621(d)(1).
[65] *See id*. §§ 9621(c), (d)(1); *see also* U.S. Envtl. Prot. Agency, *Interim Guidance for Evaluation of Federal Agency Demonstrations that Remedial Actions are Operating Properly and Successfully Under CERCLA Section 120(h)(3)* (Aug. 1996), *available at* http://www2.epa.gov/fedfac/guidance-evaluation-federal-agency-demonstrations-remedial-actions-are-operating-properly-and#intro ("completion of a remedial action is defined by the attainment of specific cleanup levels or performance goals that are specified in a decision document, such as a Record of Decision"). *See also, e.g.*, U.S. Dep't of Energy, *Guide to Ground Water Remediation at CERCLA Response Action and RCRA Corrective Action Sites*, 7-10 (Oct. 1995) [hereinafter "DOE Groundwater Guidance"] *available at* http://homer.ornl.gov/sesa/environment/guidance/gw/grndh2o.pdf ("The suitability and performance of any completed or ongoing ground water remedial action should be evaluated with respect to the objectives of those actions (e.g., . . . attainment of cleanup levels).").
[66] 40 C.F.R. § 300.430(e)(2)(i).
[67] *Id*. at §§ 300.340(e)(2)(i)(A), (B)-(E).
[68] U.S. Envtl. Prot. Agency, *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, ii (Dec. 2005) *available at* http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1000R7F.TXT (emphasis added). (Attachment J)
[69] EPA FYR Guidance Supplement at 4.
[70] EPA FYR Guidance at 4-1 (Jun. 2001); *id.* at 3-3 (stating quantitative monitoring data "are the primary bases of the technical analyses and subsequent protectiveness determination(s)").

In other words, demonstrable accomplishment of the remediation goals contained in the record of decision's remedial objectives principally drives whether a remedy is "protective" or "not protective."[71] Where RAOs and/or remedial goals may not be met, EPA must determine what additional review or action is needed.[72]

In the present case, the threat posed by GE's PCBs in the Hudson River to the health of New Yorkers and the State's environment is clear. As EPA concluded in the 2002 ROD, the significant health and ecological risks associated with the ingestion of PCB-laden fish made active remediation "necessary to protect the public health or welfare and the environment."[73] To eliminate this threat, EPA developed specific RAOs and remediation goals to be achieved by the cleanup. EPA's selection of the remedy was premised on its ability to meet these criteria within a reasonably prompt timeframe.[74] The agency now has a duty to ensure that the cleanup achieves those targets in order to protect human health and the environment.

B. EPA Set Clear Goals for Protection of Human Health and the Environment in the 2002 Record of Decision and Cannot Redefine the Measure of Success.

As explained above, setting clear, identifiable remediation goals by which success or failure of a remedy can be measured is at the heart of CERCLA. In the absence of these goals, EPA would be without a measurable standard by which to demonstrate satisfaction of its duty to protect human health and the environment. Moreover, there would be no measurable standard by which EPA and potentially responsible parties—here, GE—could be held accountable.

EPA cannot dismiss the chief remedial goals of the Hudson River remedy—the clearly defined interim fish tissue targets—at this key juncture as unimportant or meaningless. Although the remedy will not be protective until the ultimate fish tissue goal of 0.05 mg/kg is met, the interim targets of 0.4 mg/kg within five years post-dredging and 0.2 mg/kg within 16 years post-dredging are important benchmarks in evaluating whether the remedy is making adequate progress.

Over the course of the Proposed Second FYR process, EPA has repeatedly dismissed the importance of these interim targets. Distressingly, in a 2016 letter to the New York State Department of Environmental Conservation ("DEC"), EPA implied that numeric goals for PCB levels in fish established in the 2002 ROD are no longer mandatory targets for the cleanup, but merely "interim milestones that, once achieved, might allow fish advisories to be relaxed somewhat."[75] EPA also stated that the goals of the selected remedy "do not include specific

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[71] *See* EPA FYR Guidance at 3-4 (review should include "[d]ata supporting the effectiveness of the remedy in meeting cleanup levels and remedial action objectives" identified in ROD); DOE Groundwater Guidance at 7-10 ("The suitability and performance of any completed or ongoing ground water remedial action should be evaluated with respect to the objectives of those actions (e.g., . . . attainment of cleanup levels)."). Thus, where quantifiable remediation goals are not met, EPA may not determine that the remedy is "protective."

[72] EPA FYR Guidance at 4-9, 4-12.

[73] 2002 ROD at 49.

[74] *See id.* at 102-05.

[75] Letter from Judith Enck, U.S. Envtl. Prot. Agency Region 2 Administrator to Basil Seggos, New York Department of Environmental Conservation Commissioner at3 (Dec. 16, 2016) *available at* http://bloximages.chicago2.vip.townnews.com/poststar.com/content/tncms/assets/v3/editorial/c/dd/cdd3e1d5-03bb-5ee6-849e-c7631462ddbf/585c4e9a3209d.pdf.pdf. (Attachment K)

years in which specified PCB levels need to be achieved in fish in order for EPA to deem the remedy protective."[76]

These statements are irresponsible and contradict the fundamental goals of the 2002 ROD, which found "consumption of fish [to be] the major pathway of concern" for exposure to and harm from PCBs.[77] Indeed, the primary factors EPA used to select an appropriate remedy were its "ability to reduce PCB concentrations in fish" and "[t]he time to reach target PCB concentrations in fish."[78] These remain the touchstones of a successful and protective cleanup today, and to suggest otherwise ignores the current dangers posed by unaddressed PCBs in the Hudson.

While the Proposed Second FYR concludes that "the remedies at the Hudson River PCBs Superfund Site *will be protective* of human health and the environment" for the Upper Hudson River,[79] it does not provide any specific timeframe in which this will occur. However, the entire point of undergoing active remediation (i.e., dredging) in addition to MNA was to reach more protective fish tissue targets in the short-term.[80] Therefore, EPA's conclusion that the remedy "will be protective" at some unknown and undetermined point in the future is meaningless because that is the same result that would have occurred if EPA had undertaken *no active remediation at all*.

If EPA does not hold the remedy to the interim fish tissue targets, then it will be impossible to evaluate protectiveness until the MNA period is over, some 55 or more years into the future. This is entirely inconsistent with the purpose and requirements of CERCLA, and with the remedy set forth in the 2002 ROD. As discussed *infra*, it is all but certain that the cleanup will in fact miss the five-year, 0.4 mg/kg fish tissue target. Given the lengthy and uncertain timeline to reach the remedial goal of 0.05 mg/kg, EPA must be willing to measure the effectiveness of the cleanup against the interim targets, and, importantly, admit when the cleanup is falling short.

V. A "Will Be Protective" Determination is Inappropriate for the Hudson River Remedy According to EPA Guidance.

In the Proposed Second FYR, EPA concludes that the remedy "will be protective" of human health and the environment.[81] Significantly, while the agency claims the remedy will be protective at some unknown point in the future, it admits that the remedy is "not yet protective of human health and the environment."[82]

There are five possible conclusions EPA may reach about the protectiveness of the remedy in a five-year review:

1) Protective;
2) Will be protective;

[76] *Id.*
[77] 2002 ROD at 54.
[78] *Id.* at 54, 66.
[79] 2017 FYR at 24 (emphasis added).
[80] 2002 ROD at 104.
[81] 2017 FYR at 8, 71.
[82] *Id.*

3) Short-term protective;
4) Protectiveness cannot be determined (or "protectiveness deferred"); or
5) Not protective.[83]

Based on the facts and status of the OU2 Remedy, the only protectiveness determinations even potentially available to EPA are (i) not protective or (ii) protectiveness cannot be determined. As discussed further herein, based on the currently available data, EPA must determine that the OU2 remedy is *not protective*.

EPA's Comprehensive Five Year Review Guidance ("EPA FYR Guidance") and Guidance Clarifying the Use of Protectiveness Determination for Comprehensive Environmental Response, Compensation and Liability Act Five Year Reviews ("EPA Protectiveness Determination Guidance") give clear direction to EPA regional offices in how they are to arrive at five-year review protectiveness determinations. The latter guidance was issued in 2012 specifically to address concerns by the Office of Inspector General that regional offices were not applying protectiveness definitions consistently and were issuing protectiveness determinations that were not fully supported by data.[84]

A. Construction of the OU2 Remedy is Complete.

The status of the remedy is an "operating remedial action" that has not yet achieved "remedial action completion."[85] This initial classification is important as it limits which protectiveness determinations are applicable to the remedy. However, as a preliminary matter, EPA must clarify that the *construction* of the remedial action is in fact complete.[86]

EPA states in its Proposed Second Five Year Review Summary Form that the site has not achieved construction completion,[87] but simply stating this in a single place in the Proposed Second FYR, without any explanation or justification whatsoever, does not make it so. A review of the rest of the Proposed Second FYR report and appendices, the 2002 ROD, and relevant EPA guidance makes it abundantly clear that the OU2 remedy has reached the "construction completion" milestone.

As EPA repeats numerous times in the Proposed Second FYR, GE completed Phase 2 of the dredging of the Hudson River on October 3, 2015 and backfilling was completed on November

[83] EPA FYR Guidance, at 4-13; *see also* U.S. Envtl. Prot. Agency, *Guidance Clarifying the Use of Protectiveness Determination for Comprehensive Environmental Response, Compensation and Liability Act Five Year Review* (Sept. 13, 2012) [hereinafter "EPA Protectiveness Determination Guidance"] *available at* https://semspub.epa.gov/work/HQ/174829.pdf. (Attachment L)

[84] *See* U.S. Envtl. Prot. Agency, *Memo Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews* at 1 (Sept. 13, 2012) *available at* https://semspub.epa.gov/work/HQ/174829.pdf.

[85] "Operating remedial actions are those actions that are ongoing, but where cleanup levels have not yet been achieved. Such actions typically have remedial components requiring several years to reach cleanup levels (e.g., . . . monitored natural attenuation. . . .)." 2017 FYR at 4-2.

[86] The OU2 Remedy is clearly not "under construction" as the physical construction of the remedy, i.e., the in-river dredging and habitat reconstruction, has been completed. *See* EPA FYR Guidance, at 4-2. Additionally, the OU2 Remedy is not a "completed remedial action" as the cleanup levels have not yet been achieved. *See id.*

[87] 2017 FYR at 14.

5, 2015. Complete demobilization of GE's sediment processing facility—a necessary component to the dredging project—occurred in December 2016, and all other support facilities were demobilized earlier in 2016. The habitat reconstruction portion of the remedial action was completed on August 8, 2016.[88] Therefore, it is plainly clear that the active mobilization component of the remedy—that is, the dredging project—is complete. Only the MNA period and long-term operation, maintenance and monitoring ("OM&M") remain.

Throughout the Proposed Second FYR, EPA clearly marks a distinction between the construction phase of the remedy (i.e., dredging and habitat reconstruction) and the subsequent MNA period. For example, in Appendix 8, EPA states that "[r]emedial construction included dredging, backfill placement, capping and habitat reconstruction."[89] EPA continues to discuss remedial construction in the past tense throughout this Appendix.[90] Furthermore, EPA states "construction of the remedy was scheduled to commence in 2005 and to be conducted over a five-year period. This construction, in addition to monitored natural attenuation of the remaining PCBs, would lead to reductions of PCB concentrations. . . ."[91] This statement clearly delineates construction as active dredging not including the subsequent MNA period.

The 2002 ROD is also quite clear with regard to the meaning of construction of the OU2 remedy. The construction period is commensurate with active mobilization for the dredging project. It ends long before the MNA period ends and the ultimate remedial goals are reached. The 2002 ROD discusses specific remedial construction parameters: "The construction timeframes represent the estimated time required for mobilization, operation and demobilization of the remedial work, but *do not include the time required for long-term monitoring or OM&M*."[92] When discussing REM 3/10/Select, the remedy ultimately chosen for OU2, EPA states in the 2002 ROD: "*After construction is completed*, this alternative relies of institutional controls and MNA until RAOs are achieved."[93] Finally, in the context of the potential for adverse environmental impacts during construction, the 2002 ROD defines construction as "dredging and cap placement."[94]

EPA's FYR Guidance explicitly contemplates MNA remedies, like the OU2 remedy, where construction may be complete although cleanup levels have not yet been achieved. The EPA's FYR Guidance consistently defines remedial actions under construction as those where physical construction is not yet complete, as opposed to "operating remedial actions," in which construction may be complete but cleanup levels have not yet been achieved.[95]

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[88] *Id.* at 20; *see also id.* App'x 9.
[89] *Id.* App'x 8 at 2-3.
[90] *Id.* ("As a result, construction of the selected remedy *was executed* in accordance with . . .") (emphasis added).
[91] 2017 FYR at 30.
[92] 2002 ROD, at 56 (emphasis added)
[93] *Id.* at 60 (emphasis added). *See also id.* at 81 ("After construction of the remedy is completed, the natural attenuation process would provide additional reductions.").
[94] 2002 ROD at 85.
[95] EPA FYR Guidance at 4-2 (MNA remedies cited as specific example); *see also* U.S. Envtl. Prot. Agency, *Close Out Procedures for National Priorities List Sites*, 1-2 (May 2011) [hereinafter EPA NPL Close Out Procedures"] *available at* https://semspub.epa.gov/work/HQ/176076.pdf.

EPA does mention, in other areas of the Proposed Second FYR, that it will not consider the OU2 *remedy* to be complete until the natural attenuation component has also been completed and the RAOs have been achieved.[96] EPA is correct that remedial action completion will not occur until the MNA period has ended and all cleanup levels have been reached.[97] However, completion of the remedial action is an entirely distinct milestone from "construction completion."[98] It is the completion of *construction* that is relevant in determining which protectiveness determinations are available to EPA, as discussed above.

Therefore, EPA cannot credibly argue that construction of the OU2 remedy is ongoing, and any assertions to that effect are arbitrary and capricious.

B. The Only Protectiveness Determinations Available for the OU2 Remedy are "Not Protective" and "Protectiveness Deferred."

EPA's determination that the remedy "will be protective" is inappropriate for the remedy according to the agency's FYR Guidance and Protectiveness Determination Guidance. According to the Protectiveness Determination Guidance, a "will be protective" determination is only appropriate when remedial construction activities are ongoing but the remedy is anticipated to be protective upon completion and no remedy implementation or performance issues have been identified.[99] Therefore, "will be protective" is not an available option for the OU2 remedy because, as explained above, construction of the remedy is complete—the physical and engineering components of the remedial action were completed in 2015 and 2016, respectively. Moreover, regardless of the status of the construction of the remedy, exposures are not currently under control and unacceptable risks are occurring, as explained further throughout these comments.

EPA admits in the Proposed Second FYR that the remedy is not currently protective of human health and the environment.[100] The human and ecological risks remain well above EPA's acceptable risk range,[101] and the institutional controls (fish consumption advisories) are not even close to completely effective in preventing actual exposures to these unacceptable risks.[102]

For all of these reasons, EPA's determination that the remedy "will be protective" is inconsistent with agency guidance and inappropriate for the OU2 remedy.[103] The only protectiveness

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[96] *See* 2017 FYR at 8, 20.
[97] *See* EPA NPL Close Out Procedures at 1-2, 2-4; *see also* EPA FYR Guidance at 4-2.
[98] EPA FYR Guidance at 4-2.
[99] EPA Protectiveness Determination Guidance at 3.
[100] 2017 FYR at 8.
[101] The risk-based RAO for the protection of human health is 0.05 mg/kg in fish fillet based on cancer and non-cancer hazard indices for the RME adult fish consumption rate of one half-pound meal per week. Current average fish tissue levels are many times that amount (1.3 mg/kg in 2016). 2017 FYR at 17.
[102] *See id.* at 62 ("EPA acknowledged in the 2002 ROD that the consumption advisories are not fully effective in preventing or limiting fish consumption.").
[103] Indeed, as DEC pointed out in its December 2016 "Recommendations to EPA for the 'Five Year Review Report' for Hudson River PCBs Site," EPA's 2012 Five Year Review determination that the remedy "will be protective" may not have been in compliance with EPA guidance because EPA acknowledged in 2012 that human and ecological risks were not under control and that the risks remained unacceptable. *See* New York State Dep't of Envtl. Conservation, *Recommendations to EPA for the 'Five Year Review Report' for Hudson River PCBs Site* at 18-

determinations potentially available to EPA in the Proposed Second FYR are "not protective" and "protectiveness deferred." As discussed throughout this comment, based on current data, EPA must find the remedy "not protective."

VI. Current Data Indicate the Remedy is Not Protective of Human Health and the Environment.

A. *Fish Tissue PCB Concentrations*

1. The 2002 ROD Established Clear Interim Remedial Targets for Fish Tissue Concentrations.

The remedial objective in the 2002 ROD specific to fish tissue concentrations and human health is to "[r]educe the cancer risks and non-cancer health hazards for people eating fish from the Hudson River by reducing the concentration of PCBs in fish."[104] In furtherance of this RAO, the 2002 ROD contains three target fish tissue concentrations for the cleanup: 0.4 mg/kg (safe to consume one half-pound fish meal every two months); 0.2 mg/kg (safe to consume one half-pound fish meal per month); and 0.05 mg/kg (safe to consume one half-pound meal every week).[105] The final target of 0.05 mg/kg is the remedial goal of the cleanup for the protection of human health.[106]

As discussed above, EPA evaluated five remedial alternatives in the 2002 ROD. In doing so, EPA stated that "[t]he time to reach target PCB concentrations in fish was a *primary factor* in comparing remedial alternatives."[107] Alternatives that included active remediation (i.e., dredging or capping) met the interim and final targets more quickly than the No Action and MNA alternatives.[108] The table below, reproduced from the 2002 ROD,[109] illustrates the differences among the alternatives in meeting the targets.

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19 (Dec. 2016) [hereinafter "DEC Report"] *available at* http://www.dec.ny.gov/docs/fish_marine_pdf/hudsondredging5yr.pdf (Attachment M)

[104] 2002 ROD at 50.

[105] *Id.*

[106] *Id.*

[107] *Id.* at 66 (emphasis added).

[108] *Id.* at 66-67, 71-72.

[109] *Id.* at 73.

TABLE 1

Year to Reach Human Health Risk-based PCB Concentrations in Species-weighted Fish Fillet Upper Hudson River[1]

Alternative	Remediation Goal (0.05 mg/kg)	0.2 mg/kg	0.4 mg/kg
No Action[2]	> 2067	> 2067	> 2067
MNA[3]	> 2067	2035 to > 2067	2024 to > 2067
CAP-3/10/Select	> 2067	2024	2013
REM-3/10/Select	> 2067	2024	2012
REM-0/0/3	> 2067	2018	2010

1 Upper Hudson River average is weighted by river section length. River Section 1: 6.3 miles = 15.4%; River Sect ion 2: 5.1 miles = 12 .5%; and River Sect ion 3: 29 .5 miles = 72 .1%.

2 "> 2067" means that the level will not be achieved within the model forecast period (*i.e.*, by 2067).

3 Higher value is upper bound.

The modeling for the 2002 ROD projected that the interim targets would be met, on a river section average basis, in 2012 and 2024, respectively.[110] Considering that the dredging was not completed until 2015, it stands to reason that the remedy would now be projected to meet the 0.4 mg/kg by 2017 (within two years of the completion of dredging) and the interim target of 0.2 mg/kg by 2029 (within 14 years of the completion of dredging). The interim targets in the 2002 ROD, which expected fish recovery to occur more slowly than model projections, would now allow for the 0.04 mg/kg target to be met by 2020 (within five years of the completion of dredging) and the 0.2 mg/kg target by 2031 (within 16 years of the completion of dredging).[111]

As discussed above, the time to reach the interim and final targets was a key component in EPA's selection of the remedy. Based on EPA's own rationale for selecting an active remedy, it is clear that delays of ten or more years in reaching the interim and final targets are not protective of human health.

2. Fish Tissue Concentrations Have Declined Since the Dredging Period, but There is Variation Among Species and Location.

It is undisputed that current fish tissue concentrations in the Upper Hudson River threaten both human health and the environment.[112] Although still hazardous, limited post-dredging data

[110] *See* 2002 ROD at Table 11-2.
[111] *See id.* at 103.
[112] *See, e.g.*, 2017 FYR at 71 (stating that "as of the date of this five-year review, EPA recognizes the remedy at OU2 to be not yet protective of human health and the environment."); DEC Report at 28 (stating that the current fish

indicates that fish tissue concentrations in the Upper Hudson River have declined since the dredging period.[113] According to EPA, the 2016 data suggests that "fish have begun to recover from dredging impacts and are generally back to pre-dredging levels."[114] Specifically, in 2009, prior to the start of dredging, the species weighted, wet weight average was 1.4 mg/kg.[115] In 2016, one year after the completion of dredging, the species weighted, wet weight average was 1.3 mg/kg.[116] EPA also claims that certain species are at or near the 0.4 mg/kg target in the Upper Hudson River, including largemouth bass and yellow perch.[117]

The Hudson River Foundation's ("HRF") June 2017 Report, *An Independent Evaluation of the PCB Dredging Program on the Upper Hudson and Lower Hudson River*, also indicates that fish tissue concentrations in the Upper Hudson River have declined since the dredging period.[118] However, HRF found that those declines vary by location and by species. For example, in Thompson Island Pool in River Section 1, "post-dredging TPCB concentrations in pumpkinseed and small forage fish were three to six times lower than observed pre-dredging levels."[119] Further downstream, the results are mixed.[120] At sampling locations in River Sections 2 and 3, concentrations in pumpkinseed were only two times lower than pre-dredging levels, and concentrations in small forage fish had declined very little, if at all.[121] In fact, at some locations, concentrations in small forage fish were *higher* than pre-dredging levels.[122]

This variability shows that fish tissue concentrations are closely tied to localized remedial activity and sediment contamination in the Upper Hudson River. HRF concluded that dredging in the Upper Hudson River was most effective in Thompson Island Pool, where a significant amount of sediment removal occurred.[123] The lack of response in small forage fish downstream "reflects the linkages of TPCB concentrations in forage fish to localized sediment contamination levels and the limited areas that were targeted for dredging between Schuylerville and Waterford."[124] HRF's analysis should prompt EPA to reevaluate the relationship between fish tissue concentrations and localized sediments in the Upper Hudson River.

In short, while certain fish tissue concentrations have declined to some extent in the Upper Hudson River, the variation among species and locations requires additional investigation.

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tissue concentrations in the Upper Hudson River "continue to result in exposures to both human and ecological receptors which are above EPA's acceptable risk range."); Hudson River Found., *An Independent Evaluation of the PCB Dredging Program on the Upper Hudson and Lower Hudson River*, 17 (June 2017) [hereinafter "HRF Report"] *available at* http://www.hudsonriver.org/download/2017-06-01Report-HRFDredgingProgramEvaluationFinal.pdf (stating that "[b]ased on the 2016 post-dredging monitoring, TPCB concentrations in fish throughout the Upper and Lower Hudson remain above interim target levels and remediation goal specified in the ROD.").(Attachment N)

[113] *See* 2017 FYR Appx. 3 at 6-1, 6-2.

[114] 2017 FYR at 33.

[115] *Id.*

[116] *Id.*

[117] *Id*, at 45.

[118] *See generally* HRF Report.

[119] *Id.* at ii, 11.

[120] *Id.* at ii.

[121] *Id.* at ii, 11-12.

[122] *Id.* at 11.

[123] *Id.* at 17.

[124] *Id.*

3. Although There is a Significant Amount of Uncertainty and Variability Involved in Fish Tissue Recovery Rates, it is Clear That EPA Has Overstated the Recovery Rate.

At the August 9, 2017 Five Year Review Team Meeting, EPA stated that it continues to expect fish tissue recovery rates to be approximately 8% per year. However, as further detailed in an independent expert analysis, *Hudson River PCBs Site Proposed Second Five Year Review – Technical Review* prepared by S.S. Papadopulos & Associates, Inc. ("SSPA"), there is considerable uncertainty and variability in fish tissue recovery rates.[125] EPA's conversion of Aroclor data into "homologue equivalent" data is among the sources of uncertainty introduced.[126] Specifically, the method used for Aroclor data (M8082) is "known to result in inaccuracy" and increased uncertainty; the process of converting Aroclor data to "homologue equivalent" data involves a large amount of uncertainty that EPA failed to take into account; and extrapolating from one data set to another added even more uncertainty.[127] The uncertainty involved—and unaccounted for—in the data conversion process is particularly troubling, as EPA used those data to support an 8% recovery rate in fish tissue.[128]

EPA's inconsistent use of rib-out data is also problematic. EPA stated that rib-out data could be used "[i]f the margin of error between rib-on and rib-off measurements [was] less than 20% of the average of lipid normalized PCB concentrations with a 95% confidence level…."[129] Consequently, rib-out data were excluded from wet weight trends, as they differed by a factor of two or more, but the data were included in lipid normalized trends, as they differed by less than 20%.[130] However, the difference between individual paired rib-in and rib-out samples could be much greater—up to 75%.[131] Although there were significant discrepancies among some individual paired samples, EPA still utilized the suspect 2007 and 2008 data in calculating an 8% average recovery rate.[132]

In addition to these uncertainties, SSPA determined that "fish tissue recovery rates are highly variable" and misleading in the context of a protectiveness determination.[133] SSPA plotted several variations to demonstrate the uncertainty in EPA's anticipated recovery rate of 8%.[134] The variations on the use of rib-out data or Aroclor based measurement data show the potential for significantly different fish tissue recovery rates.[135] Those different rates, which ranged from 4% to 8%, could add decades onto recovery times.[136] For example, using the current average fish tissue concentration of 1.3 mg/kg, and assuming a 4% recovery rate, fish in the Upper Hudson River would not reach the 0.4 mg/kg five-year target for 27 years and the 0.2 mg/kg 16-year

[125] *See generally* S.S. Papadopulos & Associates, Inc., *Hudson River PCBs Site Proposed Second Five Year Review – Technical Review* (August 2017) (Attachment O) [hereinafter "SSPA"].
[126] SSPA at 7.
[127] *Id.*
[128] *See id.*
[129] *Id.* at 10.
[130] *Id.*
[131] *Id.*
[132] *See id.*
[133] *Id.* at 2.
[134] *See id.* at 12.
[135] *Id.* at 10-11.
[136] *See* SSPA at 18 (Table 3).

target for 43 years.[137] Even if EPA's unsupported and optimistic recovery rate of 8% actually occurs, it would take 15 years to get below five-year target.[138]

SSPA made several significant observations regarding the uncertainty and variability as it relates to EPA's anticipated 8% recovery rate:

> The average 8% rate is shown to be uncertain when it is not reproducible with slight variations in data inclusion. In fact, the variations consistently produced average rates of recovery lower than the rate calculated using EPA's approach. *EPA's approach therefore results in recovery rates that are biased high*; the EPA rate is at the fastest end of the range of recovery rates found by applying slight changes to method.
>
> Furthermore, … the individual rates of recovery vary drastically by species and river section …. Importantly, the use of an average rate, while useful in representing the central tendency of recovery rates, *is deceptive in determining EPA's protectiveness statement for the Site*, because those fish populations with slow recovery rates or slightly increasing trends have half-lives several decades longer than the 8 years suggested by the 8% rate. These populations will continue to be an exposure risk for human health beyond the timeframe suggested by the 2017 Proposed FYR.[139]

In short, EPA's conclusion that the remedy will be protective based on an 8% recovery rate fails to account for significant uncertainty and variability. Furthermore, SSPA's analysis shows that EPA's anticipated recovery rate is overly optimistic, and that slower recovery rates will add decades to the 2002 ROD timeframes.

4. <u>The Cleanup is Not on Track to Meet the First Interim Target Within Five Years of Completion of Dredging.</u>

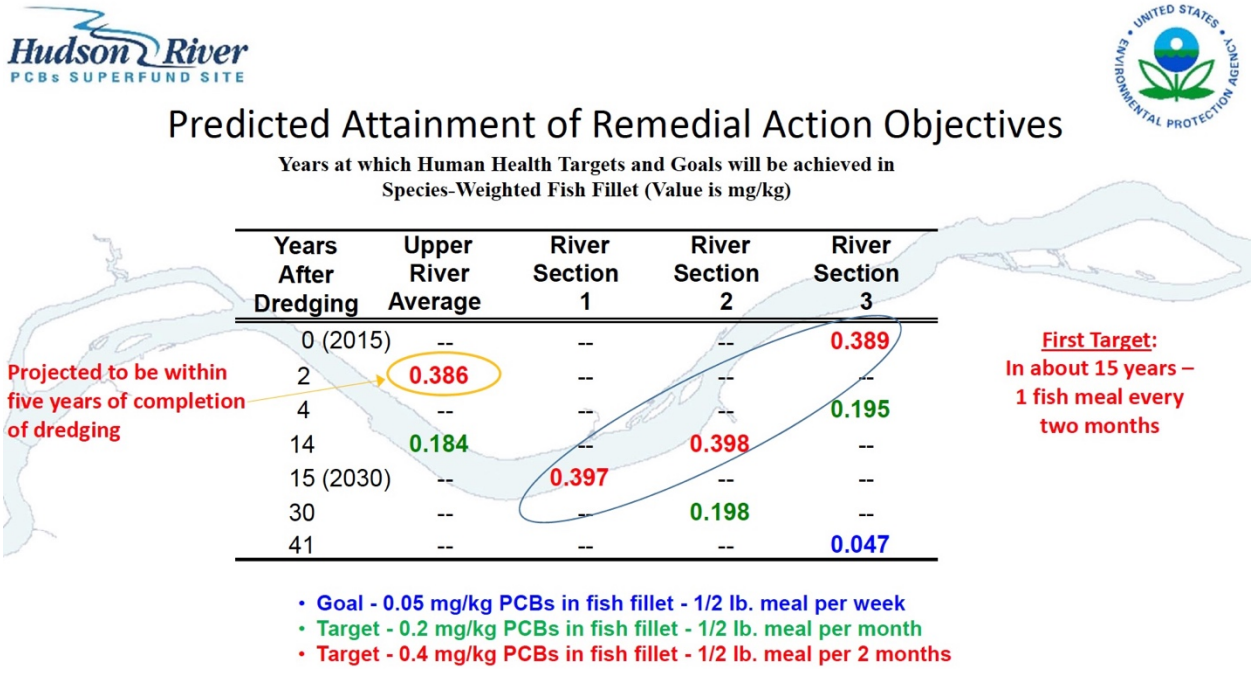
EPA recognizes that the remedy is not yet protective of human health and the environment in the Upper Hudson River, and points to the fact that the 2002 ROD did not anticipate the remedy to be protective by this time.[140] While it is true that the 2002 ROD did not expect the remedy to be protective two years after the completion of dredging, EPA ignores what the 2002 ROD *did* expect in the near term—that within five years of dredging, average fish tissue concentrations would be at or below 0.4 mg/kg. While more data is necessary to fully understand the timeline for reaching the interim and final targets, the cleanup will *not* meet the five-year target of 0.4 mg/kg for more than 15 years after the completion of dredging if its current expectations about recovery rate are correct.

According to EPA, the 2016 data indicates that the species weighted, wet weight fish tissue concentration in the Upper Hudson River is 1.3 mg/kg. With fish tissue concentrations at that

[137] *Id.*
[138] *Id.*
[139] *Id.* at 12-13 (emphases added).
[140] 2017 FYR at 8 (stating that "[a]s expected in the [ROD], average PCB concentrations in fish in the Upper Hudson are declining but have not yet reached protective levels.").

level, concentrations would have to decline at a very high rate of over 25% in order to meet the 0.4 mg/kg goal within five years of the completion of dredging, or by 2020, which is all but impossible. Even assuming an 8% decay rate, which is optimistic, the Upper Hudson Average would miss the 2020 target by more than ten years. As discussed *supra*, EPA has already determined that delays of ten years or more in meeting the interim and final targets are unacceptable. Because the data show that the recovery will occur at a rate that the 2002 ROD found was not protective in the context of other remedial alternatives, EPA has no basis whatsoever to find that the remedy "will be protective" for the Upper Hudson.

At the July 20, 2017 Community Advisory Group meeting, EPA itself admitted that the cleanup will not meet the five-year target on an Upper Hudson Average basis.[141] However, EPA has not made that clear in the Proposed Second FYR or in its public presentations to date. Rather, EPA created a PowerPoint slide based on Table 11-2 from the 2002 ROD, which shows the specific years in which the cleanup was expected to meet the interim and final remedial goals on an Upper Hudson Average and River Section basis.[142] The slide from EPA's presentation to the CAG is reproduced below.



EPA's use of this slide is misleading. The information is merely a recitation of the 2002 ROD modeling, but EPA uses it to suggest that the "First Target" is 15 years from the date of completion of dredging, not five years, as is actually the case. Moreover, the slide continues to suggest that the Upper Hudson Average will meet the 0.4 mg/kg target within five years of dredging (potentially even within two years), even though it will almost certainly miss that target. Finally, if the Upper Hudson Average will not meet the 0.4 mg/kg target until 2031 (as is

[141] EPA walked back this admission at the August 9, 2017 Public Information Meeting in NYC, suggesting that the target may not be met for seven years or more, and again at the August 16, 2017 Five Year Review Team meeting, insisting that it did not know whether the target would be met within five years.
[142] *See* 2002 ROD Table 11-2 at p.3 of 4.

the case with current conditions, assuming an 8% decay rate) one or more river sections will lag behind, meaning that in about 15 years, it is very unlikely that it will be safe to eat one fish meal every two months from each of the river sections.[143]

Although there is a significant amount of uncertainty and variability regarding decay rates, EPA must recognize that the cleanup will not meet the five-year target as set out in the 2002 ROD. In fact, it is likely that meeting the 0.4 mg/kg interim target will occur at a rate that EPA already determined was not protective for the other remedial alternatives considered in the 2002 ROD. Therefore, EPA should find that the remedy is a "not protective" and require GE to undertake for further investigation and remediation to get the cleanup back on track.

5. EPA Lacks Necessary Information to Make Long Term Predictions About Whether the Remedy Will Be Protective in the Future.

EPA asserts that it does not have sufficient data to predict future trends in fish tissue concentrations.[144] In fact, EPA repeatedly states that it needs *at least* eight more years of data to "draw statistically based conclusion about trends with a high degree of confidence."[145] However, despite lacking key information necessary to evaluate the effectiveness of the cleanup, EPA insists that declines in fish tissue concentrations are "generally consistent with ROD predictions" and that "the system is responding as anticipated."[146] In fact, the absolute level of PCBs in fish in the Upper Hudson is much higher than EPA anticipated at two years post-dredging, and the rates of decline observed are lower than EPA predicted. EPA cannot have it both ways. It should either make no prediction about the future if it thinks uncertainty is too high, or it should find that the first target will not be met if its current expectation about the rate of decline in fish tissue concentrations is correct. Both approaches lead to the same finding—that the remedy is not protective.

Essentially, EPA contends that the cleanup is consistent with the 2002 ROD as long as it will be protective at some unknown point in the future, following an undefined period of monitored natural attenuation.[147] EPA either cannot or will not provide specific timeframes in the Proposed Second FYR for when it expects the cleanup to meet the 2002 ROD targets.[148] Instead, EPA merely states that it does not expect to meet the remedial goal of 0.05 mg/kg "for decades," and that it expects to meet the interim targets of 0.4 and 0.2 "much sooner."[149]

EPA's statements in the Proposed Second FYR regarding the 2002 ROD expectations are inconsistent with its statements at recent public events. For example, in the Proposed Second

[143] *See id.* (showing that River Sections 1 and 2 were not expected to meet the 0.4 mg/kg target until 12 to 13 years after the Upper River Average).
[144] *See e.g.*, 2017 FYR at 5 (stating that "[f]ish, sediment, and water data at this early time are not sufficient to identify post-dredging trends with a high degree of confidence.").
[145] *Id.* at 6; *see also id.* at 33, 69, 70; *id.* App'x 3 at 1-2; *id.* App'x 3 at 6-2, 6-3.
[146] 2017 FYR at 58.
[147] *See id.* at 8 (stating that "EPA expects that continued natural attenuation following the completion of dredging will achieve the long term remediation goal . . . . As EPA indicated in the [ROD], EPA believes it likely that improvement will occur gradually over several decades at least."); *see also id*. at 24.
[148] *See* 2017 FYR at 58 (stating that "[a]s additional post dredging data are collected, EPA will be able to further assess the specific timeframes to achieve the 0.2 mg/kg and 0.4 mg/kg target levels.").
[149] 2017 FYR at 33.

FYR, EPA asserts that "declines in tissue concentrations consistent with 2002 ROD predictions. Although further monitoring will be required to verify that RAOs are being achieved, the lines of evidence to this point indicate that the system is responding as anticipated and that target levels will be achieved within the timeframes predicted in the ROD."[150] However, as discussed above, EPA admitted at the July 20, 2017 CAG meeting that the cleanup will miss the five-year target.

In sum, fish tissue concentrations throughout the Hudson River Superfund Site continue to pose a threat to human health and the environment. In the Upper Hudson River, evidence suggests that declines in fish tissue concentrations associated with dredging vary by species and location. Furthermore, there is considerable uncertainty and variability with regard to fish tissue recovery rates. However, it is nearly certain that the cleanup will miss the five-year interim target of 0.4 mg/kg. Finally, EPA admits that it cannot predict when fish tissue concentrations will meet the 2002 ROD targets with any confidence. Therefore, EPA cannot support its finding that the cleanup "will be protective" of human health.

6. The Lack of Response in Fish Tissue Concentrations in the Lower Hudson River Demonstrates the Need for a Full Remedial Investigation and Feasibility Study.

EPA expressly admits that fish tissue concentrations in the Lower Hudson River are not responding as anticipated. EPA recognizes that it is clear that "[t]he rate of decline of fish tissue PCB concentrations generally decreases with distance downstream. As a result, there is a decrease in the correlation between fish PCB concentrations in the Upper Hudson River and Lower Hudson River with distance downstream."[151] EPA interprets the data to show that "the Lower Hudson River recovers more slowly than the Upper Hudson under MNA."[152] In fact, the data that EPA relies on in the Proposed Second FYR show that decay rates during the MNA period from Poughkeepsie/Kingston downstream "are not statistically different from zero."[153]

TABLE 2

Decay Rates During the MNA Period According to EPA's Proposed Second FYR[154]

Monitoring Location	Wet-Weight	Lipid Normalized
Upper Hudson	16%	8%
Albany/Troy (RM152)	16%	10%
Catskill (RM113)	11%	3%
Poughkeepsie/Kingston (RM90)	8%	~0%
Newburgh (RM50)	1%	~0%

Rates of decay in the Lower Hudson River also vary by species. While EPA claims that several species are at or near the 0.4 mg/kg or 0.2 mg/kg targets in the Lower Hudson River, and that

[150] 2017 FYR App'x 3 at 7-2.
[151] 2017 FYR at 6, 33, 57, 70; *id.* App'x 3 at 7-1; *id.* App'x 3 at 4-5.
[152] *Id.* App'x 3 at 4-7.
[153] 2017 FYR App'x 3 at 7-1.
[154] 2017 FYR App'x 3 at 4-5, 4-6

yellow perch are at the 0.05 mg/kg target, other species are recovering at a slower rate. In fact, EPA admits that "decay rate estimates are variable across species and locations, with the brown bullhead demonstrating the slowest recovery . . . ."[155]

EPA attributes the differences between the Upper Hudson and Lower Hudson to a number of potential factors, including the fate and transport of PCBs in the Lower Hudson River.[156] It is likely true that fate and transport in the tidal Lower Hudson River differs from the Upper Hudson River. According to HRF, "the complexity of sediment transport in the Lower Hudson" contributes to the lack of response in fish to the upriver dredging.[157] As HRF explains, "[t]he continuous interaction of the overlying water with sediments (through setting, resuspension, and pore water exchange) and the large capacity of the sediments to sorb PCBs work together to dampen the PCB responses downstream and to greatly extend PCB response times to changes in Upper Hudson PCB loads."[158] Significantly, HRF concludes that the Lower Hudson River "appear[s] to be responding very slowly to changes in PCB inputs from the Upper Hudson."[159]

DEC has also expressed concerns about the relationship between localized sediments and fish tissue concentrations in the Lower Hudson. Specifically, DEC asserts that "the degree to which local sediments influence fish PCB concentrations is greater than thought at the time of remedy selection. As a result, there will be little additional improvement in fish PCB concentrations in the lower Hudson, particularly south of Albany, as a result of the dredging."[160] Ultimately, the issues raised by HRF and DEC regarding fate and transport of PCBs in the Lower Hudson River and the degree to which localized sediments impact fish tissue concentrations support the need for a full investigation.

EPA also speculates that other sources of PCB contamination may be responsible for the slow recovery in the Lower Hudson River. Although other sources of PCBs do exist—namely ARCO in Hastings and BICC Cables in Yonkers—EPA has stated in public meetings that it is undisputed that GE is the primary contributor. As such, the mere presence of other sources of PCB contamination should not deter EPA from ordering GE to undertake a full remedial investigation and feasibility study in the Lower Hudson River.

Despite the slow response thus far, EPA still maintains that the PCB load reduction from the Upper Hudson River will benefit the Lower Hudson River.[161] However, it is not clear how quickly that will occur, if at all. HRF anticipates that "it would take a decade or more to see appreciable change in PCB water column, sediment, and fish concentrations at many locations in the Lower Hudson."[162] DEC takes an even less optimistic view:

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[155] *Id.* at 4-11; *see also, id*. at 4-12 (stating that declines in PCB concentrations are occurring more rapidly in the Upper Hudson and less rapidly in the Lower Hudson "with estimate rates not statistically different from zero for several species at RM113, RM90 and RM50").
[156] 2017 FYR at 57.
[157] *Id.* at i.
[158] *Id.* at 16.
[159] *Id.* at 17.
[160] DEC Report at 37.
[161] 2017 FYR at 57.
[162] HRF Report at iii.

> Insufficient data are available in the lower Hudson to answer the question as to the magnitude of the delay in reaching the Remediation Goal of 0.05 ppm PCB in fish, However, given the limited impact of the remedy to date on fish in the Lower Hudson below Albany it is not anticipated that there will be further improvements in fish PCB in this area as a result of the dredging. Currently available fish PCB concentrations indicate ongoing exposures present unacceptable human health and ecological risk.[163]

DEC concludes that "the anticipated reductions in fish PCB concentrations in the lower Hudson, as a result of the remedial work in the upper Hudson, will likely not occur as anticipated in the ROD."[164]

Furthermore, the National Oceanic and Atmospheric Administration ("NOAA") recently published a peer-reviewed study that used model emulation to predict fish tissue concentrations in the Lower Hudson River based on post-ROD data.[165] The data that NOAA relied on showed that surface sediment concentrations in the Upper Hudson River were higher than expected.[166] In addition, NOAA determined that a 3% sediment recovery rate was more in line with the data than the 8% recovery rate used in the modeling for the 2002 ROD.[167] By considering these different inputs, NOAA's analysis indicates that EPA may have "greatly underestimated" the timeframes for fish recovery in the Lower Hudson River, and that it could take decades longer than anticipated to meet the interim targets south of the Troy Dam.[168] To illustrate this point, NOAA includes specific projections for white perch at RM 152.[169] Using updated sediment concentrations and assuming a 3% decay rate, white perch would not meet the 0.4 mg/kg and 0.2 mg/kg targets for 44 and 67 years, respectively.[170]

Even with skepticism and disagreement from NOAA, DEC, and HRF, EPA maintains that the slow response in the Lower Hudson is consistent with the 2002 ROD expectations.[171] This is despite its finding that the model used for the 2002 ROD "underpredicted" fish tissue levels in the Lower Hudson.[172] Moreover, EPA makes several vague and seemingly inconsistent statements about the remedy. For example, EPA contends that the 2002 ROD "did not predict significant impacts" from dredging, but nevertheless predicted "[s]ome improvements" as a

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[163] DEC Report at 26.
[164] *Id.* at 28.
[165] *See generally* L. Jay Field, et al., *Re-visiting projections of PCBs in Lower Hudson River fish using model emulation* 489, 493 (July 1, 2016) [hereinafter NOAA Study"] *available at* http://www.sciencedirect.com/science/article/pii/S0048969716302820; Nat'l Oceanic and Atmospheric Admin., *Powerpoint: Re-visiting Model Projections of Lower Hudson River Fish PCBs* (Aug. 15, 2015) [hereinafter "September 15, 2016 NOAA Powerpoint"] *available at* https://casedocuments.darrp.noaa.gov/northeast/hudson/pdf/CSF2015_AUG20_LHR_Fish_final_dist.pdf. (Attachment P)
[166] NOAA Study at 493.
[167] *See id.* at 497.
[168] *Id.* at 499.
[169] *Id.* at 495-97.
[170] *Id.* at 497.
[171] *See* 2017 FYR App'x 3 at 7-2
[172] *See* NOAA Study at 499.

result of the remedy.[173] Unsurprisingly, EPA claims that '[b]oth predictions are consistent with observations."[174] However, EPA also admits that "observations support a lack of significant response between Upper Hudson processes, e.g., dredging releases, and Lower Hudson impacts."[175] Regardless of EPA's current characterization of the 2002 ROD expectations, the lack of any significant response suggests that EPA was incorrect in assuming that the Lower Hudson River would meet the final remedial goal of 0.05 mg/kg in the same timeframe as River Section 3.[176]

In sum, the Lower Hudson River is responding very slowly to the cleanup, if at all. Evidence suggests that there is a disconnect between the remedial activities in the Upper Hudson River and the response in the Lower Hudson River. Therefore, EPA should require GE to conduct a full remedial investigation and feasibility study to address the ongoing PCB contamination in the Lower Hudson River.

B. Sediment Contamination

The 2002 ROD acknowledged that "[o]nce introduced to the river, PCBs adhere to the sediments. Physical, chemical, and biological release mechanisms allow PCBs in the sediment to be available for redistribution and to be a source of PCB contamination to the water column. Sediments would continue to release contamination to the water column and to biota, through aquatic and benthic food chains, *unless they are managed or remediated*."[177] Consequently, to address the threat to human health and the environment posed by PCB contaminated sediments, the 2002 ROD included the following remediation objectives: "[r]educe PCB levels in sediments in order to reduce PCB concentrations in river (surface) water that are above applicable or relevant and appropriate requirements,"[178] and "[r]educe the inventory (mass) of PCBs in sediments that are or may be bioavailable" in order to "ultimately reduce PCB levels in fish and the associated risks to human health and the environment.[179] So, the mass of PCBs that may become bioavailable "are closely related to the concentration of PCBs in surface sediments."[180] Consequently, the remedy focused on removing PCBs from targeted (dredged) areas, with focus on surface sediment concentrations as the main mechanism through which PCB concentrations in fish would be influenced.

The 2002 ROD thus required "[r]emoval of all PCB-contaminated sediments within areas targeted for remediation [namely, "hot spots"] with an anticipated residual of approximately 1 mg/kg Tri+ PCBs," as well as the "[u]se of environmental dredging techniques to minimize and control resuspension of sediments during dredging."[181] To this end, the 2002 ROD "estimated [that the] volume of sediments to be removed is 2.65 million cubic yards, which is estimated to

[173] 2017 FYR App'x 3 at 7-2.
[174] *Id*.
[175] *Id*.
[176] *See* 2002 ROD at 103.
[177] *Id.* at 15 (emphasis added).
[178] *Id.* at 17.
[179] *Id.* at 18.
[180] 2017 FYR at 48.
[181] *Id.* at ii-iii (emphasis added).

contain 70,000 kg (about 150,000 lbs) of total PCBs."[182] This remediation target for the chosen alternative, REM 3/10/Select, was broken down by River Section in the 2002 ROD Table 13-1, with estimated removals of 36,000 kg total PCBs for River Section 1; 24,300 kg total PCBs for River Section 2; and 9,500 kg PCBs total for River Section 3.[183]

During Phase 1 of the implementation of the selected remedy, REM 3/10/Select, EPA discovered that it had "underestimate[d] the depth of contamination during the original remedial design,"[184] and consequently, it ordered additional sediment sampling ("coring") to inform Phase 2 of dredging.[185] In addition to underestimating the depth and mass of PCB contamination, EPA also underestimated the concentration of PCBs in surface sediments.[186] Yet, despite acknowledging (1) that the 2002 ROD had underestimated the concentration, depth, and mass of PCB contamination in the sediment—*and* left more behind; (2) that "operational adjustments" meant dredging was not implemented in the manner anticipated in the 2002 ROD; and (3) the fact that "dredging began later than anticipated in the ROD,"[187] the Proposed Second FYR concludes that "EPA's remedy for the sediments was implemented successfully and within expectations described in the ROD."[188]

1. Average Surface Sediment PCB Concentrations After Dredging Are Two to Three Times Higher Than Anticipated in the 2002 ROD, Undermining EPA's "Will Be Protective" Determination.

Surface sediment concentrations are the primary source of PCBs bioavailable to fish species, and are closely linked to fish tissue concentrations.[189] For this reason, reducing surface sediment concentrations of PCBs is essential to the RAO of reducing PCB concentrations in fish.[190] The 2002 ROD anticipated that the remedy (dredging followed by MNA) would reduce surface sediment Tri+ PCB concentrations from an average of 4.6 mg/kg for River Section 1; 2.26 mg/kg for River Section 2; and 0.53 mg/kg for River Section 3; to an average of 0.96 mg/kg in River Section 1; 0.08 mg/kg in River Section 2, and 0.51 mg/kg in River Section 3.[191]

In the First FYR, EPA used the surface sediment data collected during the Sediment Sampling and Analysis Program ("SSAP") survey conducted from 2002-2005 as a pre-dredging baseline to re-estimate expected reductions in average Tri+ PCBs concentrations from implementing the dredging remedy.[192] The SSAP re-estimate with 2003 pre-dredging data found that, in actuality, two to three times *higher* Tri+ PCB concentrations existed in surface sediment.[193] Thus, as noted

[182] *Id.* at 60; *see also id.* at Table 10-1 (estimating total "PCB mass removed" to be 70,000 kg).
[183] *Id.* at Table 13-1.
[184] 2017 FYR at 4.
[185] *Id.* at 47.
[186] 2017 FYR App'x 4 at Table A4-5.
[187] 2017 FYR at 30.
[188] *Id.* at 3.
[189] 2017 FYR at 48.
[190] *Id.*
[191] 2012 FYR App'x A at Table 1 (see note 4).
[192] 2017 FYR at 49.
[193] 2012 FYR App'x A at Table 1.

by NOAA, the higher than expected pre-dredging surface sediment PCB concentrations likely extend the time required to reach recovery thresholds in fish tissue.[194]

Utilizing incorrect inputs for pre-dredging surface sediment PCB concentrations also impacts EPA's model predictions for post-dredging concentrations. Similarly, the EPA's 2002 ROD prediction for post-dredging PCB surface sediment concentrations *underestimates* the PCB concentration in surface sediment after dredging.[195] After correcting this input assumption, NOAA found that post-dredging residual PCB surface sediment concentrations were three to five times higher than predicted in the 2002 ROD, with even greater differences for River Sections 2 and 3.[196] Even utilizing EPA's own projected 8% decay rate (which NOAA and others dispute), recovery would be delayed by 25 years.[197] Comparing the EPA's 2002 ROD predictions with observed post-dredging PCB concentrations in surface sediment, NOAA found this prediction borne out, as a three to five times higher PCB concentration was actually observed in surface sediment after dredging.[198]

EPA admitted in the First FYR that after re-estimating Tri+ PCB concentrations with SSAP data, higher concentrations of PCBs would remain in river surface sediment after dredging than anticipated by the 2002 ROD.[199] However, the agency does not take the logical next step in evaluating whether this will impact its current "will be protective" determination by undermining the assumptions held in the 2002 ROD. In the Proposed Second FYR Appendix 4, EPA describes average Tri+ PCB surface sediment concentrations remaining after dredging only in *percentages*.[200]

Rather than compare the actual observed reductions in PCB residual concentrations in surface sediment with the 2002 ROD expectations and targets, EPA compares this data with the less-stringent interim "expectations" described in the First FYR,[201] without any justification of why this is correct.

Table 3 shows EPA's comparison of the percentages of PCBs remaining by concentration in surface sediment after dredging between the First FYR re-estimate and the Proposed Second FYR observed data. Looking at the actual values of the residual PCB concentrations—rather than percentages—it becomes evident that the remedy as implemented does not conform with 2002 ROD expectations or meet remediation goals judged necessary to achieve protection of human health and the environment in River Sections 2 and 3. To elucidate this discrepancy, Table 3

[194] September 15, 2016 NOAA Powerpoint at 9.
[195] *Id.* at 21.
[196] *Id.*
[197] *Id.* at 22.
[198] September 15, 2016 NOAA Powerpoint at 9.
[199] 2012 FYR App'x A at 54. *E.g. id.* ("The notable difference between the ROD-anticipated reduction and that predicted from the remedial design occurs in RS2 [River Section 2]. The reduction anticipated by the ROD (64 percent) is about twice as much of an improvement for RS2 as predicted from the remedial design (36 percent). *This indicates that it will take RS2 longer to reach its ultimate remedial goals than the forecast in the ROD*. . . . Thus based on the discussion above, achievement of the various remedial goals for RS2 may lag those anticipated by the ROD by about 10 years.") (emphasis added).
[200] *See* 2017 FYR at 50; *id.* App'x 4 at 5-2.
[201] 2017 FYR App'x 4 at 5-2.

compares the 2002 ROD expectations with the 2012 re-estimation and the 2017 actual observed surface sediment data.

TABLE 3

River Section (area weighted average)	**2002 ROD expectation**			**2012 FYR re-estimate (using 2003 pre-dredge data from SSAP survey)**			**2016 actual observed (from 2017 FYR)**	
	pre-dredge mg/kg[202]	post-dredge mg/kg[203]	% reduction	pre-dredge mg/kg[204]	post-dredge mg/kg[205]	% reduction[206]	post-dredge mg/kg[207]	% reduction[208]
River Section 1	4.6	0.96	79%	14.2	1.9	87%	0.77	96%
River Section 2	2.26	0.80	66%	11	7.1	36%	1.34	88%
River Section 3	0.53	0.51	4%	3.3	3.1	5.1%	0.83	80%

Looking at actual concentrations of residual PCBs in surface sediment, the remedy as implemented has *not* achieved the residual surface sediment PCB concentration goals in River Sections 2 and 3. This is because the pre-dredging PCB concentrations were much higher than anticipated. Because the 2002 ROD model predicting the rate of decay of residual PCB contamination has not been updated using the higher surface sediment concentration levels (the 2012 re-estimate), the model probably over predicts the rate of decay. EPA's "will be protective" determination is thus premised on inaccurate input assumptions, and cannot support the protectiveness determination.

2. <u>The Proposed Second FYR Misleadingly Compares Percentages of PCBs Removed with the 2002 ROD Percentage Reduction Goals in Concluding that the Goals Are Being Met, Despite Acknowledging that Up to Nearly Two and A Half Times More PCBs Were Found in Surface Sediment Than Expected.</u>

The Proposed Second FYR puts the remedy in the best possible light by stating that "72% of the overall PCB mass from the Upper Hudson River was removed by the dredging, which exceeds the 65% reduction assumed in the ROD."[209] This statement ignores the fact that more than two

[202] Data points for this column taken from 2012 FYR App'x A at Table 1.
[203] *Id.*
[204] Data points for this column taken from 2017 FYR at 50.
[205] *Id.*
[206] *Id.*
[207] Data points for this column taken from 2017 FYR App'x 4 at Table A4-5
[208] Data points for this column taken from 2017 FYR at 50. *See also id.* App'x 4 at Table A4-5.
[209] *Id.* at 32.

times more PCBs were found in the areas targeted for dredging than originally anticipated in the 2002 ROD.[210]

A less rosy picture is painted by examining the actual values of the total mass of PCBs removed by dredging—rather than percentages. Using this approach, it is evident that the remedy as implemented does not conform with 2002 ROD expectations, as shown in Table 4.[211]

TABLE 4	**ROD expectations (2002 ROD)**	**actual observed (2017 FYR)**
percentage of PCBs to be removed by dredging	65%	(72%)
mass of PCBs existing in dredging area	107,400 kg[212]	216,333 kg
mass of PCBs removed by dredging	69,800 kg[213]	155,760 kg[214]
residual PCBs after dredging	37,600 kg	60,573 kg

The 2002 ROD anticipated that 37,600 kg of total PCBs would remain after dredging had been completed. However, the Proposed Second FYR data indicates that 60,573 kg of total PCBs remained in the targeted river sections after dredging. This means that *much more PCBs remain* in the dredged areas than was assumed in the 2002 ROD.

Despite acknowledging that more PCBs remain than anticipated by the 2002 ROD—and, thus, that the remedy has not been implemented as described—EPA concluded that, after MNA, it "will be protective" of human health and the environment.[215] This conclusion ignores that the conditions the 2002 ROD predicted would exist after dredging, and upon which it prefaced its MNA determinations, were not achieved by the dredging, since at least two times more PCBs remain after dredging in the targeted river sections. With two times more PCBs remaining in the sediment in some areas, the 2002 ROD predictions about natural attenuation are significantly undermined, and cannot reasonably form the basis for EPA's "will be protective" determination.

The failure of the remedy to reduce the amount of residual PCBs after dredging to conform with the 2002 ROD expectations renders EPA's protectiveness finding arbitrary. EPA does not evaluate whether the fact that between two and nearly two and a half times more PCBs remain in the riverine environment will have an impact on the MNA process, potentially slowing natural recovery dramatically. The 2002 ROD itself rejected the alternatives employing MNA without

[210] *Cf.* 2017 FYR App'x 8 at 2-4 ("the PCB mass removed by dredging . . . was 2.3 times the prospective ROD estimate"); *see also* 2017 FYR at 31 ("underestimates of the depth of contamination [were]primarily caused by wood debris that interfered with sediment sampling"); *id.* at 4 ("Total PCB and Tri+ PCB mass removed were greater than planned, due to underestimates of the depth of contamination during the original remedial design. PCB mass in non-dredged areas is also greater than estimated in the 2002 ROD, although to a lesser extent than within the dredged areas.").

[211] *See also* NOAA Study at 495, Figure 5 (comparing, for each River Section, the extent to which more PCBs were present than anticipated prior to dredging and the higher-than-expected concentration post-dredging).

[212] *See* 2002 ROD at 21 (listing "total PCB mass in the sediments" in River Sections 1, 2 and 3).

[213] *See* 2017 FYR App'x 2 at Table A2-3.

[214] *Id.*

[215] 2017 FYR at 24.

dredging in favor of a remedy that included dredging and subsequent MNA precisely because the slow remediation timeline presented was inadequate to protect human health and the environment.[216] Such slowing here, by leaving behind at least two times more PCB mass than anticipated, and three to five times more PCBs in surface sediments, similarly fails to protect human health and the environment.

DEC echoed this criticism of the Proposed Second FYR, explaining that "the fact that sediment concentrations higher than anticipated will remain after dredging[] indicates that the targeted fish PCB concentrations will not be reached in the time frames identified in the ROD."[217] Both the greater-than-expected PCBs remaining after dredging and the operational delays in implementing the dredging "contradict[] the basis upon which EPA selected the remedy," namely, " that a delay in abating the uncontrolled ecological and human health exposures was not acceptable."[218]

Thus, not only does the Proposed Second FYR's comparison of the targeted river sections' 2017 status with the 2002 ROD goals via percentages mislead the public with regard to the effectiveness of the dredging, but it also raises serious questions as to the accuracy of the EPA's finding that the remedy as implemented "will be protective" of human health and the environment.[219] Furthermore, DEC calls for the "site conceptual model [] to be updated to take into account the data gathered [] since the ROD was issued that showed that higher surface sediment PCB concentrations would be left behind than anticipated . . . ."[220] Similarly, NOAA calls for the model to be updated both with the increased PCB contamination input as well as the corrected rate of decay.[221]

Accordingly, EPA must require additional dredging to remove the remaining PCBs in accordance with the 2002 ROD expectations, or reevaluate the anticipated MNA rate to account for the two times more PCBs remaining in the environment, taking into account the inadequacy of slow MNA-only timelines rejected in the 2002 ROD.

C. Water Column

To reduce environmental and human health risks, the 2002 ROD proposed two remedial action objectives related to PCB concentrations in the Upper Hudson River water column: (1) to "[r]educe PCB levels in sediments in order to reduce PCB concentrations in river (surface) water that are above surface water ARARs [applicable or relevant and appropriate requirements]"; and (2) to "[m]inimize the long-term downstream transport of PCBs in the river."[222] PCBs that are transported downstream in the water column are available to biota, contributing to the risk to

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[216] 2002 ROD at 73. *See also* DEC Report at 1 ("EPA selected this remedy primarily based upon the time it would take to achieve targeted fish PCB concentrations after dredging. . . . Specifically, EPA stated in the ROD that a delay of ten years in dredging and 0.2 mg/kg within 16 years of the completion of dredging was unacceptable. This ten year delay was used as a basis for rejecting the Monitored Natural Attenuation (MNA) remedial alternative. . . . EPA conclude the dredging was needed to accelerate the time it would take to reach the remedial targets for fish flesh in order to quickly reduce human health and ecological risk compared other alternatives that were evaluated.").
[217] DEC Report at 2-3.
[218] *Id.* at 19.
[219] 2017 FYR at 24.
[220] DEC Report at 44.
[221] NOAA Study at 499.
[222] 2002 ROD at 51-52.

human health and the environment from the Site's PCB contamination. Downstream transport also moves PCBs from highly contaminated areas to lesser contaminated or clean areas, and from the Upper Hudson to the Lower Hudson.[223]

1. The 2002 ROD Predictions Were Optimistic for the Lower Hudson.

At the time the Proposed Second FYR was issued, EPA had compiled pre-dredging period water quality data for 17 years (1991-2008), dredging period data for six years (2009-2015), and post-dredging data for one year (2016). Despite having collected over 25 years of Hudson River PCB data, some of EPA's critical modeling failed to predict trends, concentrations, decay and volatilization rates of PCBs.[224] Furthermore, the model used to analyze Lower Hudson River data systematically under-predicted Tri+ PCB concentrations at Poughkeepsie.[225] Two of EPA's models disagreed on rates of decay and neither was accurate: decay was slower than the HUDTOX MNA model predicted at Stillwater and Waterford and faster than the 2002 ROD MNA model predicted at Thompson Island Dam and Schuylerville.[226]

EPA claimed that the 2002 ROD forecast rate of natural attenuation (9.6% - 10.6%) during the pre-dredging period (2004-2008) was comparable to the observed decay rates at the four Upper Hudson River stations (4.5% - 13.1%).[227] Although Tri+ PCB concentrations at the Albany station—the uppermost river segment of the two Lower Hudson stations—were in close agreement with the four Upper Hudson stations, the modeling used to predict Tri+ PCB concentrations at Poughkeepsie under-predicted concentrations for the pre-dredging period from 2004 to 2008.[228]

EPA has conceded that the "effects of PCB load reduction from Upper Hudson to Lower Hudson are unknown. Additional years of monitoring data will be required to sufficiently evaluate MNA trends following completion of dredging activities."[229]

2. Load Reductions to the Lower Hudson Are Not as Large As Expected.

As HRF observes, in " both the pre-dredging and post-dredging periods, Tri+ PCB concentrations decreased with increasing flow for river flows less than approximately 13,000 cfs (or 1.6 times the long-term mean river flow at Waterford)" and "[f]or river flows greater than 13,000 cfs, Tri+ PCB concentrations increased with increasing flows." [230] HRF indicates that the second result is expected, and "is associated with increased flow-induced erosion of the streambed and the accompanying increase in suspended sediment loads (and particulate phase PCB transport) during the higher flows."[231] These findings also indicate that resuspension of

[223] *Id.*
[224] *See, e.g.*, 2017 FYR at 2-1 ("The modeling analysis yielded much lower estimated concentrations of volatilized concentrations in the air compared to empirical data.").
[225] *Id.* App'x 4 at 4-5, Fig. A1-4.
[226] *Id.* at 4-4.
[227] *Id.*
[228] *Id.* at 4-5.
[229] *Id.* at 2-6.
[230] HRF Report at ii, 7.
[231] *Id*. at 7.

localized sediments, rather than upstream inputs, is driving Tri+ PCB concentrations during high flow events.[232]

Modeling indicated a significant reduction in Tri+ PCB loadings during high flow events and minimal reduction during low flow events (*see* HRF Report Figure 9, reproduced below).[233] Even less reduction was predicted when based on the actual flow record from 2004 to 2008. Under this scenario, Tri+ PCB loads during the pre-dredging and post-dredging periods would be reduced by only 13% if pre- and post-dredging flows were comparable.[234]

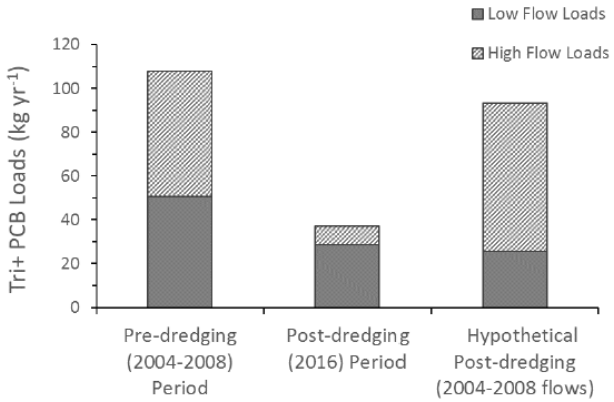

Figure 9. Estimated Tri+ PCB loads to the Lower Hudson for the 2004-2008 pre-dredging period, the 2016 post-dredging period and a hypothetical post-dredging period based on 2004-2008 flow record. Results are presented as stacked bars for low-flow (< 13,000 cfs) and high-flow (> 13,000 cfs) loads.

According to HRF,

> Tri+ PCB loads for low flow conditions were approximately 27 kg/yr for both the 2016 post-dredging period and hypothetical post-dredging scenario. This indicates that year-to-year variations in river flow will have a small effect on Tri+ PCB loads during low flows. However, Tri+ PCB loads during high flows showed large differences. This result indicates that Tri+ PCB loads during high flow conditions will likely show large year-to-year variations; e.g., from 8.3 kg/yr based on the 2016 flow record to potentially more than 100 kg/yr if the river experiences another year like 2011 with three major high flow events.[235]

[232] *Id.* at ii-iii.
[233] *Id.* at 34.
[234] *Id.* at 14.
[235] *Id.* at 14.

This analysis shows that EPA should never have expected dredging above the Federal Dam to have a major effect on the river downstream. This conclusion is further bolstered by existing post-dredging data, since 2016 was actually an abnormally low year in terms of PCB loading, but fish tissue levels still showed little to no recovery.

3. No Water Column Response Was Observed in the Lower Hudson and the Response Is Not as Anticipated in the Upper Hudson.

EPA's water column data to date shows that the impacts on water column PCB concentrations from dredging are much more immediate and localized than assumed in the 2002 ROD. Although Tri+ PCB concentrations in the Upper Hudson water column showed a relatively rapid response to the dredging, the Lower Hudson River has been slow to respond. This lag is due in part to the cyclic transfer between the surface sediment and water column during resuspension and deposition, and the fact that post-dredging Tri+ PCB concentrations averaged four times higher than predicted by the 2002 ROD models.[236] The result is that additional years of MNA will be required to reduce PCB concentrations in the water column—as well as in fish and sediment—to acceptable levels.

In short, dredging produced results in water column concentrations upriver, but not downriver. EPA's modeling is inadequate to predict if and when Lower Hudson water column PCB concentrations will reach the target concentration of 5 ng/L. Tri+ PCB concentrations at Lower Hudson River monitoring stations 1995-2016 show *no* decline,[237] and, contrary to the 2002 ROD expectations, the Poughkeepsie water column data showed no dredging impacts, suggesting that water column PCB concentrations "are regulated by local conditions."[238] HRF attributed the faulty modeling at Poughkeepsie to the complexity of sediment transport and dynamic response in the Lower Hudson.[239] Ultimately, it is unlikely that activities or conditions in the Upper Hudson River will have any significant impact on water column concentrations below the Federal Dam, further supporting the need for a full remedial investigation and feasibility study of the Lower Hudson River.

VII. EPA Must Make a Not Protective Finding for the Lower Hudson.

In the Proposed Second FYR, EPA makes no protectiveness determination with regard to the Lower Hudson River—over 150 miles of the Superfund Site from the Federal Dam in Troy to the Battery in New York City. In contrast, in the First FYR, EPA found that the remedy "will be protective" for the entire 197-mile Superfund Site.[240] EPA is now walking back that conclusion, finding that the "will be protective" determination only applies to the Upper Hudson River—the 40 miles of the Superfund Site north of the Federal Dam.[241]

[236] NOAA Study at 499.
[237] 2017 FYR App'x 1 at Fig. A1-2.
[238] *Id.* at 4-8.
[239] HRF Report at iii.
[240] 2012 FYR at vi, 40.
[241] 2017 FYR at 8, 24.

EPA's decision not to include a sitewide protectiveness determination is a major departure from the First FYR (although EPA fails to discuss it openly or clearly), and further evidences the need for a full remedial investigation and feasibility study for the Lower Hudson River. EPA's decision not to evaluate whether the remedy is protective for the lower 150 miles of the site renders the Proposed Second FYR deficient. The Lower Hudson River, which constitutes nearly 80% of the Hudson River Superfund Site, is lined with cities, towns, and villages that depend on the river for recreation, economic opportunities, and drinking water. Despite the significance of this portion of the Site, EPA has declined to make any protectiveness determination, essentially choosing to ignore the reality that the benefits of the sediment cleanup that were supposed to materialize downstream have not done so in any meaningful way.

If EPA had undertaken the required analysis for the Lower Hudson, it should have led the agency to conclude that a full remedial investigation and feasibility study for the Lower Hudson is necessary.[242] But, even without that analysis, EPA has enough information to reach the same conclusion. The Proposed Second FYR candidly states that data collected so far show that the active remediation—the dredging— in the Upper Hudson is not having any measurable impact on PCB contamination levels in the Lower Hudson.[243] In addition, the model that EPA relied upon to devise the 2002 ROD goals underestimated fish tissue concentrations in the Lower Hudson.[244] Furthermore, the Proposed Second FYR calls for more monitoring in the Lower Hudson,[245] although it fails to establish any mechanism or timeframe for this to take place.

In short, existing data shows that the remedy is not currently protective of human health and the environment in the Lower Hudson River. This is particularly troubling considering that many people in the Lower Hudson, including many New York City residents from low-income communities and communities of color, either rely on subsistence fishing from the Hudson River as an important source of food or would like to do so. The simple fact that subsistence fishing occurs in the 150-mile stretch of the Hudson River below the Federal Dam, particularly in and around New York City, reinforces the need for EPA to ensure that the cleanup is protective of the entire site. Omitting a protectiveness determination for this portion of the Site does nothing but create further concern and confusion among the millions of people who live, work, and play along the Lower Hudson from Troy to Manhattan.

VIII. Changes in Implementation of Dredging Project Do Not Explain Lack of Fish Recovery Within Expected Timeframes.

The selected remedy was premised on achieving a relatively rapid decline in fish tissue PCB concentrations, reaching a species-weighted average concentration of 0.4 mg/kg within five

[242] At the recent Informational Meeting in Poughkeepsie, NY, EPA officials stated that they weren't "there yet" when it comes to whether a RI/FS is warranted for the Lower Hudson River. *See* Oceans 8 Films, *Hudson River Action - Tell EPA: Protect people and wildlife, not GE* at minute 2:45 (June 28, 2017) *available at* https://vimeo.com/225670244. EPA itself in the 2017 FYR has called for more data collection in the Lower River, 2017 FYR at 57, but has not explained *how* such information collection will be conducted. Similarly, the 2017 FYR does not evaluate on what timeline such research will be undertaken, nor what event or evidence would trigger a full-blown RI/FS for the Lower Hudson River, rather than the mere "additional information" described in the 2017 FYR.

[243] 2017 FYR at 6, 33.

[244] NOAA Study at 499.

[245] 2017 FYR at 57.

years of the completion of dredging, or by 2020.[246] The most recent data from 2016 indicates that average fish tissue concentrations measured at 1.3 mg/kg,[247] or more than three times the 0.4 mg/kg target level. As discussed in more detail above, based on independent scientific analysis as well as analyses by DEC and NOAA, EPA's estimated 8% decay rate is not supported, and a significantly lower decay rate of 3-5% is likely more accurate.[248] However, even assuming *arguendo* that EPA's 8% rate is accurate, it is incredibly improbable that fish tissue levels will approach 0.4 mg/kg by 2020. In fact, at an 8% decay rate, it will take another 11 years to reach the five-year target; at a 5% decay rate, it will take another 18 years. In order to reduce 1.3 mg/kg to 0.4 mg/kg by 2020, the decay rate would have to be over 25%—a practical impossibility.

In an attempt to explain away this reality and justify its "will be protective" determination, EPA spent an entire appendix to the Proposed Second FYR discussing why fish tissue levels remain so far above the 2002 ROD expectations. EPA's unsubstantiated hypothesis is that changes in the implementation of the dredging project from what was anticipated in the 2002 ROD led to increased PCB levels in water that have delayed fish tissue recovery.[249]

The 2002 ROD anticipated that dredging would occur from upstream to downstream, and that two sediment processing facilities would be used, at least one of which would be located downstream of most dredging operations.[250] However, for various operational reasons, EPA determined that the project would follow a general upstream-to-downstream progression, but at times dredging would occur in multiple river sections at the same time, especially during the last two to three seasons of dredging.[251] EPA also decided to use a single, upstream facility, which resulted in more vessel traffic over the project area in the later years of dredging.[252] EPA claims that these operational changes resulted in increased levels of suspended PCBs over the entire project area and, therefore, fish tissue concentrations "may still be within the ROD-anticipated period of equilibration."[253] Based on this rationale, EPA rejects attempts to compare observed data to ROD forecasts.[254]

However, EPA fails to mention that the 2002 ROD timeframes for the interim targets of 0.4 mg/kg and 0.2 mg/kg—within five years and 16 years after dredging, respectively—already took into account up to two years for equilibration. Thus, the time to reach equilibration should not be a justification to extend the interim targets even farther into the future.

A closer look at the Remedial Action Monitoring Program ("RAMP") data also belies EPA's hypothesis. The expected fish tissue recovery trend can be described as a significant rapid decline in concentrations very soon after dredging (a "step-function"), followed by a reasonably

[246] 2002 ROD at 50; *see also id.* at 73 (Table indicating .4 mg/kg average fish tissue concentration will be reached in 2012, or three years after the then-expected end of dredging in 2009).
[247] 2017 FYR at 33.
[248] *See generally* SSPA, DEC Report, NOAA Study.
[249] *See* 2017 FYR at 37.
[250] *Id*.
[251] *Id*.
[252] *Id.*
[253] 2017 FYR App'x 8 at 2-17.
[254] *Id*. at 3-3.

stable decay rate. This trend is illustrated by the fish recovery trends for the Cumberland Bay-Wilcox site, highlighted by EPA in Figures A8-5.1 and 5.2 in the Proposed Second FYR. Upon a review of the project data, it is apparent that the step-function decline seen at Cumberland Bay in two to four years post-dredging have already occurred for the vast majority of species at the vast majority of stations along the Hudson River Site. This indicates that fish tissue levels have likely already reached equilibrium. Fish tissue levels elevated beyond what was expected at this point post-dredging are probably *not* short-term impacts due to differences in project implementation, but an indication of a significant delay in long-term recovery with negative implications for the protectiveness of the remedy.

This step-function trend is visible in Figures 5A-5R of the SSPA Report and in Figures A8-4.1-4.12 of the Proposed Second FYR. For nearly every species at every station, one discerns a trend where in the pre-dredging period concentrations remain more or less stable, and then when dredging occurs near a particular station, one observes an increase in concentrations for one or two data points. Following the increase, there is a clear, sharp decline for the one to two years. That sharp decline subsequently stabilizes into a slow, gradual decline.

EPA itself admits that "[i]n general, fish tissue PCB levels were observed to recover to pre-dredging levels within one to three years after completion of dredging upstream of a monitoring station."[255] In River Section 1, the RAMP data indicates that fish tissue levels peaked within one to two years after dredging, then rapidly declined.[256] For River Section 2 and River Section 3 the same general patterns prevail, with very few exceptions (e.g., black bass at fish monitoring stations SW1 and ND2).[257] Out of 20 measured trends in River Section 1 (four species each at five stations), 16 trends have already declined to at or below the Baseline Monitoring Program ("BMP") mean, and 15 have decreased below the Lower Confidence Level ("LCL") of the BMP as of 2016 – indicating they have reached or surpassed equilibrated levels.[258] Out of 16 trends in River Section 2 (four species each at four stations), 13 have declined to or below the BMP mean and 11 have declined to or below the BMP LCL.[259] In River Section 3, all 20 trends (four fish each at five stations) were at or below the BMP mean in 2016, although only 11 have fallen below the BMP LCL.[260] EPA also stated in a presentation to the Community Advisory Group for the Site that fish tissue concentrations decrease rapidly following spikes related to environmental dredging at other sites, and that the agency likewise expects a rapid return to baseline in the Hudson River.[261]

In short, post-dredging equilibration has already occurred in the Upper Hudson River. There has already been a large step-down in fish tissue concentrations as a result of the dredging, and from this point forward, EPA should only anticipate a stable decay rate in the absence of further removal or sequestration of PCBs. Moreover, Figures A8-1 and A8-2 demonstrate the extent to

[255] 2017 FYR App'x 8 at 2-14
[256] *Id.* at Figs. A8-4.1 to 4.3.
[257] *Id.* at Figs. A8-4.4 to 4.12.
[258] 2017 FYR at Table A8-7.
[259] *Id*.
[260] *Id*.
[261] U.S. Envtl. Prot. Agency, *Powerpoint: PCBs in Fish Tissues at the Hudson River PCBs Superfund Site: Update on Results of Baseline and Remedial Action Monitoring (2004-2013)* at 18 (Oct. 30, 2014) *available at* http://www.hudsoncag.ene.com/files/FishDataSummaryOct2014.pdf. (Attachment R)

which the 2002 ROD envisioned dredging approach was consistent with actual implementation. As EPA states, there are some deviations from the way in which the 2002 ROD contemplated the dredging project. However, the 2002 ROD approach and actual project approach are remarkably similar, with few relatively minor deviations (i.e., dredging an upstream Certification Unit ("CU") one dredging season prior to the CU immediately downstream). A notable exception is the dredging upstream of the TD1 monitoring station in River Section 1 in 2015, but this is an outlier to the general pattern. Overall, it is apparent that the dredging program progressed more or less as planned. EPA simply does not have adequate justification to identify these changes in implementation as the main reason fish tissue levels remain elevated.

In sum, the data does not support the idea that fish tissue concentrations are still being significantly impacted by the dredging activity. The expected step-function drop in fish tissue levels has already occurred; in most species at most stations, the fish have already equilibrated. Thus, EPA is left with fish tissue concentrations that are more elevated than expected at the time of the 2002 ROD and it is very unlikely that these concentrations will decline at the rate EPA predicted. In light of these conditions, the agency needs to take a hard look at what went wrong and what must be done to ensure the RAOs are met within the approximate timeframes set forth in the 2002 ROD.

IX. EPA Failed to Act On the Follow-Up Recommendations and Key Concerns from The 2010 Peer Review Panel, the Natural Resource Trustees, New York State, and the Hudson River Foundation To Adaptively Manage the Remedy.

Since at least 2010, scientists from federal, state, and independent institutions have repeatedly shared with the EPA and the public substantive and credible analyses that clearly indicate the Hudson River Superfund Site remedy and cleanup to date is *not* protective of human health and the environment.

A. 2010 Peer Review Panel Findings.

In the Spring of 2010, a panel of seven independent scientists selected by both the EPA and GE was tasked with evaluating all aspects of Phase 1 dredging operations from the first year of active remediation and reporting back recommendations for changes to remedial designs for Phase 2 operations. The panel's report was released in September 2010.[262] While the Panel acknowledged there were serious challenges in Phase 1, it recommended that with appropriate adjustments based on good data and sound science, Phase 2 remedial action should proceed. One of the most critical observations (and resulting recommendation) made by the panel was that neither EPA nor GE has sufficient data or a credible tool to project recovery.[263] The panel stated that the HUDTOX/FISHRAND models (originally used during development of the 2002 ROD) are outdated and inadequate to accurately project MNR and post- dredge fish recovery rates.[264]

[262] *See generally Hudson River PCBs Site Peer Review of Phase 1 Dredging* (Sept. 10, 2010) [hereinafter "Phase 1 Review"] *available at* https://www3.epa.gov/hudson/pdf/hudsonriverphase1dredgingreport_final.pdf. (Attachment S)
[263] *Id.* at 13.
[264] *Id*.

The panel told EPA and GE that in order to create more effective and comprehensive dredge-design paradigms for successive remediation protocols, they should collaborate on the creation of a new "Fate, Transport and Risk Model" utilizing the real-time data collected during the first phase of dredging and data from year one of Phase 2. The updated fate, transport, and risk model would enable EPA and GE to better understand the implications of operational changes on long-term recovery rates, and would support EPA and GE in making appropriate and meaningful risk management decisions about dredging productivity, BMPs, and the long-term fate and transport of PCB residuals and resuspension and release.[265]

The panel further advised the five-year timeline for project duration should be extended to provide necessary flexibility to meet the actual remediation need of the river while protecting long-range remedy goals. Finally, the panel stated that there should not be a limit on the PCB mass to be removed during remediation as the total amount of PCB inventory in the river is unknown.

B. Federal Trustees Study Supports A "Not Protective" Determination.

In direct contradiction to the conclusions made by EPA Region 2 staff in the First FYR and in the Proposed Second FYR, scientists from federal, state and independent institutions have shared with EPA and with the public substantive and credible analysis that clearly indicate the Hudson remedy and the cleanup action to date is "not protective" of human health and the environment as implemented.

In an inter-agency communication to EPA Region 2 and in a peer-reviewed study,[266] NOAA informed EPA that "recovery of the Upper and Lower Hudson will not be reached due to elevated PCBs remaining in surface sediment equivalent to a series of Superfund Sites being left behind,"[267] and that "post-remedial PCB concentrations in the Upper Hudson River sediments will exceed previous EPA model predictions by a factor of 3-to-5 times."[268] The Trustees also warned EPA that "achieving the Remediation Goals for PCB fish tissue concentrations in the Lower Hudson River would take several decades longer than expected,[269] and that "additional removal of PCB-contaminated sediment in the [Upper Hudson] [is] needed to achieve reductions in [Lower Hudson] fish PCBs anticipated in the ROD."[270]

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[265] 2012 FYR at 36.

[266] *See* NOAA Study; *see also* Nat'l Oceanic and Atmospheric Admin., *Powerpoint: Re-visiting Model Projections of Lower Hudson River Fish PCBs* (May 19, 2015) [hereinafter "May 19, 2015 NOAA Powerpoint"] *available at* https://www.fws.gov/northeast/ecologicalservices/HudsonRiver/docs/Lower%20Hudson%20River%20Fish%20HRF%20Field%2005192015.pdf. (Attachment P)

[267] Letter from Dr. Robert Haddad, Nat'l Oceanic and Atmospheric Admin., to Robert Sussman, U.S. Envtl. Prot. Agency, entitled "Phase 2 Remediation, Hudson River PCB Superfund Site" (Dec. 2, 2010) [hereinafter "Haddad Letter"], available at http://www3.epa.gov/hudson/pdf/CorrespondenceReceived_FiveYearReview_HudsonRiverPCBs.pdf. (Attachment T)

[268] May 19, 2015 NOAA Powerpoint at 15.

[269] NOAA Study at 499.

[270] May 19, 2015 NOAA Powerpoint at 36.

C. New York State Analysis and Review Support A "Not Protective" Determination.

Acting on behalf of the interests of New York State and its citizens, the Office of the Attorney General ("OAG") notified EPA in September 2016 that "it is now clear that the remedy has not met the remedial action objective of reducing PCB concentrations in fish to 0.4 mg/kg by 2016, and may not reach the ROD's more dramatic reductions to 0.05 mg/kg." [271]

The OAG advised the EPA that it "must determine with reasonable certainty the time-frame by which there will be a reduction of PCB concentrations in fish so that fish consumption advisories for PCBs may be lifted in all contaminated River reaches of the Hudson River for all species and that EPA's determination of remedy's protectiveness must be supported by a comprehensive Fish Consumption Survey to quantify current and potential future human exposure."[272] Furthermore, the OAG insisted that EPA "must clearly define the time-frame for achieving the remedial action objectives set forth in the ROD" and cautioned that "in evaluating that time-frame, EPA must take into account the change in fish tissue sampling that occurred during GE's implementation of the baseline and remedial fish monitoring.[273] The OAG letter reflects the State's deep concerns regarding "localized effects of human exposure in certain more contaminated areas of the River" and urged EPA to evaluate those effects "as part of EPA's Five Year Review and protectiveness determination."[274]

In December 2016, the DEC—a Hudson River Superfund Site Trustee and primary natural resource manager for the State's natural resources— issued a preliminary review of the effectiveness of the cleanup to date.[275] DEC concluded that "the Remedy is not protective of human health and the environment based on uncontrolled risks, and EPA should undertake all necessary actions to ensure that the remedy becomes fully protective to the benefit of the people of New York State."[276]

DEC's review identified a serious failure that EPA continues to dismiss: that "there are known exposures to both human and ecological receptors which have not been controlled and which remain in excess of EPA's acceptable risk range."[277] Moreover, "sediment concentrations higher than anticipated will remain after dredging, [which] indicates that the 3 targeted fish PCB concentrations will not be reached in the time frames identified in the ROD."[278] DEC recommended that EPA "optimize the remedy through further remedial work as necessary to achieve the targeted fish PCB reductions identified in the ROD."[279]

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[271] New York State Attorney General Letter (Sept. 16, 2016) *available at* http://www.scenichudson.org/sites/default/files/9.16.16_Letter-NYOAG-to-EPA-re-cleanup-failure.pdf. (Attachment U)
[272] *Id.* at 4-5.
[273] *Id.*
[274] *Id.*.
[275] *See generally* DEC Report.
[276] DEC Report at 3.
[277] *Id.* at 2.
[278] *Id.* at 2, 3.
[279] *Id.*

DEC's review also underscores the failure of the remedial action to achieve benefits in the Lower Hudson River. As such, DEC informed EPA that it "must expand the investigation of the site to include performance of a Remedial Investigation and Feasibility Study for the portion of the site between the Federal Dam at Troy and the Battery in New York City . . . to address the currently uncontrolled unacceptable risks to human health and the environment.[280]

D. Hudson River Foundation Report Does Not Support "Will Be Protective" Determination.

In fall of 2016, HRF directed a team of independent scientists and engineers with a wealth of expertise related to PCBs and the Hudson River to review project data related to the Upper Hudson Superfund dredging program. [281] On June 1, 2017, HRF released its report, finding that "based on 2016 post-dredging monitoring, TPCB concentrations in fish throughout the Upper and Lower Hudson remain above interim target levels and remediation goal specified in the ROD."[282]

Similar to concerns expressed by NOAA and DEC, HRF observed that EPA has not planned an adequate data collection program to find out if monitored natural attenuation will work as expected. HRF advised that "modifications to the post-dredging monitoring program and continued evaluation of the next few years of monitoring data are therefore recommended to assess if natural attenuation will be sufficient in reducing PCB concentrations in fish in a reasonable time frame or if additional remedial actions will be required."[283]

The panel corroborated the findings of DEC and the Federal Trustees that a major assumption in the ROD—that the Lower Hudson would receive similar benefits from the dredging action in the Upper Hudson—did not, and is not, likely to occur. In fact, "water column, sediment and fish in the Lower Hudson below Albany are showing slow responses to the Upper Hudson dredging program."[284] This may be due "to the complexities of sediment transport in the Lower Hudson"[285] as noted by HRF, but the indisputable fact is the lower portion of the Superfund Site is showing little or no benefit from the dredging in the Upper Hudson. Over the past 10 years, 5.2 million pounds of PCB-contaminated sediment have landed in the Lower Hudson, presenting an uncontrolled risk that EPA is failing to address.

While HRF did not seek to answer the question of whether the cleanup of the Hudson River Superfund Site is protective, it did analyze all available project data, concluding that there is not enough post-dredging information to make a definitive conclusion regarding the success of the remedy.[286] HRF suggests that "a fuller and more comprehensive analysis of the effects of the

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[280] *Id.* at 2.
[281] Hudson River Found., *About HRF* (last visited Aug. 31, 2017) http://www.hudsonriver.org/?x=about ("The purpose of the Hudson River Foundation is to make science integral to decision-making with regard to the Hudson River and its watershed and to support competent stewardship of this extraordinary resource.").
[282] See generally HRF Report at 17.
[283] *Id.* at i.
[284] *Id.*
[285] *Id.* at iii.
[286] *Id.* at 9-10 ("Only a year's worth of post-dredging data was available to the panel. . . . It could therefore be argued that one year of post-dredging monitoring data is not sufficient to evaluate the full benefits of the dredging program.").

dredging will be possible as new data are collected and other evaluation tools, such as numerical models, are utilized in understanding the longer-term impacts and trajectories."[287]

X. Answering the Three Five Year Review Questions Result in the Conclusion That Remedy is Not Protective of Human Health and the Environment.

Question A: Is the remedy functioning as intended? NO.

As discussed in detail in herein, current data demonstrates that the remedy is not functioning as intended. While removal of PCB-laden sediment has resulted in some reduction in fish tissue, surface sediment, and water PCB concentrations, the fact remains that all three media were far more contaminated than EPA believed at the time it issued the ROD. EPA failed to reevaluate its chosen remedy in light of this information, despite disagreement from its sister federal agencies, New York State, and independent scientists, as well as environmental organizations and the public.

As a result, fish tissue levels remain 300% greater than the first interim goal—0.4 mg/kg—which, according to the ROD, should be reached in less than three years, by 2020. Even EPA acknowledges that it is extremely unlikely this target will be met. In addition, EPA admits that the Lower Hudson is not responding as predicted to the dredging upriver and that it appears that local sediments, rather than upstream load, are the main driver of fish body burdens of PCBs.

Question B: Are the exposure assumptions, toxicity data, and Remedial Action Objectives used at the time of the remedy still valid? NO.

EPA has failed to acknowledge in the Proposed Second FYR any new information related to exposure assumptions or toxicity data that could impact the human health risk assessment. First, recent science indicates that PCBs are more toxic than previously thought. While EPA is still classifying PCBs as probable human carcinogens (EPA has not officially changed the Integrated Risk Information System listing, toxicity values or carcinogenicity of PCBs in the last 17 years[288]) with a cancer weight-of-evidence classification B2,[289] the International Agency for Research on Cancer ("IARC"), of the World Health Organization, has now listed PCBs as a known human carcinogen.[290] In addition, dioxin-like PCBs can now be evaluated via EPA's listing of non-cancer endpoints for dioxin[291] via the reference dose ("RfD")[292] in EPA's

[287] HRF Report at 2.
[288] *See generally* U.S. Envtl. Prot. Agency, *Integrated Risk Systems Information Chemical Assessment Summary: Polychlorinated biphenyls* (May 1, 1989) [hereinafter "EPA IRIS for PCBs"] *available at* https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0294_summary.pdf.
[289] *See generally* ATDSR PCBs Case Study, *supra* n.7.
[290] IARC, a branch of the World Health Organization, coordinates and conducts research on the causes of human cancer and develops scientific strategies for cancer control. In February 2013, 26 experts from 12 countries met at IARC, Lyon, France, to reassess the carcinogenicity of polychlorinated biphenyls (PCBs). On the basis of sufficient evidence of carcinogenicity in humans and experimental animals, the IARC classified PCBs as carcinogenic to humans (Group 1). *See generally* IARC PCBs Carcinogen Evaluation, *supra* n.9.
[291] U.S. Envtl. Prot. Agency, *Risk Assessment for Dioxin at Superfund Sites* (Feb. 17, 2012) *available at* https://www.epa.gov/superfund/risk-assessment-dioxin-superfund-sites#toxicity.
[292] An estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects

Integrated Risk Information System ("IRIS")[293] as well as several additional toxicological endpoints which have been updated in terms of health effects.

Second, recent science indicates that exposure to PCBs through inhalation is a more significant risk than previously believed. The risk characterization of the ROD and the intention of the RAOs are primarily intended to control unacceptable PCB exposures through consumption of contaminated food (i.e. fish). [294] However, since 2002, the scientific community has documented that exposures to PCBs can occur through contaminated water, direct skin contact, or breathing contaminated air.[295] In a 2015 Review of Scientific Literature, David O. Carpenter, M.D., presents information that indicates the inhalation of vapor-phase PCBs may be as or even more important than ingestion via fish consumption and other animal fats.[296] The research highlights the severity of the potential risks from "volatilized" or airborne PCBs, which have been associated with certain chronic illnesses—such as cancer, cardiovascular disease, hypertension, and diabetes—even at relatively low levels.[297]

All of this information adds to the growing body of research which demonstrates that PCBs are more toxic to humans than previously believed when the human health risk assessment was being developed for the ROD. As a result, the Proposed Second FYR needs to address the greater toxicity as a change in assumptions and new information that was not available at the time the ROD was developed.

Finally, significant changes in demographics and fish consumption patterns on the Hudson River, particularly in the Lower Hudson, mean that more people are relying on Hudson River fish for subsistence than at the time the ROD was issued. Due to the failures of longstanding fish consumption advisories to protect human health, an uncontrolled exposure through consumption of fish. Recent angler surveys have shown consumption of fish from the Hudson River remains a major health concern despite the existence of longstanding NYSDOH fish consumption advisories. In 2012, the Cornell Cooperative Extension performed a survey of over 300 anglers, finding that approximately 11% of those surveyed ate Hudson River fish.[298] In 2013, NYSDOH

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during a lifetime. *See* U.S. Envtl. Prot. Agency, *Reference Dose (RfD): Description and Use in Health Risk Assessments* (Mar. 15, 1993) [hereinafter "EPA RfD Fact Sheet"] *available at* https://www.epa.gov/iris/reference-dose-rfd-description-and-use-health-risk-assessments.

[293] The IRIS Program is located within EPA's National Center for Environmental Assessment ("NCEA") in the Office of Research and Development ("ORD"). *See* U.S. Envtl. Prot. Agency, *Basic Information about the Integrated Risk Information System* (last visited Aug. 31, 2017) *available at* https://www.epa.gov/iris/basic-information-about-integrated-risk-information-system. (Attachment V)

[294] EPA's program and regional offices identify human exposure pathways and estimate the amount of human exposure under different exposure scenarios (Exposure Assessment). EPA RfD Fact Sheet at 1.3.3.Then they combine their exposure assessment with the hazard information and toxicity values from IRIS to characterize potential public health risks (Risk Characterization). *Id.* at 1.3.4.

[295] *See* EPA IRIS for PCBs.

[296] D. Carpenter, *Exposure to and Health Effects of Volatile PCBs*, Rev. Envtl. Health 1 (Feb. 2015) (Attachment W)

[297] *See* M. Kouznetsova et al., *Increased Rate of Hospitalization for Diabetes and Residential Proximity of Hazardous Waste Sites*, 115(1) Envtl. Health Perspectives 75 (Jan. 2007); Alexander Sergeev & David Carpenter, *Hospitalization Rates for Coronary Heart Disease in Relation to Residence Near Areas Contaminated with Persistent Organic Pollutants and Other Pollutants*, 113(6) Envtl. Health Perspectives 756 (Jun. 2005). (Attachment X)

[298] *See* New York State Dep't of Health, *Hudson River Fish Advisory Outreach Project Update*, 5 (Sep. 19, 2013), *available at*

presented preliminary results of its own angler survey showing even higher consumption percentages (near 50%), also noting that awareness of fish consumption advisories in the more populated and linguistically diverse Lower Hudson was about half of what it was in the Mid- and Upper Hudson regions.[299]

Since 2000, additional populations that rely on subsistence fishing have moved into Mid- and Lower Hudson River communities, and surveys indicate these anglers feed fish to their families.[300] The Proposed Second FYR also fails to consider these changes in subsistence fish consumption patterns, which increase exposure and human health risks. Subpopulations of subsistence anglers are currently consuming small forage fish in ways that not been included in the human health risk assessment, such as utilizing the entire fish in preparing spiced whole fish mash or paste for flavoring traditional dishes. Previous risk assessments were limited to the risks of consuming larger, traditional trophy or game fish, such as bass and perch. It is important that the exposure assumptions take into account all of the consumption patterns order to accurately capture the risks that the Hudson River Superfund Site poses to human health.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy? YES.

The decision-making process that led to the ROD relied on a complex suite of human health risk assessment tools and guidelines, [301] as well as multiple sediment and water sampling programs. Those were in turn used by EPA and GE as the baseline informational database used in multipart mechanistic mathematical models to forecast future concentrations of PCBs in the Hudson River.[302] While the extensive body of scientific "information" for the site was appropriately employed in the remedy selection, EPA has failed to apply that same diligence to the evaluation of the newest scientific analysis and actual project data in the Proposed Second FYR.

Post-ROD data collected after 2002 show higher levels of surface sediment contamination than anticipated in portions of River Sections 2 and 3 that were not targeted for dredging. In fact, analyses of post-ROD data indicate that post-remediation PCB concentrations will be five times higher than assumed by the ROD. These residuals raise significant scientific uncertainty as to whether all RAOs, including target PCB levels in fish, will be fully achieved.

Furthermore, sediment and bioaccumulation models (HUDTOX and FISHRAND) used in the ROD are no longer considered scientifically valid. The models require re-examination, in light of

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http://www.hudsoncag.ene.com/files/Hudson%20Fish%20Health%20Advice%20Outreach%20091913.pdf. (Attachment Y)

[299] *See id.* at 6, 20; Hudson River PCBs Community Advisory Group, *Hudson CAG Meeting Summary*, 5-6 (Sep. 19, 2013) available at http://www.hudsoncag.ene.com/files/Final%20Meeting%20Summary_Sept192013.pdf. (Attachment Z)

[300] Garcia, Michael, *Hudson River Angler Survey*, Scenic Hudson and Sierra Club (Dec. 2016), *available at* http://www.scenichudson.org/sites/default/files/HR_Angling_Study.pdf (Attachment AA)

[301] Phase 1 Review (summary of existing conditions), 1991 Database Report, 1995 Data Evaluation and Interpretation Report, 1997 Low Resolution Sediment Coring Report, 1998 Human Health Risk Assessment, 1999 Revised Baseline Ecological Risk Assessment, 2000 Revised Human Health Risk Assessment, 2000 Revised Baseline Monitoring Report, 2000 Feasibility Study Report, *all available at* https://www3.epa.gov/hudson/plans.html.

[302] *See* DEC Report.

the above-referenced data, to determine the likelihood that RAOs will be fully achieved. Post-Phase 1 modeling by GE validated the ROD's conclusions that dredging of contaminated sediment does not impede recovery of the river through resuspension of PCBs, but rather achieves significant progress towards RAOs by removing PCBs from the system.[303] However, neither this model nor any other updated sediment transport or bioaccumulation model has been used to date to evaluate how much higher-than-expected surface sediment PCB concentrations outside of the area targeted for dredging will impact the ability of the remedy to be protective of human health and the environment in the future.

XI. EPA Must Take the Following Actions Necessary to Ensure Protectiveness.

A. Clearly Define Goalposts for Success and Failure of the Cleanup and Order Additional Remediation.

EPA's Proposed Second Five Year Review of the Hudson River Superfund Site lacks clear metrics to evaluate the success or failure of the cleanup. Without clear metrics, the public is left in the dark as to how EPA compared current conditions with the 2002 ROD expectations to reach its conclusion that the remedy will be protective. Therefore, we urge EPA to identify and list the criteria that it used to evaluate the performance of the remedy in the Final Second FYR, as well as the criteria that the agency will use for subsequent reviews. This should lead to a fair consideration of all relevant targets, not a selective view of only the targets that are being met.

The interim and final fish tissue concentration targets should be among the most important benchmarks that EPA uses to evaluate the success or failure of the remedy. Despite EPA's reliance on the accelerated timelines to meet fish tissue targets in selecting the remedy, the agency fails to measure current conditions against them in a straightforward way. This is not acceptable. Clear benchmarks, measured in years after dredging, would ensure that all interested stakeholders—GE, Federal Trustees, DEC, community and environmental advocates, and the public—understand whether the cleanup is making the necessary progress toward protection of human health and the environment. Moreover, benchmarks would ensure that EPA, and in turn, GE, can be held accountable for cleaning up the River *within in the timeframes anticipated in the 2002 ROD*.

We urge EPA to expressly include at least the following benchmarks as a way to measure the success or failure of the remedy to protect human health and the environment both in subsequent five-year reviews and as more data becomes available each year:

1. Species-weighted fish fillet Upper Hudson average PCB concentrations must be at or below 0.4 mg/kg within five years of the completion of dredging (by 2020).
2. Species-weighted fish fillet Upper Hudson average PCB concentrations must be at or below 0.2 mg/kg within sixteen years of the completion of dredging (by 2031).
3. Largemouth bass, whole body PCB concentrations must be within the recalculated range of 0.2 mg/kg to 0.07 mg/kg within 23 years of the completion of dredging (by 2038).
4. Species-weighted fish fillet River Section 3 average PCB concentrations must be at or below 0.05 mg/kg within 43 years of the completion of dredging (by 2058).

[303] *See* Phase 1 Report.

Because the selected remedy is not currently protective, and people are still face unacceptable human health risks *daily* due to PCB contamination, EPA should further clarify that failure to meet these benchmarks means that the remedy is not functioning as intended. EPA should also develop a plan for adaptive management so that it is prepared to address potential problems with the remedy as they become apparent.

Moreover, the failure to meet the benchmarks should indicate to the agency that further active remediation is necessary. As discussed *supra*, the time to reach the human health targets was an important factor in EPA's selection of an active remedy. EPA's own rationale makes it clear that delays of ten or more years in reaching the interim and final 2002 ROD targets are unacceptable. Therefore, failure to meet the benchmarks within the timeframes anticipated in the ROD—including the current failure to meet the five-year target— should prompt EPA to order GE to perform additional remedial action. Finally, EPA should consider adding species-specific or more geographically limited targets, as well as ecological targets, to the criteria that evaluates to determine the success or failure of the remedy.

B. Immediately Order GE to Initiate a Remedial Investigation and Feasibility Study for the Lower Hudson.

EPA implicitly admits that the cleanup is not protective of human health and the environment in the Lower Hudson River by omitting a protectiveness determination for the 150-mile stretch below the Federal Dam.[304] As discussed above, in the First FYR, EPA issued a sitewide protectiveness determination for the entire 197-mile Superfund site.[305] However, the Proposed Second FYR contains no such determination.[306] While EPA claims that the cleanup "will be protective" in the Upper Hudson River (despite evidence to the contrary discussed herein), EPA makes no official protectiveness determination about the cleanup for the 150-mile stretch of the Hudson River below the Federal Dam.[307]

It is abundantly clear that EPA should order a full remedial investigation and feasibility study for the Lower Hudson River. EPA admits that fish tissue concentrations in the Lower Hudson River are not responding as anticipated; EPA concedes that the Lower Hudson is responding more slowly under MNA; and EPA recognizes that there is little to no change in fish tissue concentrations from Poughkeepsie downstream. Furthermore, the remedy only produced results in water column concentrations upriver, not downriver, indicating that it is unlikely that additional activities in the Upper Hudson River will have any significant impact on the Lower Hudson River.

While EPA says it will continue to investigate the Lower Hudson, it provides no specific plan of action to do so and no criteria to indicate under what conditions it would order a remedial investigation and feasibility study. That is not acceptable. Evidence right now suggests that there is a disconnect between the remedial activities in the Upper Hudson River and the response in

[304] *Id.* at 8.
[305] 2012 FYR at iv, 40.
[306] *Compare* 2017 FYR at 8, 24, 70 *with* 2012 FYR at iv, 40.
[307] *See* 2017 FYR at 8, 24, 70.

the Lower Hudson River. As such, EPA should immediately require GE to conduct a full remedial investigation and feasibility study to address the ongoing PCB contamination in the Lower Hudson River.

C. Collect Additional Data as Expeditiously as Possible.

Among the few points of consensus in EPA's Proposed Second Five Year Review is the need for more data to predict future trends. EPA must ensure that future data collection takes into account expert advice, including that of DEC and HRF.

DEC maintains that a more robust fish and sediment sampling program is necessary for the Hudson River Superfund Site.[308] An expanded sampling program would allow EPA "to determine if the current surface sediment PCB concentrations are capable of meeting the intent of the ROD."[309] DEC also recommends that EPA utilize a "pool by pool" scale in designing the sampling program to better understand the progress made as a result of the remedy.[310]

While EPA claims that it needs eight to ten more years of data, HRF's report suggests that a more reliable sampling program would allow EPA to begin to evaluate future trends much sooner—as early as a couple of years from now. Specifically, HRF recommends that:

(i) EPA Method 1668 (a high resolution, congener-based method) should be used to improve the accuracy and reproducibility of PCB water column, sediment, and fish measurements,
(ii) the USGS suspended sediment monitoring at Waterford should be re-instated to support evaluations of PCB loads to the Lower Hudson,
(iii) additional high flow samples should be collected at Waterford to support evaluations of PCB loads to the Lower Hudson for high flow conditions, and
(iv) PCB concentrations should be monitored in surface sediments and sediment cores from selected locations in the Lower Hudson to improve our understanding of time responses in the tidal freshwater and estuarine portion of the river. [311]

EPA cannot take a "wait-and-see" approach to data collection, kicking the can down the road to the *next* five-year review or the one after that. While EPA is collecting data, people and wildlife continue to be exposed to dangerous levels of PCBs on a daily basis. EPA must devise fish, sediment and water sampling plans that gather data in an aggressive manner to discern the effectiveness of the remedy as quickly as possible.

[308] DEC Report at 2 (recommending that EPA "perform the sampling work necessary to complete a detailed evaluation of the performance of the remedy, including increasing the sampling of sediment and fish tissue to the scale and frequency necessary to optimize the remedy through further remedial work as necessary to achieve the targeted fish PCB reductions identified in the ROD").
[309] *Id.* at 28 (also stating that "the current EPA approved sampling plan is not designed to answer that question with the appropriate degree of statistical certainty.").
[310] DEC Report at 40.
[311] HRF Report at iii; *see also id.* at 19-20.

D. Update the HUDTOX and FISHRAND Models.

Using model emulation, NOAA has found that the higher than anticipated residual PCBs could lead to lengthy delays in fish recovery times.[312] In addition, as discussed *supra*, projections of fish recovery indicate considerable delay in the short-term targets. Moreover, estimates of the amounts of PCBs in the sediment changed dramatically after the ROD was issued. Under these circumstances, it is unreasonable to continue to rely upon simulations from a model that is now wholly outdated. Instead, EPA should develop a new transient model that takes account of all the observed data collected during the dredging phase and can provide useful short-term simulations of fish recovery.

E. Evaluate Effectiveness of NYSDOH Fish Consumption Advisories.

EPA did not evaluate the effectiveness of the institutional controls, such as NYSDOH's fish consumption advisories, in addressing the human health risks associated with PCB contamination. Understanding that institutional controls are an imperfect means of managing risk, the 2002 ROD only included them because of the limited time period for which the most restrictive fish consumption advisories would remain in place (i.e., until the interim goals were met). Currently, however, the remedy is failing to meet the ROD goals in the Upper Hudson River, and the remedy is having little to no impact on the Lower Hudson River. The known ineffectiveness of the institutional controls, particularly in light of the remedy's failure to meet the interim goals, means an impermissible level of risk to human health currently exists at the Hudson River Superfund Site.

Furthermore, EPA has not conducted sufficient outreach to subsistence anglers regarding the risks of consuming Hudson River fish. EPA's repeated reliance (particularly in the agency's recent Public Information Meetings) on NYSDOH's fish consumption advisories is insufficient. Despite acknowledging that the fish consumption advisories are *not* successful in preventing people from consuming PCB contaminated fish in unsafe amounts, EPA continues to insist that the implementation of NYSDOH's institutional controls are not within its jurisdiction. However, EPA holds the ultimate statutory responsibility for reducing risk to human health and the environment. If the NYSDOH fish advisories are inadequate to protect the public from PCB contamination risks (as DEC contends, in contrast to EPA's statements in the Proposed Second FYR[313]), *EPA* must either find ways to make those controls protective or implement additional controls. Therefore, it is imperative that EPA improves outreach to communities that are most likely to engage in subsistence fishing.

F. Update the Community Involvement Plan for the Hudson River Superfund Site.

EPA is not performing adequate outreach to communities along the length of the Site. While EPA has a Community Involvement Plan ("CIP"), it has not been updated in approximately eight

[312] NOAA Study at 495.

[313] *Compare* 2017 FYR at 24 ("In the interim, human exposure pathways that could result in unacceptable risks are being controlled.") *with* DEC Report at 27 ("Available information indicates that people continue to eat fish despite the institutional controls, and that these exposures represent human health risk beyond the EPA acceptable risk range.").

years.[314] The most recent update to the CIP, in 2009, was only "intended to guide activities through the completion of dredging."[315] Now that dredging is complete, EPA should revise the CIP to better address the ongoing risks associated with PCB contamination that will continue for decades along the entire Hudson River Superfund Site.[316]

Although the Proposed Second FYR discusses additional measures mentioned in the First FYR,[317] the agency failed to organize any outreach to environmental justice communities during this comment period. In updating the CIP, EPA should ensure that its outreach extends to the diverse communities present along the Lower Hudson River. The CIP indicates that EPA's community involvement efforts have largely focused on upriver communities.[318] However, communities along the Lower Hudson River, including low-income communities, communities of color, and subsistence fishing communities, will also be exposed to PCB contamination for the foreseeable future.

EPA's community involvement goals include providing understandable information to the public, ensuring that the public has a meaningful opportunity to engage with EPA, and helping the public understanding the Superfund decision-making process.[319] However, it is difficult to understand how many of EPA's community involvement activities could actually meet these goals as they relate to downriver communities. For example, it is not reasonable to expect people who live near the Lower Hudson to benefit from EPA's enhanced physical presence in the Upper Hudson through field offices, public meetings, community events, and media appearances. Additionally, EPA recognizes that the far more populated and diverse Lower Hudson is home to a greater number of non-English speaking residents.[320] However, there is no indication that EPA has made specific efforts to ensure that its outreach materials, like fact sheets, technical documents, and e-mails, are widely available to various audiences.

The CIP's goal with regard to environmental justice is "to increase awareness and information about the project, especially in communities that may not know how to access information or that may not have many opportunities or methods to do so."[321] We urge EPA to take a hard look at whether the agency is meeting this goal. EPA originally only scheduled two public information meetings on the Proposed Second FYR, neither of which were located in or near New York City. Moreover, it was clear from the first public information meeting in Poughkeepsie that EPA has failed to undertake sufficient outreach to subsistence fishing communities. When asked who among the crowd of over 300 people was a subsistence fisher, not a single person raised their

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[314] *See generally* U.S. Envtl. Prot. Agency, *Hudson River PCBs Superfund Site Community Involvement Plan* (June 2009) [hereinafter "CIP"] *available at* https://www3.epa.gov/hudson/cip.htm.
[315] CIP at 1.
[316] *See id*. at 1-4 (stating that "[b]ecause EPA does not have the information necessary to identify the precise timing of all activities and points for community involvement, this CIP will remain a living document that will continue to evolve as the project progresses").
[317] 2017 FYR at 25.
[318] *See CIP*. at 1-2 (stating that one of the major elements of EPA's CIP is "a notable EPA presence in the upriver community via the Hudson River Field Office."); *id*. at 3-2 (noting that "[t]he Upper Hudson River is the focal point for project activities.").
[319] *Id*. at 4-1.
[320] *Id*. 3-2 to 3-5.
[321] *Id*. at 4-12.

hand. EPA should follow its own directive from the CIP, and "seek assistance from agencies who work with immigrant, low-income, and non-English speaking communities" to inform people about the extent of the contamination in the river and the existing fish consumption advisories.[322] EPA should also consider developing specific strategies for reaching out to underrepresented communities, as it has done in other locations.

XII. Conclusion

For the aforementioned reasons, EPA must find that the remedy for the Hudson River Superfund Site is "not protective" of human health and the environment in its Final Second FYR. EPA's preliminary determination that the Hudson River remedy "will be protective" of human health and the environment is arbitrary and capricious and not supported by data and analyses by independent scientists, the Natural Resource Trustees for the Site, and New York State. The Final Second FYR must outline next steps toward additional remediation of the Upper Hudson to meet the remedial objectives within the timeframes set forth in the 2002 ROD. Moreover, the Final Second FYR must include a commitment to a full remedial investigation and feasibility study of the Lower Hudson River. A finding by EPA that the remedy is not protective will put the entire Hudson River on the path to quicker recovery, and will realize the Superfund program's goal of protecting the health of the people and wildlife living in and around the Hudson River.

[322] *See id.*