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19TH DISTRICT, NEW YORK

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Congress of the United States
House of Representatives
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2 SUMMIT COURT, SUITE 103
FISHKILL, NY 12524

TOWNE CENTRE AT SOMERS
268 ROUTE 202, SUITE D105
SOMERS, NY 10589

ORANGE COUNTY GOVERNMENT CENTER
255 MAIN STREET, ROOM 3232G
GOSHEN, NY 10924

1440 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, DC 20515

DISTRICT OFFICES: (845) 206-4600
WASHINGTON, DC OFFICE: (202) 225-5441

www.hayworth.house.gov

April 9, 2012

U.S. Environmental Protection Agency, Region 2
Judith A. Enck, Regional Administrator
Main Regional Office
290 Broadway
New York, NY 10007-1866

Dear Administrator Enck:

I'm writing in regard to the Environmental Protection Agency (EPA)'s five-year review of the cleanup efforts at the Hudson River Polychlorinated Biphenyls (PCBs) Superfund Site. Given the serious environmental and public health risks associated with PCB contamination, thorough assessment of progress to date and what remains to be done, and how best to do it, is essential.

On March 30, 2012, EPA announced the start of the five-year review, to be completed by the end of April 2012. Leading environmental groups have been independently monitoring the project since its inception, and they have expressed concerns to me that this amount of time would be insufficient to complete a comprehensive review. I understand that similar projects have required several months for appropriate evaluation. I'd appreciate your considering an extension of the deadline, as well as explaining EPA's reasoning for pursuing the current, apparently accelerated, timeline.

As someone who shares your commitment to protect our nation's environment, I look forward to working with you to achieve a thorough cleanup and restoration of the Hudson River at the PCBs Superfund Site.

Sincerely,

Nan Hayworth

Nan Hayworth, M.D.
Member of Congress

MAURICE D. HINCHEY
22ND DISTRICT, NEW YORK

WASHINGTON OFFICE:
2431 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-3222
(202) 225-6335

http://hinchey.house.gov

Congress of the United States
House of Representatives
Washington, DC 20515-3222

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April 13, 2012

Ms. Judith Enck
Regional Administrator
US EPA Region 2
294 Broadway
New York, NY 10007-1866

Dear Administrator Enck:

I am writing to express my support for a robust, thorough and detailed 5-year review of the Hudson River PCB remediation effort. As you know, this review is required by the Superfund law[i] in order to evaluate the implementation and performance of a cleanup plan, such as the Hudson River dredging effort, to ensure that it protects human health and the environment. Given the importance of the Hudson PCB cleanup, it is imperative that this 5-year review is not undermined by an impractical and compressed timeframe.

As you know, for the last three decades I have been deeply engaged in the effort to require General Electric to pay for and remove the 1.3 million pounds of PCBs it dumped into the Hudson River between 1947 and 1977. I am proud to have worked closely with you on this issue for many years, and I appreciate your continued leadership on this critical cleanup. It was with great pleasure that I joined you last November to announce the commencement of the second phase of dredging the Hudson River. I know you share my resolute commitment to making sure this cleanup is as successful as possible and that all steps are taken to remove these contaminants and restore the river to its rightful and healthy condition.

It is my understanding that EPA may be considering allotting just one month to complete the 5-year review. This would be a mistake. Such a short time frame would undoubtedly limit what can be reviewed. In fact, EPA's own documents recommend that "the five-year review process begin nine to twelve months before the scheduled planned completion date so that a site inspection and a comprehensive data and document review can be conducted by the five-year review team."[ii]

According to EPA's current guidance on 5-year reviews[iii], there are six components to this process:

1. Community involvement and notification,
2. Document review,
3. Data review and analysis,
4. Site inspection,
5. Interviews, and
6. Protectiveness determination.

BINGHAMTON OFFICE:
100A FEDERAL BUILDING
BINGHAMTON, NY 13901
(607) 773-2768

ITHACA OFFICE:
123 SOUTH CAYUGA STREET
SUITE 201
ITHACA, NY 14850
(607) 273-1388

KINGSTON OFFICE:
291 WALL STREET
KINGSTON, NY 12401
(845) 331-4466

MIDDLETOWN OFFICE:
CITY HALL, THIRD FLOOR
16 JAMES STREET
MIDDLETOWN, NY 10940
(845) 344-3211

MONTICELLO OFFICE:
18 ANAWANA LAKE ROAD
MONTICELLO, NY 12701
(845) 791-7116

As part of this process, the guidance goes on to say that EPA should address the following key questions[iv]:

1. Is the remedy functioning as intended?
2. Are the exposure assumptions, toxicity data, cleanup levels, and Remedial Action Objectives still valid?
3. Has any other information come to light that could call into question the protectiveness of the remedy?

I, like many others, continue to have concerns about the amount of contamination that may remain in the Hudson River following the current plans. That is why, as part of this review, I believe EPA should consider issues raised by the federal Natural Resource Trustees, including the option of additional dredging, which would be consistent with the Record of Decision, and examining the scope of the current dredging footprint.

Given the amount of work necessary to complete this review and the questions that EPA needs to address, I strongly urge EPA to allow more time for the 5-year review to ensure effective public participation and the necessary comprehensive analysis. This review should not cause any delays in the implementation of the current cleanup plan, as the Superfund law clearly intends.

A proper 5-year review would allow EPA, and the public, to understand what progress is being made on restoring the river. It will also ensure that the appropriate remedies are being pursued to achieve the goals set by the Record of Decision.

Restoring the Hudson River is a national priority and an example of the critically important role EPA plays in protecting public health and environment. It is shameful that the agency has been repeatedly subjected to spurious, politically motivated attacks of late. These attacks, along with attempts by House Republicans to slash EPA's budget, not only undermine the agency's efforts to protect our air and water, they also directly undermine EPA's ability to carry out clean up efforts such as the Hudson River PCB remediation project.

Please know that I will do all I can to ensure that EPA has the resources it needs to carry out its critically important mission. I am grateful for all the work you to do to protect New York and our country from harmful pollutants.

Best regards.

Sincerely,

Maurice D. Hinchey

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[i] Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act(CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).
[ii] www.epa.gov/superfund/cleanup/postconstruction/5yr.pdf.
[iii] http://www.epa.gov/superfund/cleanup/postconstruction/fiveyearreviewfactsheet.pdf.
[iv] Ibid.

Hudson River Sloop Clearwater
Natural Resources Defense Council
Riverkeeper
Scenic Hudson

May 4, 2012
Judith Enck, Regional Administrator
US EPA Region 2294 Broadway
New York, NY 10007

Dear Judith:

We would like to thank you for your recent decision to provide a short extension of the completion deadline for the mandatory, statutory 5-Year Review of the Hudson River's PCB remediation site, and we truly appreciate your willingness to respond to the concerns we shared with you in our letter dated April 2, 2012.

However, we remain troubled that the Hudson's first 5-Year Review will be limited in scope and fails to allot the time customary for this process, especially in regards to document review and stakeholder participation. Given the scope and complexity of the Remedy and the ongoing issues raised by an array of governmental and non-governmental stakeholders, we believe that a six month completion deadline would allow for an adequate review. Importantly, Section VIII of the 5-Year Review report is supposed to contain "a discussion of unresolved concerns or items raised by support agencies and the community."[1]

Under both CERCLA's statutory language and long-standing EPA policy, a cornerstone of the 5-Year Review process is that cleanup projects must be responsive to current conditions, new information, and technological advances. The 5-Year Review is intended to broadly assess a remedy and ensure that it is designed and implemented to achieve the intended protectiveness for human health and natural systems. Both the law and guidance clearly anticipate that new understandings and advanced removal methods will be incorporated during remediation to ensure the protectiveness of a remedy.

Several federal and state natural resource agencies, along with municipal governments and respected independent scientists, have raised serious concerns including a) the discovery that the Hudson's PCB contamination is much greater than originally assumed and its implication for the remedy's protectiveness b) the effect of this greater contamination on restoration and recovery options, c) the lack of adequate monitoring protocols for sediment and benthic fauna, d) additional exposure pathways that may impact the Remedial Action Objectives. Current quantitative and qualitative analyses not available at the time of the Record of Decision (ROD) or Consent Decree (CD) support these concerns. These and other issues must be included within the scope of the 5-Year Review and examined in conjunction with the project's initial assumptions and predictions, to determine the long-term protectiveness of the remedy. The resulting data will also serve to inform the adaptive-management framework under which the Remedial Action Work Plans (RAWPs) for each successive year of Phase 2

[1] OSWER No. 9355.7-03B-P pg.3-7

dredging are implemented. This is also consistent with the Peer Review Panel recommendation that "in a project of the complexity and duration of the Hudson River PCBs Site cleanup, EPA needs to be able to adapt to new information and make or require changes through adaptive management in order to achieve the expected benefits of the project."

Given the overall requirements and standards involved in this review process, we hope additional time will be devoted to ensure this examination accomplishes all critical components of USEPA's Comprehensive Five-Year Review Guidance documents. Accordingly, as part of that process we have summarized below specific concerns and issues that should be considered as USEPA determines the protectiveness of the remedy.

Impact of Greater PCB Contamination Levels on Protectiveness of Remedy

The amount of PCB toxins expected to remain in the Hudson at the end of the cleanup is a primary trigger for Superfund's' 5-Year Review requirements[2] and is foundational to Remedial Action Objectives (RAOs) in the ROD. However, actual conditions found during in-the-water operations revealed that high levels of PCB contamination are much deeper and more widely distributed than originally assumed. We believe that accurately determining both the depth and areal extent of contamination is a priority issue that must be examined in order to answer the three questions that frame the Hudson's first Five-Year Review. This would be entirely consistent with provisions in the ROD that directed the USEPA to conduct sampling that "will cover both target areas as well as the areas outside the current target area boundaries. In this manner, EPA will produce a current contamination map of the Site on which to finalize its target area selection."[3]

Study Issues

- The discovery of much greater PCB contamination during Phase 1 requires a more comprehensive identification of the vertical and horizontal distribution of toxic sediment for Phase 2. Two significant unknowns are the distribution of contaminated sediment outside of the Dredge Area Delineations (DAD) and how the greater contamination of unremediated areas may reduce the protectiveness of the remedy if not addressed.
- Re-analyze the sediment transport model with the new contamination data to determine the likelihood that unremediated PCBs outside the current DAD would recontaminate the site after dredging is completed.

Impacts of Projected Post-Remedy Contamination Levels on Protectiveness

In addition, federal agencies tasked with completing the Natural Resource Damage Assessment (NRDA) and implementing a restoration plan after the Superfund cleanup is completed have identified, an estimated 136 acres of highly toxic sediment in River Sections 2 & 3 that will be left unremediated in the current remedy, but which the ROD anticipated would be much less highly contaminated than it actually is. This amount of contamination

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[2] CERCLA § 121(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 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."

[3] Responsiveness Summary; Hudson River PCBs Site Record of Decision: Response to Master Comment 605 pg. 4-2.

will continue to impair human health and wildlife recovery, can limit the restoration of the river and may be a source of recontamination to dredged areas if not addressed during the present cleanup.

Study Issues

- Review the results of the federal agencies' analyses and conclusion that, due to greater PCB contamination than assumed under the ROD, response action is not expected to achieve all target cleanup levels in the timeframe expected and therefore an important Remedial Action Objective (RAO) may not be achieved.
- Both federal and state support agencies responsible for the maintenance and health of the river's economic and environmental resources have offered sound guidance to address this issue. USEPA and GE should determine how to incorporate these recommendations into the design and Remedial Action Work Plan (RAWP) in successive years of the cleanup.
- Monitoring of pre- and post-remedy sediment concentrations are not adequate to determine the protectiveness of the remedy, especially in river sections 2 and 3, where recent data estimates that post-remediation PCB concentrations (in the river section as a whole, not limited to the areas within the DAD) will be five times higher than predicted by the USEPA models.
- There is no unlimited use/unrestricted exposure for Phase 1 dredge areas, specifically CU-1, which includes the Ft. Edward yacht basin where sediment redeposition over the remedy cap will impede full use and unrestricted access. Further remediation action should be examined and implemented.
- Future RAWPs should include navigational dredging as part of the dredging design as there will otherwise, be no unlimited use/unrestricted exposure for the navigational channel in the entire 40-mile active remedy area of the Superfund site. This will continue to impede the New York State Canal Corporation from executing its constitutionally mandated dredging responsibility for the Champlain Canal.
- Re-examination of untargeted hot-spots should be conducted in river sections 2 & 3 as under the current approach, there will be no unlimited use/unrestricted exposure for human, wildlife and NRD restoration activities in the Phase 2 dredge area.

Predicting Protectiveness of Remedy for Fish Tissue Concentrations.

Reducing fish tissue levels of PCBs is a major cleanup level parameter in the ROD, but it is no longer clear that the current remedy will meet the timelines projected in the ROD for fish tissue level reductions.

The "protectiveness" provisions in the ROD target the attainment of a fish PCB concentration of 0.4 mg/kg – which was deemed protective of the average adult who consumes one fish meal from the Upper Hudson every two months – within the entire upper Hudson River within 20 years of active remediation. A target PCB fish concentration of 0.2 mg/kg was expected to be attained in River Section 2 within 32 years of active remediation.

The ROD's target reductions in cancer risk correspond to these fish tissue concentrations and timelines; however, other examinations of sediment concentrations, like those described by the Federal Trustees, indicate these targets will not be reached in the timeframe anticipated in the ROD and imply further remediation of heavily contaminated sediment may be necessary.

Study Issues

- Bioaccumulation model assumptions of contaminant concentrations have not been updated to reflect the new sediment contaminant data and projections of fish tissue PCB concentrations are systematically over-optimistic relative to observed values. Re-analysis of this fundamental model with the new sediment contamination data is required to assess the short- and long-term likelihood of the remedy's protectiveness.
- The peer review panel recommended further development of the bioaccumulation model to improve its accuracy for the Hudson River system. A status update should be provided and plans for further model development should be developed.
- Since the ROD, the science of human health risk assessment has evolved, with respect to the use (or misuse) of the "average adult male" as a metric for evaluating risks of exposure to contaminated fish and shellfish. EPA should evaluate the protectiveness of the remedy, for all affected human populations and sub-populations, in light of current best practices for scientific risk assessment.

Institutional Controls and Fish Advisories

Institutional controls are currently inadequate to prevent ongoing overconsumption of contaminated fish (e.g., fish advisories are not preventing subsistence anglers from eating the fish). For example, a 2010 Angler Survey performed by Clearwater along the Peekskill waterfront from Annsville Creek to Verplanck as part of a Community-Based Environmental Justice Inventory reports higher levels of contaminated fish consumption, especially by Environmental Justice populations, than previous surveys. This indicates that far more public education and better signage is needed to effectively prevent this route of exposure to PCBs.[4]

Study Issues

- Review current institutional controls, assess efficacy, and develop enhanced control strategies to improved public awareness and behavior, and minimize exposure in communities.

Optimizing Habitat Reconstruction

The ROD and all subsequent decisions projected a cleanup that substantially reduces PCB contamination in the water and soil and a remedy that leaves behind an environment capable of supporting diverse marine communities that will help heal the river after active remediation is completed. The habitat recovery work is intended to reestablish marine vegetative beds and habitats damaged by dredging operations and residual PCB contamination. However, adjustments to dredge area slopes, backfill sediment profiles and selection of plants must be appropriate for natural and native regeneration to occur. In addition, USEPA should adequately identify, and ensure the repair and restoration of, unique natural resources of the riverine system, like benthic invertebrate populations, that may suffer severe damage during active remediation.

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[4] Citizen's for Equal Environmental Protection (CEEP), Hudson River Sloop Clearwater and Peekskill Environmental Justice Council, Community-Based Environmental Justice Inventory for the City of Peekskill, Dec. 21010 www.clearwater.org/wp-content/images/2011/03/CBEJI_FINAL-_DRAFT-1-30-11-for-printing.pdf

Study Issues

- The five-year review should evaluate pre- and post-dredge habitat assumptions and address state and federal natural resource agency concerns in regards to habitat reconstruction during remediation.

Protectiveness for Human Health

Recent studies by the NYS Department of Health have investigated additional dimensions of public health impacts from PCB exposure, including non-cancer risks and non-consumption exposure pathways. These initial results warrant further assessment of the remedy's protectiveness for human health.

Study Issues

- Review the protectiveness of the remedy in light of the potential for airborne exposure and the larger amount of contamination to remain in place post-remedy.
- New York State's Department of Health Reference Doses (RfDs) for Chronic Oral Exposure has not changed but the USEPA Integrated Risk Information System[5] (IRIS) is currently assessing noncancerous risks from PCBs. The Review should develop a plan for incorporating any new guidance into the remedy as it becomes available.

Protectiveness With Respect to Other Remedial Action Objectives

The goals of the ROD include compliance with ARARs, reduction of cancer and non-cancer health risks to humans through exposure pathways other than fish consumption (such as through primary and secondary contact), reducing the inventory (mass) of PCBs in sediments that are or may be bioavailable, minimizing the long-term downstream transport of PCBs in the river, and compliance with federal and state water quality standards.

Study Issues

- Review the effectiveness of the remedy with respect to all of the ROD's objectives.

Environmental Conditions and Extreme Events

A significant type of site-condition highlighted in 5-Year Review guidance documents is whether the site was subject to a 100-year flood after the remedy was selected. The Upper Hudson experienced this level of flooding in 2011, which scoured PCBs from the unremediated river bottom and sent elevated PCB loads downstream and also was subject to storm events that forced a halt to dredging operations twice. Climate change science also teaches that the frequency of such storms will increase in the coming decades. .

Study Issues

- Review engineering standards of cap and habitat reconstruction and designs in light of the multiple events already experienced by the site and projections for increasing frequency and intensity of storm/flooding events due to climate change.
- Review sediment transport models to determine the likelihood that unremediated PCBs outside the current DAD would recontaminate the site after dredging is completed, under projected future climate conditions.

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[5] USEPA's Integrated Risk Information System (IRIS) is a human health assessment program that evaluates information on health effects that may result from exposure to environmental contaminants.

Returning the economic and ecological potential of the Hudson River to communities long denied these benefits is our highest priority. A measured and focused review of the PCB project will help ensure a cleanup that is responsive and protective in both the short and long-term.

Ned Sullivan, President
Scenic Hudson

Paul Gallay, President
Riverkeeper

Jeff Rumpf, President
Hudson River Sloop Clearwater

Lawrence Levine, Senior Attorney
Natural Resources Defense Council

Cc: Admin. Lisa Jackson (EPA)
Hudson Valley Congressional Delegation
Deputy Sec. Energy & Envir. Bob Hallman (NYS Office of Governor)
Asst. Dep. Sec. Envir. Basil Seggos (NYS Office of Governor)
Asst. Admin. Mathy Stanislaus (EPA)
Asst. Admin. Cynthia Giles (EPA)
Cmr. Joe Martens (DEC)
Dir. Brian Stratton (NYS Canal Corps)
Asst. Cmr. Eugene Leff (DEC)
Eric Schniederman (NY AG)
Brian Donohue (DOJ)

Bcc: Wendi Weber
Robert Foley
Robert Haddad
Tom Brosnan
Kevin Farrar
Joe Moloughny
John Davis (NYS AG's office)

From: Robert Michaels <bam@ramtrac.com>
To: Larisa Romanowski/R2/USEPA/US@EPA
Date: 05/04/2012 11:12 AM
Subject: Issues for EPA to consider in its five-year review of Hudson River PCB dredging

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In its five-year review of the Hudson River PCB dredging project, EPA should consider the following three emerging developments in deciding whether Phase 2 can be resumed and implemented safely:

--1. High-flow events are predicted to occur with increasing frequency in future years, as illustrated last year by events such as Tropical Storms Irene and Lee; such events will drive PCB sediments mobilized by dredging downstream for decades to come;

-–2. The US Commerce Department this year added sturgeon to the Endangered Species List, requiring protection of their Lower Hudson River habitat from PCBs because, according to EPA (and others), their early life stages are unusually susceptible to PCBs, and

-–3. Scientific articles now link PCBs to developmental processes that are thought to underlie causation of autism, most notably calcium channel effects that alter nerve cell dendrite branching patterns and, in turn, alter synapse formation in developing brains (in animal bioassays).

EPA has used reported adverse effects of PCBs as justification for removing PCB-contaminated sediments via dredging, but this is misleading for three reasons. First, fundamental to EPA's dredging plan is allowance of an increase in PCB mobilization for seven or so years of dredging on the hope that reduction will be on the horizon. However, the horizon, as always, keeps receding as it is approached. Second, natural attenuation is occurring and will continue to occur even without dredging. Third, cleaner methods of dredging can be used in place of clamshell dredging.

EPA, therefore, must decide whether and how it can justify increased exposure to PCBs associated specifically with clamshell dredging for most of the next decade, and I would say well beyond. EPA further must explicitly address the newly recognized and increased risks to human and environmental health, which already have materialized, and which will get worse before they get better as long as clamshell dredging continues for removal of PCB sediments in the Upper Hudson River.

Additional and related issues for the five-year review are explicated in my letter, attached, published in the Daily Gazette on 2012.04.28 and on my blog, at http://environmentalhealthrisk.blogspot.com. I look forward to EPA's thorough, fair, and objective consideration of the issues explicated for the five-year review.

I thank you for considering the facts that I have presented.

Very truly yours,
Bob Michaels

Dr. Robert A. Michaels; PhD, CEP
President
RAM TRAC Corporation
3100 Rosendale Road
Schenectady, NY 12309-1510

http://www.ramtrac.com
http://environmentalhealthrisk.blogspot.com
bam@ramtrac.com
(518) 785-0976

Daily Gazette Letters to the Editor for April 28
Saturday, April 28, 2012

Expansion of PCB dredging will only make Hudson dirtier

Environmental groups advocating expansion of Hudson River PCB dredging (March 31 Gazette) are premature at best, given the ongoing five-year review of the dredging project by the Environmental Protection Agency.

Maybe politics will drive the result of this review, but EPA and environmental groups should consider the documented, substantial long-term consequences of dredging, rather than seizing on the simplistic, short-term expedient of digging up more PCB sediment. As past toxicologist for the Natural Resources Defense Council, I know that taking the long view is a hallmark of environmental activism.

After the first season of dredging, GE reported that sediment samples outside the dredged area "show that dredging caused widespread redistribution of PCB-containing sediments on the surface of the river bottom." High-flow events already have driven some of this dredge-mobilized sediment downstream.

Future high-flow events likewise will transport dredge-mobilized PCBs downstream, where they will enter water, air and ecosystems. This includes the habitat of Hudson River sturgeon, recently classified as "endangered" by the Commerce Department, which now must protect its habitat under the Endangered Species Act.

Maybe advocates of expanded dredging think EPA data indicate that dredge-mobilized PCBs are not a problem, but this is false. EPA's official Hudson River PCB Dredging Peer Review Panel concluded in 2010 that the agency failed to set an allowable sediment loading limit, failed to gather data needed do this, and failed to develop models to predict transport of dredge-mobilized sediment.

The agency therefore cannot assure the public that transport of sediment already mobilized by dredging won't increase for decades, threatening ecosystems in the Lower Hudson River. It cannot assure the Commerce Department that endangered sturgeon can survive decades of increased PCB transport to the Lower Hudson River. Yet, the agency seeks to resume dredging.

Phase 1 dredging was supposed to demonstrate the feasibility of Phase 2, but it did not do so. It was designed to succeed because it featured bank-to-bank dredging to reduce mobilization of PCB sediments.

Even so, massive sediment mobilization occurred. More will occur in Phase 2, because only PCB "hotspots'" will be dredged. Mobilization will transport PCBs to areas of the river bottom that are not slated for future dredging.

High-flow events such as storms are forecast to occur with increasing frequency in the future. Future events will have more severe consequences, as the area of dredged river bottom increases. Cumulative transport of dredge-mobilized PCB sediments may, [over time, stop] the recovery of endangered Lower Hudson sturgeon.

EPA should address these issues in its five-year review. Certainly, the Commerce Department will.

Environmental groups likewise should consider them, to protect Hudson River communities and ecosystems. To be an environmental activist is to take the long view. Environmental groups can ignore long-term consequences of positions that they advocate for short-term benefit — but only at the peril of their legacies.

Robert A. Michaels, PhD
Schenectady
The writer is president and principal toxicologist of RAM TRAC Corp.

Howard P. Milstein
Chairman
Thomas J. Madison, Jr.
Executive Director

New York State Thruway Authority
New York State Canal Corporation

www.canals.ny.gov

Brian U. Stratton
Director

May 14, 2012

David King
USEPA
Hudson River Field Office
421 Lower Main Street
Hudson Falls, NY 12839

Re: Five Year Review, Hudson River PCBs Superfund Site

Dear Dave:

I recently forwarded to your office an electronic copy of a sediment sampling report dated March 2011 prepared on behalf of the Thruway Authority and Canal Corporation (NYSCC) by Barton and Loguidice, P.C. The report details sediment samples collected from areas surrounding CU-1 in the vicinity of the Fort Edward Yacht Basin that were not dredged by General Electric in Phase 1. I urge the USEPA to fully consider this data during the five year review for the Hudson River PCBs Superfund Site that is currently underway.

The report clearly documents that sediment conditions in the areas immediately surrounding CU-1 meet the Record of Decision (ROD) criteria for inclusion in the remedy. The NYSCC believes that these areas were incorrectly excluded from the Phase 1 dredging activities due to the fact that the boundaries (and depth of contamination) of CU-1 were based on highly inaccurate and low-confidence sediment cores. The USEPA and the Peer Review Panel both recognized this shortcoming and consequently the boundaries of all Phase 2 dredge areas bounded by low confidence cores are being confirmed with new data.

I am particularly interested in USEPA's decision whether the areas surrounding CU-1 will be remediated during Phase 2. The NYSCC believes they meet the removal criteria specified in the ROD and therefore USEPA should require GE's inclusion of these areas in future design documents.

Sincerely,

Joseph Moloughney, P.E.
Director of Environmental Affairs

200 Southern Boulevard, Post Office Box 189, Albany, New York 12201-0189 518-436-3055 / 1-800-253-6244 Fax: 518-471-5936

ANDREW M. CUOMO
GOVERNOR

JOE MARTENS
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233-1010

MAY 22 2012

Ms. Judith A. Enck
Regional Administrator
United States Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

Dear Ms. Enck:

In many ways, the current EPA five-year review of the Hudson River PCB remedial action is a milestone for progress toward the recovery of the Hudson River. Phase 1 of the dredging project and the Peer Review of Phase 1 have been completed. Phase 2 of the project is well underway, and we foresee continued cooperation from General Electric.

In addition, the adequacy of controls on resuspension of contaminated sediment has been confirmed. Fish and water sampling taken after Phase 1 and during Phase 2 show that the dredging process itself does not have measurable short-term adverse impacts. In fact, preliminary data suggest that the dredging project has already had a beneficial impact by reducing PCB levels in surface water in areas that have been dredged.

Yet, analyses performed by federal natural resource trustees indicate that, following remediation, average levels of PCBs in surface sediment of River Sections 2 and 3 will remain high enough to continue to cause injury to natural resources. EPA should take a hard look at this issue in the course of its five-year review of the remedial action.

Several environmental groups and legislative leaders have requested EPA to extend the target date for completion of the review, and I am pleased that EPA has done so. I encourage EPA to consider providing additional time to enable the public to provide comments and for your agency to complete its review.

If DEC can be of assistance to EPA during this review, please let us know.

Sincerely,

Joseph J. Martens

Hudson River Sloop Clearwater
Natural Resources Defense Council
Riverkeeper
Scenic Hudson

May 29, 2012

Judith Enck, Regional Administrator
US EPA Region 2
294 Broadway
New York, NY

Dear Judith:

We are writing to urge USEPA to include and evaluate in the 5-Year Review of the Hudson River PCB Superfund site all key unresolved concerns and issues raised by local, state and federal agencies involved in the Hudson River cleanup, including NYSDEC, the NYS Attorney General's office the NYS Canal Corporation, NOAA, and USFWS, as well as the Community Advisory Group's independent technical consultants and EPA's own Phase 1 Peer Review Panel.

We appreciate the time you and your staff have taken to meet with us in recent weeks. However, we remain gravely concerned that critical issues will not be substantially addressed by the 5-Year Review that is currently slated for release by May 31, 2012. Specifically, given USEPA's duty to determine the "protectiveness" of the remedy as it is currently being implemented, and the overall criteria and standards of the USEPA's Comprehensive Five-Year Review Guidance, the following topics that have been raised by the above-referenced parties – and that were described in our letter to you dated May 4, 2012 – must be afforded comprehensive treatment in the Review:

- Data collected since EPA issued the 2002 Record of Decision (ROD) show higher levels of surface sediment contamination than the ROD anticipated in portions of River Sections 2 & 3 that are not slated for dredging. These residuals raise significant scientific uncertainty as to whether all Remedial Action Objectives (RAOs), including target PCB levels in fish, will be fully achieved.

- Monitoring of pre-and post-remedy sediment PCB concentrations is not adequate to determine the protectiveness of the remedy, especially in River Sections 2 & 3, where analyses of post-ROD data indicate that post-remediation PCB concentrations will be five times higher than predicted by the ROD.

- Sediment and bioaccumulation models (HUDTOX and FISHRAND) used in the ROD are no longer considered scientifically valid and require re-examination, in light of the above-referenced data, to determine the likelihood that RAOs will be fully achieved. (Post-Phase 1 modeling by GE validates 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. However, neither this model nor any other updated sediment transport or bioaccumulation model has been used, to date, to evaluate whether higher-than-expected surface sediment PCB concentrations *outside* of the area targeted for dredging will detract from the protectiveness of the remedy.)

- Current and projected changes in the physical site conditions, due to multiple flooding events, sediment re-deposition, and changing climate conditions, require re-verification of sediment transport predictions (*e.g.*, regarding areas not currently slated for dredging) and engineering standards for caps and habitat reconstruction.

- Institutional controls appear inadequate to prevent overexposure during the remedy and beyond (*e.g.*, fish advisories are not preventing subsistence anglers from eating the fish).

- Design and standards for habitat reconstruction and species recovery are not optimized and require improvements.

We remain alarmed that the abbreviated deadline of May 31st will simply not allow all the critical components outlined in USEPA's Comprehensive Five-Year Review Guidance documents – including identification of information that may warrant additional studies – to be completed in the rigorous manner they deserve.

Moreover, since we understand that EPA has not received or invited comments from the Natural Resource Trustee agencies on the 5-Year Review, we are attaching to this letter, for inclusion in the record of the 5-Year Review, past correspondence and analysis by the federal Trustees on several of the issues listed above.[1]

Restoring the environmental and economic health of our world-renowned river depends on a rigorous implementation of the dredging remedy. The remedy must be responsive to the most current information, practices and design standards to maximize the likelihood of success. In light of the decades-long damages to this public resource, the interest of diverse stakeholders in a comprehensive restoration, and the enormous expense of this remedy, EPA must openly and thoroughly examine the issues above and ensure an efficient, effective cleanup of the Hudson River.

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[1] Certain documents publicly available at the following weblinks:
http://www.darrp.noaa.gov/northeast/hudson/pdf/HUD_DEL_SETAC_2011PCBposter.pdf
http://www.fws.gov/contaminants/restorationplans/HudsonRiver/docs/lettertoGEPhase2design_signed.pdf
Federal Trustees' NRDA pre-meeting presentation to the Hudson River PCBs Superfund Site Community Advisory Group on June 30, 2011:

We greatly appreciate EPA's commitment over the last several years to a transparent public process during the implementation of this historic environmental project. And as always, we will continue to share with you our concerns and hopes for the future of a healthier Hudson River.

Sincerely,

Ned Sullivan, President
Scenic Hudson

Paul Gallay, President
Riverkeeper

Jeff Rumpf, President
Hudson River Sloop Clearwater

Larry Levine, Senior Attorney
Natural Resources Defense Council

Cc: Admin. Lisa Jackson (EPA)
Hudson Valley Congressional Delegation
Deputy Sec. Energy & Envir. Bob Hallman (NYS Office of Governor)
Asst. Dep. Sec. Envir. Basil Seggos (NYS Office of Governor)
Asst. Admin. Mathy Stanislaus (EPA)
Asst. Admin. Cynthia Giles (EPA)
Cmr. Joe Martens (DEC)
Dir. Brian Stratton (NYS Canal Corp)
Asst. Cmr. Eugene Leff (DEC)
Eric Schniederman (NY AG)
Brian Donohue (DOJ)
Wendi Weber (USFWS)
Robert Foley (USFWS)
Robert Haddad (NOAA)
Tom Brosnan (NOAA)

June 21, 2011

John G. Haggard
General Electric Corporation
Project Coordinator
320 Great Oaks Office Park, Suite 319
Albany, NY 12203

Dear Mr. Haggard:

The Federal natural resource trustee agencies, the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Department of the Interior (DOI) communicated with you in two prior letters (November 7, 2005 and August 14, 2006) about the Phase 1 remediation and habitat replacement and reconstruction project for the Hudson River PCB Site. These letters informed you of our concerns about the potential for natural resource injury that could result from implementing these remedial measures and provided recommendations about the Phase 1 Intermediate Design Report (IDR) and the Phase 1 Final Design Report (FDR), respectively. In December 2010, GE agreed to conduct the Phase 2 remediation that EPA identified.

After reviewing General Electric's draft Phase 2 IDR, the U.S. Environmental Protection Agency's (EPA) June 23, 2009 approval letter, the Phase 1 Peer Review Report, and the December 2010 15(b) Phase 2 decisional documents (Engineering Performance Standards, Critical Design Elements, Performance Standards Compliance Plan Scope, Remedial Action Monitoring Scope, and Operation, Monitoring and Maintenance), we continue to be concerned about the injury that will result from the remedy as designed and stress to you the need for modifications that will reduce that injury and accelerate recovery of the ecosystem. These changes focus broadly on three major areas of benefit that could be achieved by integrating remediation and restoration:

- Additional removal of sediments in River Sections 2 and 3 to reduce post-remediation surface PCBs and future injury,
- Enhancements to the habitat replacement and reconstruction program to reduce the amount of unmitigated remedy-caused injury to natural resources expected based on the Phase 2 Final Design Report, and
- Improvements to the adaptive management plan and post-construction monitoring consistent with sound scientific principles.

Additional Sediment Removal

We continue to have significant concerns regarding the level of PCBs that will remain in surface sediments post-remediation which will likely delay recovery of the river. Our analysis of remedial design data indicates that:

- Average surface PCB contamination in River Sections 2 and 3 are higher and sediment natural recovery is much slower (verging on negligible) than what was believed when the Record of Decision (ROD) was originally issued in 2002 (Figure 1, Field et al., 2009). Average surface (maximum in top 12 inches) PCB concentrations in River Sections 1 and 2 are equally elevated (>100 ppm total PCBs), but the surface clean up trigger in River Sections 2 and 3 (~90 ppm) is about 3 times higher than in River Section 1 (~30 ppm total PCBs).

- Few (five, or 9%)) of the especially sensitive or unique habitat (ESUH) areas are likely to attain <1 ppm total PCBs in post-remediation surface sediments unless additional removal is performed (Rosman et al., 2009)

- Given these facts, following remedy implementation, approximately 5 times higher concentrations of bioavailable PCBs will be left behind in surface sediments in River Sections 2 and 3 than the ROD envisioned in 2002 (Figure 2, Field et al., 2009). This includes 136 acres outside of the dredge footprint, where surface levels will exceed 25-30 ppm total PCBs (Field et al., 2011).

- Elevated post-remedy levels of PCBs in surface sediments in River Sections 2 and 3, including in ESUHs, represent a long-term exposure pathway and injury to the public's resources, including aquatic invertebrates, fish, birds and wildlife.

- Therefore, we believe that the projected recovery of the river ecosystem will likely be protracted well beyond the multi-decadal time frame forecast in the ROD.

- As we have noted previously, future injury can be reduced through supplemental removal coordinated with the EPA remedy.

The federal Trustees therefore urge GE to achieve the original risk-based goals of the ROD by dredging sufficient river bottom to attain surface sediment concentrations closer to what the ROD envisioned. In part this can be accomplished by applying River Section 1 surface criteria to River Sections 2 and 3. This enhancement to the design would result in the additional removal of approximately 136 acres of PCB-contaminated sediment from River Sections 2 and 3. Our recommendation of a uniform surface criterion across all three River Sections would significantly reduce bioavailable PCBs, reduce ongoing injury and promote recovery of the river. Additional removal using a lower PCB trigger in ESUH areas could further enhance recovery and reduce injury.

Habitat Replacement and Reconstruction

As stewards of natural resources, the Federal Trustees' concerns with the Phase 2 design for habitat reconstruction parallel those previously expressed in letters to General Electric on the Phase 1 design. These concerns focus on the stability of the river bottom, the quality of the habitats that will be reconstructed, and the degree to which both structure and function of the disrupted habitats will be restored to pre-remedy conditions.

A high quality design for habitat replacement and reconstruction linked with further PCB reduction are the first stages in recovering unconsolidated river bottom (UCB), aquatic vegetation (SAV), shoreline (SHO) and riverine fringing wetland (RFW) habitats that will be harmed by the remedy. Given the numerous problems encountered during the 2010 Phase 1 habitat reconstruction season and the problems encountered with the SAV planting and RFW seeding effort, we recommend significant improvements to the Phase 2 habitat replacement and reconstruction, increased flexibility in habitat reconstruction approaches, and strengthening adaptive management during the construction phase to minimize future problems.

Our on-going concerns with the habitat replacement and reconstruction plans in the draft Phase 2 FDR and Phase 2 Remedial Action Work Plan (RAWP) include:

- Insufficient volume of backfill is being proposed to restore SAV beds to optimal elevation for successful outcome;
- Excessive capping/hardening of the river bottom and potential for hardening of the shoreline;
- Lack of a habitat layer in addition to, and on top of, the isolation and armored layers for all constructed caps;
- Backfill material that could be low in organic carbon and nutrients;
- No consideration of the use of upland dredge spoil material as backfill source material;
- Side slopes that are constructed too steeply, i.e., 3:1,which decreases river bottom stability, instead of a 6:1 to 10:1 slope;
- Backfill and cap tolerances that are too broad and do not target creation of optimum elevations for plant reestablishment;
- Reconstruction of insufficient amounts of SAV, RFW, and SHO habitat ($\leq$ 1:1 instead of >1:1);
- Plant and seed stock that are not solely derived from local Hudson River or its watershed phenotype and genotype;
- Reliance on seeding in RFW Zone A rather than planting;
- Over-reliance on natural recovery of aquatic vegetation beds without adequate measures in place to assure corrective actions if necessary;
- Use of shoreline treatment designs that lead to unnecessary hardening, lower plant diversity, loss of woody debris, and overall loss of habitat;
- Lack of special design treatments to augment recovery of especially sensitive or unique habitats that receive no special design treatments to augment recovery of these designated areas;

- No consideration for harvesting and reseeding adult freshwater mussels to promote recovery of a keystone species, which will otherwise be dredged and disposed of during remediation;
- Restrictions on depth of removal in nearshore areas and elevated PCBs in surface sediments outside dredge prisms immediately after dredging will provide a continuing pathway of PCBs to ecological receptors.
- Insufficient redundancies, backup capacity, and flexibility to allow problem solving and adaptive approaches within habitat construction phase; and
- Insufficient reporting to and coordination with the trustees.

The federal Trustees believe that many of the natural resource injuries related to remedy implementation can be avoided or minimized through improvements to the Phase 2 Final Design Report for 2011 and subsequent years, and potentially to aspects of the Phase 1 Design that would be implemented in 2011 or beyond. This can be achieved by modifying the Final Design so that it is more consistent with restoration principles (Williams et al. 2009), and strives to maximize reconstruction of the habitats harmed by the remedy and by residual PCBs. For example:

Incorporation of a Separate Habitat Layer in Cap Design: Construction of a habitat layer on top of and in addition to the isolation and armor layers is consistent with EPA's (2005) Contaminated Sediment Remediation Guidance for Hazardous Waste Sites and EPA's (2010) Critical Phase 2 Design Elements . A habitat layer would enhance the physical isolation of indigenous benthos from the residual PCBs and minimize bioturbation of the residual sediments and would provide substrate for rooting plants, burrowing organisms and nesting fish, thereby reducing remedial injury from cap construction. Site specific habitat layers have been incorporated into cap design/construction at the Onondaga Lake and Reynolds Metal Co. Superfund Sites. The proposed "habitat layer backfill" is not equivalent to a habitat layer that is integral to a cap design. The "habitat layer backfill" is solely for SAV bed reconstruction within the elevation restrictions set forth in the 2010 Critical Phase 2 Design Elements and is the same as the Phase 1 15% allocation backfill, but for the volume restriction.

Mussel Beds: The federal Trustees are concerned about the destruction of freshwater mussel beds in remediation areas, as mussels are one of the more threatened classes of organisms in North America. The number and biomass of Hudson River freshwater mussels will be reduced significantly during sediment removal. Subsequent capping and backfill have the potential to further degrade their habitat. Freshwater mussels are long-lived organisms that have a unique life history. Larvae of freshwater mussels (glochidia) utilize fish hosts that are specific to a given mussel species before settling onto substrate. Removal of large beds of mussels and increased spacing between remaining beds increases the time that is required for mussels to naturally recolonize dredged areas and may promote recolonization by non-indigenous mussels, reducing habitat value and contributing to increased natural resource injury. Mussels are considered keystone species in the environment because they support a number of ecosystem services, e.g., sediment stability,

nutrient cycling, increased biogenic structure, increased periphyton abundance, and increased abundance and richness of invertebrates. One solution to reducing the harm caused to mussels in the Upper Hudson from remedial actions is to collect a portion of the adults being removed, hold them in a hatchery until remediation is completed in that area of the river, and then transplant them into remediated areas. These mussels will provide the foundation for future generations. A field survey documenting the species inhabiting the Upper Hudson and the habitats where they are found would also inform the habitat reconstruction efforts.

Use of Upland Dredge Spoils: During Phase 1, GE argued that it could encounter issues with insufficient backfill quantities to meet contract specifications. Given that removal of contaminated sediments is very likely deeper than previously estimated and sufficient backfill will be required to restore SAV and RFW to design elevations in all certification units, the use of readily-available upland dredge spoils may become more advantageous during Phase 2 remediation. We would welcome further discussion with GE about this possibility.

Adaptive Management, Success Criteria, and Long-Term Monitoring

We are also concerned that the development of Phase 2 success criteria be completed prior to Phase 2 implementation to ensure that appropriate baseline data have been collected. Performance-based criteria should assess habitat replacement and reconstruction efforts and demonstrate the successful recovery of the structure, function, quality, sustainability, and resilience of all reconstructed habitats. Adaptive management should be based on an understanding of system functions using effective monitoring and models to adjust management approaches to improve outcomes (Williams et al. 2009) The Phase 2 Adaptive Management Plan should be flexible and responsive to anticipated and unanticipated problems. The plan should trigger implementation of timely and appropriate corrective actions that will set the reconstruction efforts for each of the four habitat types back on the recovery trajectory toward attainment of success.

Integrating sediment and habitat restoration with remediation would be the most efficient way of restoring resources to baseline conditions and reducing future injury, and would reduce costs and time to implementation. General Electric, in its 2001[1] comments to EPA on the Proposed Plan for the Hudson River PCB Site, expressed significant concern about the adverse consequences of remedy implementation on Hudson River habitats and the species they support, and submitted an assessment of EPA's Habitat Replacement Program and the probable effects of the in-river remedy on fish populations. These documents highlight General Electric's concern for environmental impacts to natural resources during remedy selection that should be reflected in its remedial design and remedial action phases of the Hudson River cleanup.

The federal Trustees urge reconsideration of the issues highlighted in our two prior letters to General Electric on the Phase 1 design and in this letter on the Phase 2 design. These

[1] GE comment letter to EPA on the Proposed Plan is dated Dec 2000, but the referenced attachment is dated April 2001.

include maximizing the benefits of the habitat reconstruction component of the remedial design, incorporating primary restoration into the remedy, and strengthening the adaptive management and monitoring program to increase the likelihood of successful recovery. This can be achieved by modifying the Final Design to be more sensitive to the environment, more consistent with restoration principles, and more directed at maximizing restoration of the habitats harmed by the remedy and by residual PCBs.

Ultimately, a restored Hudson River benefits all including the natural resources that comprise this ecosystem, the economies that benefit from the services derived from the river and those that live and work along the shores and in neighboring communities and who have expressed their concern for the restoration of this historic and nationally important river.

We suggest that we use this opportunity to discuss these issues in a timely fashion. If you agree, please contact me (Tom Brosnan) at (301) 713-3038 ext.186 or Robert Foley at (413) 253-8732.

Sincerely,

Thomas Brosnan
Hudson River Trustee
National Oceanic and Atmospheric Administration

Robert Foley
Hudson River Case Manager
Department of the Interior

References

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Office of Response and Restoration
Silver Spring, Maryland 20910

December 2, 2010

Via Email and Fed Ex

Robert Sussman
Senior Policy Advisor
U.S. Environmental Protection Agency
Ariel Rios Building, Mail Code 1101A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Re: Phase 2 Remediation, Hudson River PCB Superfund Site

Dear Mr. Sussman:

The National Oceanic and Atmospheric Administration's Office of Response and Restoration (NOAA OR&R), on behalf of the Department of Commerce, thanks you for meeting with us on November 30, 2010 to discuss our recommendations regarding the Hudson River PCB Superfund Site Phase 2 remediation. The intent of this letter is to reiterate the points that Tom Brosnan and Lisa Rosman of my staff raised on Tuesday and to provide you with the documentation supporting those points.

NOAA, in its natural resource trustee capacity, works to protect and restore coastal resources from threats related to releases of hazardous substances and oil spills. NOAA has a long history of working with the US Environmental Protection Agency (EPA) to maximize the cleanup and ultimate restoration of the Hudson River PCB Site.

As relayed previously, NOAA has significant concerns regarding the scope and design of the Phase 2 remedy that EPA will present to GE for its opt in/opt out decision, and the condition of the river that will be left behind for the natural resource trustees to restore. Our analyses indicate that:

- Average surface PCB contamination in River Sections 2 and 3 are 5-10 times greater and sediment natural recovery is much slower (verging on negligible) than what was believed when the ROD was originally issued in 2002 (Figure 1).

- Average surface (maximum in top 12 inches) PCB concentrations in River Sections 1 and 2 are equally elevated (>100 ppm total PCBs), but the surface clean up trigger in River Sections 2 and 3 (~90 ppm) is about 3 times higher than in River Section 1 (~30 ppm total PCBs).

- Given these facts, following remedy implementation, approximately 5 times higher concentrations of bioavailable PCBs will be left behind in surface sediments in River Sections 2 and 3 than the ROD envisioned in 2002 (Figure 2). This should translate into a proportional

increase in fish tissue PCBs and a delay in the projected recovery of the river and the natural resources services that the river supports. There is no evidence to suggest that Hudson River fish will behave differently from the theoretical response.

- To our knowledge, none of these points are disputed by EPA. NOAA suggests that EPA conduct an analysis on the impacts of these findings on changes to risk to fish, wildlife or humans relative to the risks originally projected by the 2002 remedy, and an evaluation of the potential need for a change in the scope of the remedy. GE's untested model seems to be the only basis for EPA to believe that fish concentrations will achieve target levels in the time frame envisioned by the ROD, rather than a more protracted time frame.

- These concerns are further compounded by the proposed one pass approach to dredging that has the potential to leave dredgeable inventory in-place and surface PCBs above 1 ppm Tri+ PCBs because remediation would be to a prescribed elevation. The one pass approach could result in substantial and unnecessary capping of the river bottom, much more than envisioned by the ROD and the Engineering Performance Standards since depth of contamination is not adequately characterized and the overcut is insufficient to address depth of contamination uncertainties.

- From NOAA's perspective, EPA should continue to minimize the amount of capping allowed consistent with the 2004 Engineering Performance Standards.

- Finally, significant problems encountered during Phase 1 habitat reconstruction led to unsuccessful habitat mitigation. Many of these problems have not been adequately addressed in the Phase 2 design to ensure effective reconstruction of high quality, sustainable and resilient habitat.

The impacts of maintaining the current course of action is clear and troubling to NOAA:

- A series of Superfund-caliber sites will be left behind due to the level and extent of unremediated surface sediment PCBs;

- These elevated post-construction concentrations are often adjacent to the cut lines. This will result in the high likelihood of remediated areas becoming recontaminated;

- Restoration with the appropriate nexus to the locations of the ecological injuries as directed by the NRDA process will not be feasible due to the remaining contamination and projects may need to be relocated further from the site of injury;

- Recovery of the Hudson River will be further delayed, due to remaining PCBs and the improper and insufficient habitat reconstruction, resulting in a loss of ecosystem productivity;

- This will set a national precedent as the Hudson River remediation is being closely watched by PRPs, EPA, trustees and NGOs nationwide. This is a precedent NOAA doesn't want repeated.

NOAA urges EPA to seek to achieve the original risk-based goals of the ROD, by trying to achieve surface concentrations closer to what the ROD envisioned. This can be accomplished by applying River Section 1 surface criteria to River Sections 2 and 3. Most of the highly contaminated surface sediment remaining in River Sections 2 and 3 after Phase 2 remediation is in close proximity to Phase 2 dredge

prisms. NOAA strongly recommends additional removal of highly contaminated sediments especially within 100 to 200 feet of the dredge lines (Figure 3; Figures distributed at meeting not transmitted). This enhancement to the design would result in the additional removal of 80-100 acres (15-18 % increase in sediment volume) (Tables 1 and 2) and is within the volume of sediment removal envisioned in the original ROD. Our recommendation of a uniform surface criterion across all three River Sections would significantly reduce bioavailable PCBs.

NOAA also wants to ensure that EPA realizes that the Trustees plan to communicate our analysis of the post-remediation surface sediment PCBs to the public shortly so that they understand the challenges the Trustees will face in identifying and implementing in-kind/in-place restoration in the Upper Hudson due to much more bioavailable sediment PCB contamination left behind than we consider acceptable.

NOAA thanks EPA for the opportunity to express these concerns and would be happy to present these concerns to other EPA Senior Leadership, if so desired. Finally, NOAA urges EPA to seriously evaluate the merits of our proposal to expand the dredge prism boundaries to remove high concentrations in adjacent sediments and to improve restoration of habitats impacted by the remedy.

Sincerely,

Robert Haddad, Ph.D.,
Chief, Assessment & Restoration Division
Office of Response and Restoration
National Oceanic & Atmospheric Administration

Cc: Judith Enck, EPA
Walter Mugdan, EPA
Eric Schaaf, EPA
Paul Simon, EPA
Mathy Stanislaus, EPA
Jim Woolford, EPA
Betsy Sutherland, EPA
Craig O'Connor, NOAA
Tom Brosnan, NOAA
Lisa Rosman, NOAA
Bob Foley, USFWS
Wendi Weber, USFWS
Brian Donahue, USDOJ
Peter Kautsky, USDOJ
Stuart Gruskin, NYSDEC
Alison Crocker, NYSDEC
Kevin Farrar, NYSDEC
Andy Gugliemli, NYSDEC
John Davis, NYS AG
Eugene Leff, NYS AG

Figure 1. A comparison of estimated pre-remediation surface (top 2 inches) Tri+ PCBs. Blue bars are modeled concentrations reported in the Feasibility Study and used in selection of the remedy. Red bars are post-ROD data collected for the design. This illustrates that average surface PCB contamination in River Sections 2 and 3 are 5-10x greater than what was believed when the ROD was originally issued in 2002. (Total PCBs = ~3x Tri+ PCBs)

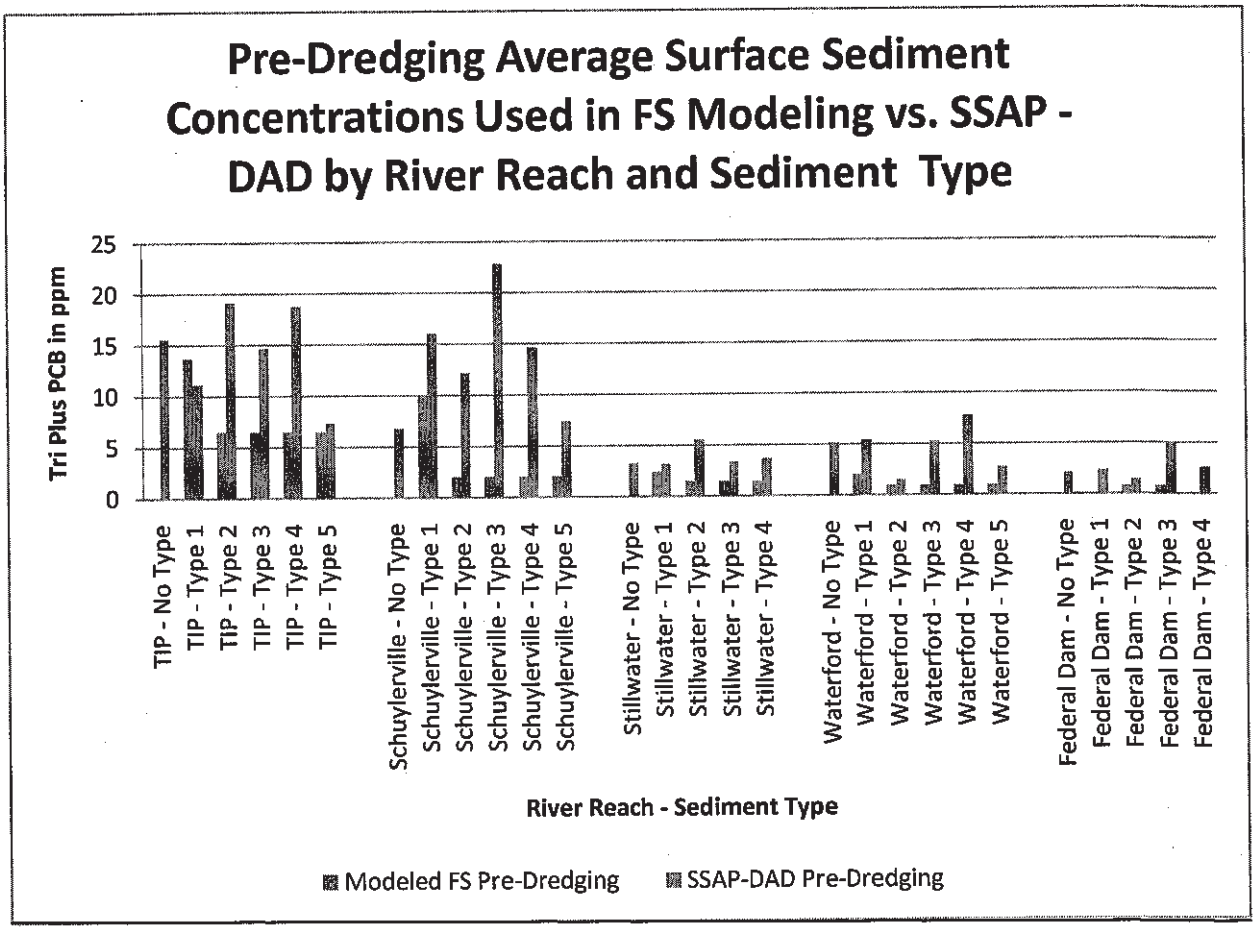

Figure 2. A comparison of estimated post-remediation surface (top 2 inches) Tri+ PCBs. Blue bars are modeled concentrations reported in the Feasibility Study and used in selection of the remedy. Red bar are based upon post-ROD design data. This illustrates that after the remedy is implemented. approximately 5x higher concentrations of bioavailable PCBs will be left behind in surface sediments in River Sections 2 and 3 than was envisioned in the 2002 ROD. (Total PCBs = ~3x Tri+ PCBs)

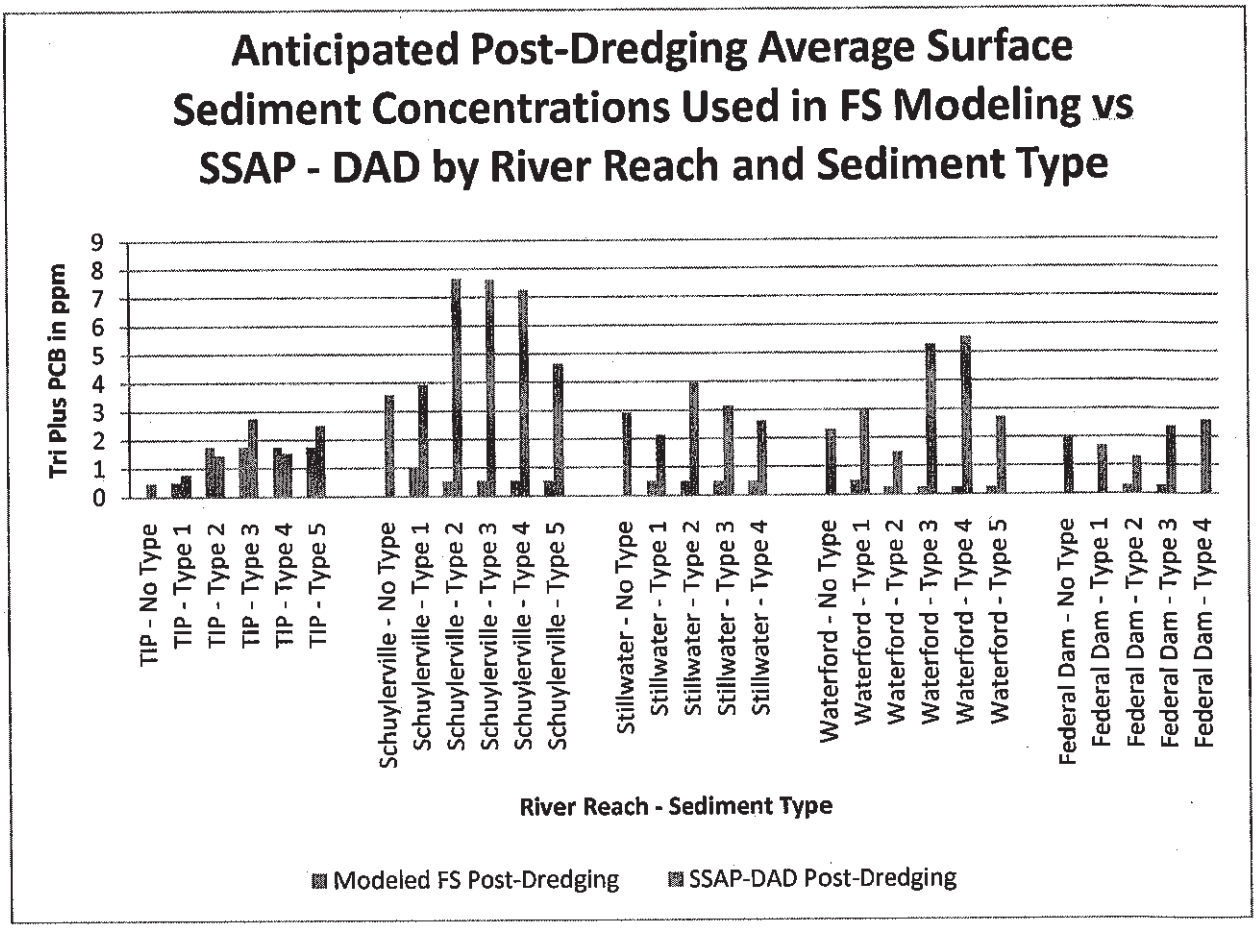

Figure 3. Additional reductions in estimated surface (top 2 inches) Tri+ PCBs achieved with additional removal in River Sections 2 and 3 through the application of the River Section 1 surface sediment cleanup trigger. Red bars indicate no addition removal from current Phase 2 design. Blue and green bars represent River Section 1 criteria within a 100 ft and 200 ft buffer respectively, of the existing dredge prism. The black bar applied River Section 1 surface trigger to River Sections 2 and 3. (Total PCBs = ~3x Tri+PCBs)

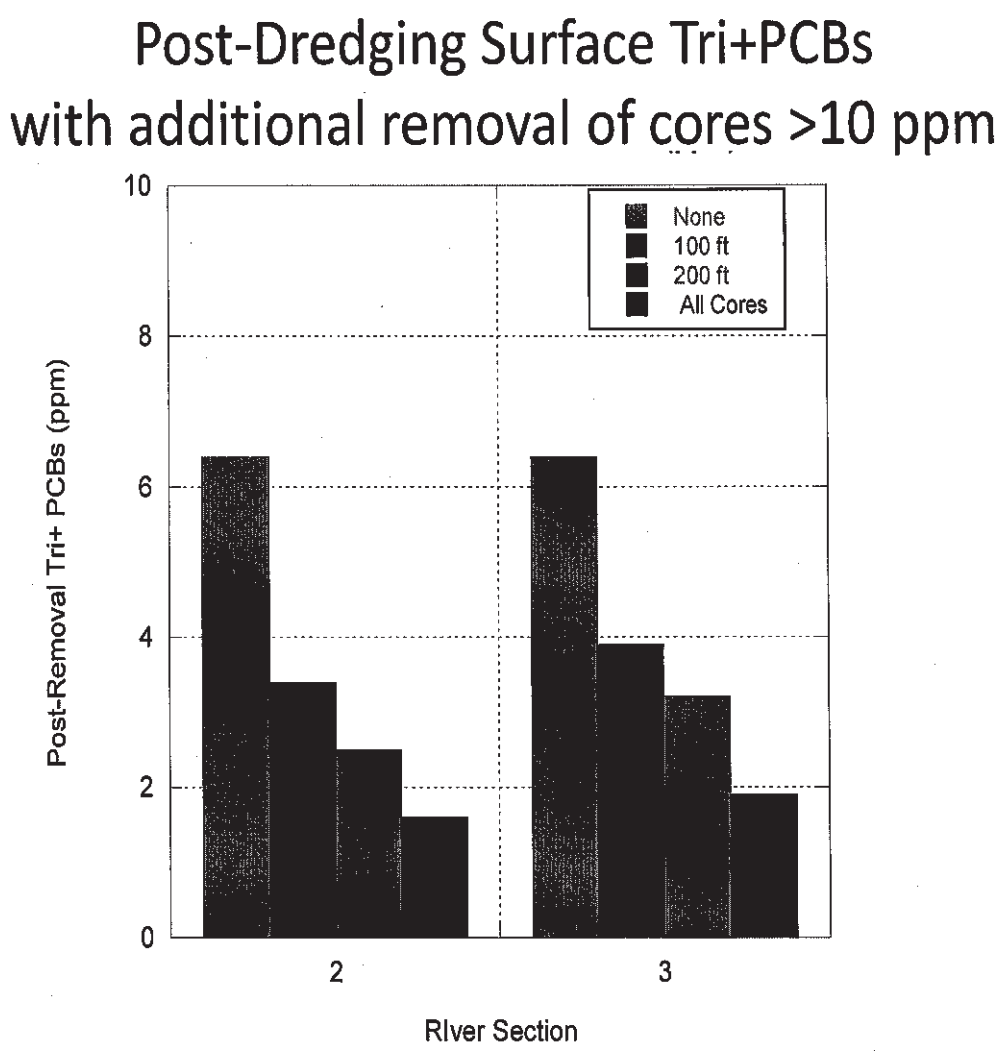

Table 1. Estimated number of acres based on distance beyond dredge footprint and estimated post-remedial surface Tri+ PCB concentrations.

River Section	Total Number of Acres with Surface Tri+ PCB >10 ppm			Estimated Tri+ PCB (ppm) in Surface Following Additional Removal of cores with Surface Tri+ PCB >10 ppm			
	Within 100 ft of dredge prism	Within 200 ft of dredge prism	Removing All Cores Outside Dredge Prism	Within 100 ft of dredge prism	Within 200 ft of dredge prism	Removing All Cores Outside Dredge Prism	No Additional Removal
RS2	29.0	37.0	44.9	3.4	2.5	1.6	6.4
RS3	51.4	62.1	91.0	3.9	3.2	1.9	6.4

Note: Basis for the acreage estimate: one core=1/8 acre from Garvey personal communication 2010. Surface definition is consistent with EPA July 26, 2004 Final Decision DAD Dispute.

Table 2. Volume estimates for different enhanced removal scenarios.

Estimated PCB Post Remediation	Estimated Area (acres) RS2+RS3	Estimated Additional Removal Volume (1000 cy)				
		Assuming 1ft DoC	Assuming 2ft DoC	Assuming 3ft DoC	Assuming 4ft DoC	Assuming 5ft DoC
All Cores within 100 ft >10ppmTri+	80	129	258	387	516	645
All Cores within 200 ft >10ppmTri+	99	160	319	479	639	799
All cores >10ppmTri+	136	219	439	658	878	1097

Hudson River Remedy Part I:
Unremediated PCBs and the Implications for Restoration

Jay Field [1], Lisa Rosman [2], Tom Brosnan [3], Bob Foley [4]

[1]NOAA/OR&R/Assessment and Restoration Division: Seattle, Washington, USA

[2]NOAA/OR&R/Assessment and Restoration Division: New York City, New York, USA

[3]NOAA/OR&R/Assessment and Restoration Division: Silver Spring, Maryland, USA

Abstract

The Hudson River PCB Superfund Site encompasses approximately 200 miles from Hudson Falls to the Battery in New York City. The dredging remedy, selected in 2002, was estimated to remove 2.65 million cubic yards of sediments from the upper 40 miles (River Sections 1, 2 and 3) between Fort Edward and the Federal Dam in Troy. Characterization of sediment during remedial design found higher and more widespread PCB concentrations in the surface, and much slower natural recovery than models predicted for the 2002 remedy. The first phase of the remediation dredged 48.3 acres of River Section 1 in 2009 and capping was required for about 36% of the dredged area. Phase 2 remediation will commence in 2011 in River Section 1. Phase 1 and Phase 2 combined will remediate at least 493 acres and remove 95% or more of PCBs from within that footprint. However, 136 acres of surface PCBs exceeding 10 ppm Tri+ (25-30 ppm total) PCBs will remain outside of the dredge footprint, and the average PCB concentration in the surface of River Sections 2 and 3 will be five times higher after remediation than predicted by the 2002 remedy. Our analyses evaluate the degree and extent of contamination remaining outside the areas designated for dredging and the potential for impacts of the current remedy on recovery and restoration of the Hudson River.

Introduction

Remedial design sampling in the Upper Hudson (Figure 1) found higher and more widespread PCB concentration in the surface and much slower natural recovery than models predicted for the 2002 remedy.

Average post-remediation surface sediment concentrations will be five times higher in River Section (RS)2 and RS3 than EPA anticipated when developing the ROD (Field et al 2009).

In December 2010, GE agreed to perform the second phase of dredging in the Upper Hudson River. According to EPA, "Phase two will require GE to remove an estimated 95 percent or more of PCBs from the areas designated for dredging." (EPA 2010).

The focus of this presentation:

- What will remain in the surface sediment outside of areas designated for dredging?
- What are the potential impacts of these unremediated PCBs on restoration and recovery of the river?

Methods

Surface sediment concentrations represent the concentration in the top 12 inches (EPA 2004).

Calculation of average concentrations by river section before dredging: Most remedial design data (NOAA 2010) were collected using a systematic grid design. River section average sediment PCB concentrations were calculated as the arithmetic average of surface sediment concentrations (n=8884). For River Sections 2 and 3, most of the cores were collected from fine-grained sediments.

Calculation of estimated post-dredging PCB average concentrations: Cores within the remedial design dredge footprints (GE 2005, GE 2007) were assigned surface sediment Tri+ PCB and total PCB concentrations of 0.25 ppm and 0.5 ppm, respectively, and averages for each river section were re-calculated.

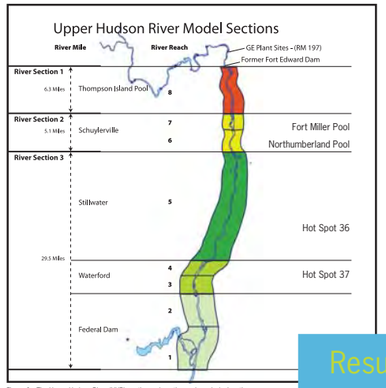

Figure 1. The Upper Hudson River (UHR) section, subsection and reach designations.

Table 1. Target cleanup levels for the Upper Hudson River (EPA 2002).

River Section 1 (Reach 8: Thompson Island Pool):

3 g/m² Tri+ PCBs[1] Mass per unit area (MPA)

10 mg/kg Tri+ PCBs in surface sediment (in top 12 inches)

(~ 25-30 ppm total PCBs)

River Sections 2 & 3 (Reaches 1-7)

10 g/m² Tri+ PCBs MPA

30 mg/kg Tri+ PCBs in surface sediment (~ 60-90 ppm total PCBs)

[1]Tri+ PCBs: sum of trichloro- through decachlorobiphenyl PCBs

Results

Average surface PCB concentrations pre-remediation in RS1 and RS2 are comparable and exceed 100 ppm total PCBs (Figure 2).

The cleanup levels for RS2 and RS3 are three times higher than for RS1 (Table 1). As a result, estimated post-remediation surface PCB concentrations will be greatly reduced in RS1, but not as much in RS2 and RS3 (Figure 3).

Many of the RS2 and RS3 cores with concentrations exceeding the surface criterion for RS1 (10 ppm Tri+ PCB) are within 200 feet of the Phase 2 areas designated for dredging (Figures 4-7).

Using the surface criterion for RS1 throughout the Upper Hudson would result in comparable surface concentrations (Figure 3) and capture efficiencies in all three river sections (Table 2). Applying the surface criterion for RS1in RS2 and RS3 would require dredging approximately an additional 136 acres (Table 3).

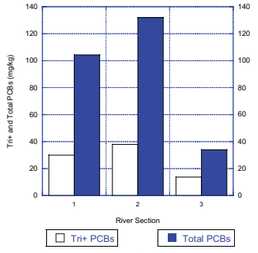

Figure 2. Pre-dredging average Tri+ and Total PCB concentrations (mg/kg) in surface sediment by river section. Target cleanup level for surface is 10 mg/kg Tri+ PCB in River Section 1 and 30 mg/kg Tri+ PCB in River Sections 2 and 3.

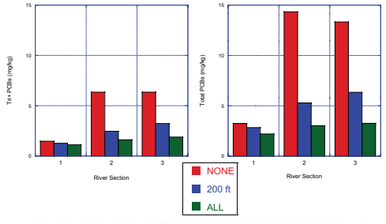

Figure 3. Post-dredging estimated average Tri+ and Total PCB concentrations (mg/kg) in surface sediment by river section under three scenarios: 1) current remedial design; 2) additional removal of cores with surface Tri+ concentration exceeding 10 ppm that are within 200 feet of existing dredge areas; 3) additional removal of all cores with surface Tri+ PCB concentration exceeding 10 ppm.

River Section 2

Figure 4. Map of the Upper Fort Miller Pool (River Section 2, river mile 187.8) showing cores outside of Phase 2 dredge prisms that exceed 10 ppm Tri+ PCB (red circles) and are within 200 feet of dredge prism boundary (red circles with white halo).

Fort Miller Pool (river reach 7) in the vicinity of Thompson Island.

Figure 5. Map of the Northumberland Pool (River Section 2, river mile 184) showing cores outside of Phase 2 dredge prisms that exceed 10 ppm Tri+ PCB (red circles) and are within 200 feet of dredge prism boundary (red circles with white halo).

River Section 3

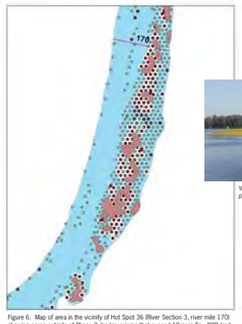

Figure 6. Map of area in the vicinity of Hot Spot 36 (River Section 3, river mile 170) showing cores outside of Phase 2 dredge prisms that exceed 10 ppm Tri+ PCB (red circles) and are within 200 feet of dredge prism boundary (red circles with white halo).

Yellow floating heart, Nymphoides peltata, at Hot Spot 36.

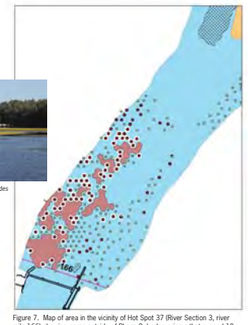

Figure 7. Map of area in the vicinity of Hot Spot 37 (River Section 3, river mile 166) showing cores outside of Phase 2 dredge prisms that exceed 10 ppm Tri+ PCB (red circles) and are within 200 feet of dredge prism boundary (red circles with white halo).

Table 2. Estimated capture efficiency of cores with surface concentrations greater than 10 ppm Tri+ PCBs by River Section based on Phase 1 (GE 2005) and Phase 2 (GE 2007) dredge prisms. Capture efficiency is calculated as the number of cores with surface concentration exceeding 10 ppm Tri+ PCB removed divided by the total number of cores with surface concentration exceeding 10 ppm Tri+ PCB.

	Capture Efficiency of Cores with Surface Tri+ PCBs > 10 ppm	
River Section	Current Dredge Area Delineation	Removal of Additional Cores Within 200 feet
1	0.97	0.99
2	0.64	0.94
3	0.45	0.84

Table 3. Estimated number of acres and post-remedial surface Tri+ PCB concentrations based on additional removal of cores outside of the current Phase 2 dredge prisms exceeding the River Section 1 surface criterion.

River Section	Total Number of Acres Outside Dredge Prisms with Surface Tri+ PCB >10 ppm		Estimated Tri+ PCB (ppm) in Surface Following Additional Removal of Cores with Surface Tri+ PCB >10 ppm		
	Cores within 200 ft of Dredge Prism	All Cores Outside Dredge Prism	Cores within 200 ft of Dredge Prism	All Cores Outside Dredge Prism	No Additional Removal
RS2	37	45	2.5	1.6	6.4
RS3	62	91	3.2	1.9	6.4

Note: Basis for the acreage estimate: one core=1.8 acre from E. Garvey personal communication 2010. Surface PCB concentrations as defined by EPA (2004).

Impacts on Recovery and Restoration

Recovery of the Upper and Lower Hudson River will be delayed longer than anticipated in the 2002 ROD due to elevated PCBs remaining in the surface sediment – equivalent to a series of Superfund-caliber sites being left behind.

The majority of the elevated post-construction sediment concentrations are adjacent to planned dredge areas. This will result in the high likelihood of remediated areas becoming recontaminated.

Appropriate restoration of injured natural resources under the Natural Resource Damage Assessment (NRDA) process, should take place where those resources were most impacted. The magnitude of contamination remaining post - dredging likely will make this infeasible, and restoration projects may need to be located further from the site of injury.

Restoration of the Hudson could be significantly accelerated through additional remediation of highly contaminated surface sediments adjacent to currently delineated dredge areas. Failure to remediate those sediments will eliminate significant opportunities for restoration of natural resources in precisely those locations where it would be most valuable.

References

- EPA. 2002. Record of Decision, Hudson River PCBs Site, New York. U.S. Environmental Protection Agency. February 2002.
- EPA. 2004. Final Decision Regarding General Electric Company's Disputes on Draft Phase 1 Dredge Area Delineation Report and Draft Phase 1 Target Area Identification Report. July 26, 2004, Attachment 2.
- EPA. 2010. "EPA Announces Requirements for Next Phase of Hudson River PCB Cleanup." U.S. Environmental Protection Agency. December 17, 2010.
- Field, J., J. Kern, and L. Rosman. 2009. "Evaluation of Natural Recovery Models for Sediment in the Upper Hudson River." Poster Presentation, Battelle 5th Interntional Conference on Remediation of Contaminated Sediments, February 2009, Jacksonville, FL. http://www.darrp.noaa.gov/northeast/hudson/pdf/Battelle09_Field_NatRecovery_508.pdf
- GE 2005. Phase 1 Intermediate Design Report Hudson River PCBs Superfund Site. Prepared by BBL for General Electric, Albany, New York. August 22, 2005.
- GE 2007. Hudson River PCBs Site Phase 2 Dredge Area Delineation Report, Prepared by Quantitative Environmental Analysis (QEA) for General Electric, Albany, NewYork. December 17, 2007.
- NOAA 2010. Hudson River Database and Mapping Project. http://response.restoration.noaa.gov/querymanager

HUDSON RIVER NATURAL RESOURCE DAMAGE ASSESSMENT (NRDA)

Pre-CAG Meeting, Ft. Edward, NY

June 30, 2011

Tom Brosnan[1], Bob Foley[2]

1. NOAA
2. US Fish and Wildlife Service

Introduction on Trustee Perspectives

- **Superfund –hazardous waste releases**
  - cleanup (EPA, NYSDEC): reduce or eliminate present and future threats to human health and/or the environment
  - restoration (trustees: USFWS, NOAA, NYSDEC): protect and restore injured natural resources; NRDA: past, present and future injuries/lost uses from release and remedy
- **Coordination of cleanup and restoration -broad trustee goals:**
  - Minimize remaining surface contamination, and
  - Maximize amount and quality of reconstructed habitat
- **Why?** Most effective restoration and recovery begins with cleanup and reconstruction of habitats

Today:

Presentations: *analyses and recommendations to GE on improvements to the Phase 2 Remedial Design that could be implemented to reduce ongoing and remedial injury to natural resources and accelerate recovery of the river.*

1. **Unremediated PCBS in the Hudson River: Implications for Recovery and Restoration**
2. **Habitat Replacement and Reconstruction and the Implications for Restoration**
3. **Q&A**

Websites for Additional Information

- http://www.fws.gov/contaminants/restorationplans/HudsonRiver/index.html
- http://www.darrp.noaa.gov/northeast/hudson/admin.html

Trustees Letter to GE on the Phase 2 Design Report

- http://www.darrp.noaa.gov/northeast/hudson/pdf/lettertoGEPhase2design_signed.pdf. June 21, 2011

Poster: Unremediated PCBS in the Hudson River: Implications for Recovery and Restoration . April 2011.

- http://www.darrp.noaa.gov/northeast/hudson/pdf/HUD_DEL_SETAC_2011PCBposter.pdf

Poster: Habitat Replacement and Reconstruction and the Implications for Restoration . April 2011.

- http://www.darrp.noaa.gov/northeast/hudson/pdf/HUD_DEL_SETAC_2011habitatposter.pdf.

Websites (cont.)

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Trustees Letter to General Electric regarding Intermediate Design Report, November 7, 2005.

http://www.darrp.noaa.gov/northeast/hudson/pdf/letter_GE_November_2005.pdf

UNREMEDIATED PCBS IN THE HUDSON RIVER: IMPLICATIONS FOR RECOVERY AND RESTORATION

Jay Field[1], Lisa Rosman[1], Tom Brosnan[1], Bob Foley[2]

1. NOAA/OR&R/Assessment and Restoration Division
2. US Fish and Wildlife Service

Unremediated PCBs: Summary

- Phase 2 remediation requires GE to remove at least 95% of PCBs from the areas designated for dredging.
- Pre-dredging PCB concentrations in the Upper Hudson River are much higher than the levels predicted by the EPA's models.
- Post-dredging, high levels of PCBs will remain in the surface in areas *not* designated for dredging, especially in River Section 2 and 3 ---these are unremediated PCBs.
- Most of the unremediated PCBs are found in close proximity (within 200 ft) of existing dredge area boundaries
- Unremediated PCBs are likely to negatively impact the recovery and restoration of the river.

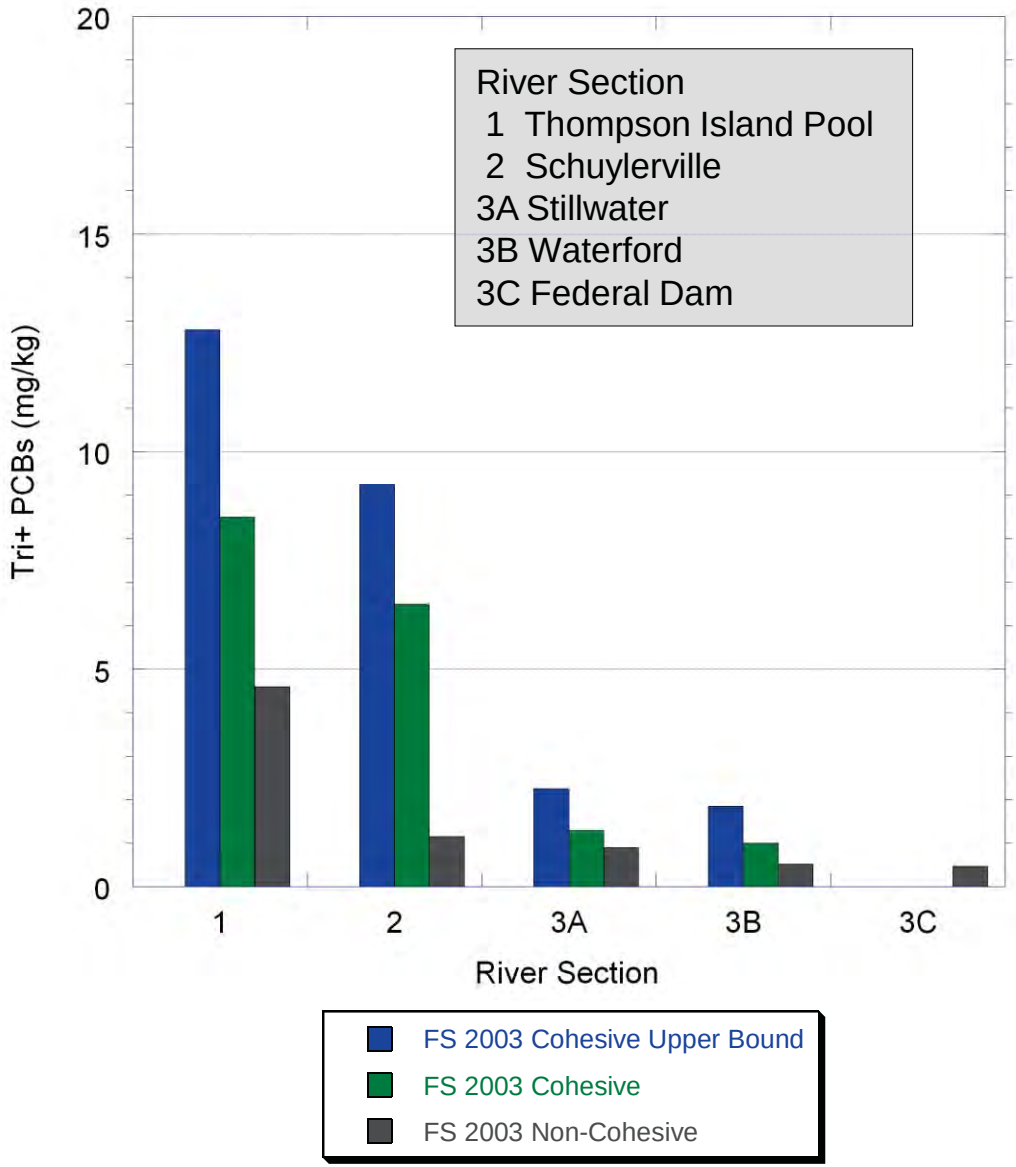
Key Questions

- Model Predictions: How do PCB concentrations in the surface compare with the PCB concentrations predicted by a model? (both before and after dredging)
- Extent of Unremediated PCBs: What are the expected PCB concentrations in the surface sediment outside areas designated for dredging?
- Impacts of Unremediated PCBs: What are the potential impacts of these high levels of unremediated PCBs in surface sediment on the recovery and restoration of the river?

Model Predictions: Pre-Dredging Surface Sediment Concentrations

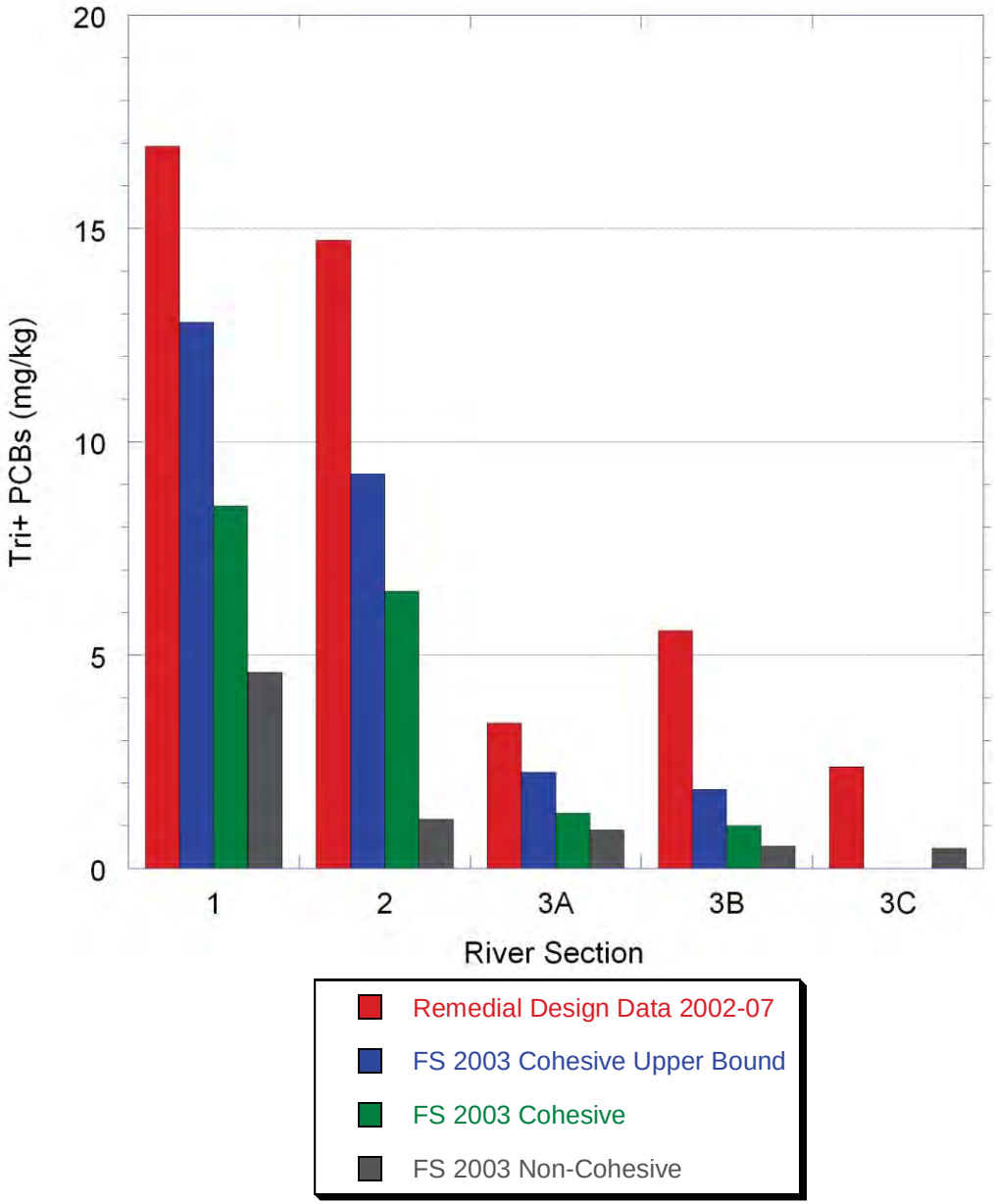
- EPA (and GE) used models to predict the PCB concentrations in the surface sediment at the time of dredging (dredging was expected to begin in 2003) and after dredging was completed.
- Between 2002 and 2007, GE collected about 9000 sediment cores to define areas that needed to be dredged according to the selected remedial alternative in the ROD.

Model Predictions for 2003 Average Surface Tri+ PCBs by River Section (top 5 cm)



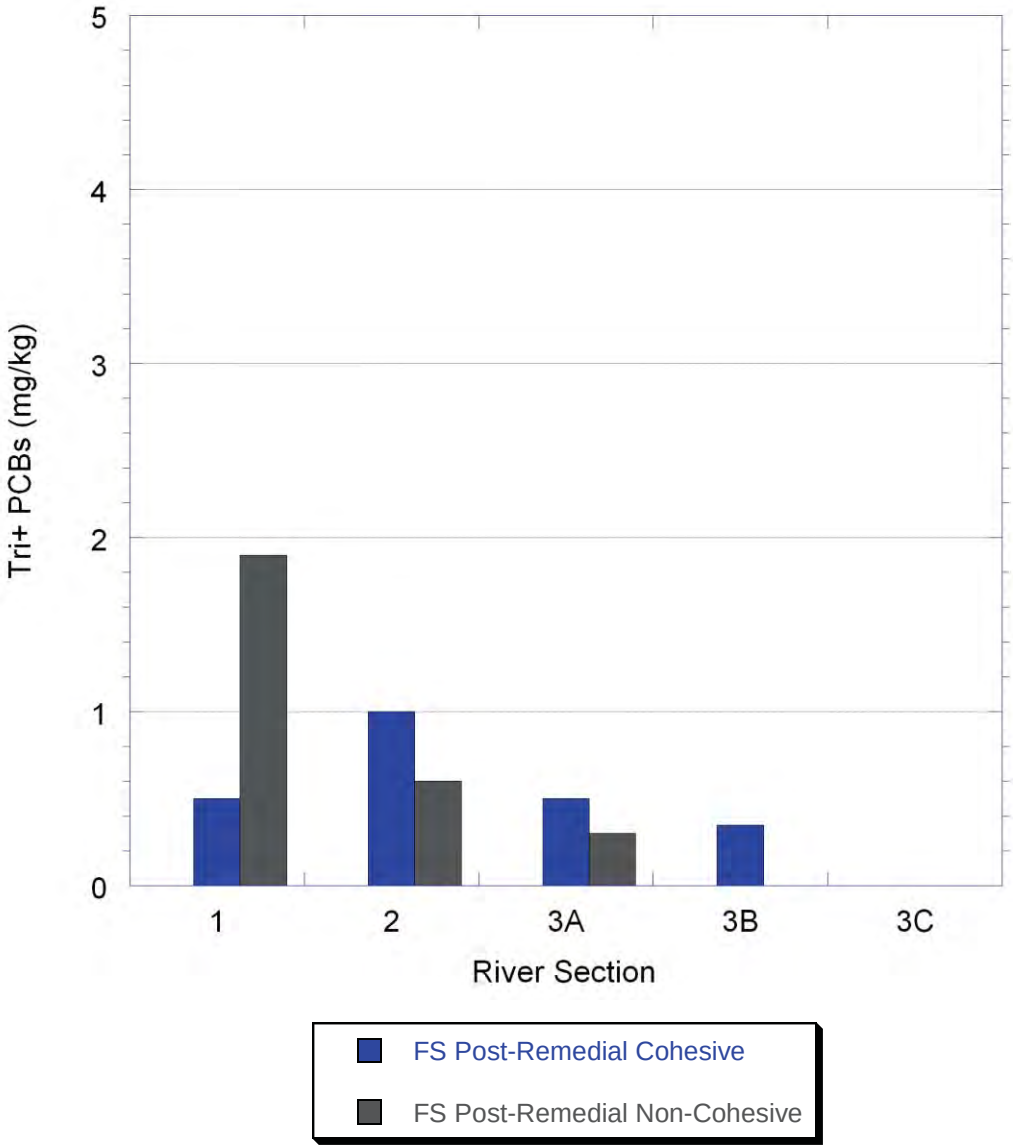
- Models evaluated cohesive (fine-grained) and non-cohesive sediments.
- Model predictions of Tri+ PCB concentrations in the surface by river section and sediment type before the start of dredging.
- Samples collected to define dredge areas in River Sections 2 and 3 targeted fine-grained sediment (cohesive sediment).

Comparison of Average Tri+ PCBs by River Section from Remedial Design with Model Predictions for 2003 Surface (top 5 cm)



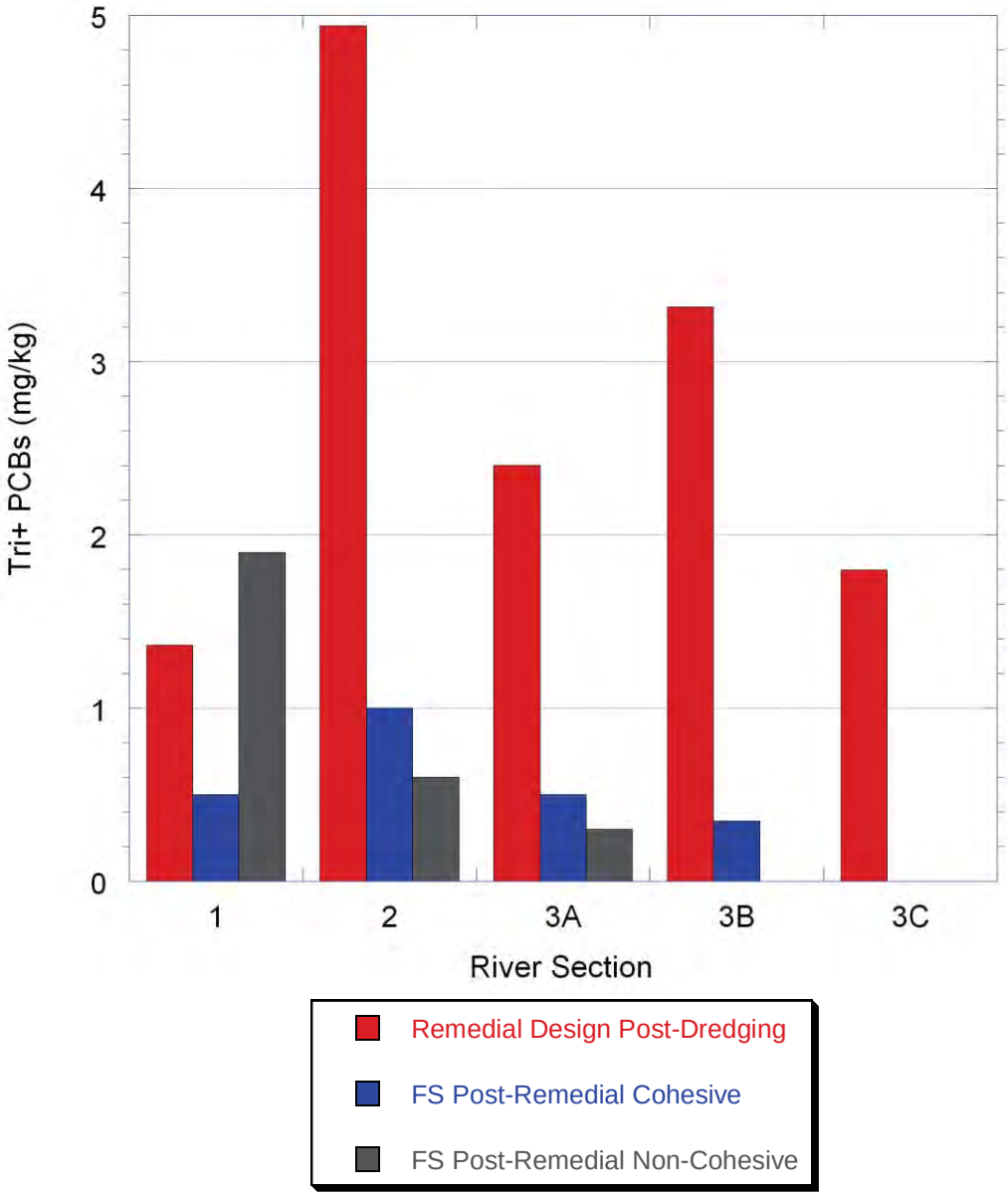
- Natural recovery models greatly overestimated the rate of recovery.
- Remedial Design Tri+ PCB concentrations from the top 5 cm (red bars) exceeded the upper bound of model predictions (blue bars) and were more than 2X the concentration predicted for cohesive sediments in all 3 river sections (green bars).
- Widespread burial of PCBs in the surface sediment was not observed.

Estimated Post-Dredging Surface Concentrations from Model Predictions



- The Record of Decision expected that the selected alternative would result in average Tri+ PCB concentrations in the upper 5 cm in cohesive sediments less than 1 ppm throughout the Upper Hudson.

Estimated Post-Dredging Surface Concentrations Compared to Remedy Expectations



- River Section 1: Estimated post-dredging Tri+ PCB concentrations from Remedial Design data for the top 5 cm (red bars) are comparable to model predictions
- River Sections 2 and 3: Post-dredging concentrations are estimated to be about 5X higher than model predictions

Unremediated PCBs: Surface

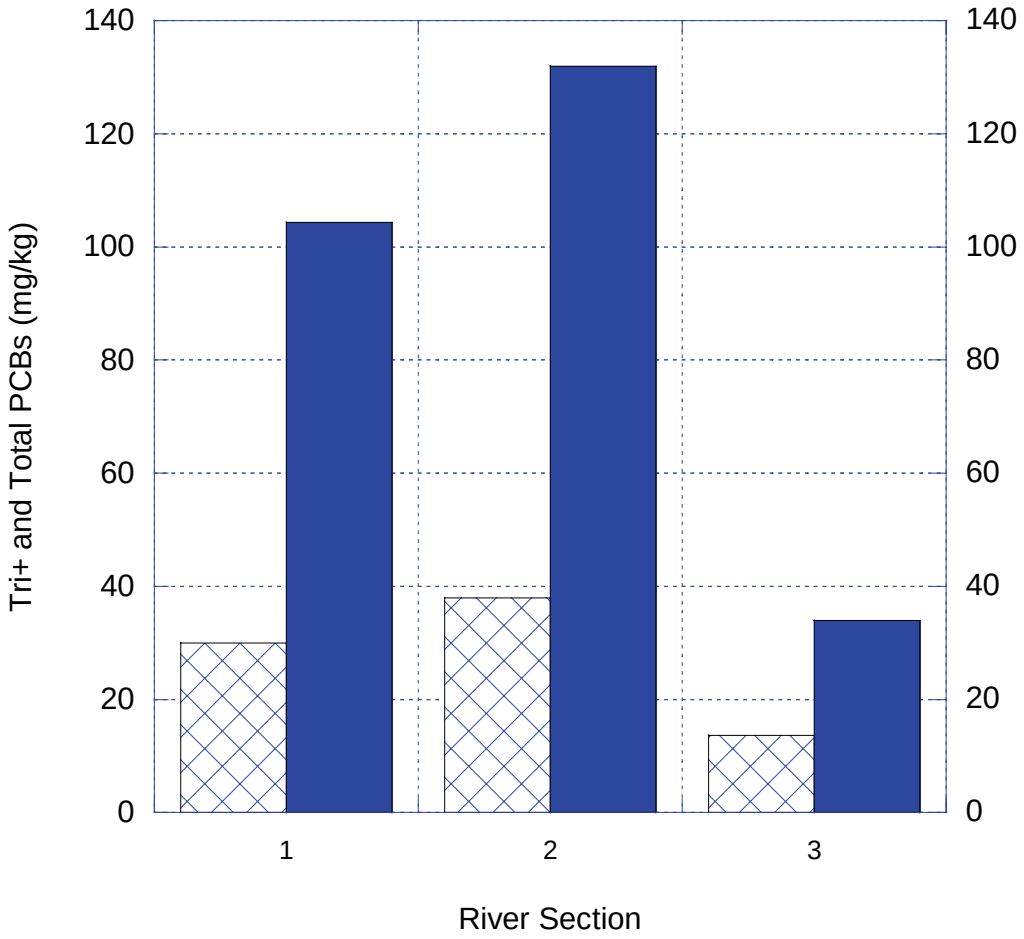
- "Surface" for the purposes of the target cleanup triggers is defined by EPA as the concentration of the PCBs in the top 12 inches of sediment

Target Cleanup Triggers

- River Section 1 (Thompson Island Pool):
  - 3 g/m^2 Tri+ PCBs Mass per unit area (MPA)
  - **10 mg/kg Tri+ PCBs in surface sediment** (in top 12 inches) (~ 25-30 ppm total PCBs)
- River Sections 2 & 3
  - 10 g/m^2 Tri+ PCBs MPA
  - **30 mg/kg Tri+ PCBs in surface sediment**

    (~ 60-90 ppm total PCBs)

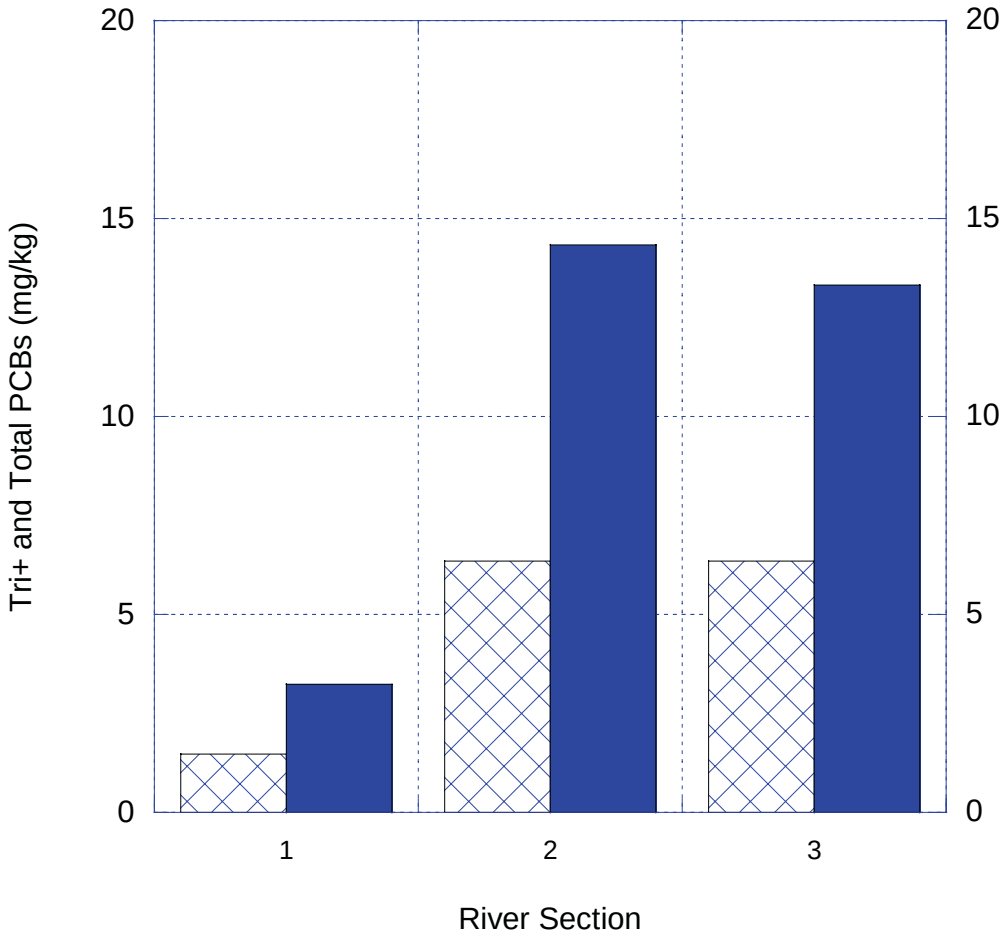
Pre-Dredging Surface PCBs



Prior to dredging:

- Average PCB concentrations in the surface (top 12 inches) in River Sections 1 and 2 exceed 100 ppm total PCBs (solid blue bars) and 30 ppm Tri+ PCBs (hatched blue bars).

Estimated Post-Dredging Surface PCBs



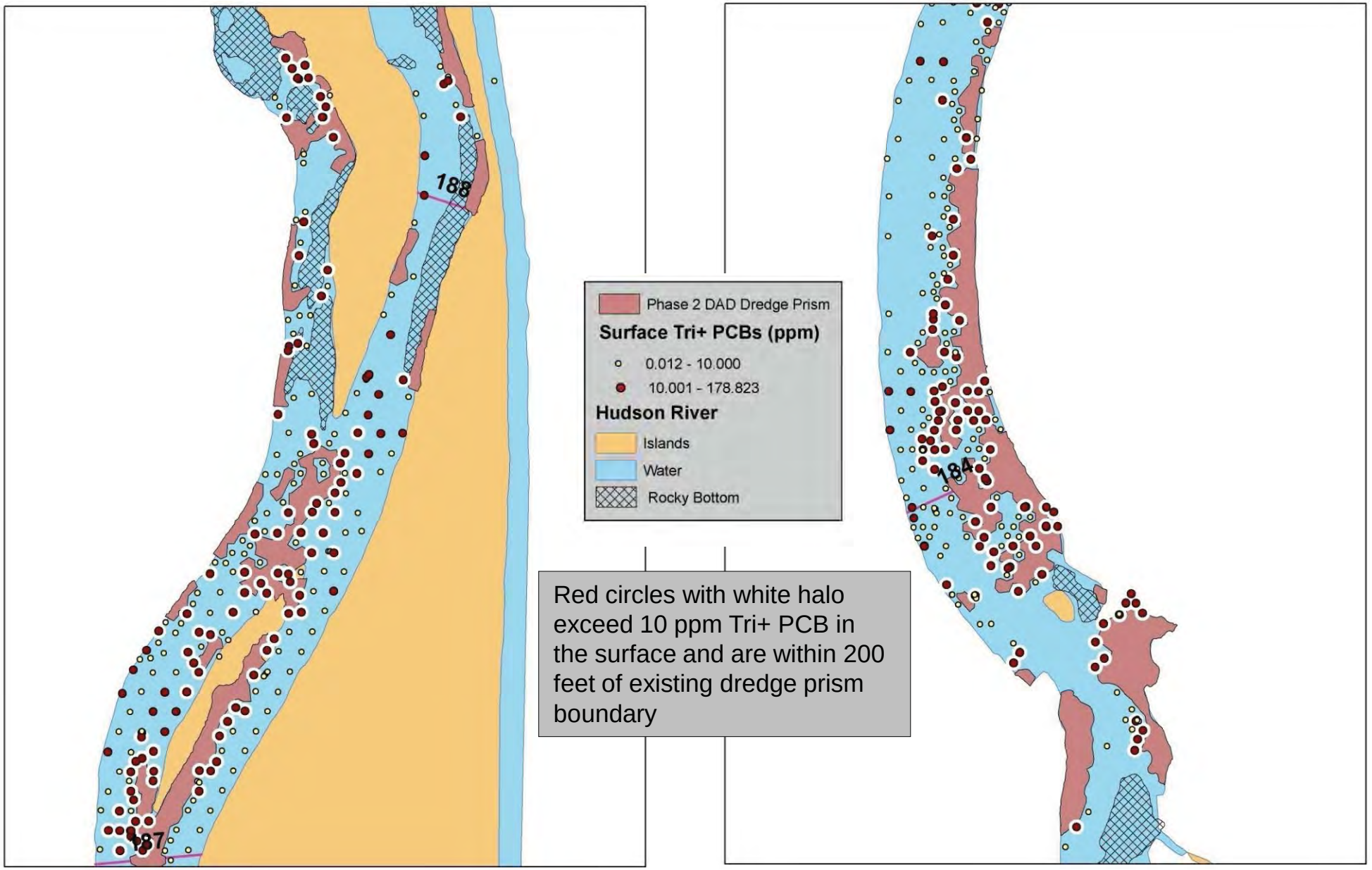
Post-dredging:

- Surface PCB concentration in River Section 1 will be greatly reduced.
- Surface PCB concentration in River Sections 2 and 3, though reduced, will remain highly elevated

River Section 2

Upper Fort Miller Pool

Northumberland Pool

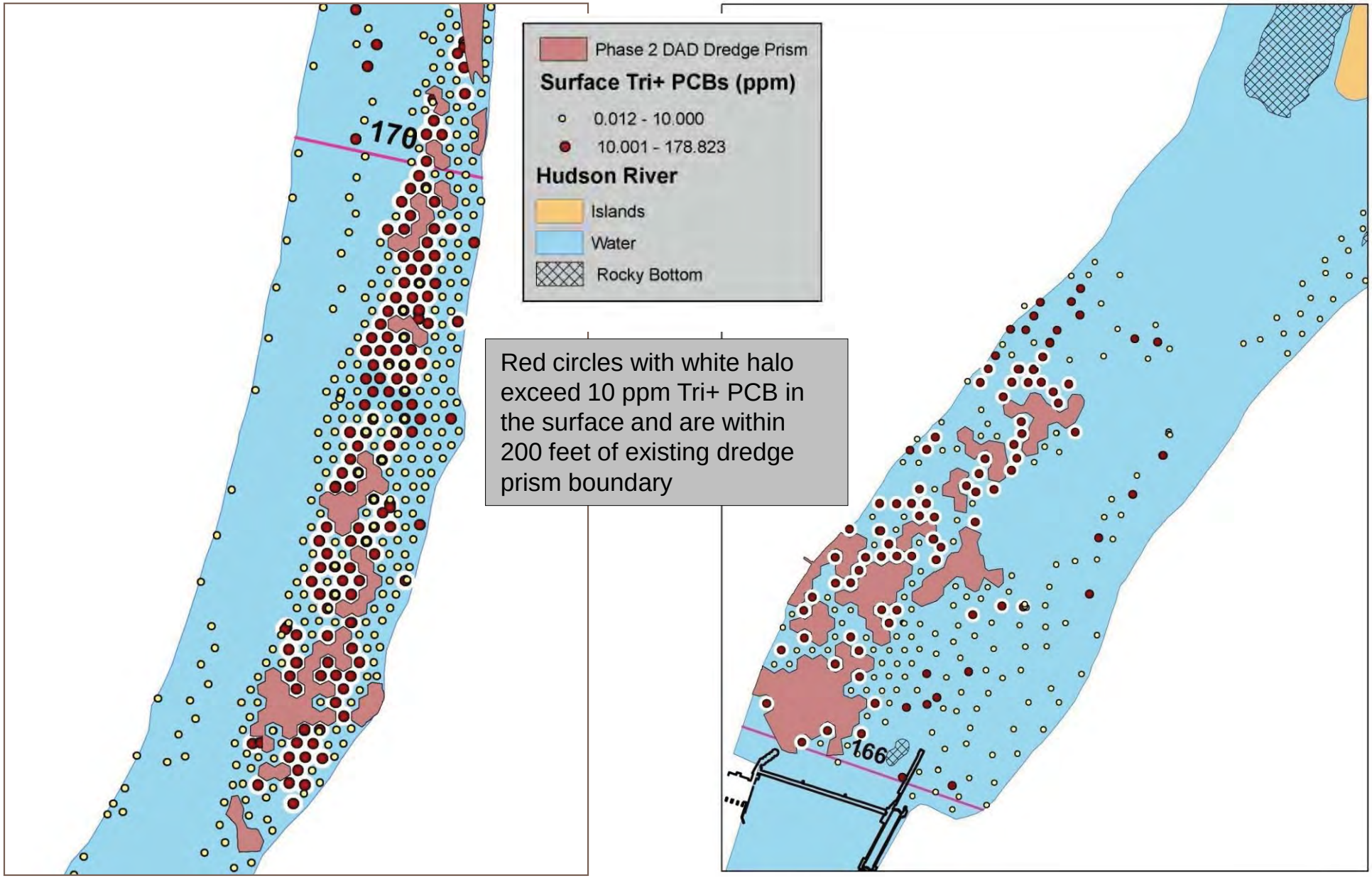


Red circles with white halo exceed 10 ppm Tri+ PCB in the surface and are within 200 feet of existing dredge prism boundary

River Section 3

Hot Spot 36

Hot Spot 37



Red circles with white halo exceed 10 ppm Tri+ PCB in the surface and are within 200 feet of existing dredge prism boundary

Weed Bed at Hot Spot 36

Estimated number of additional acres and post-remedial surface Tri+ PCB concentrations

Table shows the estimated **number of acres** and post-remedial surface Tri+ **PCB concentrations** based on additional removal of cores outside of the current Phase 2 dredge prisms exceeding the River Section 1 surface criterion.

River Section	Total Number of Acres Outside Dredge Prisms with Surface Tri+ PCB >10 ppm		Estimated Tri+ PCB (ppm) in Surface Following Additional Removal of Cores with Surface Tri+ PCB >10 ppm		
	Cores within 200 ft of Dredge Prism	All Cores Outside Dredge Prism	Cores within 200 ft of Dredge Prism	All Cores Outside Dredge Prism	No Additional Removal
RS2	37 acres	45 acres	2.5 ppm	1.6 ppm	6.4 ppm
RS3	62 acres	91 acres	3.2 ppm	1.9 ppm	6.4 ppm
Total	99 acres	136 acres			

Note: Basis for the acreage estimate: one core=1/8 acre from E. Garvey personal communication 2010. Surface PCB concentrations as defined by EPA (2004).

Model Predictions of Natural Recovery: Pre- and Post-Dredging Surface Sediment Concentrations (top 5 cm)

- Pre-dredging sediment concentrations exceeded the upper bound of model predictions and were more than two times higher the mean concentration predicted for cohesive sediments in all 3 sections of the Upper River.
- In River Section 1, the estimated post-dredging surface concentration of PCBs is consistent with model predictions
- In River Sections 2 and 3, estimated post-dredging surface concentrations of PCBs are **five times higher** than the expected concentrations based on model predictions.

Unremediated PCBs

- Average surface PCB concentrations pre-remediation in River Sections 1 and 2 are comparable and exceed 100 ppm total PCBs.
- Surface cleanup trigger for River Sections 2 and 3 is three times higher than for River Section 1. Consequently, estimated post-remediation surface PCB concentrations will be greatly reduced in River Section 1, but not nearly to the same degree in River Sections 2 and 3.
- High percentage of cores outside of dredge areas with surface concentrations exceeding 10 ppm Tri+ in River Sections 2 and 3 are in close proximity (within 200 feet) to the areas designated for dredging.

Concerns about Unremediated PCBs

- PCB hot spots will be only partially remediated in River Sections 2 and 3
- Highly contaminated areas will remain adjacent to dredged areas post-remedy.
- Many of these areas are located in shallow (<10 ft) water, making the adjacent non-dredged areas vulnerable to disturbance and resuspension.
- Recontamination of remediated areas is likely.

Potential Impacts on Recovery

- Highly elevated PCB concentrations will remain in the surface following remediation, with average surface concentrations 5X higher in River Sections 2 and 3 than anticipated in the ROD.
- Recovery of the Upper and Lower Hudson River is likely to take much longer than anticipated by the 2002 ROD.

Potential Impacts on Restoration

- The magnitude of contamination remaining post-dredging may limit the type and amount of in-river restoration options in the Upper Hudson, where it would be most valuable.
- In-river restoration projects may need to be located further from the areas of greatest remaining contamination.
- Recovery of the Hudson could be significantly accelerated through additional removal of highly contaminated surface sediments adjacent to currently delineated dredge areas. This would also provide the trustees with additional opportunities for restoration in the Upper Hudson.

Websites for Additional Information

- http://www.fws.gov/contaminants/restorationplans/HudsonRiver/index.html
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http://www.darrp.noaa.gov/northeast/hudson/pdf/letter_GE_November_2005.pdf

HUDSON RIVER REMEDY PART II:

Habitat Replacement and Reconstruction and the Implications for Restoration

Lisa Rosman[1], Carl Alderson[2], Bob Foley[3], Tom Brosnan[4]

1.NOAA/OR&R/Assessment and Restoration Division

2.NOAA/Restoration Center

3.US Fish and Wildlife Service

4.NOAA/OR&R/Assessment and Restoration Division

Outline

- **Brief Status of the Hudson River Remedy**
- **Habitat Replacement/Reconstruction Program**
- **Habitat Quality Issues**
- **Recommended Components of a High Quality Habitat Design**
- **Summary**

Status of the Remedy: Phase 2

- EPA and GE agreed on a remedy that includes river bottom dredging and a habitat replacement and reconstruction program.
- Phase 1 of the remediation was conducted in River Section 1 in 2009. The habitat replacement and reconstruction program for Phase 1 focused on four habitat types.
- Phase 2 comprises the rest of the dredge areas, including completion of River Section 1, beginning in Spring 2011, and similarly includes a habitat replacement and reconstruction component for four habitat types.

Habitat Replacement and Reconstruction Program

- The Habitat Replacement and Reconstruction program was designed to partially replace the habitat destroyed by remediation.
- Primary goal: replace the functions and characteristics of impacted habitats so that they return to the range of functions and characteristics found in similar areas of the river not impacted by dredging.
- The Trustees have identified improvements to this program that will reduce the time to recovery of the Hudson River ecosystem.

Unconsolidated River Bottom (UCB)

- UCB Defined as Unvegetated River Bottom
- One of Two Backfill Types Placed in Dredged UCB
  - Type 1: Medium Sand
  - Type 2: Coarse Sand/Gravel
- Examples of Ecosystem Services
  - Habitat for plants, invertebrates, fish and wildlife
  - Sediment for replenishing floodplains

Aquatic Vegetation Beds (SAV)

Wild celery, *Vallisneria americana*

White water lily, *Nymphaea odorata* (foreground)

- SAV Defined as Vegetated (Submerged or Floating Plants) River Bottom;
- Numerous SAV Present but Dominated by Wild Celery
- Two Methods for Re-establishment
  - Active: Planting 2 submerged &1 floating spp.
  - Passive: Natural recolonization
- Examples of Ecosystem Services
  - Sediment stability
  - Nutrient and organic cycling
  - Provision of habitat for invertebrates, fish and wildlife

Riverine Fringing Wetlands (RFW)

- RFW Defined as Emergent Vegetation;
- Numerous RFW species present
- Method for Re-establishment
  - Zone A: Seeding
  - Zone B: Planting
- Examples of Ecosystem Services
  - Sediment stability
  - Energy Dissipation
  - Nutrient and organic cycling
  - Provision of habitat for invertebrates, fish and wildlife

Shoreline (SHO)

- SHO Defined as Banks above 5000 CFS;
- Methods for Stabilizing
  - Backfill (soft)
  - Biologs (Phase 1 only, soft)
  - Angular stone (hard)
- Method for Re-Vegetating
  - Plantings using Live Stakes
  - Lawn or Herbaceous Seed Mix
- Examples of Ecosystem Services
  - Shoreline stability
  - Shade and cover
  - Nutrient and organic cycling
  - Provision of habitat for invertebrates, fish (when inundated) and wildlife

Woody debris provides habitat and dissipates energy

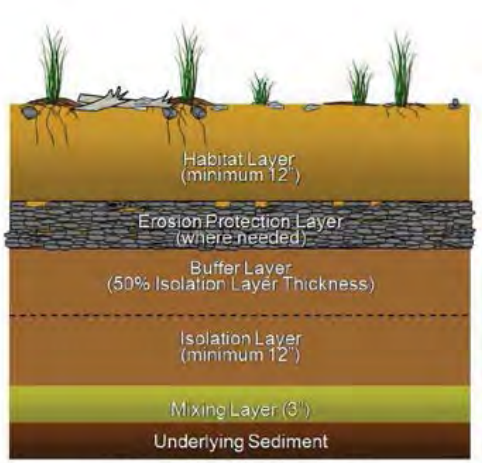
Examples of Habitat Quality Issues

- Potential for Recontamination of Remediated Sediments and Continued PCB Exposure
- Steep (≥3:1) and Unstable Slopes
- Hardened Shorelines and River Bottom

- Delayed and Prolonged Recovery of Freshwater Mussels
- Reduced Bottom Habitat Available for Recolonization of Aquatic Vegetation Bed
- Lower Diversity of Plant Community
- Poorer Quality Breeding, Nursery, Foraging, and Sheltering Habitat
- All the Above Result in the Loss of Habitat Complexity, Function, Resiliency, and Sustainability

Recommended Components of a High Quality Habitat Design

1. Greater PCB removal in the Upper Hudson River
2. More than 1:1 replacement and reconstruction of SAV, RFW, and SHO habitat
3. Provision of sufficient backfill quantity and quality for optimal re-establishment of all disturbed SAV beds
4. Backfill tolerances should be more suitable for habitat reconstruction (RFW: $\pm$0.1 ft, SAV: -0.25 ft to +1ft)
5. More gradual river bottom slopes ($\leq$10:1) for re-establishment of SAV, RFW, sediment stability, low resuspension of sediments
6. Habitat layer on top of all caps to support emergent and aquatic plants, nesting fish, burrowing invertebrates and wildlife

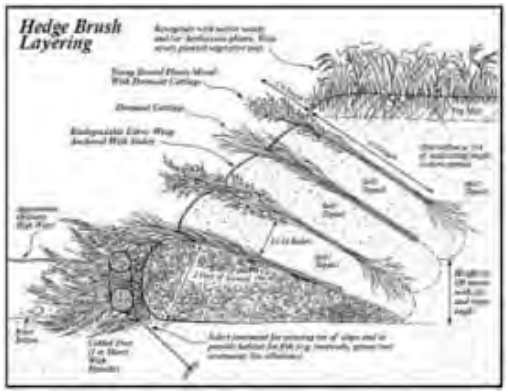


General Schematic of Cap

Source: NYSDEC 2010

Recommended Components of a High Quality Habitat Design

7. Revegetate from locally collected stock (EPA Eco Level III Region 59 Hudson River sub-region)



8. Replacement of plant species diversity and structure

9. Reconstruction and seeding of dredged freshwater mussel beds lost during remediation.

10. Place stronger emphasis on reconstructing natural soft shorelines.

11. Improve the outcome and function of ecosystem and habitats monitoring and using models in an adaptive management strategy.

12. Use performance-based criteria that define the successful recovery of function, sustainability, and resilience of reconstructed habitats

Implications of the Habitat Replacement and Reconstruction on Recovery of the River

- The Trustee's starting point is a robust PCB clean up and a high quality design for habitat replacement and reconstruction. These should be the first stage in recovering all habitats in the Hudson River.

- The quality of the reconstructed four habitat types impacted by remedial activities is of great importance to the Trustees.

- Further reductions in PCBs in sediments, and improvements to both the habitat components of the remedial design and the adaptive management plan could accelerate the recovery of the Hudson River.

- These changes could also reduce short- and long-term residual and remedial injury to natural resources (Brosnan and Foley 2011).

QUESTIONS?

For More Information

Poster: Habitat Replacement and Reconstruction and the Implications for Restoration

http://www.darrp.noaa.gov/northeast/hudson/pdf/HUD_DEL_SETAC_2011PCBposter.pdf

Poster: Unremediated PCBS in the Hudson River: Implications for Recovery and Restoration . April 2011.

http://www.darrp.noaa.gov/northeast/hudson/pdf/HUD_DEL_SETAC_2011PCBposter.pdf

U.S. Fish and Wildlife Service

Contact: Kathryn Jahn (607) 753-9334 Kathryn_Jahn@fws.gov

Website: http://www.fws.gov/contaminants/restorationplans/HudsonRiver/index.html

NOAA

Contact: Lisa Rosman (212) 637-3259 lisa.rosman@noaa.gov

Website: http://www.darrp.noaa.gov/northeast/hudson/admin.html

For Press Inquiries:

U.S. Fish and Wildlife Service

Contact: Meagan Racey (413) 253-8558

meagan_racey@fws.gov

http://www.fws.gov/contaminants/restorationplans/HudsonRiver/index.html

NOAA

Contact: Ben Sherman (301)-713-3066 x178

Ben.sherman@noaa.gov

Website: http://www.darrp.noaa.gov/northeast/hudson/admin.html