UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2

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SUBJECT: Responses to National Remedy Review Board and Contaminated Sediments Technical Advisory Group Recommendations for the Gowanus Canal Superfund Site, Brooklyn, New York

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TO: Amy R. Legare, Chair
National Remedy Review Board

and

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Contaminated Sediments Technical Advisory Group

The Environmental Protection Agency's (EPA's) National Remedy Review Board (NRRB) and Contaminated Sediments Technical Advisory Group (CSTAG) (the "Boards") provided advisory recommendations to EPA Region 2 (the "Region") related to the proposed remedy for the Gowanus Canal Superfund site, located in Brooklyn, New York, in a memorandum dated November 28, 2012.

The Region greatly appreciates the Boards' thorough review and thoughtful comments on the proposed remedial action for the site, which was discussed during the Boards' June 20-21, 2012 meeting.

Responses to the recommendations are provided below. Many of the Boards' recommendations have been incorporated into the December 2012 Feasibility Study Report Addendum (FS Report Addendum) and Proposed Plan. Our specific responses to the Boards' advisory recommendations are provided below. For convenience purposes, each recommendation is presented in the order identified in your memorandum, followed by our response.

Site Characterization

Recommendation #1:

The package provided by the Region to the Boards indicates that current background values are based on samples taken within the Gowanus Bay and Upper New York Bay. The Boards note that the open waters of the Gowanus Bay and Upper New York Bay are substantially different environments from the canal, which is a narrow, man-made waterway. The area surrounding the Gowanus Canal is heavily urbanized with a mixture of residential, commercial and light

industrial land uses. Therefore, it is expected that polycyclic aromatic hydrocarbon (PAH) concentrations in the canal—even without the former manufactured gas plant (MGP) and combined sewer overflow (CSO) contributions—would be higher than the heavily flushed bay areas directly connected to the open ocean. The Boards recommend that the Region explain the basis for the selection of bay area background values and their applicability to the Gowanus Canal environment as compared to determining values that reflect anthropogenic background PAH concentrations endemic to the Gowanus Canal.

Response #1:

The term "background" refers to chemical concentrations (or locations) that are not influenced by contamination from a specific Superfund site. EPA guidance (2002) states the following:

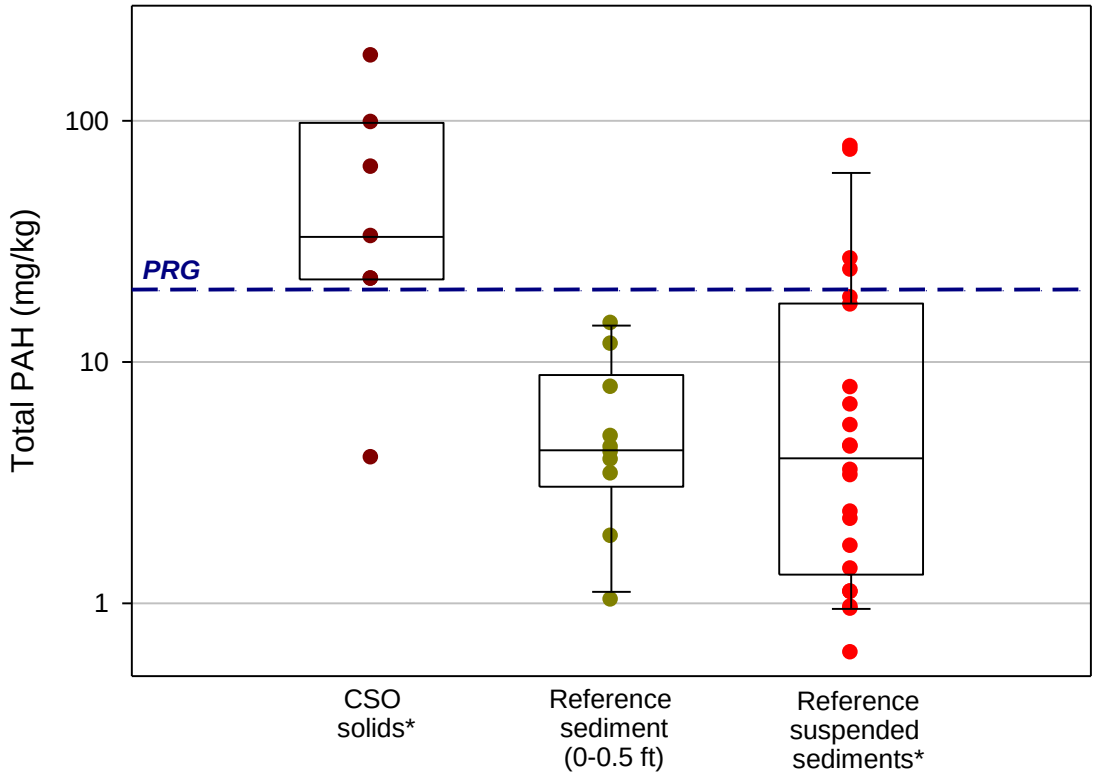
> A background reference area is the area where background samples will be collected for comparison with the samples collected on the site. A background reference area should have the same physical, chemical, geological, and biological characteristics as the site being investigated, but has not been affected by activities on the site... [T]he ideal background reference area would have the same distribution of concentrations of the chemicals of concern as those which would be expected on the site if the site had never been impacted. In most situations, this ideal reference area does not exist.

A background area for the Gowanus Canal ideally would be located upgradient of the reaches affected by contaminant releases to the canal. This, however, was not possible because the entire canal is contaminated. Other nearby water bodies with similar characteristics that were known to be unaffected by point sources of contamination could not be identified. Therefore, reference locations in Gowanus Bay and Upper New York Bay were selected for consideration in the ecological risk assessment and the human health risk assessment (HHRA). The reference locations were positioned on an approximate grid with increased spacing with increasing distance from the mouth of the canal to characterize gradients in contaminant concentrations and biological effects, if present. Although Gowanus Bay and Upper New York Bay are more open than the Gowanus Canal, the sediments in this area provide the best available representation of regional background conditions excluding point source releases and surface runoff to the canal. Previous studies have shown that for the entire New York/New Jersey harbor system, total PAH concentrations in the sediment ranged from 0.7 mg/kg to 22.1 mg/kg (EPA, 1998).

The sediment remedy for the Gowanus Canal will result in a "clean" surface on the canal bottom. If the PAH contributions from the former MGPs and CSOs were completely eliminated, then the sediment-associated PAHs deposited on this clean surface would be derived primarily from suspended sediments delivered to the canal from Upper New York Bay via tides and the Flushing Tunnel, storm sewers, and direct runoff to the canal. However, only 2 percent of the Gowanus Canal watershed is drained by storm sewers and 6 percent is drained by direct runoff. Therefore, in this case, it is estimated that the average PAH concentration in newly deposited canal sediments would be similar to the regional background range.

CSO discharges to the canal will not be entirely eliminated as part of the sediment remedy. The anthropogenic background level of PAHs in surface sediment after the proposed sediment remedy is implemented will depend on the level of CSO reductions. The goal is to reduce the contribution of CSO solids so that the average total PAH concentration in Gowanus Canal surface sediments after remediation does not exceed the preliminary remediation goal (PRG) of 20 milligrams per kilogram (mg/kg).

The surface sediment data for the reference area samples have been used to represent regional background conditions in Upper New York Bay. Figure 1, below, summarizes total PAH[1]



*Estimated using whole water sample data assuming that all PAHs are adsorbed to the particulate phase. CSO samples are from the four major outfalls that account for 95 percent of the annual discharge.
The boxes show the 25th, 50th, and 75th percentiles, and the whiskers show the 10th and 90th percentiles. Whiskers are not shown if n<9.

Figure 1: Total PAH Concentrations in Reference Area Samples and CSO Solids

concentrations in the reference area surface sediment samples, estimated concentrations on suspended sediments in reference area surface water samples, and estimated concentrations on CSO solids from the four outfalls that account for 95 percent of the annual discharge. The median total PAH concentrations in reference area surface sediments and suspended sediments

[1] Sum of 17 detected PAHs.

are similar and are an order of magnitude lower than the median concentration in CSO solids. The PRG of 20 mg/kg falls at the upper end of the range of reference area concentrations. This PRG should be attained if sufficient CSO reductions are achieved. These issues are addressed in more detail in the FS Report Addendum.

It should also be noted that every watershed is different and site-specific data are not available to predict post-remedy PAH concentrations with any certainty. While Stout *et al.* (2004) suggests that 20 mg/kg is a value above which other point source contamination may be suspected (based on analysis of nine urban waterways), these waterways are not necessarily comparable to the Gowanus Canal.

Recommendation #2:

The Boards recommend that the Region provide additional information supporting its finding that contaminant releases from surface water runoff and groundwater discharge, including laterally through porous bulkheads, are not a significant contribution to risk. With regard to groundwater, the Boards also recommend that the Region explain in its decision documents how the approach is consistent with OSWER Directive 9283.1-33, June 2009, *Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration* (*e.g.,* that the cleanup approach does not rely on dilution or dispersion of contaminated groundwater daylighting into the canal).

Response #2:

Surface water runoff and groundwater discharge were identified as contaminant transport pathways in the conceptual site model for the canal. Surface water runoff was identified as a relatively minor source compared to other sources, because direct runoff drains only 6 percent of the watershed surrounding the canal. No exposure pathway to groundwater exists other than discharge to the canal (*i.e.,* there is no beneficial use of groundwater).[2] The potential risk from contaminated groundwater discharges to the canal was evaluated by calculating PAH Toxic Units (TUs) for each groundwater sample collected during the Remedial Investigation (RI). The TUs, which are based on the protection of benthic organisms, were used to identify and prioritize areas with the potential for contaminated groundwater discharge to recontaminate canal sediments following a remedial action.

In addition to the three former MGPs, 16 upland sites were found to have the potential to discharge contaminated groundwater to the canal. All but one of these sites, the former 1st Street Basin, have been referred to the New York State Department of Environmental Conservation (NYSDEC) for investigation and remediation under the State Superfund, Brownfields or Spills programs.

[2] The canal is located within the area designated for the Brooklyn Queens Sole Source Aquifer. Groundwater is not, however, used as a potable water supply in this part of Brooklyn.

The proposed cleanup approach for the Gowanus Canal is consistent with OSWER Directive 9283.1-33, June 2009, *Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration,* because it does not rely on dilution or dispersion of contaminated groundwater discharging into the canal. The criteria in the OSWER Directive that "groundwater should not be allowed to migrate and further contaminate the aquifer or other media" has been met by identifying the groundwater discharges that should be addressed under the State Superfund program. Additionally, in-situ stabilization (ISS) and the active layer in the sediment cap that are proposed for the canal would be designed to adsorb contaminants in upwelling groundwater prior to discharge to the canal.

The Region is undertaking additional studies to determine and manage, through stabilization and capping, the effects of contaminant leaching from native sediments to upwelling groundwater that discharges to the canal. These studies include testing native sediment samples using EPA Pre-Method 1314, *Liquid Solid Partitioning as a Function of Liquid Solid Ratio Using an Up Flow Percolation Column Procedure*. The results of these tests will be used to estimate the cumulative mass expected to leach as a function of the liquid-solid ratio moving through the native sediment.

Potential contaminant contributions through porous bulkheads will be addressed as part of the upland site investigations.

Recommendation #3:

During the presentations to the Boards, the potential for recontamination was discussed. The Boards recommend that the Region: 1) develop short- and long-term monitoring endpoints to assess such potential recontamination before remedy selection to ensure that proper baseline information is collected prior to remedy implementation, and 2) if recontamination occurs, assign appropriate responsibility to mitigate the source.

Response #3:

The Region is in the process of developing performance standards that will be used to assess remedy effectiveness and identify recontamination pathways. PRGs for protection of the ecological community and performance standards for the post-remedy clean surface are summarized in Table 8 of the Proposed Plan. The PRGs will also be used as performance standards for the post-remedy clean surface. Draft performance standards are presented in the FS Report Addendum section entitled *Supplemental Evaluation to Support Remedy Selection and Performance Assessment*. Performance standards for assessing the effectiveness of non-aqueous phase liquid (NAPL) mitigation measures will be developed based on the results of NAPL mobility testing. These performance standards will be included in the short- and long-term monitoring program. Baseline monitoring data will be collected prior to remedy implementation.

Recommendation #4:

One of CSTAG's earlier recommendations was that additional data be collected to improve the understanding of sediment and contaminant transport in the Gowanus Canal and to estimate the mass balance of sediments and contaminants at the site. Additional data can be used to: 1) more accurately estimate the burial rate of contaminated sediments in the canal by clean sediments transported into the canal from Gowanus Bay, including during flood tides; and 2) calculate the solid and contaminant loadings to the canal from the CSOs. The Boards also believe that additional data would better inform the remedial design for the site. These data should provide better quantification of the sources (specifically from the CSOs, the Flushing Tunnel and the bay) and help characterize the contaminant levels associated with the solids that deposit in proximity to the CSOs on which benthic feeding organisms will be exposed. The Boards recommend that the Region proceed with this data collection.

Response #4:

The Region did a qualitative estimate of the relative mass balance using multiple lines of evidence in the *Impact of Combined Sewer Overflows on Gowanus Canal Sediments, Gowanus Canal, Brooklyn New York*, which can be found in the FS Report Addendum. In November 2012, National Grid submitted technical memoranda independently corroborating the inaccuracy of the New York City Department of Environmental Protection's (NYCDEP's) position on relative mass balance. National Grid has also submitted to the Region its December 2011 Groundwater Model Report, October 2012 Hydrodynamic and Sediment Transport Modeling Report and December 2012 Vessel Impacts Study Report. In addition, National Grid submitted additional sediment sampling data in its Summer 2011 Data Summary Report, dated July 2012. National Grid and NYCDEP are also in the process of collecting additional wet weather CSO sample data. The Region will review and consider the results of the additional sampling and modeling, as appropriate, to inform and refine issues relating to mass balance as the remedial design proceeds.

The Region believes that further refinement of the sediment and contaminant mass balance beyond the steps noted above is not feasible or beneficial until later in the process for a number of reasons. The Canal is subject to a constantly changing variability in inputs which make it difficult to precisely quantify mass balance. Changes include the frequency, size, and nature of storm events, and on-going development. Broader changes in sediment and contaminant transport conditions in the canal may occur after implementation of the New York City Department of Environmental Protection's (NYCDEP's) Gowanus Canal Waterbody/Watershed Facility Plan (Facility Plan; NYCDEP, 2009). In particular, rehabilitating the Flushing Tunnel will increase its average capacity by 40 percent, and reconstructing the Gowanus Pump Station and replacing the force main will reduce the annual volume of CSO discharges to the canal by 34 percent in a typical precipitation year, although the CSO solids load at the head of the canal (outfall RH-034) will increase by approximately 5% and still contribute 97 percent of the CSO solids load to the upper reach of the canal. These improvements under the Facility Plan are scheduled to be completed in 2014.

While the net effect of these changes can be best quantified after the improvements are completed, other planned and anticipated storm sewer separation and redevelopment projects thereafter will continue to alter the CSO loadings, creating a steadily moving and variable baseline.

Preliminary Estimate of Solids Reductions Needed to Achieve Remediation Goals, Gowanus Canal, Brooklyn New York, which can be found in the FS Report Addendum, summarizes the sources of solids to the Gowanus Canal and describes current and expected future conditions after implementation of the Facility Plan. Based on the available information, the Region has developed a preliminary estimate of the additional CSO reductions that are needed to achieve the remediation goals. As noted above, the Region will continue to review and consider additional information to refine issues relating to mass balance as the remedial design proceeds.

Institutional Controls

Recommendation #5:

The Boards note that the Region's package and presentation did not provide detailed information on the institutional controls (ICs),which will be needed for protectiveness and to protect the integrity of the remedy. For example, the Region indicated that, even if the remedy is fully successful in achieving all stated remedial action objectives (RAOs) and cleanup levels, polychlorinated biphenyl (PCB) contaminant levels in fish, while lower, will still pose an unacceptable risk to consumers. The Boards recommend that the decision documents clearly describe the specific ICs, media to which they will apply, and area that they will cover. The Boards note that ICs should also include the existing fish advisories, especially since it is anticipated that fish and crab abundance may increase post remedy due to improvements in water quality and habitat. Current fish advisories should be updated in the event that fish populations rebound after remedy implementation and as fish contaminant levels decrease as a result of remediation.

Response #5:

The Proposed Plan provides details related to the ICs that are proposed to be part of the remedy. The existing fish consumption advisory is included as an IC because of the anticipated unacceptable human health risk associated with the consumption of PCB-contaminated fish and shellfish after the remedy is implemented. This fish consumption advisory for Upper New York Bay identifies PCBs as one of the contaminants of concern. Because the preferred remedy will not fully eliminate the need for fishing advisories due to contaminants from New York Harbor, the Region intends to continue to coordinate fishing advisory education and awareness efforts with the appropriate governmental agencies. The Region may also seek to have the appropriate governmental agencies update signage along the canal to indicate that fish and shellfish consumption may still pose a risk even after the remedy has been completed.

Additional ICs related to the proposed capping and ISS elements of the canal remedy may include, but not be limited to, the following:

- Restrictions on anchoring vessels within the canal to prevent damage to the cap (mooring to bulkheads is already standard current practice).
- Limitations on construction and navigation dredging within the canal.
- Bulkhead maintenance agreements or deed restrictions that specify or limit what can be done with regard to bulkhead construction or repair.

ICs for the proposed confined disposal facility (CDF) or on-site beneficial use would include, but not be limited to the following:

- Restrictions on digging or drilling within stabilized fill material or within the CDF.
- Limitations on the types of structures, if any, that can be placed on top of the CDF.
- Limits on the types and size of plants, if any, which could be allowed to grow on top of the CDF.

In addition, current and future high density residential redevelopment projects along the banks of the canal and within the sewershed would need to be constructed consistent with current NYC guidelines (NYCDEP, 2012) so as to not contribute sewage discharges to the canal that would result in compromising the remedy. Separated stormwater outfalls may also require discharge control methods.

Remedial Action Objectives/Preliminary Remediation Goals

Recommendation #6:

RAOs - The Region's package included a number of RAOs for the cleanup. The Boards note that several of the RAOs are worded vaguely and recommend that the Region include RAOs that are clearer, measurable and describe the objectives to be achieved by the remedy. The Boards also note that the Region's presentation indicated an unacceptable risk to the environment from direct toxicity to the benthic community as evidenced through the toxicity testing conducted at the site. The Board recommends that the RAOs more clearly reflect this information.

PRGs – Based on the presentation to the Boards, urban runoff and CSO overflows will discharge to the canal at some level. These discharges will contribute site related contaminants which may accumulate in the canal sediments. The Region indicated that the individual chemicals' contaminant accumulation might result in recontamination leading to the cleanup no longer being protective of human health and the environment. The Boards recommend that the Region clearly explain the basis for each PRG in the decision document, including the causal linkage between site-related risk and the PRGs.

PRGs for PAHs – Based on the presentation, it was unclear to the Boards how the Region has interpreted and used the data generated for the development of the PAH PRG. For example, it was not clear whether or how the toxicity testing data collected during the remedial investigation have been used to develop an RAO or select a sediment PRG. The Region's preferred approach uses a PRG that is the PAH concentration in surface sediment at which the predicted level of toxicity is low or negligible. This concentration is used to ensure that the remedy achieves protectiveness of human health and the environment regardless of the causative contamination's source. The Boards recommend that the Region clearly explain in the decision documents how the available data are being considered in the development of the sediment PAH PRG, including how the data were interpreted and used as the basis for the PAH PRG.

Response #6:

The Region developed more specific RAOs, PRGs, and draft performance standards for the Gowanus Canal that have been included in the FS Report Addendum. It is the Region's intention to include this information in the Record of Decision (ROD) for the canal. To facilitate the management and evaluation of the remedial alternatives, the Gowanus Canal was divided into 3 Remediation Target Areas (RTAs) that correspond to the upper reach (RTA 1), middle reach (RTA 2), and lower reach (RTA 3). The PRGs were used to develop remedial alternatives that would protect human health and the environment. All soft sediments would be dredged under the preferred remedy resulting in a post-remediation clean surface. Therefore, there is no dredging cleanup level. The PRGs will be used as performance standards for the post-remedy clean surface.

The RAO for the protection of the benthic community has been revised to read as follows:

> Reduce the toxicity to benthic organisms in the canal from direct contact with PAHs, PCBs, and metals in sediment to levels that are comparable to reference conditions in Upper New York Bay.

The FS Report Addendum documents the technical basis for each PRG and the rationale used to identify the cause of the risk. This information also will be included in the ROD. As noted above, the long-term monitoring approach for assessing the protection of the benthic community will rely primarily on toxicity testing rather than comparison of chemical concentrations in sediment to cleanup levels. If the canal sediments are determined to be more toxic than reference area sediments, then additional analyses will be performed to identify the COCs that are causing the toxicity. The long term monitoring approach and associated performance standards will be presented in the long term monitoring plan for the canal.

The development of the site-specific, risk-based PRG for total PAHs to address this RAO is fully documented in the FS Report Addendum section entitled *Supplemental Evaluation to Support Remedy Selection and Performance Assessment, Gowanus Canal, Brooklyn, New York*. Briefly, the PRG of 20 mg/kg total PAHs at 6 percent total organic carbon (TOC) is the geometric mean of the Lowest Observable Adverse Effects Concentration and the No Observable Adverse Effects

Concentration derived from the site-specific toxicity test data. The performance standard for this RAO is:

- The maximum surface sediment total PAH concentration is less than the risk-based PRG of 20 mg/kg;
- If metals are determined to be potentially bioavailable, then the maximum lead and copper concentrations in surface sediment are less than the upper bound of the reference area concentrations;[3] and
- The maximum PCB concentration in surface sediment is less than the reference area concentrations.

Performance standards will be documented in the post-remediation Long-Term Monitoring Plan for the canal.

Recommendation #7:

The Region's package indicates that the PRGs for PAHs and other contaminants of concern (COCs) are based on ecological risk and human health direct contact. The presentation to the Boards also indicated that subsistence fishing and other exposures occur in the canal; the baseline human health risk assessment, however, only evaluated recreational fish ingestion scenarios. To better reflect the findings of the human health risk assessment, the Boards recommend that the Region develop subsistence fishing PRGs (*i.e.*, the expected concentrations in fish tissue) for PAHs and other COCs in fish and shellfish tissue that is protective of human health through fish/shellfish ingestion; this information can then be used in determining a site-wide final cleanup level that is protective of human health and ecological receptors.

Response #7:

The recreational fishing scenario was evaluated in the RI based on the best available information at the time the HHRA, and only crab tissue samples were analyzed for PAHs because PAHs do not tend to bioaccumulate in fish tissue. The following additional analyses have been completed and are reported in the FS Report Addendum:

- Potential human health risks from ingestion of PAHs in fish tissue were estimated using PAH data for crab tissue to represent PAH concentrations in fish. These calculations indicate that risks from exposure to carcinogenic PAHs[4] in fish tissue are on the order of 10^{-6} for the reasonable maximum exposure (RME) recreational fishing scenario, which is one to two orders of magnitude lower than the risk from exposure to PCBs.

[3] See Table 1 of the Proposed Plan for a summary of the range and average concentrations for harbor reference data for PAHs, PCBs, copper and lead. The 80 mg/kg copper and 94 mg/kg lead values presented in this table are the maximum non-toxic reference concentrations.

[4] Benzo(a)anthracene and dibenz(a,h)anthracene.

- Potential human health risks from the ingestion of fish and crabs in the canal based on a subsistence fishing scenario have been estimated.
- Potential human health risks from the ingestion of fish and crabs caught from the reference area in Upper New York Bay were also estimated for the recreational and subsistence fishing scenarios.

The RAO for fish consumption is to reduce the contribution of PCBs from the Gowanus Canal to fish and shellfish by reducing the concentrations of PCBs in Gowanus Canal sediment to levels that are within the range of Gowanus Bay and Upper New York Bay reference concentrations. PRGs have not been developed for tissue because the home ranges of the fish and shellfish species evaluated in the HHRA are not restricted to the Gowanus Canal, and the contaminant concentrations in tissue reflect contributions from all of the areas in which they forage. Additionally, the ingestion of some fish and shellfish species from the reference area in Upper New York Bay also poses an unacceptable risk. Therefore, reductions in contaminant concentrations in canal sediments will not necessarily result in reductions in tissue concentrations to levels that do not pose a risk. Instead, Safe Tissue Levels (STLs) were back-calculated for both recreational and subsistence fishing RME scenarios. STLs for carcinogenic effects were calculated for individual COCs at the 10^{-6} risk level so that cumulative risk from exposure to all COCs would not exceed 10^{-4}. STLs for non-carcinogenic effects were back-calculated to achieve a hazard index of less than one. These STLs can be used for risk communication purposes.

Recommendation #8:

PRGs for Copper and Lead - The Region's package indicates that the PRGs and subsequent cleanup levels for sediments be set at 80 mg/kg for copper and 94 mg/kg for lead. The Boards note that these chemical-specific PRGs and cleanup levels would be used to define the areal extent addressed by the remedial action and to measure remedy performance over time (taking into account potential recontamination). The Boards recommend that the Region explain in its decision documents the scientific and technical basis used for developing individual PRGs; for example, the Region should explain whether and how it evaluated technical issues such as the application of equilibrium partitioning, acid volatile sulfide/simultaneously-extracted metals testing, and other aspects of sediment chemistry that may impact contaminant-specific risks. The Boards note that, given the high organic carbon content, an organo metal complex may prevail as well as the acid volatile sulfides reaction; the differences are that the organo metal complex is mobile, may be toxic, biologically available, and may be the dominant reaction. The Boards also note that a geochemical model would be useful in predicting and determining which reaction may be dominant given site-specific input and field data; results from this modeling can be used as the basis for additional sediment investigation or decision making. The Boards recommend the Region investigate or determine the dominant metal reaction occurring in the sediments that controls metal mobility and aquatic toxicity or bioavailability. Obtaining detailed information on copper speciation in both solids and sediment pore-water is recommended. The Boards also

recommend that the decision documents include further clarification on the basis for these PRGs' development.

Response #8:

As previously noted, the FS Report Addendum includes revised RAOs and PRGs for the Gowanus Canal sediments. The basis for the PRGs and factors that influence bioavailability and contaminant-specific risk are discussed in the FS Report Addendum. Risk-based PRGs for the protection of the benthic community were not developed for metals because the Acid Volatile Sulfide and Simultaneously Extracted Metals analyses indicate that bioavailability of metals is low. This evaluation is based on a commonly used and accepted EPA model which accounts for the organic carbon content of the sediment (EPA, 2005). The Region does not intend to perform additional geochemical modeling or collect copper speciation data at this time, however, the need for such modeling and data will be reviewed during the scoping for remedial design data collection.

The long-term monitoring approach for the canal will be based on performance standards to assess remedy effectiveness and protectiveness. The performance standards for assessing the protection of the benthic community will primarily rely on toxicity testing to determine whether canal sediments are significantly more toxic than reference area sediments. If, during long-term monitoring, canal sediments are determined to be toxic, then additional analyses will be performed to determine the cause of the toxicity. Geochemical modeling may be incorporated as a tool in the long-term monitoring assessment.

Recommendation #9:

Based on the package and presentation to the Boards, several COCs were identified, but only a limited number of PRGs were developed. The Boards recommend that the Region in its decision documents explain the basis for the final list of COCs and associated PRGs.

PRGs for PCBs – The Region acknowledged during its presentation that there are unacceptable human health risks arising from the ingestion of PCB-contaminated fish and crabs and, as a result, included an RAO for this pathway. It is unclear to the Boards, however, what the sources of these PCBs are since PCBs in fish tissue from the harbor reference areas were high enough to cause unacceptable risk. Furthermore, it was unclear to the Boards how much risk reduction can be expected from remediating the canal sediments and reducing the CSO releases. The Boards recommend that the decision documents should include sediment and fish tissue PRGs for PCBs and provide the timeframe for when these PRGs are expected to be achieved. The Boards note that this information should help evaluate remedy protectiveness for five-year reviews.

Response #9:

The COCs for ecological risk were identified as chemicals with concentrations that exceeded both risk-based screening levels and were statistically higher than reference area concentrations.

PAHs, PCBs, lead, copper, barium, cadmium, mercury, nickel and silver were identified as COCs. Ecological PRGs were developed for PAHs only because PAHs are most likely causing the toxicity in the sediments. PRGs were not developed for metals because they are not likely to be bioavailable. PCBs and metals co-occur with PAHs and, therefore, will be addressed through the remediation of the PAHs. This rationale is provided in the Proposed Plan.

As detailed in the FS Report Addendum, post-remediation performance standards for lead, copper, and PCBs will be developed to monitor potential recontamination of the canal bottom. Performance standards are not being developed for the other metals because lead and copper were elevated to a greater degree than the other metals, and correlation analysis indicates that barium, cadmium, nickel and silver are positively correlated (*i.e.,* co-occur) with either lead or copper. Although mercury is not positively correlated with PAHs, lead, or copper, average mercury concentrations in surface sediment and tissue samples collected from the Gowanus Canal and the reference area similar; therefore, mercury was not carried forward as a COC.

The long-term monitoring plan for the canal will include performance standards to evaluate the effectiveness of NAPL mitigation measures, including the sediment cap. In addition, the Region intends to incorporate data collection and analysis methods for multiple lines of evidence that will be used to distinguish post-remedy surface sediment impacts from various transport mechanisms. For example, compositional analysis of PAH mixtures and detailed bathymetric mapping may be used to differentiate between former MGP impacts and CSO impacts.

The Region did not develop PRGs for PCBs in tissue because the home ranges of the fish and shellfish species evaluated in the HHRA are not restricted to the Gowanus Canal and the PCB concentrations in tissue reflect contributions from all of the areas in which they forage. Therefore, reductions in PCB concentrations in canal sediments will not necessarily result in reductions in PCB concentrations in tissues to levels that do not pose a risk.

The RAO for the protection of human health from the ingestion of PCB-contaminated fish and shellfish has been revised to read as follows:

> Reduce the contribution of PCBs from the Gowanus Canal to fish and shellfish by reducing the concentrations of PCBs in Gowanus Canal sediment to levels that are within the range of Gowanus Bay and Upper New York Bay reference concentrations..

The proposed sediment remedy includes removal of all soft sediment, where most of the PCBs and metals are also found**,** and installation of a cap that will result in a "clean" surface. Therefore, the RAO should be achieved when the proposed remedy is completed.

The new sediments that would accumulate on the clean surface would consist of solids from CSO and storm sewer discharges, and direct runoff and suspended sediments from Upper New York Bay transported into the canal through the Flushing Tunnel and tidal action. If sufficient CSOs reductions are achieved, then the PCB concentrations in the newly deposited sediments should be within the range of concentrations found in Upper New York Bay. The long-term

monitoring plan will present the approach for evaluating remedy effectiveness and protectiveness. The draft performance standard is as follows:

> The remedy will be considered effective if the post-remedy surface-weighted average PCB concentration in sediment is less than the upper bound of PCB concentrations in Upper New York Bay reference area sediment.

The CSO reductions are needed to achieve the risk-based PRGs. The level of reductions needed is estimated in the FS Report Addendum. Under current conditions, the PCB concentrations in reference area fish tissue pose a risk. If the canal is cleaned up to similar concentrations as the reference area, the fish tissue will still pose a risk. While the concentration may not be protective, it is the best that can be achieved. In addition, during the long-term monitoring, the Region plans to collect fish and shellfish tissue data to compare with STLs for risk communication purposes.

Recommendation #10:

Consistency with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) – The Boards note that the PRGs presented by the Region for surface water and sediment are based on a level of protection at 10^{-5} (one in 10 thousand). The Boards note that, consistent with the NCP, remediation goals for carcinogens should be developed using 10^{-6} (one in a million) as the point of departure. The Boards recommend that the PRGs and RAOs be written in a manner that is consistent with the NCP and OSWER Directive 9355.3-01, October 1988, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, and that the Region explain in its decision documents how it developed the surface water and sediment PRGs and RAOs in a manner that is consistent with the NCP and existing Superfund guidance.

Response #10:

PRGs were not included for surface water because the concentrations of carcinogenic PAHs in canal surface water are not significantly different than concentrations in the Gowanus Bay and Upper New York Bay reference area. Surface sediment PRGs for individual carcinogenic PAHs are based on a risk level of 10^{-5} so that the cumulative risk from exposure to all carcinogenic PAHs will not exceed 10^{-4}. Additional PRGs have been calculated based on risk level of 10^{-7} for individual carcinogenic PAHs so that the cumulative risk from exposure to all carcinogenic PAHs will not exceed 10^{-6}. These PRGs are documented in the FS Report Addendum. The Proposed Plan includes the PRGs that are based on the 10^{-4} cumulative risk level because they correspond with the upper bound of EPA's risk management range. The sediment PRGs based on the 10^{-6} cumulative risk level are similar to the mean reference area concentrations for three PAHs and lower than mean reference area concentrations for one PAH. The sediment PRGs based on the 10^{-4} cumulative risk level are higher than the mean reference area concentrations. The PRG for sediment is based on the 10^{-4} cumulative risk level because the PRGs based on the 10^{-6} cumulative risk level may not be achievable given the regional background (*i.e.*, reference area) carcinogenic PAH concentrations.

Remedy Performance

Recommendation #11:

Source Control – Based on information provided to the Boards, there are multiple sources of contamination causing releases into the canal– primarily, the former MPGs and CSOs. The Boards recommend that all continuing contamination sources be identified and evaluated, in part to determine which ones can be controlled, as discussed in OSWER Directive No. 9285.6-08, February 2002, *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites.* The Boards further recommend that the Region determine to what degree contaminant releases should be controlled, inclusive of CSOs (especially at RH-034, as this outfall is a major source of contaminants), in order for the remedy to remain protective.

Response #11:

Multiple sources of contamination are causing releases into the canal. The primary ongoing sources are the three former MPGs and the CSOs in the upper reach of the canal (outfalls RH-034 and OH-007). If left unabated, the contaminant contributions from the former MPGs and the CSOs will impact the protectiveness and sustainability of the remedy. Therefore, control measures to address the former MPGs and CSOs were incorporated into the remedial alternatives.

NYSDEC has selected a remedy for the Carroll Gardens/Public Place former MGP site, but has not yet gone through the remedy selection process for the Fulton and Metropolitan former MGP sites. Based upon the remedy selected for the Carroll Gardens/Public Place former MGP, it is presumed that the remedy for all three of the former MGPs will include the construction of a cutoff wall between the site and the canal, removal of major mobile coal tar sources, and recovery of coal tar product collected in the approach to the cut-off wall.

To address the discharge of hazardous substances, such as PAHs associated with typical urban drainage, the following CSO control measures were screened based on effectiveness, implementability, and cost (see the FS report addendum): no action; optimization of existing trap chamber in CSO OH-007; CSO sediment trap at CSO RH-034; silt curtains and/or netting facilities, maintenance dredging; sewer cleaning and CSO storage. The permanent installation of silt curtains was screened out based on the fact that they would not provide sufficient solids control and they would deteriorate and require extensive maintenance over the long term with the surface water velocities in the canal once the Flushing Tunnel is put back into operation. The temporary use of silt curtains during dredging operations will be evaluated as part of the remedial design.

To ensure continued protection of the canal remedy, future permanent CSO sediment controls are required. Scientific literature suggests that it can be assumed that the "first flush" comprises approximately 20% of the total discharge volume and contains between 30% and 60% of the total PAH load of the discharge (Stein, 2006). It is anticipated that capturing approximately twice the amount of the "first flush" of the design storm event from CSO outfalls RH-034 and OH-007

(NYCDEP, 2009) would ensure that the protectiveness of the remedy is maintained. In order to achieve this minimum level of CSO solids control, based on the preliminary screening, in-line retention tanks are presumed to be constructed near outfalls RH-034 and OH-007; tank volumes of 6- to 8-million gallons and 3- to 4-million gallons were preliminarily selected for outfalls RH-034 and OH-007, respectively, on the basis of their capacity to reduce CSO volume and solids that will be protective of the Superfund remedy.

For costing purposes, an 8-million-gallon in-line storage tank (estimated by the Region to cost $46,429,000) would be installed for outfall RH-034 and a 4-million-gallon in-line storage tank (estimated by the Region to cost $31,272,000) would be installed for outfall OH-007, These estimates do not include operation and maintenance costs associated with CSO controls. For the purpose of developing construction costs associated with CSO control, it was assumed that these tanks could be located on available New York City (NYC)-owned land in the vicinity of the outfalls. The confirmation of the availability of these locations, as well as further evaluations of measures to achieve the post remedial objectives for the canal sediments, will be completed during the remedial design and under NYCDEP's contemporaneous Long-Term Control Plan (LTCP) development process.[5] These efforts may identify more efficient cost-effective and protective alternatives to achieve the remedial goals.

CSO control measure screening and NCP criteria analysis and tank sizing cost estimates are presented in the FS Report Addendum.

The approach for determining the degree to which CSOs must be controlled is described in the FS Report Addendum. The goal is to reduce the contribution of CSO solids so that the average total PAH concentration in surface sediments after remediation does not exceed the PRG of 20 mg/kg. A linear reduction in CSO discharges from RH-034 and OH-007 was used to estimate a linear reduction in associated average surface sediment concentrations in the upper reach of the canal. CSO reductions needed to achieve the PRG in surface sediments after remedy implementation are estimated to be in the range of 58 to 74 percent. The estimate of the required reduction in CSO discharges may be refined during pre-design investigations.

Recommendation #12:

Long-Term Effectiveness – Based on information presented to the Board indicating multiple contamination sources (*e.g.*, RH-034 and OH-007), which, if left unabated, the PAH contributions of the CSOs in the upper part of the canal may impact the protectiveness and long-term effectiveness of the proposed remedy. The Region expressed its belief that the former MPG sources will be brought under control in a timely manner pursuant to State enforcement orders. The Region also indicated that there is a consent order between New York State and NYC

[5] Following the upgrades to the Flushing Tunnel and pump station, NYCDEP will conduct post-construction monitoring and then will begin the planning and public participation related to the LTCP, which will analyze the next stage of CSO-related improvements for the canal. The LTCP is to be submitted to NYSDEC in June 2015.

regarding CSO discharges control. With regard to the CSO outfalls, the Region discussed a number of options for reducing the discharge of solids (including PAHs that are associated with these solids) into the canal (*e.g.*, in-line storage, sediment traps, weirs, and retention). The Boards recommend that the Region explain in its decision documents how the comingling of solids and associated addition of PAHs from the CSO outfalls (specifically RH-034 and OH-007, since they are at the head of the canal) with other COCs in the canal potentially impacts the integrity and long-term effectiveness (*e.g.*, through recontamination) of a CERCLA remedial action (*i.e.*, dredging and capping) at this site. The Boards also recommend that the Region consider developing contingencies for the remedy selected to address potential future releases leading to incomplete source control (*e.g.*, if the former MPG cleanups are not 100 percent effective).

Response #12:

The average concentration of PAHs in surface sediment in the upper canal after the canal remedy is implemented, will depend on the relative contributions of contaminated solids from the CSOs, storm sewers, and direct runoff, the Upper New York Bay tidal effects, NAPL discharge, and groundwater dissolved-phase discharge. Failure of source control measures implemented for the former MGPs or the CSOs can impact the remedy as a result of deposition of contaminated material on top of the cap or, for the former MGPs or other impacted upland properties, through upward NAPL or groundwater migration through the cap.

The reference area data (Figure 1) indicate that the suspended sediment contributions from Gowanus Bay and Upper New York Bay would be below the PRG and would not compromise the long-term effectiveness of the remedy. Harbor sediment contributions would in fact tend to slightly reduce canal sediment contaminant levels through mixing.

The Region will be closely coordinating with the NYSDEC regarding the former MGP and other uplands cleanups. For a hypothetical situation where upward NAPL or groundwater migration causes source control remedy failure, several corrective measures should be available. As a starting point, remedial measures in areas with active NAPL migration must offer additional protection. ISS is an additional measure that is being considered for these areas. Sections of the cap where breakthrough from migration from below the cap might take place can be designed to allow these sections to be removed and replaced.

Regarding CSO discharges, CSO sampling data indicate that the continued contributions from CSOs discharging to the head end of the canal (primarily by RH-034) will result in surface sediment concentrations that exceed the PRG after remedy implementation. In addition, hazardous substances within the canal tend to adsorb to CSO solids because of their high organic carbon content. Consequently, not reducing the CSOs at the head end of the canal would represent incomplete source control that would compromise the long-term effectiveness of the remedy.

NYSDEC is currently overseeing work being performed by NYC to reduce CSOs to the canal by approximately 34 percent. These reductions, however, affect only the mid- and lower canal CSO

outfalls. While NYCDEP's Facility Plan will reduce overall CSO discharges to the canal, it will not reduce discharges at RH-034 (upper canal); in fact, it will increase them by approximately 5%. Therefore, the CERCLA goal is to reduce the contribution of CSO solids and associated PAHs from RH-034 and OH-007 by 58 – 74% such that post-remediation CSO contributions do not result in average total PAH surface sediment which exceed the PRG.

The Region understands that the LTCP process laid out in the CSO Consent Order between New York City and the State of New York includes a 1-year, post-construction monitoring program and evaluation and determination of whether the CSO controls implemented have achieved the planned effectiveness with respect to established Clean Water Act (CWA) water quality objectives. The Gowanus Canal LTCP will then be developed by NYCDEP and approved by NYSDEC. The Region plans to closely monitor the effectiveness of NYC's CSO control actions to assure that the actions achieve what is planned with respect to reducing solids discharges to the lower canal under the CWA. Additional CSO controls beyond those in the Facility Plan to address hazardous substance and solids discharges to the upper canal will be required as part of the Superfund remedy.

As a final contingency for addressing contamination from surface sediment deposition, the armoring layer of the cap can be designed to be set below the navigational depth, thus allowing sediment removal to this buffer layer. Depending on the design of the cap armor layer, special armoring that allows hydraulic removal closer to the armoring layer could be used in select areas of the canal.

Recommendation #13:

CSO Discharges – Based on information presented to the Boards, the Region believes a reduction of CSO solids discharges may be appropriate primarily on the basis of PAH concentrations on CSO solids. The Boards note that the Region stated that the range of PAH concentrations associated with CSO solids overlaps the range of toxicity values under consideration for PRG development. In addition, anthropogenic background contaminant concentrations in an industrial canal (as discussed under site characterization above) may also be within the range of PAH concentrations on CSO solids. The Boards recommend that in its decision documents the Region explain why it believes a CSO response is an appropriate part of the CERCLA preferred remedy; in particular the Region should clearly explain the basis for determining that CSO solid PAH concentrations are elevated compared to anthropogenic background PAH concentrations and establishing the preferred remedy's toxicity-based cleanup levels.

Response #13:

The toxicity test data indicate that the surface sediments in the upper reach of the canal, which is the reach most heavily influenced by CSO solids, are toxic relative to reference stations in Gowanus Bay and Upper New York Bay, which establishes the need for remedial action. The average total PAH concentration on CSO solids from the four major CSO outfalls is estimated to

be 61 mg/kg, which exceeds the PRG of 20 mg/kg by about a factor of three. As noted in the response to Recommendation #1, the two major sources of sediments and solids to the Gowanus Canal are CSOs and suspended sediments delivered to the canal from Upper New York Bay through tidal action and the Flushing Tunnel from Upper New York Bay. As shown in Figure 1, the median PAH concentration in reference area surface sediments and suspended sediments in surface water samples is about 6 mg/kg.

Following the implementation of the proposed remedy, the anthropogenic background level of PAHs in surface sediment would depend on the level of CSO reductions. Storm sewers and direct runoff drain only 2 percent and 6 percent respectively of the Gowanus Canal watershed and are therefore considered minor contributions. The goal is to reduce the contribution of CSO solids so that the average total PAH concentration in Gowanus Canal surface sediments after remediation does not exceed 20 mg/kg. The PRG is at the upper end of the range of reference area concentrations, and is expected to be achievable if CSOs to the upper reach of the canal are reduced by 50 to 70 percent. Further detail is provided in the FS Report Addendum regarding CSO impacts and the basis for the PAH PRG.

Recommendation #14:

Cap - The preferred remedy presented to the Boards includes a cap with an armor layer consisting of large rocks. The Region indicated that all contamination in the native sediment would not be removed from the canal, and the armor layer is necessary to protect the cap from propeller wash. The Boards note that the armor layer would make it extremely difficult to perform future dredging that may be required as part of the remedy's operation and maintenance. The Boards recommend that the Region consider the need to carry out future dredging operations when evaluating options for designing the cap's protective cover system.

Response #14:

Under the proposed remedy, the armor layer of the cap would be located 2 to 3 feet below the anticipated future navigational depth to allow for future maintenance dredging and to provide a benthic habitat layer. Removal of sediment that accumulates on top of the armor layer would be possible with specific armoring systems and the use of hydraulic dredging. Alternative armoring approaches may be evaluated during remedial design.

Recommendation #15:

Solidification - The Region indicated that it is considering the use of ISS to prevent the upward migration of NAPL from the native sediment to the soft overlying sediment to prevent recontamination of surface sediments once dredging is complete. Based on the information provided to the Boards, it is not clear whether NAPL is migrating upward from the native sediments to the soft overlying sediments, especially given the low upward groundwater velocity. The Boards note that the NAPL at the interface of the native and overlying sediment

could be present from downward migration or from lateral migration. Since the Region indicated that any lateral migration will be addressed by the former MGP cleanups the Boards recommend that the Region document and/or further evaluate whether NAPL is migrating or has the potential to migrate upward such that solidification is necessary in addition to the planned sediment cap to achieve a protective remedy.

With regard to solidification as a way to prevent upward NAPL migration, the Boards note that this approach may adversely affect groundwater flow paths due to the size of the area planned for solidification, as solidification generally decreases the solidified mass' permeability. This decrease can raise the level of groundwater in the aquifer and result in migration of groundwater to other destinations (e.g., negative impacts to nearby basements). The Boards recommend that the Region carefully evaluate how much decreased permeability is acceptable before solidification causes adverse impacts to the groundwater flow. Since it is harder to accurately control solidification agent dosing in the field compared to the laboratory, the Boards recommend that the Region perform a pilot study to evaluate the sensitivity of permeability to the application of the solidification/stabilization agent. The Boards recommend that the decision documents include a contingency to address and mitigate potential adverse impacts on groundwater flow, if the Region decides to consider the solidification process as part of the remedy.

The Boards note that the addition of a one foot oleophilic clay treatment layer as specified in the feasibility study may be adequate to minimize advective transport of PAHs without the underlying native sediment needing to be solidified. The Boards recommends that the Region further evaluate whether the specified cap thickness is adequate without solidifying the native layer or if a thicker cap could eliminate the need to solidify. Whether the native layer is solidified or not, the Boards note that control of gas migration minimizes the release of contamination by ebullition.

Response #15:

The Region recognizes that NAPL saturations at the native-soft sediment interface could be the result of release and/or transport mechanisms other than upward NAPL transport in the canal. NAPL saturations were used as an indicator for NAPL transport because NAPL saturation across this interface suggests a lack of a capillary barrier (area where water is the wetting fluid) to inhibit NAPL flow. Without a capillary barrier, groundwater advection can more readily transport NAPL in to the canal. Further studies are planned to measure NAPL saturations, identify whether NAPL is the wetting fluid, and assess NAPL discharges to the canal.

The Region believes that ISS offers an advantage over using only a cap. Sediment with applied ISS has the adsorbents or other reagents mixed into the sediment in addition to the adsorptive capacity of the cap compared to a cap where these materials are provided only as a cover/cap on top of the sediment. Dispersing or mixing the reagents in the sediment to meet specific performance criteria may be more beneficial and cost effective than putting all the materials into

a cap. In areas with suspected NAPL migration, a combination of these two approaches is proposed to increase remedy effectiveness.

ISS is a component of the preferred remedy for several reasons, including that it may be a strong complement for capping strategies. ISS has the ability to immobilize NAPL migrating upward through the native sediment by a combination of mechanisms which include absorption of the mobile NAPL and reductions in permeability of the sediment and effective diffusive transport of NAPL constituents.

ISS may have other benefits beyond controlling NAPL migration. It can immobilize very high concentrations of PAHs making it more technically and economically feasible to maintain an active cap due to the cost associated with specialty reagents versus the high levels of contamination. Also, a stronger canal bottom could benefit bulkhead stability, decreasing the costs for bulkhead replacement.

The Region recognizes that because the canal is a groundwater discharge zone, high permeability areas in the canal bottom would be needed to allow continued groundwater discharge following remedy implementation. The effect of ISS reagent dosing on permeability would be evaluated during the pre-design bench scale and pilot investigations. ISS can also be used to make some sections of the canal impermeable, directing groundwater discharge to specific sections of an active cap for treatment. The two approaches to manage contaminated sediments (ISS and capping) would, therefore, have to be integrated to have overall success.

The Region agrees that ebullition may be a significant NAPL transport mechanism and must be controlled for the remedy to be effective. Potential ebullition would be limited to cap areas (not ISS-treated areas) and would be addressed during the cap remedial design.

Recommendation #16:

Contingency - Based on the package presented to the Boards, the Region's preferred approach would include an oleophilic clay treatment layer to prevent dissolved phase and NAPL from discharging into the canal. The Region indicated that at some point, this treatment layer may become saturated such that it may need to be replaced. The Boards recommend that the Region consider developing and proposing a contingency remedy (and estimated associated costs) to address possible replacement of the treatment layer. The Boards believe that an important factor for the Region to consider in this regard is that materials may settle on top of the treatment layer (*e.g.*, if upland sources are not controlled sufficiently or in a timely manner).

Response #16:

The FS report does not preclude the use of different active cap designs for remedy implementation. Although specific processes were selected for alternative development and evaluation in the FS report, these processes are intended to represent the broader range of process

options within a general technology type as described in *Guidance for Conduction Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988).

Alternative cap design other than the one presented in the FS report may be evaluated during the remedial design. These may include using a low permeability component to control where groundwater discharges to the canal. The low permeability component could include "windows" where groundwater is allowed to discharge through media that can be replaced.

Periodic costs listed in *A Guide to Developing Cost Estimates During the Feasibility Study* include periodic costs for "Remedy Failure or Replacement." These costs would depend on the reason that the remedy is failing and requires replacement.

Recommendation #17:

Alternative Approach – Another of CSTAG's earlier recommendations was that the Region consider developing and evaluating an alternative (or component of an existing alternative) that includes the temporary draining of all or portions of the canal (*e.g.,* head of canal, shallow areas, turning basins, areas slated for ISS) to facilitate implementation of the current preferred remedial approach. Including such an alternative in the Proposed Plan should provide the community and other stakeholders with an opportunity for meaningful input in the remedy selection process. If feasible, dewatering would address several complexities of the preferred remedy, including employing ISS under wet conditions, encountering debris while dredging, and placing three distinct cover layers; it would also help facilitate bulkhead replacement. The Boards recognize this may involve temporarily redirecting several outfalls, which the Region appears to have already explored (*e.g.,* RH-034 to the Flushing Tunnel).

Response #17:

Dry excavation is retained as a process option in Table 3-3 of the FS report where technologies are screened. The Region believes that there are sections of the canal (*i.e.,* the turning basins) where this technology may be applicable. Mechanical dredging was used in the development of remedial alternatives, but as previously stated in responses to other recommendations, it is considered the representative process option for the removal general response action.

Dry excavation is not considered a viable technology for the entire canal due to potential odors emitting from dewatered sediments and the difficulty to control odor emissions while in the canal. Removal of the canal water could also induce canal wall and bottom instabilities due to changes in the pressures exerted on these features. Maintaining conditions for dry excavation may also be impractical in areas with high groundwater flows.

Stakeholders

Recommendation #18:

The Region's package stated that the remedy would be implemented using an adaptive management approach. During the presentation and subsequent discussions, the Region clarified how this approach might work. The Boards note that many of the decision points were in remedial design. Consistent with the NCP, the public should have meaningful input into the remedy selection process. The Boards recommend that the decision documents include a decision tree or similar visual presentation of the remedy selection and CERCLA decision-making process, as well as clear explanations of the decision points and the rationale for selecting remedial action alternatives, how the Region will make the decisions, and how the public will be given a reasonable opportunity to comment.

Response #18:

Prior to implementing remedial design activities, the Region intends to update the community relations plan as required by the NCP §300.435C. This plan will address the process for public participation during the remedial design. The Region intends to continue to work closely with the impacted community and other stakeholders.

Scope of Action

Recommendation #19:

The Region's package included information on: 1) sources of contamination and potential recontamination of the canal; 2) use of CERCLA authority to select a remedy for the site; and 3) use of State enforcement authorities to secure source control actions at the three former MPGs and to achieve the anticipated extent of CSO improvements by NYC as part of compliance with CWA requirements. The Region's package also states that the CWA-contemplated actions by themselves will not be sufficient, that other interim or permanent CSO actions are needed, and such actions will be required as part of the Superfund remedy. No specific actions to address CSOs were included in the Superfund alternatives presented, although the use of CSO holding tanks was considered as a conservative high-cost option. The Boards recommend that the Region more clearly explain in its decision documents the full scope of its preferred alternative and include a cost estimate that covers all components of the CERCLA cleanup. In particular, the Boards recommend that the decision documents clarify: 1) the role of CERCLA response authorities with respect to cleanup actions needed to prevent recontamination from CSOs that could undermine the integrity of the CERCLA cleanup; 2) the relationship to the CERCLA cleanup of any CSO interim actions that may be undertaken pursuant to the State enforcement order; and 3) the costs associated with CERCLA response actions needed to prevent or minimize recontamination from CSOs that could undermine the integrity of the canal cleanup.

Response #19:

CERCLA Section 121 (Cleanup Standards) states a strong statutory preference for remedies that are highly reliable and provide long-term protection. EPA's RI/FS Guidance (EPA, 1988) states that appropriate waste management options that ensure the protection of human health and the environment may involve, depending on site-specific circumstances, the complete elimination or destruction of hazardous substances at the site, the reduction of concentrations of hazardous substances to acceptable health-based levels, and prevention of exposure to hazardous substances via engineering or ICs, or some combination of the above. CERCLA places an emphasis on evaluating long-term effectiveness and related considerations for each of the alternative remedial actions (§121(b)(1)(A)).

NYCDEP is currently implementing CSO control measures for the Gowanus Canal pursuant to the above-noted CSO Consent Order under authority of the CWA. The broad purpose of the CSO Consent Order is to achieve the fishable/swimmable goals of the CWA consistent with the National CSO Control Policy. Because there are no CERCLA-enforceable actions in the CSO Consent Order, the Region has no assurance that interim CSO reductions and other actions in NYCDEP's anticipated final Gowanus Canal LTCP will satisfy the needs of the CERCLA remedy and assure the long-term effectiveness of the remedy.

As noted in previous comment responses, sampling data indicate that CSOs discharging to the Gowanus Canal are COC source contributors, which if not reduced, will result in surface sediment concentrations exceeding the PRG following remedy implementation. Not reducing COCs and solids discharges from CSOs, primarily from RH-034 at the head end of the Canal and OH-007 in the middle, will represent an incomplete control of a major source that will compromise the long-term effectiveness of the remedy. Reducing CSO solids discharges to the canal is, therefore, a necessary alternative remedial action that will sustain the long-term effectiveness of the remedy.

With regard to the cost of CSO controls for discharges to Gowanus Canal:

- NYCDEP evaluated CSO-related control alternatives ranging from $900,000 for floatables skimming alone to $1.59 billion for combined sewer separation. The alternatives included the construction of storage tanks that started at estimated conceptual costs of $200 million without details on locations.

- NYCDEP reported the following in its Facility Plan Report (NYCDEP, 2009): *The elements of the Waterbody/Watershed Facility Plan will be implemented by September 2014, with the exception of dredging, which is contingent upon NYSDEC issuance of all necessary final, non-appealable permits, the application for which will be submitted by June 2010. The estimated cost for all elements is $257.1 million (June 2008 dollars).*

  - The $257.1 million NYCDEP cost estimate includes the rehabilitation of the Gowanus Canal Flushing Tunnel, reconstruction of the Gowanus Pump Station, floatables controls

at major CSOs (RH-034 and OH-007) and periodic skimming, and programmatic implementation of sustainable stormwater management initiatives.

- NYCDEP estimated the cost of the rehabilitation of the Gowanus Canal Flushing Tunnel to be $83.2 million (June 2008 dollars). Therefore, the CSO reduction cost estimated by NYC in its Facility Plan is approximately $174 million.

- To put the above in context of other CSO control measures recently implemented by NYCDEP:

    - $291 million spent on its 43 million gallon capacity Flushing Bay CSO Facility completed in 2009.
    - $33 million spent on the 5 million gallon capacity CSO storage tank at Alley Creek CSO facility in Bayside, Queens, completed in May 2011.
    - $404 million spent on its 50 million gallon capacity Paerdegat Basin CSO Facility in Brooklyn, which began operation in May 2011.

The Region had anticipated developing the costs of implementing additional CSO controls based on the extensive work that NYCDEP had done to develop its Facility Plan and other LTCP projects throughout NYC. However, NYCDEP has only performed a feasibility analysis of additional controls suggested by NYSDEC (NYCDEP, 2012) and it has not developed costs for implementing the additional controls needed to sustain the remedy.

As described in Response #11, the Region developed conceptual cost estimates for the construction costs of offline storage tanks to retain CSO at outfalls RH-034 and OH-007. The Region's conceptual construction costs are significantly less than those estimated by NYCDEP.

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