Beneficial Use of Dredge Materials for the Improvement and Enhancement of Eastchester Bay Wetlands and the Water Based Economy of the Eastern Bronx

Draft Environmental Impact Statement

USACE Public Notice #97-13010- Y2
Royal Marina Application

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Submitted to:

- New York State Department of Environmental Conservation
- U.S. Army Corps of Engineers, New York District
- New York State Department of State

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Summary

• **Introduction:** The applicant proposes to dredge Royal Marina on City Island, and utilize the sediment to create a new wetland with a diverse assemblage of wetland environments around the nearby Pelham Bay Landfill. This will produce a variety of new habitats supporting a broad base of benthic, aquatic and avian species. This project will be conducted under the guidance of Columbia University engineers, Lamont Doherty and Gaia Institute scientists. This project provides many long-term societal and environmental benefits, and no long-term adverse impacts. Mitigative measures are planned to minimize potential adverse short-term impacts during the construction period. The diverse long-term benefits greatly outweigh short-term impacts. Formal regulatory review processes have resulted in documented, broad-based support for the project from local residents, environmental groups and maritime organizations. The project will be closely monitored by scientists and engineers performing comprehensive research after construction. An important goal of the project is the reversal of the trend of loss of vital wetland systems in urban areas, and revitalization of maritime industry by enhancing harbor access. This project will serve as a pilot study for broad-scale implementation of this technology to construct new wetlands in coastal urban areas.

The proposed project aims to renew an urban waterfront by dredging, increase the intensity of the water-based uses of this and nearby properties, and thus contribute to both state and local waterfront revitalization efforts. By demonstrating how water-based economic activities can be strengthened, at the same time increasing habitat diversity and ecological productivity of the area, this coupling of economic and ecological goals will have the following effects:

1) diminishing contaminant discharge from sediments, non-point sources, and landfill leachate by reducing the surface area of the sediments, and increasing biogeochemical activities which remove or sequester harmful constituents;

2) increasing habitat heterogeneity in northwestern Eastchester Bay by restoring historically prevalent diverse habitat types including intertidal marsh, mudflat, rocky intertidal, rocky subtidal zones, and creeks which were diminished, displaced or destroyed through past decades by landfilling much of the surrounding environment.

3) providing economically attractive dredge disposal options for western Long Island Sound coastal communities of Queens, the Eastern Bronx, and surrounding coastal counties in general; &

4) intercepting and treating stormwater and CSO discharges from city streets and highway infrastructure as well as flows of leachate from the landfill.

The redevelopment of marinas coupled with salt marsh restoration can also serve as a catalyst for related private investment in water-based industries in the area, providing economic incentives to

refurbish maritime properties in nearby deteriorated sites, preventing further deterioration, improving the existing economic base of the local community, restoring contiguity between regionally important habitat types, and improving the viability of integrated commercial and recreational uses of the area.

- **Proposed project:** The Applicant proposes to dredge sediments from Royal Marina on City Island, then beneficially use the dredged materials to create salt marshes around the Pelham Bay Landfill and the southern tier of Pelham Bay Park. Dredging of Royal Marina, and other marinas in the Eastchester Bay vicinity, is necessary to return water depth to prior navigable levels. This will restore capacity to again berth larger boats in existing slips, and again bring in larger vessels, which is no longer feasible at low tide. The dredge material will be used to construct a new salt marsh around Pelham Bay Landfill, as described below.

This project will create new intertidal ecosystems, including salt marsh, rocky intertidal, rocky subtidal, and creek habitat. Each of these provide unique circumstances for foraging and protection from predators for various fish, invertebrate and avian species. The marsh and creek ecosystems also provide important capacities for water purification of toxics and excess nutrients. Construction of the new salt marsh will be achieved by building a stone dike wavebreak/containment facility, placement of dredge material between the wavebreak and shore, and subsequent planting of the salt marsh cordgrass, *Spartina alterniflora*. Salt marsh is capable of removing pollutants and chemicals of concern (COCs) from leachate from the adjacent landfill, stormwater runoff, combined sewer overflows (CSOs) as well as from the dredged sediments themselves. The creation of an intertidal wetland together with rocky subtidal and intertidal habitat will also contribute to the environmental quality and the essential fish habitat of the region.

This proposed beneficial use plan for dredged materials around Pelham Bay Landfill and the Southern Tier of Pelham Bay Park aims to restore, in total, about 30 acres of intertidal marsh as well as more than ten acres of rocky intertidal and subtidal rocky habitat through the building of a 4,000 foot long stone dike containment facility. The initial phase of this work, beginning with ≈ 1.5 acres of marsh and a 400 foot length of rock armor wall, will create more than a half acre of rocky intertidal and subtidal habitat, providing a prototype, at 1/20 scale of the entire project, for evaluating the success of benthic macrophyte and faunal recruitment and development, as well as biochemical, geochemical, and geophysical contributions to water quality. This area, with appropriate controls, will be a primary focus of the research and development work of the Pelham Project, described immediately below.

The Pelham Project: Developing Wetlands for the Disposal and Treatment of Dredged Material, is a project of Columbia University. It is a collaboration of the Earth Engineering Center and the Lamont Doherty Earth Observatory of Columbia University, with the Gaia Institute. The Pelham Project will:

- design the dredge material containment stone dike wave break;
- investigate the development of marsh capacities to remove sediment contaminants;
- oversee dredging, saltmarsh construction and maintenance;
- stage a major interdisciplinary research effort on the marsh for at least three years, including investigations on hydrology and hydrodynamics, geophysics and sedimentology, biology, ecology, and geochemistry.

7.The Pelham Project plan describes a three year evaluation of a pilot dredged material containment facility through a heavily instrumented, intensive research program evaluating engineering criteria, hydrodynamics, geophysics, biology/ecology, and geochemistry. Since, to our knowledge, no such integrated and comprehensive steps towards evaluating the physical and (bio)geochemical processes of developing ecological systems on dredged sediments have been taken before, the initial scope was described of three year duration. The project will seek funding to continue after this initial 3 year period, in order to span at least the full five year monitoring recommendations of the Harbor Estuary Program. Such support for longer term monitoring would allow the Pelham Project to compare results of shorter versus longer monitoring for salt marsh restoration, and provide a means of evaluating specific benchmarks in marsh development which could be used to inform the Harbor Estuary Programs guidance documentation.

Because of its ongoing value as an information source, it is likely that the Pelham Project will continue in some form beyond the initial three year period. Research and development programs of this magnitude almost inevitably uncover new issues while documenting previously unresolved mechanisms governing the physical and biogeochemical behavior of natural systems. Longer term monitoring and evaluation could be insured from the onset by funding commitments to match the preferred evaluation period.

This first stage of the Pelham Project is a pilot to evaluate design, construction and implementation methods, as noted in the Research Tasks section of the Pelham Project. The characterization of sediment stabilization and conditioning methods will provide the basis for the buildout phase of the rest of the structure over several additional years. As this approach becomes a major solution to the dredging, landfill leachate, and non-point pollution problems, the research and development component of the Pelham Project will be called upon to answer specific questions after the first three years.

Modeling and monitoring will be utilized to develop predictive frameworks for the behavior of sediments, as noted on page 1 of the Pelham Project, addressing both the growth and development of *Spartina*, as well as contingency plans to meet sediment and plant coverage specifications. This approach is commensurate with the mission of the Pelham Project to demonstrate the feasibility, long term stability, and advantages of engineered constructed wetlands for dredge material treatment and disposal, including an evaluation of uptake of leachate COCs, stability of sediments, growth and development of *Spartina* and macrofaunal elements. Since hundreds of saltmarshes have been restored on various kinds of sediment by Environmental Concern, Inc., and thousands in sum when the work of the Army Corps, and many municipalities, agencies, and private countries around the country are added, the experience base for such predictions is in place to make this work a success. Design specifications for planting success will be met by iterative replanting and sediment reconditioning, as necessary.

This work fulfills the intent and aims of the scope of work for The Pelham Bay Landfill Wetlands Investigation: An Evaluation and Analysis of the Contribution of Wetland Systems to Environmental Quality in Eastchester Bay, issued by the New York City Department of Environmental Protection, which states: *"Wetlands enhancement in Eastchester Bay through creation, restoration or augmentation of existing wetlands areas will be an integral part of New York City's remediation of the Pelham Bay Landfill."* The larger aim for this specific project is

to remediate sediment quality while mitigating non-point source pollutant inputs into Eastchester Bay. The ultimate use of these research results is the development and improvement of similar projects in other parts of New York City and other suitable coastal urban areas.

- **Environmental setting of the areas to be affected:**

Royal Marina is on City Island, which borders the Long Island Sound on its eastern shore, and Eastchester Bay on its western shore. It is connected by bridge to Pelham Bay Park in the Bronx. City Island is recognized by the New York City Waterfront Revitalization Program as a maritime center supporting concentrations of commercial and recreational boating, as well as other commercial uses.

The Pelham Bay Landfill is situated in Pelham Bay Park, where the mouths of the Eastchester Creek and Hutchinson River open into Eastchester Bay. The landfill was built on salt marsh, rocky outcroppings, rocky intertidal and subtidal habitat. Pelham Bay wetlands are considered a Significant Coastal Fish and Wildlife Habitat by the NYS Department of State, and a Special Natural Waterfront Area by New York City's Waterfront Revitalization Program .

- **Significant beneficial and adverse impacts:**

All long term environmental impacts of this proposed project are beneficial, including:

Economic enhancement of local marinas and waterfront properties;
Increase in intertidal wetlands and rocky benthic habitat within the Pelham Bay Significant Coastal Fish and Wildlife Habitat ;
Overall increase in water quality and essential fish habitat;
Mitigation of landfill leachate from Pelham Bay Landfill;
Mitigation of storm water and combined sewer overflow discharges;
Increase in waterbased recreational use of the area.

With one long term result of mixed impacts:

Replacement of sedimentary benthic habitat covered by dredged material with salt marsh habitat and rocky benthic and intertidal habitat (this is discussed in detail in the Technical Appendix #1).

Significant possible short term adverse impacts:

Release of sediments, odors and contamination during dredging and wetland construction.

- **Mitigation measures proposed:**

A containment facility around the Pelham Bay Landfill and Park will improve sediment quality; i.e., natural (biogeochemical and physical) processes in the containment facility will remove pollutants and prevent metals from entering the waters of Eastchester Bay;
Saltmarsh planted on the surface of these sediments within the containment facility will stabilize the dredgings;
Benthic habitat destroyed by dredge material placement will be replaced by the addition of rocky benthic environments of the stone dike containment facility;

Total habitat area and diversity will be increased by the addition of intertidal saltmarsh, intertidal rocky habitat of the stone dike above the tideline, and subtidal rocky benthic habitat on the stone dike below the tide line;

Marsh stem and root development will mitigate against sediment resuspension during acute storm events, and the 'roughness' of stem surfaces will increase sediment and pollutant capture;

The root zone (rhizosphere) of the marsh will add surfaces for the growth and development of microbial communities which protect ecological and human health;

- **Management practices to ameliorate or eliminate negative impacts during and following construction:**

Amelioration/elimination of sediments/contamination release during dredging and wetland construction:

Deployment of silt curtains;

Timing of dredging/construction to avoid critical spawning/larval distribution &/or attachment periods;

Prevention of possible contaminant or sediment release due to erosion of marsh or creeks during storm events:

Construction and positioning of rock armor such that it protects the marsh during early development and through all parts of the tidal cycle under acute storm conditions;

Stratified placement of sediments to maximize containment and minimize remobilization potential during acute storm events;

Dense plantings of cord grass on creek edges coupled with ribbed mussel introduction, so the byssal strands, a tough protein attachment structure of the mussels, holds plant stems together, increasing the resistance to erosion of the creek edge;

Seeding creek beds with oysters and oyster shells to initiate oyster reef formation to minimize or eliminate creek bed erosion (see Technical Appendix for more detailed descriptions & citations).

4.The DEIS does not discuss any reintroduction: oysters are already prevalent in adjacent habitat in and around Eastchester Bay. The point is to incorporate various structure enhancing members of the faunal community in this restoration as a means of effecting erosion control through the growth and development of the natural system. As stated, the proximate aim of the Pelham Project here is "Seeding creek beds with oysters and oyster shells to initiate oyster reef formation to minimize or eliminate creek bed erosion". Since the aim is to produce a modular containment facility containing somewhat more than an acre of intertidal marsh, in filling and emptying each tidal cycle water flow rates will reach ten cubic feet per second or more. To minimize erosion, it will be necessary to allow a creek form to organize itself into meanders. This means that sediment deposition will occur on the convex side, with scour occurring on the concave side of the meander. The aim of the Pelham Project is to minimize sediment mobilization, and create an environment which favors sediment deposition and treatment. This will require the incorporation of natural systems which dissipate energy in intertidal and creek environments and thereby stabilize sediments against perturbations. Materials in the abiotic environment are structured by biological components to organize the flow such that scouring energy is organized to maximize the exchange of nutrients or pollutants between biogeochemical systems-cordgrass and its cobionts. This aim is noted in the Pelham Project (p 5, inter alia) as well as the DEIS (p 3 inter alia). Alternatives to natural systems which dissipate and organize the energy of tidal movement are hardened rock or concrete engineered solutions, but these do not meet the aim of the Pelham Project of "... coupl(ing) the structural engineering practices of containment facility construction

with the ecological engineering of habitat construction and restoration" (p 4), nor do they utilize the biogeochemical organizers of this process, i.e., "...saltmarsh cordgrass activity ... augmented by microbial cobionts and certain invertebrate animals".

Since oysters and black mussels are prevalent in the Eastchester Bay area at present, the best case scenario would be to protect the public from this attractive nuisance through the development of a citizens watchdog monitoring and protection program. To do this, the Pelham Project could explore such a program with environmental groups which have already expressed an interest in the protection of water quality enhancement biota in the area: SoundWatch, SoundWaters, New York Coastal Fisherman's Association, the Bronx Council for Environmental Quality, the New York Membership of the Sierra Club, the Stewardship Program of the NYC Soil and Water Conservation District, and local marinas, yacht clubs, sportsmen's groups, and bait and tackle shops. Initial conversations on this matter have also been initiated with the Bronx detail of the NYS Conservation Police.

- **Issues of controversy, if any**

Public comment to date has exposed no issues of controversy. Comments received in response to Public Notice for USACE #97-13010- Y2 expressed overwhelming support for the environmental benefits of this project. Responses came from groups including local environmental organizations, civic and maritime associations, as well as local residents.

3.NYC DPR indicates that responsibility for the underwater lands resides with this agency. Representatives of this agency have informed us that restoration of historic habitat, repair of liabilities of existing land adjoining the proposed constructed wetlands, and unearthing the creeks presently channelized in storm drains in order to create freshwater and brackish creeks and ponds with available flow and groundwater are also aims of NYC DPR.

- **Matters to be decided, including a listing of each permit or approval:**

The New York State Department of Environmental Conservation, United States Army Corps of Engineers Joint Application for Permit was filed, together with the Federal Consistency Assessment Form were filed. Relevant agencies suggested that the response to comments be given in an EIS/SEQR framework, as presented in these documents. Standing record of requisite determinations are as follows:

USACE, pending review of these documents;
NYS Dept. of State, project approved, as consistent with the New York State Coastal Management Program (letter attached);
NYS DEC Clean Water Certificate, pending review of these documents.

Description of the proposed action

- **Purpose or objective, public need and public benefits, including social and economic considerations:** This project contains a two-fold objective: The first is the dredging of the local channels and marinas, in this case Royal Marina of City Island.

The second objective of this project is the restoration of intertidal wetlands including salt marsh and intertidal rocky habitat as well as benthic rocky habitat around the Pelham Bay Landfill and southern tier of Pelham Bay Park. The initial phase of this work will be accomplished by placing

dredge materials from Royal Marina within a stone dike containment facility for the purposes of water quality improvement and habitat enhancement of the Eastchester Bay ecosystems. This second objective is also clearly the means for realizing the first objective, i.e. the disposal option of beneficial use of dredge materials in salt marsh creation around Pelham Bay Landfill makes the dredging of marinas and channels economically feasible.

The proposed project aims to renew an urban waterfront by dredging, increase the intensity of the water-based uses of this and nearby properties, and thus contribute to both state and local waterfront revitalization efforts. By demonstrating how water-based economic activities can be strengthened, at the same time increasing habitat diversity and ecological productivity of the area, this coupling of economic and ecological goals will have the following effects:

1) diminishing contaminant discharge from sediments, non-point sources, and landfill leachate by reducing the surface area of the sediments, and increasing biogeochemical activities which remove or sequester harmful constituents;

1.Tests performed on the sediments at Royal Marina indicate that they contain very little contamination (see Sampling Protocols and Results Appendix). As described in the Technical Appendix (p 13), coherent gray clays or gleys are encountered below varying thicknesses of surface sediments. It is widely understood that gleys such as these were deposited in a lacustrine environment several thousand years prior to the time when rising sea level filled the basin of Long Island Sound with brackish water. These gleys are therefore quite unlikely to be contaminated with dioxins, PCBs, and PAHs, as well as priority metals. Dredging of Royal Marina is directed to remove approximately three feet of sediments, down to these gray clays.

New sediment that accumulates in the Marina is likely to be less contaminated based on documented trends in contaminant input for New York Harbor[1] (& ref. below), San Francisco Bay (van Geen and Luoma, in press, and references therein), and other urban estuaries. The Pelham Project also sites specific work on sediment quality both in the Geophysical and Sedimentological Research section (p 12) as well as the Geochemical Research section (p 16). As noted in the this document, a number of methods will be used to characterize sediment quality, including the evaluation of concentrations of sensitive indicators such as Pb in long thin cores at several locations.

The DEIS and the Pelham Project both assume that the marina on the northwest coast of City Island and the containment facility around the Pelham Bay Landfill will act as sedimentary environments. As noted above (and below), improved sediment quality in the NY Harbor Estuary is expected to contribute to improved sediment quality in the marina, while this same tendency coupled with the biogeochemical mechanisms at work in the marsh environment of the containment facility are expected to greatly improve sediment quality around the landfill. The technical appendix documents the kinds of sediment and water quality improvement which can be expected in wetland environments. As stated in the Technical Appendix and in the Pelham

[1]Ayers, R.U. and S.R. Rod. 1986. Patterns of Pollution in the Hudson-Raritan Basin. Environment. 28(4): 14-43. Bopp, et al. 1991. A Major Incident of Dioxin Contamination: Sediments of New Jersey Estuaries. Envrion. Sci. Technol., Vol. 25, No. 5. p. 951-956. Wenning, et al. 1994. Accumulation of Metals, Polychlorinated Biphenyls, and Polycyclic Aromatic Hydrocarbons in Sediments from the Lower Passaic River, NJ. Arch. Environ. Contam. Toxicol. 27, 64-81. Bopp, et al. 1998. Trends in Chlorinated Hydrocarbon Levels in Hudson River Basin Sediments. Environmental Health Perspectives, vol. 106, Supplement 4, August, 1998.

Project, the purpose of this work is to assess and characterize new accumulations of specific sediment categories deposited on the site from local to regional sediment sources. The geophysical, hydrodynamic, and geochemical research and development framework of the Pelham Project will thus analyze this sediment stream to document how well characterized mechanisms of pollutant removal protect local environmental quality from chemicals of concern.

Data sets put together by Bopp, Chillrud, and their collaborators[2] as well as by EPA indicate that groups of specific pollutants have decreased in various portions of the New York/New Jersey Harbor River Estuary over time. While data sets are site specific, it is clear that overall tendencies are towards greatly improved sediment quality, between about a factor of five and an order of magnitude (see table 3, p 142 in Chillrud et al. 1996). This trend supports the generalizations expressed in the DEIS that sediment quality has improved in the past three decades in the NY/NJ Harbor Estuary.

The Pelham Project, in which a number of the above cited authors are collaborators, will augment and enhance such data for the western Sound and Eastchester Bay. Measurement of pre- and post-construction concentrations of chemicals of concern are central features of the documentation in the proposed research and development program. While such efforts have been outside of the scope of virtually all testing protocols for dredging projects to date, they are included in the Pelham Project in order to provide a solid basis for future policy decisions in the harbor estuary.

2) increasing habitat heterogeneity in northwestern Eastchester Bay by restoring historically prevalent diverse habitat types including intertidal marsh, mudflat, rocky intertidal, rocky subtidal zones, and creeks which were diminished, displaced or destroyed through past decades by landfilling much of the surrounding environment.

2.Item #2 on pages 2 & 6 states that "diverse habitat types" are more valuable than the present uniform habitat type. Specifically "... intertidal marsh, mudflat, rocky intertidal, rocky subtidal zones, and creeks" are known by all working ecologists and fisheries biologists to be more biologically diverse, ecologically productive, and therefore valuable than subtidal sedimentary habitat by itself. This, therefore, does not assume that created wetland habitat will be more valuable than existing subtidal area. The basic assumption of these portions, and the whole of the DEIS, is that habitat diversity is of much greater value than habitat uniformity. The DEIS provides documentation for this in terms of overall ecological productivity, biogeochemical capacities to remove chemicals of concern and improve water and sediment quality, and in terms of essential fish, invertebrate, and waterfowl habitat. Specifically, based on the primary literature cited in the DEIS and historic and recent work in biogeography, intertidal marsh, flat, intertidal rocky habitat, together with subtidal rocky and sedimentary habitat, are together more valuable than subtidal sedimentary habitat by itself. Extant habitat in Eastchester Bay presently lacks

[2]Bopp, R.F. and H.J. Simpson, 1989. Contamination of the Hudson River: The sediment record. In Contaminated marine sediments- Assessment and remediation. Nat. Acad. Press. p. 401-416; Bopp, R.F., S.N. Chillrud, E.L. Shuster, H.J. Simpson and F.D. Estabrooks. 1998. Trends in chlorinated hydrocarbon levels in Hudson River basin sediments. Environmental Health Perspectives 106 (supplement 4): 1075-1081; Bopp, R. F., H. J. Simpson, S. N. Chillrud, and D. W. Robinson. 1993. Sediment-derived chronologies of persistent contaminants in Jamaica Bay, NY. Estuaries. 16(#3b): 608-616; Chillrud, S. N., H. J. Simpson, and R. F. Bopp. New York Harbor sediments as indicators of temporal trends in particle-reactive contaminants. Chapter 3 in Ph.D. thesis. Columbia Univ. 1996.

these former components in significant proportions. Since the former were essential constituents of the essential fish and estuarine habitat of historic Eastchester Bay, matching re-introduction ratios to past presence will enhance the value of present sedimentary benthic habitat (see accompanying benthic habitat survey). As noted in the Pelham Project, specific geochemical, hydrodynamic, biological and ecological measures will be utilized to evaluate changes as a function of area and type of habitat covered and created in the process of building the containment facility.

The bathymetric and biological surveys are given in response to question 18 below. In terms of project success and the functional capacity of the intertidal wetland, as stated on page 1 of the Pelham Project Proposal: "Predicted outcomes of habitat construction and restoration efforts associated with the containment facility should be stated as testable hypotheses with developmental timetables, inviting and facilitating scientific and public evaluation of project success". As noted on page 8 of the DEIS, "Monitoring and maintenance would proceed for at least 3 years following (the initial planting)". This monitoring and maintenance will track the two fundamental variables governing plant survival, growth and development: hydrology and sediment size class (or, inversely, pore geometry and volume). By iterative approaches, the required hydrological and sediment size classes will be established, with the initial dredged materials, or through subsequent amendments, replanting as required.

3) providing economically attractive dredge disposal options for western Long Island Sound coastal communities of Queens, the Eastern Bronx, and surrounding coastal counties in general; &

4) intercepting and treating stormwater and CSO discharges from city streets and highway infrastructure as well as flows of leachate from the landfill.

The redevelopment of marinas coupled with salt marsh restoration can also serve as a catalyst for related private investment in water-based industries in the area, providing economic incentives to refurbish maritime properties in nearby deteriorated sites, preventing further deterioration, improving the existing economic base of the local community, restoring contiguity between regionally important habitat types, and improving the viability of integrated commercial and recreational uses of the area.

- **Needs/Benefits**

This project fills several needs.

1. The need for dredging of NYC Harbor and environs is well-known. Economic viability of the marinas is compromised if these facilities cannot be dredged. The present high costs of disposal options make dredging marinas economically impossible.

2. The public need and interest in water access remains strong and growing, while the capacity for marinas and public parks to fill this need have been compromised by the deterioration of waterfront infrastructure because of increasingly high maintenance costs. Fishing is a significant public recreation, but fisheries production has been compromised by the historic destruction of essential fish habitat including intertidal mudflats, marshes, intertidal rocky coastal features, as well as benthic rocky habitat and creeks.

Benefits of this project include water quality improvement, habitat enhancement, and revitalization of waterbased economies, both commercial and recreational.

- **Location and physical dimensions of the action**

The project consists of building a containment structure (a stone dike) around a portion of Pelham Landfill and the Southern Tier of Pelham Bay Park along Eastchester Bay in the borough of the Bronx. This cell will be filled with dredged sediment from the Royal Marina, and planted to establish a salt marsh. Figure 1 is an aerial photograph from about 30 years ago, which shows the general context in which this project will take place. The line indicates the 2,000 yard distance between the Royal Marina and the Pelham Bay Landfill. The actual path followed by the barges involved in this project will be approximately 3,000 yards.

Figure 2 shows the dimensions and general nature of the proposed marsh system, along with tidal creek forms for bringing water into and out of the containment facility, as well as with potential tidal fresh or brackish water ponds which could be restored or created in areas where stormwater infrastructure can be modified for this purpose.

Figure 3 shows the dimensions of the rock wall to be constructed.

- **Background and history**

---Royal marina/dredging history

As stated above, City Island is recognized by the New York City Waterfront Revitalization Program as a maritime center supporting concentrations of commercial and recreational boating, as well as other commercial uses. City Island was up until recent times a world renowned boat building center, where several shipyards which produced many of the America's Cup winners. City Island's economic base is still centered around the water, with sail making companies, marinas, sailing schools, fishing charter boats and seafood restaurants forming the major draw for visitors throughout the summer months. The waterfront character of City Island is however becoming compromised, as several marinas have closed within recent years, leaving vacant yards which have been targeted for development for non maritime uses including luxury condominiums and a crematorium. Silting in, and the high cost of dredging together pose one of the major difficulties these marinas must face to stay in business.

---Landfill/wetlands history

Decline in the Eastchester Bay region started well before the Pelham Bay Landfill with wetland destruction, pollution, and over fishing, eroding the health and diversity of the estuary. Substantial increase in sewage discharge directly into the Hutchinson River, Eastchester and Westchester Creeks further degraded the environment. The Hunts Point and Wards Island waste water treatment plants improved the quality of the discharge, and the upgrading of these plants has allowed for a substantial return of oyster reefs from Clason's Point in the East River, east and north to City and Hunter Islands.

The Pelham Bay Landfill was initiated in 1963 as part of a plan to utilize about 1,000 acres of the Park for municipal solid waste disposal in New York City. Due to efforts by local environmental groups such as the Bronx Council for Environmental Quality, the landfilling was limited to the present 81 acres. A law suit filed in 1991 due to leachate discharging directly into Eastchester Bay found New York City in violation of the Clean Water Act. While the Pelham Bay Landfill has now been capped, and leachate from the southwest corner of the landfill is

pumped to the Hunts Point wastewater treatment facility, this arrangement may allow leachate mounded under the cap to migrate through the eastern and northern reaches of the rock armor wall. A large rock lined stormwater discharge, positioned near where historic maps indicate a former arm of Westchester Creek connected to Eastchester Creek, enters the cove just north of the landfill from the direction of I 95 and the Hutchinson River Parkway. Smaller discharges (5' diameter and less) occur through the adjacent section of Pelham Bay Park, carrying water which supports green films of Enteromorpha, a weedy green algae often indicative of high nitrogen inputs.

5.Empirical studies are the only means for characterizing leachate quantity, quality, or attenuation under various habitat restoration scenarios around the Pelham Bay Landfill. To date, assertions on any mitigation due to the biogeochemical removal by salt marsh environments, or due to any impact of decreased infiltration through capping are not substantiated. The Pelham Project is the only proposal on the horizon which aims to intensively study the post-closure surroundings of the Pelham Bay Landfill by characterizing the geochemistry and biogeochemistry of sediments and saltmarsh within and adjacent to the confined containment facility planned for the area around the landfill.

We are aware of no existing databases or long term empirical studies characterizing actual attenuation effects which follow landfill closure under a geomembrane cap. While it is expected that leachate flux will probably decrease but not cease under these circumstances, there are no empirically informed, well calibrated models to predict how this may occur. It is also possible that at least three independent inputs may contribute to ongoing leachate:

1) hydraulic conductivity may continue, since the cap may not be perfectly leak tight;
2) leachate may remain in the landfill and/or continue to be produced by ongoing breakdown of organic matter within which will continue to drain; and,
3) water table fluctuations may introduce leachate into natural groundwater flowing underneath the site, or move groundwater into the landfill.

It is expected that the boundary conditions established by any wetlands constructed around the landfill will increase the hydraulic head somewhat during low tide, thereby reducing discharge, and increasing sedimentation and hydraulic resistance of discharge areas around the landfill. Only the type of detailed surveys, modeling studies, and long terms monitoring proposed by the Pelham Project can provide answers to the question of leachate movement and treatment into the landfill boundary.

The Pelham Project aims is to characterize leachate/groundwater flux, and to investigate biogeochemical processes which regulate COC removal. Integrated dimensional models will be used, incorporating monitoring and real-time data collection. The Woodward-Clyde work on the landfill characterized this flow to be about 80,000 gallons per day[3], but no real time data on the geochemistry of this flux was measured.

6. More detail is needed with respect to the leachate treatment aspect of this project including uptake by plants and animals and the effectiveness of treatment during cold weather periods.

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[3]Woodward-Clyde Consultants, Inc. 1993. Remedial Investigation Report. Pelham Bay Landfill, Bronx, New York. April - June 1993. Woodward-Clyde, New York.

Landfill leachate is now regularly treated with constructed and restored wetlands.[4] While differences occur between warm weather and cold weather performance of bio(geo)chemical processes, nitrogen, carbon, sulfur, and other biogeochemical cycles are operative in cold climates and during the colder periods of the annual cycle. The point made in many different places in the DEIS Technical Appendix is that little or no treatment is afforded by present circumstances, but, as the body of literature cited there and here attest, treatment is effected by constructed or restored wetlands. The only question which remains is, exactly how much.

The DEIS Technical Appendix gives the ranges for metals and other chemicals in the Pelham Bay Landfill leachate (p 11). This data was gathered by Woodward-Clyde for the RI/FS phase of the work involved in closure and capping (see footnote below), but no provision was made for post-closure detailing of outputs from the Pelham Bay Landfill. The Pelham Project would fill this information gap by documenting how specific physical-chemical sediment and biological interfaces affect water and sediment quality.

Since the general, 'average', macroscopic behaviors of constructed and restored wetlands are already detailed and described in several thousand peer reviewed articles, referenced, in part, below, and in the bibliography of Technical Appendix to the DEIS, relevant details for Eastchester Bay can only come from new geochemical characterizations. Developing the requisite picture of exactly how this geochemistry impacts the biota of Eastchester Bay requires the integrated Biological/Ecological Research outlined in the Pelham Project, coupling real-time, continuous data geochemical collection (p 15 & ff) with characterization of how key chemicals are partitioned between sediments, microbes, plants, and animals.

In sum, as noted on page 16 of the Pelham Project, detailed knowledge of the behavior of chemicals in leachate, water column, and sediments around the Pelham Bay Landfill will come from "Continuous monitoring of key properties inside and outside the marsh, as well as in the upper layer of marsh sediment." This is key to determining release and uptake at the chemical level in the estuary.

In general terms, metals in sediments are partitioned differentially between plant and animal tissue in various environments. The argument on this matter was simplified in the DEIS and Technical Appendix for the sake of brevity. Since nitrogen, phosphorous, and dissolved organic carbon are basically nutrients for microbes, plants and animals, the only question which remains regards metals. The Technical Appendix addresses this question from the classic and recent literatures (pp 22-23), and notes how input variability is a critical factor for past scientific studies. In general, however, there are patterns of uptake and partitioning of various metals. Data from a classic paper on metals partitioning is graphed below to show similarities and differences between *Spartina* roots and shoots and the ribbed mussel. The Y axis indicates percentage uptake. For the five metals listed, only cadmium and lead are higher in the ribbed mussel than in *Spartina* roots, as indicated by the arrows.

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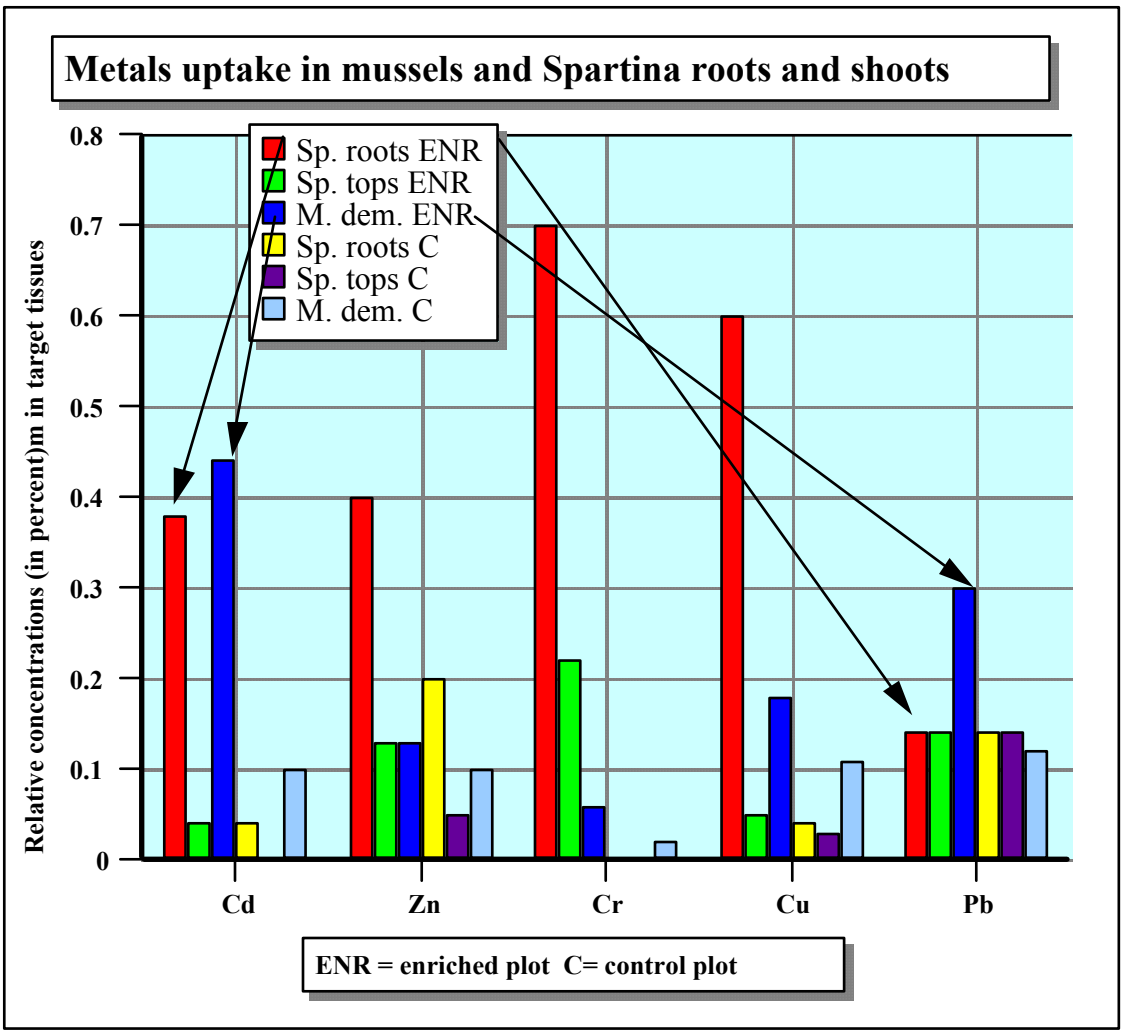
[4] Constructed Wetland for the Treatment of Landfill Leachate, ed. by G. Mulamoonil, E. McBean, and F.A. Rovers. 1998. Lewis Publishers, Boca Raton, FL. Leachate Treatment System Using Constructed Wetlands, Town of Fenton Sanitary Landfill, Broome County, New York. 1993. Energy Authority Report 94-3 (dated November 1993). Energy Research and Development Authority. Constructed Wetlands for Water Quality Improvement, ed. by G.A. Moshiri, Chapts 50, 51, & 52. Lewis Publishers, Boca Raton, FL.



This figure elucidates the general pattern of rhizosphere/leaf & stem interactions modulating metal behavior within the plant, with differential uptake and/or storage characterizing the role of the ribbed mussel, one critical faunal element in metal transport and fate. The text of the original article stresses that sediments retain the highest concentrations of metals, and that, within these, microbial and biogeochemical reactions are major regulators of metal behavior in salt marshes.

The Pelham Project will characterize baseline water quality in Eastchester Bay, and monitor input and output water from constructed marshes to evaluate biogeochemical effects of these constructed marshes.

NYC DPR has built valuable freshwater wetlands in the Park adjacent to the Landfill, protected by a slurry wall, but as yet only small salt marsh restoration projects have been attempted in this section of Eastchester Bay which, because of their scale, cannot have significant impact on water quality and the establishment of essential fish habitat.

- **Timing and schedule of the action.** Dredging will take place during cooler months of the year to avoid interference with summer recreational water uses. Sufficient dewatering prior to planting is expected to take from one to several weeks, followed by the planting of salt marsh

cordgrass optimally beginning in April. The construction phase should therefore be completed in spring, to allow the cordgrass the longest possible growing season for establishment. Monitoring and maintenance would proceed for at least 3 years following (see Pelham Project description in the Summary section at the beginning of this document).

- **Relationship of the project to land use plans, zoning restrictions and other adopted plans and programs at the local, regional or state level.**

New York State Coastal Management Program: As part of this permitting process the New York State Dept. of State has approved the project as consistent with the New York State Coastal Management Program. Their letter is attached.

New York City's Waterfront Revitalization Program (NYC DCP 97-01 January 1997, Investing in the Waterfront: New York City's Waterfront Revitalization Program):

All portions of this project are encouraged and given priority in NYC's Waterfront Revitalization Program, including

a. Dredging to maintain recreational marinas on City Island and surrounding areas
b. Dredging to maintain local navigational channels
c. Disposal of dredge materials utilizing beneficial uses such as wetland creation
d. Coastal vegetation restoration to connect significant ecological communities, minimizing nonpoint discharge into coastal waters (such as from the Pelham Bay Landfill), and improving aesthetic resources.

There are no portions of this project that are in conflict with any of the policies of this local waterfront revitalization plan.

According to this document, this project should be judged as an "inherently consistent action", as defined on page 6:

> "Some proposed projects directly foster the goals set for each of the waterfront functional areas. These activities include in-place bulkhead repair and replacement in the Significant Maritime and Industrial Areas, *wetlands and habitat restoration and passive open space acquisition within the Special Natural Waterfront Areas*, and disposition of city-owned property in areas outside the SMIAs and SNWAs. When one of these activities is proposed in a designated location, it would not require consistency review since the activity has already been determined to be consistent within the applicable WRP policies."

The salt marsh restoration facility is within the East River-Long Island Sound SNWA, and thus has already been determined to be consistent with the applicable WRP policies.

Dredging of Royal Marina is also entirely consistent with the NYC WRP policies, as shown in:

> **Policy 3: Promote use of New York City's waterways for commercial and recreational boating and water-dependent transportation centers.**
>
> ....Passenger ship operations and maritime centers, such as City Island, Sheepshead Bay, and Great Kills, support concentrations of commercial and recreational boating, as well as other commercial uses. In areas that support concentrations of commercial and recreational boating, maintenance activities for these uses have priority over other activities and are generally consistent with the WRP.

3.1.C. Permit maintenance and repair measures that support commercial and recreational boating, including maintenance dredging.

3.1.D. Maintain channel depths necessary to accommodate port activity.

Use of dredge material to create wetlands is also directly supported by Policy 2.3:

Policy 2: Support water-dependent and industrial uses in New York City coastal areas that are well-suited to their continued operation.

2.3 Provide infrastructure improvements necessary to support working waterfront uses.

2.3.F. Dredge spoils must be disposed of using an approved method at an approved site. *Priority for the disposal of dredged materials should be given to beneficial uses, such as wetland creation, beach nourishment or port redevelopment, that are appropriate for the material and its level of contamination.*

Intertidal salt marsh and intertidal rocky habitat restoration together with the construction of historic benthic rocky habitat is entirely consistent with Policy 4, as given below.

Policy 4: Protect and restore the quality and function of ecological systems within the New York City coastal area.

4.1 Protect and restore the ecological quality and component habitats and resources within the Special Natural Waterfront Areas, Recognized Ecological Complexes, and Significant Coastal Fish and Wildlife Habitats.

B. Avoid fragmentation of natural ecological communities and maintain corridors to facilitate the free exchange of biological resources within and among these communities. Protect those portions of the SNWAs which have been identified as key to maintaining habitat connections within the ecological complexes.

D. Where practical, restore ecological complexes so as to ensure their continued existence as natural, self-regulating systems.

Restoration of salt marsh and rocky habitat around the perimeter of the Pelham Bay landfill and down the southern tier of Pelham Bay Park serves to connect the wetlands and rocky islands north and east of the landfill with another areas to the south. The intent is to extend a more continuous mosaic of integrated, high quality habitat closer to the more impacted westerly sections of Long Island Sound, connecting with the more isolated designated part of the East River-Long Island Sound Special Natural Waterfront Area (SNWA) -Palmer Inlet.

In addition, restoration around the Pelham Bay Landfill, as well as landfilled sections of the Southern Tier of Pelham Bay Park would allow the restoration of creeks in this area by daylighting water flows which are presently housed in decaying stormwater infrastructure under landfill in the Park. Features such as tidal creeks and freshwater tidal ponds and herring habitat add another layer of nutrient and pollutant removal and fisheries production to the estuarine system, thus acting in concert with

Policy 5: Protect and improve water quality in the New York City coastal area.

5.2 Protect the quality of New York City's waters by managing activities that generate nonpoint source pollution.
A. Use best management practices, *including the preservation and enhancement of coastal vegetation,* to minimize nonpoint discharge into coastal waters of excess nutrients, organics, eroded soils, and pollutants, and to control stormwater runoff from roadways and other developed areas.

5.3 Protect water quality when excavating or placing fill in navigable waters and in or near marshes, estuaries, tidal marshes, and wetlands.
A. Undertake dredging and dredge spoil disposal in coastal waters in a manner that meets state dredging permit requirements, *protects significant coastal fish and wildlife habitats, natural protective features, wetlands and aquatic resources, and, where feasible, maintains or improves aesthetic resources*.

8.The description of the New York Coastal Fisherman's plan which was described in the minutes of the local community board proceedings (with S. Hoeger of Creative Habitat) for a restored wetland near Watt Avenue in the southern tier of Pelham Bay Park appears to be a modification of a restoration plan developed for this and adjacent areas in 1994-1995 by Gaia Institute staff. This and other plans to increase the area of marsh will increase seed and propagule source exchange between developing marsh systems, with the likely effect of increasing biodiversity and biogeochemical capacity.

In terms of tie-in with other proposed wetlands in the locale and region, the Pelham Project is also coordinated with the work of the Harbor Estuary Program Restoration and Acquisition subgroup to conserve, restore, and protect critical habitat in the Western Sound and in the NY/NJ Harbor Estuary.

(See question 11 below on the matter of aesthetic resources).

- Identification of authorizations, permits and approvals required:

This EIS document forms part of the response to comments for Army Corps of Engineers permit application #97-13010- Y2**.** As part of this permitting process the New York State Dept. of State has also approved the project as consistent with the New York State Coastal Management Program. Their letter is attached.

Environmental setting

General description of City Island area:
Royal Marina is located on City Island, an area recognized by the New York City Waterfront Revitalization Program as a maritime center supporting concentrations of commercial and recreational boating, as well as other commercial uses. City Island is a residential area as well, supporting approximately 1500 homes and 5,000 residents. Much of the coastline has hardened edges with private piers, and some swimming beaches. There are a few small marshes, and one Federally mapped wetland (off Tier and Ditmars Streets to the south of Royal Marina).

Pelham Bay Landfill :
The Pelham Bay Landfill is situated within a state recognized Significant Coastal Fish and Wildlife Habitat. This area is also within the East River-Long Island Sound Special Natural Waterfront Area as recognized by the New York City Waterfront Revitalization Program (January 1997). The former New York City Department of Sanitation (DOS) municipal landfill covers approximately 81 acres of Pelham Bay Park. It appears on the New York State Inactive Hazardous Waste Site List because of illegal dumping of hazardous materials such as industrial waste and waste oil.

In the past, collection and drainage infrastructure directed leachate into Eastchester Bay. Because of this, the City of New York was found to be in violation of Clean Water Act Statutes in a suit filed by the New York Coastal Fisherman's Association. Major chemicals of concern (COCs) were found to be lead, benzene, and various polycyclic aromatic hydrocarbons (PAHs) derived from petroleum products (Woodward and Clyde 1993), as well as high concentrations of ammonia and BOD (This lawsuit may have served to hasten closure work on this landfill).

Human health issues regarding the landfill are of critical concern because it is adjacent to several communities, including Throgs Neck, Country Club and City Island. It is also near Orchard Beach, one of the most popular bathing beaches in New York City. Bronx citizens have been concerned about the environmental impacts of the Pelham Bay Landfill from its beginning in the early 1960s. The Talliposa Site, as it is known locally (and was, in former times, by the Native Americans), together with about 1,000 adjacent acres in Pelham Bay Park, were marked to be landfilled with New York City garbage for decades following the opening of the dump in 1963. Public opposition changed the City's plans, and Fresh Kills was eventually chosen to be the large New York City Landfill. While the flow of contaminated water into Eastchester Bay remains an issue for a number of Bronx residents, many continue to fish and swim in the vicinity of the landfill, often on the landfill itself, regardless of official prohibition.

Other environmental issues of concern in the nearby area include the police firing and bomb detonation range on Rodmans Neck, across Eastchester Bay from the landfill, between the landfill and Royal Marina on City Island (see Figure 1). SoundWatch, an environmental advocacy group based on City Island, has sued New York City for the quantities of lead built up in the soil of Rodmans Neck, necessitating a multi million dollar cleanup of lead from the site.

Impacts/Mitigation

Impacts
Unlike most proposed projects where there are major short and long term negative effects, the majority of impacts which result from this project will be environmentally, socially and economically beneficial. A review below of impacts listed in Part 2 of the Full Environmental Impact Assessment will illustrate the predominance of net long-term beneficial impacts as opposed to a relatively few short term adverse impacts associated primarily with the dredging itself.

If maintenance dredging of marinas is considered an unavoidable necessity or priority, as identified in the New York City Waterfront Revitalization Program, then most of the short term adverse impacts would also need to be considered unavoidable in this project, leaving only beneficial aspects of marsh restoration. Mitigation measures to minimize these short term adverse impacts are also discussed below.

The beneficial use of dredge material to restore salt marshes in the vicinity of the Pelham Bay Landfill could also produce one potential short term adverse impact, the further possible release of sediments and contaminants associated with dredged materials during the filling of the containment facility. These too will be minimized by the use of silt curtains and timing of construction to avoid impact on the especially vulnerable stages in the life cycles of estuarine organisms. The long term positive benefits of this project outweigh the short term adverse impacts, and are also produced in general by the salt marsh restoration component of this project. For example, whatever quantity of contaminants and sediment may be released during dredging and construction, hundreds to many thousands of times that amount will be absorbed by the salt marsh system over the years of its function. As such, even in terms of the specific short term adverse impacts, the net outcome as a result of this project would be beneficial. This would also hold true for the only possible long term adverse impact, the possible release of contaminants due to erosion during storms. Whatever might be released during a possible storm event would be outweighed by the net uptake of the marsh system over time. Since, in their present position beneath Royal Marina and elsewhere in the local environs, some sediments are likely to be resuspended during catastrophic storm events, wetland construction with dredged sediments may be considered as posing less risk, in many cases, than the no action alternative.

The long term benefits of this project include social, environmental, economic and aesthetic benefits to the local region, as listed below.

IMPACT ON LAND

1. Will the proposed action result in a physical change to the project site?
Increase in salt marsh and rocky benthic and intertidal habitat (**beneficial**).

9. The DEIS goes to some length to indicate that habitat types cannot be valued in isolation. As the DEIS states on page 12: "This project will create saltmarsh around the landfill and park perimeter by constructing a stone dike, replacing (emphasis added), in the process, intertidal and subtidal rocky habitat (which has been lost). This recreation of the mosaic of diverse and productive habitat types destroyed by (past) landfilling will allow the present structure to become more fully integrated with the natural and historic landscape of the region."

The DEIS here states that a primary value of habitats derives from their interaction with other habitat types, and is thus based on a large body of scientific literature documenting how species richness or diversity is a function of habitat diversity. MacArthur stated this thirty years ago[5]: "...the number of ...species could be predicted in terms of the structure of the habitat...". What he showed is that the more diverse habitat structure, the more diverse species composition. More recent papers have demonstrated how habitat diversity at various scales is specifically responsible for species richness.[6]

As described in the primary literature, habitats support ecological communities through interaction with other ecological communities in adjacent and nearby habitats. Increased

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[5] Mac Arthur, R.H. 1968. The Theory of the Niche., *In* Population Biology and Evolution, ed. by R.C. Lewontin. Syracuse University Press, Syracuse, NY pp 159-176; , although the point had been made in an earlier paper, Mac Arthur, R.H. & J.W. Mac Arthur 1961. "On Bird Species Diversity. Ecology 42: 594-498.

[6] Mac Arthur, R.H. & R. Levins. 1964. "Competition, Habitat Selection, and Character Displacement in a Patchy Environment," Proc. Nat. Acad. Sci. 51:1207-1210.

diversity and density of organisms at edges between habitats has been documented repeatedly in a large body of literature. It had already been repeatedly demonstrated in the literature three decades ago that the diversity and density of organisms increases in the zones between different habitats, that is, in ecotones.[7] The value of subtidal habitat is thus increased by proximity to other intertidal and subtidal habitat types because of the ecotones between these habitat types, and, as specifically noted in the DEIS from direct measures and mechanisms in the more recent literature, because of the increased foraging and protection afforded various stages of the life cycle of the various species by the connection of different habitat types[8]. The Pelham Project will document these changes in geochemistry and hydrodynamics which impact fin fish, invertebrate, macrophyte, and microbial populations and consortia with pre and post-construction geochemical, hydrodynamic, and ecological measures of habitat diversity. Also, as noted on page 8 of the DEIS, "Monitoring and maintenance would proceed for at least 3 years following (the initial planting)". This monitoring and maintenance will track the two fundamental variables governing plant survival, growth and development: hydrology and sediment size class (or, inversely, pore geometry and volume). By iterative approaches, the required hydrological and sediment size classes will be established, with the initial dredged materials, or through subsequent amendments.

The bathymetric and benthic surveys given in question 18 indicate that much of the Eastchester Bay habitat surrounding the Pelham Bay Landfill and southern tier of Pelham Bay park is presently limited to a relatively flat, subtidal basement of fine sedimentary materials. This area is inhabited by what appears to be a relatively a relatively uniform fauna, consisting largely of annelids (plume worms). The containment facility will be designed to raise a portion of this area to intertidal grade, and distribute rock over other substantial sections, greatly increasing habitat types and connections. Subtidal rock surfaces and variegated surfaces in the benthic environment elevated above the flat sedimentary plain in the course of construction and through water movement into and out of the facility will increase material fluxes between sediment and rocky surfaces with the water column, including oxygen fluxes. Such exchanges support a larger variety of invertebrates. The rock armor surfaces of the stone dike similarly provide substrata for increasing species richness, as shown in a number of environments.[9] (See also #2).

2. Will there be an effect to any unique or unusual land forms found on the site?
The landfill is an unusual land form at this time. It was built on a mosaic of rocky archipelago, tidal flats and salt marshes. This project will create saltmarsh around the landfill and park perimeter by constructing a stone dike, replacing, in the process, intertidal and subtidal rocky habitat. This recreation of the mosaic of diverse and productive habitat types destroyed by landfilling will allow the present structure to become more fully integrated with the natural and historic landscape of the region (**beneficial**).

IMPACT ON WATER

3. Will the proposed action affect any water body designated as protected?
no
4. Will proposed action affect any non-protected existing or new body of water?

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[7] Odum, E.P. 1971. Ecology, 3rd Edition. p 157. Saunders Publishing, Philadelphia, PA.
[8] As noted in the Technical Appendix to the DEIS. See Bohnsack et. al. 1991; and Irlandi & Crawford 1997.
[9] Douglas, M. & P.S. Lake 1994. Species richness of stream stones: an investigation of the mechanism generating the species-area relationship. Oikos, 69: 387-396.

While not protected, the Pelham Bay Landfill and environs are either part of or contiguous to the Pelham Bay Significant Coastal Fish and Wildlife Habitat. The whole Pelham Project will act to increase the area of intertidal sedimentary wetlands by approximately 10%, and improve water quality by a like amount in this important environmental area The stone dike will increase rocky intertidal and benthic habitat between five and ten times in Eastchester Bay, removing nitrate and ammonia, and adding essential fish habitat (**beneficial**).

5. Will proposed Action affect surface or groundwater quality or quantity?
The net effect of this project should be to favorably improve water quality of Eastchester Bay, as well as and leachate impacted groundwater coming from the Pelham Bay Landfill. Day lighting stormwater by recreating ponds and creeks in the Southern Tier of Pelham Bay Park will also increase water quality and quantity of local ground water recharge (**beneficial**).

6. Will proposed action alter drainage flow patterns, or surface water runoff?
The project will alter the drainage flow coming off the landfill, as well as stormwater flow along the southern tier of the park, once that part of the project is built. With the creation of freshwater ponds and the restoration of fresh water tidal marshes and herring habitat, modifications in flow patterns should be a change for the better, although the possibility exists for runoff erosion problems within the marsh itself. Hydrological modeling in the Pelham Project, coupled with monitoring and maintenance of the project after construction should identify potential problems, and efforts will be made to establish a the drainage pattern which maximizes habitat and water treatment and minimizes scour into sediments (**beneficial**).

IMPACT ON AIR

7. Will proposed action affect air quality?
Due to the increase in wetland vegetation, and the effect of plant communities in 'scrubbing' the atmosphere of particulate and atmospheric pollutants, net air quality should improve as a result of this project. There may be short term negative impacts during dredging and construction, especially in terms of odor production, but this should be for a short period of time, several days to a week or more, as sediments are dredged, placed in barges, transported to the containment area, and placed in the containment facility. The odor should not differ significantly from a low tide event in the area which exposes anoxic sediments (**beneficial**).

8. Will proposed action affect any threatened or endangered species?
There are no species presently existing on the project site which are on federal or state endangered or protected lists (pers. comm. Dave Kunstler, NYC Parks Department). The increase in salt marsh habitat, however, could beneficially impact various declining species. Two examples are given below.

10. Beginning with water birds, Dave Kunstler of NYC DPR has gathered field data through observations at a dozen sites throughout Pelham Bay Park since February, 1994. The present habitat value for rare and endangered species of this category is limited (common loon (special concern), ruddy duck (S1), barn owl (special concern) and Fosters tern (S1) have been seen here in winter, by New York Natural Heritage Program). By increasing habitat diversity and food type, the Pelham Project should act to increase the diversity of this list.

The ecological mosaic to be restored by the Pelham Project will provide breeding and foraging habitat for Atlantic silversides, a principle food of the fluke or summer flounder. At the same

time, the habitat diversity proposed by the Pelham Project supports a greater diversity of polychaete worms, amphipods, isopods, pelecypods, and macrophytes, food materials for winter flounder throughout their range[10].

To our knowledge, no other steps are presently under consideration to monitor protected, endangered or other species, or reestablish essential fish habitat. The Pelham Project has the added value of addressing non-point source pollution sources as well as any potential contaminants from the Pelham Bay Landfill or other sources. Thus, only the Pelham Project will provide for enhancement of monitoring in and around Eastchester Bay, augmenting, complementing and extending the work by NYC DPR staff members (M. Feller, D. Kunstler, R. DeCandido and their associates), the volunteers of the annual bird migration census, and others, to collect and integrate data on protected, endangered, or important species, including essential fish and waterfowl habitat of the Eastchester Bay/Pelham Bay Park area.

There is an historic occurrence on the project site of one plant, *Eleocharis helophila* (saltmarsh spikerush), which is listed as S2 (rare) on the New York State Heritage program list. It has not been seen on the project site since the 1940s. There is only one stand still known in the state, on eastern Long Island. When this project is complete, the Parks Department is very interested in attempting to reintroduce this plant onto the constructed salt marsh habitat.

Nearby Pelham Bay Lagoon supports a large over wintering population of black ducks, often over 200 individuals. While not listed as endangered or protected, they are known to be declining for decades. The Long Island area is one of two concentrations of them (Chesapeake Bay being the other). When complete, this marsh construction would create a habitat similar to Pelham Bay Lagoon, and could conceivably support further populations of these and other ducks. (**beneficial**)

While not endangered, the flounder fishery in Eastchester Bay has been depleted in recent years through over fishing and habitat destruction. While flounder are not strictly connected to saltmarshes, one of their major prey species, Atlantic Silversides, breeds in marshes, and another, the banded killifish, frequents marshes to feed. Seining has frequently produced flounder adjacent to Pelham Bay Park and Palmer Inlet saltmarshes, and it is expected that the salt marsh restoration, creek forms, and water flowing into and out of Eastchester Bay from the wetlands would provide essential habitat for flounder, increasing growth rates of local stock. (**beneficial**)

9. Will proposed action substantially affect non-threatened or non-endangered species? Resident and migratory fish, shellfish and other wildlife species will acquire new habitat mosaics, and overall productivity and biodiversity of the area will increase .

The historic record yields a significant measure of habitat destruction in the area around the mouth of Eastchester Creek:

"The Pelham Bridge, over the mouth of the East Chester Creek, has long been famous for the size and quality of fresh fish taken in and around the waters of the Bay and River". And

[10]Klein-MacPhee. 19798. Synopsis of Biological Data for Winter Flounder, *Pseudopleuronectes americanus* (Walbaum). FAO Fisheries Synopsis No. 117. NOAA Technical Report NMFS Circular 414. US Dept. of Commerce, Washington, D.C.

"...within the past twenty years, bass of large size and weighing from 50 to 60 pounds, have been taken with the hook in this vicinity. Black fish are still numerous around the rock and reefs along the shore"(words of the Reverend Charles E. Lindsley as quoted in Scharf's History of Westchester County , vol. 1, p 706, 1886). While striped bass of nearly similar size are still caught in the region, blackfish are largely confined to rocky areas colonized by bladder wrack and other brown and red intertidal and benthic algae east and north of City Island. The stone dike containment facility and salt marsh around the landfill and Pelham Bay Park will reduce and reverse the habitat fragmentation caused by landfilling, with the intent of reestablishing the more westerly blackfish habitat around the landfill. (**beneficial**).

IMPACT ON AGRICULTURAL LAND RESOURCES

10. Will proposed action affect agricultural land resources?
no.

IMPACT ON AESTHETIC RESOURCES

11. Will proposed action affect aesthetic resources?
As described in question 2, this project will increase the area of wetlands. Salt marshes will increase by approximately 10%, while rocky intertidal and rocky benthic habitat area will increase by five to ten times for the Pelham Bay area. As such, it is not obviously different or in sharp contrast to surrounding land use, but enhances it, to some extent screening and surrounding the Landfill, which is in sharp contrast to the surrounding Pelham Bay Park natural areas, with rocky and intertidal habitat akin to the historic archipelago covered decades ago. (**beneficial**).

IMPACT ON HISTORIC AND ARCHAEOLOGICAL RESOURCES

12. Will proposed action impact any site or structure of historic, prehistoric or paleontological importance?
no

IMPACT ON OPEN SPACE AND RECREATION

13. Will proposed action affect the quantity or quality of existing or future open spaces or recreational opportunities?
By increasing the amount of habitat, this project should result in more fish production, a greater diversity of fin fish species in the area, as well as better water quality for nearby local swimming areas. Where possible, such as along the southern tier of the park, care will be taken to provide access to the water, as this portion of the park is used for fishing.(**beneficial**).

IMPACT ON CRITICAL ENVIRONMENTAL AREAS

14. Will proposed action impact the exceptional or unique characteristics of a critical environmental area (CEA) established pursuant to subdivision 6 NYCRR 617.14(g)

no

IMPACT ON TRANSPORTATION

15. Will there be an effect to existing transportation systems?
If Eastchester Creek, Bronx River and other nearby federal navigation channels are also dredged as part of this project, it would improve availability of waterbased transportation, as well as transportation to and from the Bronx from other areas by larger boats capable of bringing more passengers or goods. (**beneficial**).

IMPACT ON ENERGY

16. Will proposed action affect the community's sources of fuel or energy supply?
no.

NOISE AND ODOR IMPACTS

17. Will there be objectionable odors, noise, or vibration as a result of the Proposed Action?
During the relatively short period of time during dredging and construction of the marsh, there may be some release of odors and noise. The odors largely derive from hydrogen sulfide and other compounds produced in anoxic muds. Since low tide exposes large areas of sediment at present, this impact is likely to be minimal. Noise produced by dredging will occur during cooler months, which will diminish the contact local citizens have with the noise. **(possible short term adverse impact).**

IMPACT ON PUBLIC HEALTH

18. Will proposed action affect public health and safety?
Given the documented ability of marshes to sequester and/or detoxify the chemicals of concern from the landfill leachate, as well as other chemicals of concern found in the waters of the NYC metropolitan region, together with pathogens, this project will favorably impact public health and safety. (An in-depth discussion of these capabilities of marshes to improve water quality are given in Technical Appendix #1 of this document.) (**beneficial**).

IMPACT ON GROWTH AND CHARACTER OF COMMUNITY OR NEIGHBORHOOD

19. Will proposed action affect the character of the existing community?
As described earlier in this document, dredging of the local marinas will help these facilities stay in business, and preserve the maritime character of City Island and other coastal communities of the Bronx, Queens, and coastal counties in the state. This should also prevent high density development on these sites, minimizing the negative impact on roadways, schools, and other local infrastructure (**beneficial**).

20. Is there, or is there likely to be, public controversy related to potential adverse environmental impacts?
No. Major environmental organizations have already received the Public Notice for USACE #97-13010- Y2, or have been otherwise contacted. Most have sent letters of support for this project, e.g. SoundWatch, NY Coastal Fisherman's Association, Coalition for the Bight, City Island Civic Association, City Island Nautical Museum. While specific concerns were raised about extent of contaminants in the sediment to be dredged, and minimizing the potential release of contaminants during dredging, construction, and post construction, (see letters in accompanying appendix), the letters were overwhelmingly supportive of the net environmental benefits of this project.

Fuller discussions of these impacts and their mitigation can be found in the Technical Appendix #1 of this document.

Alternatives

In regard to the Royal Marina application, there are two possible actions:

dredging or not dredging.

With regard to Eastchester Bay, there are two possible approaches to restoration:

wetland construction vs no wetland construction.

Altogether, there are only four possible outcomes:

1) no dredging and no wetland construction;
2) dredging with no wetland construction;
3) no dredging with wetland construction; and
4) dredging and wetland construction.

No Action Plan

Leaving Royal Marina sediments in place will not necessarily 'lock in' contaminants. Natural forces are likely to intervene, and resuspend sediments into the water column through storm surges or wind driven wave action from the southwest. Sediments can also be resuspended by the 20 to 30 mile per hour scour of inboard and outboard motors, since power boats have long used the method of turning up the throttle while docked to resuspend sediments to deepen slips, with negative impacts on surrounding waters.

The no action plan could also lead to the irretrievable loss of waterfront properties for water based uses. Derelict properties adjacent to the Royal Marina attest to the economic difficulties of water based activities in recent years. Without low cost dredging and disposal, the tight, but inverse relationship between profit margins of marina operations and the costs of maintenance can push the property into non-water based uses. Commercial developments presently under consideration include a crematorium, and shops and high density condominums. The latter would add stresses on existing infrastructure, from crowded roadways, to crowded classrooms. Simply stated, the no action plan would likely have irretrievable effects in the immediate and the long term future of water based economic activity of City Island and surrounding coastal areas, and negative effects on coastal communities generally.

Dredging Without Building Local Wetlands.

Sediments could be removed from the Royal Marina and disposed of upland or below the waterline without the construction of intertidal marsh habitat. This is now only theoretically possible, since costs are too high for Royal Marina or similar facilities. Dredging alone would deepen slips and allow access of deeper draft vessel, but it does not address the fact that bulkheads seawalls have channelized flow, eliminating necks and spits of land, and with them, the shallow, depositional, productive marsh environments. Also, simply disposing of sediments will not benefit water quality in the region by removing BOD, nitrate, and suspended solids, as would constructed wetlands. Upland or deep water disposal do not support fin fish and shell fish growth and productivity. Nor do upland or deep water disposal rectify the local loss of more than a thousand acres of salt marsh, rocky intertidal, and rocky subtidal habitat, or the historic net loss of 45,000 acres of tidal wetlands in the whole of New York City (90% to 99%).

Since dredging costs may account for one to several years of a marina's profits, disposal pricing is critical. Even the sediment testing cost itself may be a substantial fraction of a years profits, so this insures that dredging is not likely to be seriously considered unless disposal costs are low, which points directly towards the economic efficiencies of local disposal of locally dredged materials, as in the creation of local salt marshes.

Building Local Wetlands Without Dredging Building wetlands in itself serves water quality goals, and increases fisheries production. An acre of tidal wetland has been valued at $75,000 as a water treatment facility (see technical appendix for a discussion of economic valuation). This would make the whole thirty acre proposed Pelham Project wetland worth $2,250,000 in terms of water purification capacity. Miller has also valued commercial and recreational fisheries production of an acre of wetland at about $8,000/acre/year. This adds up to about a quarter million dollars per year in perpetuity for the 30 acre salt marsh.

Wetland construction alone can also contribute to the settlement of legal disputes. The law suite filed by the State of Connecticut against New York State for polluting western Long Island Sound is based on pollutant loadings. Since marshes can remove nitrogen, biochemical oxygen demand, suspended solids, and pathogens, while providing habitat for fish, constructing marsh systems should then be considered, with other point and non-point pollution programs, as a means of solving specific interstate water quality disputes.
Marsh restoration, however, costs money. Coupling it with dredge disposal creates a source of funding for the restoration, potentially making more of it possible.

Building marshes with locally dredged material. In sum, although salt marshes would be of value to build for themselves for pollutant removal and fisheries production, for whatever purpose they may be constructed, such marshes need to be planted on specific size classes of sediments, which are available at Royal Marina and at other sites in local channels and docking areas. Only by using such locally dredged sediments to construct local marshes is value added simultaneously to both the water based economy and to ecological productivity and biodiversity. The proximity of dredging and disposal allows low cost dredging, which supports boating and water based recreation and transportation. This adds to ease of access to commercial and recreational fisheries, while marshes constructed on these sediments remove BOD and ammonia,- causes of hypoxia and fish kills, while at the same time creating essential fish habitat.