Response to Comments
Royal Marina Permit Application

USACE Public Notice #97-13010- Y2

July 13, 1998

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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Pelham Project: Beneficial Use of Dredge Materials for the Improvement and Enhancement of Intertidal Marsh, and Rocky Intertidal and Rocky Subtidal Benthic Habitat.
Comments to Public Notice #97-13010- Y2: Summary and Response

A number of comments were submitted as letters to the U.S. Army Corps of Engineers (USACOE), in response to Public Notice #97-13010- Y2, dated 21 October 1997, by the applicant Royal Marina. This notice is in reference to an application for a USACOE determination of 404(b)(1) compliance (40 CFR 230). The comments have been collected from these letters and are summarized below. Some comments have been condensed or paraphrased in order to simply and clearly represent the primary thrust of the questions.

While most letters expressed support for this project, comments pointed toward basic problems with dredging, moving dredged materials, displacing habitat, releasing toxics, wetland creation, and potential environmental benefits and hazards of such activities, as well as economic and environmental problems inherent with no action. The summary of comments from different letters presented below reiterate many of the same issues and requests for information. In a number of cases, information was requested on various aspects of the same subject matter. The accompanying EIS addresses each issue in a comprehensive manner. In this document, we respond specifically to the question/concern raised and refer the reader to the EIS for a more broad-based treatment of that and related issues. Answers to questions or comments, or requests for information, are located under the name and date of the organization or agency responsible for producing the letter.

The Pelham Project, initiated by the dredging application of The Royal Marina, has a specific mission, to demonstrate the feasibility, long term stability, and advantages of engineered constructed wetlands for dredge material treatment and disposal. This demonstration requires answers to specific questions in engineering, hydrodynamics, geophysics, biology, and geochemistry. For this reason, the dredging of the Royal Marina has been laid out as a three year research and development program to thoroughly investigate the feasibility of beneficial use of dredged material in marsh restoration. A number of potential advantages are cited in what follows, but it must be recognized that, in order to facilitate the cost efficiencies of using local dredged materials in local ecological restoration programs, it is necessary to test the assumptions and predictions regarding pollutant removal in the context of measured effects on dredgings in containment facilities.

Positive response/ no additional information requested:
A) Coalition for the Bight
Comments dated October 24, 1998

"I am delighted to respond to you public notice #97-13010-Y2 with an affirmative response. This application for a permit begins a process some of us have been advocating for a long time - the use of dredged material in a pilot application for use in the creation of a wave break and restoration of salt marsh to contain leachate from a landfill. ...speaking environmentally, this must be a unique win/win application. The marina gets its dredging done, the community could see this as a first step in the long-awaited process of "containing" the Pelham Bay landfill leachate, and the Port of New York could get a "reasonable" disposal site for dredged material with a beneficial reuse tag. Bravo!"

B)Barbara Dolensek

Comments dated November 9, 1998

"As a resident of City Island living on the west side of the island facing Eastchester Bay, I would like to lend my support to the proposal to dredge the bay and to place the dredging material at the Pelham Bay landfill to restore the salt marsh and to contain the leachate. Although I am also pleased that the dredging process will improve business opportunities for the marinas on City Island and I am happy that efforts to contain the ill effects of the landfill continue, I am especially happy about the fact that the wetlands will be a beneficiary. Too often these areas around major urban centers have been destroyed or severely damaged, but biologists have revealed their incalculable value, not only for wildlife but also for humans. This pilot project, which will realize a longtime dream of Drs. Julie and Paul Mankiewicz, is a crucial step in the restoration of a vital part of our environment".

C) City Island Civic Association, Inc.
Comments dated November 10, 1997

"We are elated that dredging of Eastchester Bay that we have been working on for so long is coming to fruition. As we are all aware of, the disposal of dredged material was the greatest impediment to the dredging that is very important to maintaining a productive and viable water related industry. The fact that Dr. Paul Mankiewicz and the Gaia Institute developed a procedure to utilize dredged material ecologically, new horizons will be opened. If this pilot project of utilizing dredged material is successful, it will work to the extensive benefit of our National economy. If City Island organizations with our various degrees of expertise can be of service in this project, we are available".

D) The Garden Club of City Island
Comments dated November 12, 1997

"We are pleased to respond to your notice #97-13010-Y2. It gives us an opportunity to join with Dr. Mankiewicz in his efforts to remediate the problem of leachate and improve water quality in Eastchester Bay by the creation of a wave break and the restoration of salt marsh with dredged material. When this plan comes to fruition, it will prove itself to have been a "pilot" for the rest of the country, all having similar problems, and a large feather in the cap of the Corps when they actualize the good Dr.'s proposal and "meet the needs and welfare of the people". It is fitting that, in sponsoring this effort to ameliorate the situation, recycle dredged material, and emphasizing the "local" aspect, you will be in charge, as my friend Eugenia Flatow says, "of a win-win application". Excelsior!"

E) American Marine Rail, L.L.C.
Comments dated November 13, 1997

"We fully support this project. One of our major developmental impediments is the inability to find suitable and reasonably priced disposal for dredged materials in connection with our projects. I strongly support and encourage you to facilitate development of this project as an excellent alternative to the problem which we face for disposal of dredged materials. Furthermore, this project provides a responsible "local" solution to New York City's dredge spoils disposal dilemma, rather than merely "exporting" our local problem to other areas. Not only will the successful development of this project benefit the Port of New York and New Jersey economically, but it also will have significant ancillary environmental benefits in enabling

the region to lower its air pollution and traffic congestion by facilitating development of its marine resources".

F) The City Island Historical Society
Comments date November 14, 1997

"We are very pleased with this proposal on several fronts: first, because the dredged materials will help to contain the Pelham Bay Landfill leachate -- a longtime concern of residents; second, because the recreation of local wetlands will be a beneficial byproduct of the process; and third, because the dredging of Eastchester Bay will help the community of City Island restore its flagging maritime industry, a heritage of which we are very proud indeed".

G) SoundWatch
Comments dated November 17, 1998

"It is not often that an environmental group supports the idea of open water dredging but in this case we believe the project is based on well thought out, environmentally minded science which will ultimately help not only the City Island community but the environment as well. It seems to us to represent a win-win situation for all involved.

We have only two concerns. The first is the initial dredging of the benthic materials found around the marina. We understand that it is difficult to contain the toxins found in these materials and hope that care will be taken to disperse as little as possible into the surrounding environment. Our second concern is the possible destruction of the wave break during a severe hurricane. We would hope the wave break would be built to hold in the most violent of storms.

We are pleased that your office is considering this worthy project and hope that it is successful and the beginning of many of its kind".

H) The Port Authority of NY & NJ
Comments dated November 18, 1998

"While we are mindful of the importance of maintaining recreational marinas, the focus of our comments is in support of the unique approach to dredged material disposal being proposed by the applicant. As you know, there is a dirth of disposal alternatives available in the region, particularly within the State of New York. The applicant has seized upon an opportunity to initiate a beneficial reuse of dredged material by means of wetlands enhancement/creation. This approach offers the advantages of proximity to the dredging site and ecological enhancement of the shoreline of nearby parklands. The Port Authority supports this concept and urges the Corps to advance this program as expeditiously as possible".

I) JP's Waterside Restaurant
Comments not dated

"Public notice #97-13010-Y2 describes the best approach to the economics and the environment of City Island I know about. I have had customers come in to the Waterside Restaurant for a meal, and be unable to leave the Island because their boat was stuck in the mud. The Royal Marina project will make sure that future dredging can be done at a reasonable cost.

To build a marsh around the Pelham Bay Landfill, clean up Eastchester Bay, and keep the marinas in business should be a model all over the City. As a businessman who would like to see things that make sense done to improve the environment, I strongly support the Army Corps in this project. It should be used as a model for all future work - helping the economy and improving the environment".

Additional information requested:
A) U.S. Coast Guard - Staten Island
Comments dated 27 October 1997

1) Provide exact dates of operations, when they are known, to USCG Office.

- Specific plans, schedules and dates of operation will be submitted to the USCG Office by the company which is awarded the contract to dredge as soon as these plans become available.

B) SoundKeeper
Comments dated 17 November 1997

We do not oppose the concept of using dredge material on a project specific basis in an attempt to create saltmarsh soils. In our view, one major criteria must be met before such material is used for this purpose: a scientifically sound determination that the dredge material will not leach or otherwise release contaminants into the environment.

1) Requesting specific measures to be used to contain contaminants during dewatering while the dredged materials are stored in upland areas. Will storage methods prevent contaminant migration or leaching into dikes or groundwater.

- At present, there are no plans to store or apply materials to upland sites, so the concomitant problems of leaching will not be encountered in the Pelham Project.

2) Concerns about temporary upland storage of dredge materials. What will happen to the stored dredge material if the saltmarsh creation is not approved or completed?

- No upland storage is involved. See above.

3) Concerns regarding the formation of creeks in the created saltmarsh, that the formed creeks will act as conduits for contaminants to enter Eastchester Bay - especially during storm events - unless the dredge materials contain no contaminants.

- The sediments from Royal Marina, and from nearby channels, are already in contact with the water column. They will be moved from one portion of Eastchester Bay to an adjacent area within a radius of a few thousand yards. These materials will be developed into intertidal salt marsh to increase biogeochemical activity to facilitate pollutant removal and to regulate contaminant movement. In a large number of cases,

dredging will occur to a depth of approximately one yard. Because this cubic yard per square yard of dredged material will be placed to depths of three yards in the containment facility, this will decrease the surface to volume ratio of these Eastchester Bay sediments, diminishing the total surface area through which these sediments exchange contaminants with Eastchester Bay, thereby reducing, by physical and geometrical means, potential contaminant release.

Creek forms inevitably develop in sedimentary surfaces. Storm events will not add much volume to the creek forms which develop in the containment facility along the Pelham Bay Landfill since, during high tide, these creeks will be covered with water, and experience relatively minor forces compared to maximum tidal fluxes at mid tide. At mid and low tide, the marsh and creeks will be protected by the stone dike, which will extend to at least high tide level. The containment facility will be designed to protect the marsh, sediments, and creeks from wave action.

Contrary to suffering erosion events, it is expected that these marshes will accrete, i.e., capture more sediment from the water column. It is expected that the 30 acre build out of this entire salt marsh restoration project could capture tens of tons of sediment per year, including in this accretion potentially orders of magnitude more contaminants than it may release through erosion of creek surfaces. This is a primary focus of the testing planned for this restoration.

For any creeks restored further inland with storm water or ground water inputs along the Southern Tier of Pelham Bay Park, materials will be structured in order to mainly move through existing sediments, and to be coupled with fresh water ponds, to regulate storm surges, and provide for herring habitat restoration.

C) U.S. Fish and Wildlife Service
Comments dated 18 November 1997

1) Information requested on analysis of dredge material for contaminants to determine if proposed disposal method would not affect fish and wildlife resources.

- Analytical data from Environmental Testing Laboratory's analysis of sediment samples collected from Royal Marina on 2/23/98 are attached as an appendix to the EIS accompanying this Response to Comments. Below is the summary and discussion from that appendix.

Sediment Data Conclusions and Discussion
Of the metals detected in the Royal Marina sediments, Cd, Cu, Pb, and Hg were the chemicals that exceeded the EPA Criteria and the mean value for expected soil concentrations in the Eastern United States. Cadmium concentrations exceeded the range of expected soil concentrations for the Eastern States.

A comparison of the detected metal concentrations at Royal Marina, to Region 5 Guidelines for the Pollution Classification of Harbor Sediments, indicate that none of the sediments would be considered Heavily Polluted, and only Copper and Mercury (Cu and Hg) barely fall into the Moderately Polluted level. All other detected metal concentrations found at Royal Marina would fall into Non-Polluted Category.

No herbicides, pesticides or PCBs were detected in the samples.

From a comparison of the average OVA and Semi-OVA concentrations to two (2) EPA guideline levels, the following chemicals revealed concentrations that exceeded at least one of the environmental screening values: acenaphthylene, benzo(a)anthracene, and chrysene. In the cases of acenaphthylene and chrysene, there was only one screening value available. Both averages exceeded the guideline level, however, in both cases the detected values were just over the screening guideline levels. In the case of benzo(a)anthracene, the detected concentration exceeded the EPA Region 3 value, but was lower than the EPA Interim Sediment Criteria Value.

The detection of polyaromatic hydrocarbons (PAHs) in these sediments is potentially linked to coal dust particles, which are ubiquitous throughout the sediments in the region. If the source is coal dust, then it is likely that the PAHs are in particulate, or less soluble, form. In particulate form, PAHs are less bioavailable to potential human or wildlife receptors. Fuel spills in marinas themselves, however, can also contribute to PAHs.

A comparison of the detected chemical concentrations found at the Royal Marina to previous sediment metal concentrations, detected from four separate sampling periods between 1991- 1995, at Newark Bay, Arthur Kill and East River Bays indicates that concentrations at Royal Marina are well below the measured levels found at the other NY/NJ locations. In many cases the Royal Marina sediment concentrations were an order of magnitude or more lower than the other NY/NJ sites. The Table below provides a comparison of the Royal Marina averages compared to the NY/NJ Harbor Concentration Levels. It should be noted, however, that the contaminant levels within the above noted contained embayments may be substantially higher than rest of the harbor.

Table of Royal Marina Averages Compared to NY/NJ Harbor Levels

Analyte
Acenapthylene
Benzo(a)anthracene

Lead
Cadmium
Copper
Mercury

As seen in the Table above, the average concentration for acenaphthylene for the Newark Bay, Arthur Kill and Newtown Creek was 1021 ug/kg whereas, the acenaphthylene concentration detected at Royal Marina was 57.5 ug/kg; and the average concentration for the other sites for benzo(a)anthracene was 3572 ug/kg, while the average benzo(a)anthracene concentration at Royal Marina was 386 ug/kg. In the case of metals, Lead (Pb) concentrations at the other sites were between 50 - 990 mg/kg versus 47.85 at

the subject site. Cadmium (Cd) concentrations were between 8 - 22 mg/kg at the NY/NJ sites and at the subject site the average was 1.58 mg/kg. The levels of Cu and Hg reached as high as 970 mg/kg and 31 mg/kg, respectively. In comparison, the average Cu value was at 71.5 mg/kg and the average Hg concentration was 0.86 at Royal Marina.

As expected the chemical concentrations detected in the Royal Marina indicate that the sediments have most likely been affected by anthropogenic chemical sources. This is more apparent with the Semi-VOAs than with the metals; since most of the metals fell within naturally occurring metal concentrations for soils in the region. The exception being the detected cadmium levels, which exceeded the range of regional cadmium concentrations. In the case of the PAHs, there is some likelihood that these chemicals can be attributed to coal dust that is pervasive throughout the sediments in the region. There is an auspicious lack of volatile organic (OVA), herbicide, pesticide and polychlorinated biphenyl (PCB) concentrations in the sediment samples. Furthermore, none of the detected chemical concentrations from the Royal Marina indicated that the sediments were grossly contaminated by any single chemical or group of chemicals - especially when they are compared to other sediment samples collected from the NY and NJ harbors nearby.

2) Information requested on dredging method and the potential affects on water quality and resuspension of contaminants into the water column.

- Specific plans will be submitted by the company which is awarded the contract to dredge. In general, however, larval and juvenile fin fish and shell fish life cycle sensitivities will be used to identify the dredging and containment facility construction windows. Silt curtains and similar approaches will be evaluated as practices to isolate impact and manage plume movement off site as well.

3) Provide disposal site characterization, in reference to current restoration site conditions, the configuration of the restoration site, including grading, plantings to be used, and monitoring schedule.

- The disposal site consists of largely soft sediments surrounding the Pelham Bay Landfill and the southern tier of Pelham Bay Park, from the area south east of the shore road bridge along the Hutchinson River/Eastchester Creek navigation channel, up to approximately 300' off shore, parallel to the rock armor of the landfill and the shoreline of Pelham Bay Park. Most of the benthic area consists of soft sedimentary materials, some of which, as noted in the Woodward-Clyde Remedial Investigation, are 'hot spots' for some contaminants. By enclosing this area within a rock armor containment facility constructed for the purpose, the configuration of the restoration site will be established. This can then be filled with dredged sediments from the Royal Marina. It is expected that this initial 1 1/2 acre phase will be planted, for the purpose of testing approaches, with one or several of the following: Spartina alterniflora plugs grown from native seed, hydroseeded material from collected native seed; natural inputs from local seed sources; and/or wind throws gathered from nearby shores of Pelham Bay Park. Grading will be carried out so as to optimize plant and/or seedling colonization of optimal low marsh habitat between the mid and high tide marks, but focused at about the 2/3 tidal mark. Grading will be carried out so as to encourage creek formation, and to minimize potential Phragmites habitat along potential freshwater inputs at the landfill and park edges. An

intensive three year monitoring schedule has been developed to assess biomass production and below ground development. A similar monitoring program will be utilized to assess rocky intertidal and rocky subtidal macrophyte recruitment and habitat development on the rock armor wall. The rock armor is a critical feature here, since it will increase intertidal and subtidal area by at least a factor of 4, i.e., there will be four times the area of habitat on the rock armor than in the present sedimentary habitat. Colonization rates and diversity will be a critical feature to monitor in order to characterize the effects of this disposal site on ecological productivity, biodiversity, and the development of essential fish habitat.

4) Provide information on capping material and dewatering procedures and how they will act to protect fish and wildlife from contacting any of the contaminants.

- The Pelham Project, using benthic sediments now under the Royal Marina, aims to test sequestering ability of various treatments in the constructed marsh around the Pelham Bay Landfill and Pelham Bay Park, from direct seeding of the dredged sediments, to use of plugs of Spartina alterniflora. The primary 'cap' which will be evaluated is the development of rhizosphere and microbial community interactions which act to regulate material movement. Secondarily, sedimentary import, applications of sediments from other areas, and manufactured soils will be evaluated in terms of application efficiencies, costs and benefits.

Since this is not a land application of dredged materials, dewatering should not involve much change in redox or oxidation state. A number of means are presently under investigation as to how to optimize coalescence in the dredged materials to increase structural integrity within the containment facility.

D) NY Coastal Fisherman's Association
Comments dated 18 November 1997

We support the finding of beneficial uses for dredge materials, in particular, projects that will improve water quality and create marine habitat for a declining fishery. For your information, we fully support the proposed restoration and creation of wetlands in Pelham Bay Park, and, to some extent have been involved in the plan's inception. However, we have some concerns which are listed below.

1) Request for copy of laboratory analytical results for the dredge material.

- Analytical data from Environmental Testing Laboratory's analysis are attached as an appendix to the EIS.

2) Wave break is not currently constructed. Have permits been issued for the wavebreak construction?

- The dredging application is an application for the permit to build the rock armor wavebreak.

3) How will resuspended sediment be contained during disposal operations?

- Specific plans will be submitted by the company which is awarded the contract to dredge. In general, however, larval and juvenile fin fish and shell fish life cycle sensitivities will be used to identify the dredging and containment facility construction windows. Silt curtains and similar approaches will be evaluated as practices to isolate impact and manage plume movement off-site as well.

4) Will the dredge materials have a negative effect on existing shellfish beds and marine organisms in the area of the proposed project?

- Beyond the careful identification of the optimal dredging window to do the least damage, dredging will have a number of specific effects. All attached shellfish within the containment facility will be covered by dredged material. A number of members of the sedimentary benthic community can move relatively rapidly, from razor clams, to nereid worms, isopods, and decapods, some of which taxa are good swimmers. A substantial fraction of these organisms may be able to move out of the path of the dredged fill, especially if it is moved in by clam shell dredge. The precautions noted in the above response should protect the vast majority of fin fish and shell fish. In a matter of 10 to 30 months, it is expected that the overall diversity of fin fish and shell fish will increase in and around the containment facility because of the increase in habitat diversity.

5) Will the operations create odors that may be offensive to the adjacent residential community?

- Since this is not a land application of dredged materials, the materials should not undergo much change in redox or oxidation state. Because the material will not be dewatered or dried on land, sulfide will only be released by surface layers, and should not exhibit much change over background from surrounding marshes and mud flats.

6) What are the time frames for the proposed project?

- The permit could be issued during the Summer or Fall of 1998. The project could then start immediately, dependent upon the availability of dredging windows for fisheries protection.

7) Will water quality be affected for traditional public uses of Eastchester Bay, such as fishing and swimming?

- The construction of these marshes on dredged materials are expected, based on the published literatures, to improved water quality in Eastchester Bay. The capacity of salt marshes to remove BOD, the carbon compounds which cause biological oxygen demand, has been documented over the past three decades. These carbon compounds are responsible for hypoxia and fish kills. Marshes growing on silty sediments, like those from Royal Marina, have been documented as capable of removing tens of pounds of nitrate per acre each year. Turbidity, caused by materials which make the water cloudy or murky, is also removed by salt marshes. The aim of the project is to recreate 30 acres of salt marsh and about ten acres of rocky intertidal and rocky subtidal habitat. This should greatly increase essential fish habitat in Eastchester Bay by restoring habitat types which have been lost by landfilling.

With the use of silt curtains and other mitigation measures, increases in turbidity should not be noticeable at the local swimming beaches during dredging and building. The created marshes should act to decrease potential pathogens and coliforms from CSO events (each acre of tidal wetland has been valued at $75,000 as a water treatment facility (Miller Living in the Environment, p 150)), thus improving swimmability of the waters into the future.

8) How will the material be transported to the site?

- Dredged materials will be barged the roughly two thousand yards from the Royal Marina to the containment facility around the Pelham Bay Landfill and the Southern Tier of Pelham Bay Park for the first acre and a half of marsh construction. Other materials from nearby marinas and channels may be brought in by similar means over similar distances to this containment facility. Rock for the containment facility will also be brought in by barge from where such materials are presently anchored prior to transport, in the East River, adjacent to Throgs Neck.

E) SoundWatch
Comments dated 17 November 19978

1) Concerns regarding dredging operations and the containment of the toxins found in the dredge materials. How will the dispersion of contaminants be minimized?

- While specific plans will be submitted by the company which is awarded the contract to dredge, the use of silt curtains will be investigated to isolate impact and minimize off-site plume movement.

2) Concern about possible destruction of wavebreak. Will it be constructed to withstand hurricanes and violent storms?

- Storm surges are a concern, since there is about a mile of fetch from the Southeast. Similar rock armor structures have been built in many places, however, and the engineering and associated liabilities addressed in certified designs. Present plans have not been finalized as to exactly which corporate entity will take responsibility of certifying the structural elements of the project calls.

F) NOAA - National Marine and Fisheries Service
Comments dated 2 December 1997

Do not conceptually oppose the maintenance dredging activity, and understand the difficulty of locating suitable upland or aquatic disposal sites for contaminated dredged material. Are familiar with the generic literature which describes how wetland creation and restoration activities may be used in some situations for beneficial uses, however need substantial clarification before authorizing in this valuable habitat.

1) Types of existing habitat functions and values that would be modified or displaced should the proposed disposal activity be permitted.

- The Pelham Project containment facility should increase habitat functions, values, and types. Historically, intertidal rocky and marsh habitat as well as subtidal rocky habitat in the archipelago of the Northwestern Sound have been displaced by landfilling. The containment facility construction aims to replace these, together with tidal creek environments. Because the rock armor has a higher surface area than the benthic habitat on which it is placed, the total area of benthic habitat will remain about the same. The vast majority of sedimentary benthic habitat will be conserved in Eastchester Bay, and because the latter will be adjacent to rocky benthic habitat following construction, this should increase the overall diversity and productivity of essential fish habitat.

2) Provide bulk sediment characterization data for the material to be removed from the boat basin.

See response to C)1) of US Fish and Wildlife Service, dated 18 November 1997.

3) Accounting of how the dredging, disposal and wetland creation activities were designed to ensure adequate protection of fish, wildlife and humans from possible contamination.

- Specific plans will be submitted by the company which is awarded the contract to dredge. In general, however, larval and juvenile fin fish and shell fish life cycle sensitivities will be used to identify the dredging and containment facility construction windows. Silt curtains and similar approaches will be evaluated as practices to isolate impact and manage plume movement off site as well.

4) Description of pre- and post-construction conditions of the areas proposed to receive dredged material. Include plans and cross-sections.

- Pre and post construction conditions are described in the EIS document , Location and physical dimensions of the proposed action, in Figures 1- 3. As part of the dredging project, an engineering study, including a load bearing analysis of benthic materials, must be done to adequately address this question. This work is central to the research and development of the Pelham Project.

5) Explanation of how proposed disposal activity meets appropriate Clean Water Act criteria for placing fill material in waters of the U.S.

- The project aims to move sediment from one portion of Eastchester Bay to an adjacent area within a radius of a few thousand yards. The sediments, which are intertidal in parts of the Royal Marina and subtidal in others, as well as in nearby channels, will be positioned to increase biogeochemical activity and biodiversity. The Pelham Project strongly supports the essence of the “no net loss” concept of the Clean Water Act and wetland protection by serving to enhance and expand Eastchester Bay intertidal wetlands including salt marsh and rocky habitat, together with rocky benthic habitat. This also fits the requirements of more recent regulatory aims to enhance Essential Fish Habitat while increasing the beneficial functions and values of these habitats, including, but not limited to, sediment decontamination. (See EIS for further discussion of the Pelham Project in relation to Clean Water Act goals).

G) New York State Department of State

Comments dated 15 December 1997

The Department of State has received many comments on the proposed placement of dredged material within a containment structure to be built around the existing Pelham Bay landfill. Most of the comments received support the alternative, beneficial reuse of dredged material in an application such as that proposed by the Gaia Institute. However, some issues need clarification or elaboration.

1) Requests the use of least disruptive dredging methods to minimize potential resuspension of contaminated sediments. Recommends the use of hydraulic dredging operation, or similar low-turbidity method.

- Specific plans, including comparative evaluations of different dredging methods will be submitted to the NYS Department of State by the company which is awarded the contract to dredge. Initial investigations suggest that hydraulic dredging may move a multiple of the quantity of water impacted by clam shell dredging, but more informed analyses will follow upon the site-specific investigation by the dredging company. The intent of the principles in the Pelham Project is to utilize larval and juvenile fin fish and shell fish life cycle sensitivities to identify specific dredging and containment facility construction windows.

2) Has the NYC DEP reviewed or concurred with the proposed configuration and method of containment?

- See response NYCDEP below

H) New York City Department of Environmental Protection
Comments dated 15 January 1998

Generally supportive of salt marsh creation and restoration projects, and interested in bioremediation techniques.

1) Requests clarification on whether any of the proposed activities would take place on New York City Property, and on the jurisdiction and boundaries of the proposed project.

- Specific plans will be drawn and stamped following a survey of the area determining the exact boundaries of the Pelham Project. In regard to the question of responsibility for the land in question vis a vis Application #97-13010-Y2, Mary Alice Lee of the Parklands Office of the New York City Department of Parks and Recreation Parklands Office confirmed that the area which will be modified under this application, between mean high water and the US Pierhead line, is under NYC DPR jurisdiction.

2) Requests engineering specifications of proposed wave wall, and an indication of who would be responsible for maintaining the structure.

- The present plan for the structural elements of the project calls for a PE from the Port Authority to stamp the final drawings.

3) Requests information of the effects on circulation and water quality the wave wall would have on Eastchester Bay and inlet.

- While the Pelham Project plans to utilize hydrodynamic models to evaluate changes in circulation around the wave wall along the mouth of the Hutchinson River and Eastchester Bay, an initial look using standard analytical tools indicates that the structure will change circulation in Eastchester Bay as measured by Reynolds and Froude numbers.

At the north end of the Pelham Bay Landfill rock armor, where the Hutchinson River moves under the Shore Road Bridge, the ship channel and water flow is constrained to the south west by bedrock outcroppings. While the wave wall in this region will constrain the flow, the Reynolds number, $Re = lU/\mu$ (or discharge width times velocity divided by viscosity), the ratio of inertial to viscous forces, might only change by a factor of two to eight, since the river width would be reduced by half or less, leading to an increase in Re by a factor of 2, and most of the velocity of the river flows down the ship channel at present (because of the resistance of the bedrock at the channels edges), the wave wall might only increase this by a factor of 2, during normal flows. Storm flows may double this estimate. Within a few hundred yards from the mouth of the Hutchinson River, the width of Eastchester Bay increases to 300 and then 500 yards, so the constriction of the wave wall could amount to a velocity increase of about a third to a fifth, with much less effect on turbulence of the moving water mass than nearer to the bridge. This increased rate of river flow and tidal movement would, however, bring more oxygenated water into contact with the rocky intertidal and benthic habitat on the wave wall, increasing growth and development rates, as well as feeding rates by filter feeders which become associated with these structures.

At the southern end of the landfill and along the Southern Tier of Pelham Bay Park, the width of the wave wall falls to a fifth and less of the length and width of Eastchester Bay, contributing little to velocity changes in these areas of the Bay. A different key measure of estuaries is often used at this scale to evaluate changes in water movement, the Froude number, the ratio of inertial to gravitational forces, $F = V^2/gl$. Since l, the length term, is in the denominator here, as opposed to the Reynolds number where it is in the numerator, its increase or decrease has the opposite effect as in the Reynolds number. Since the contribution of the wave wall would be $\leq 1/5$ of the length and width of Eastchester Bay, it appears that circulation, as measured by the Froude number, would be affected by this construction in the range of about 20%. Specific scenarios would have to be evaluated, however, to predict what effects this may have on the flora and fauna of there area, which the Pelham Project aims to do with hydrodynamic modeling.

Water quality contributions by this construction and restoration can be more readily evaluated from the comparative scientific literatures. The acre and a half initial test cell of the constructed salt marsh would come into contact with about a million gallons of water per each tidal change. Once the Spartina alterniflora develops through four to six weeks of the growing season, suspended solids would be removed physically by the grass structure. BOD and nitrate would be removed by biochemical mechanisms at rates of tons and tens of pounds per year, respectively (see Technical Appendix #1). Metals, especially lead, zinc, chromium, cadmium, and nickel may be sequestered where Eastchester Bay supplies net annual sediment loadings, and where metal concentrations

are in the tens of parts per billion range. Migration of some metals from sediments containing parts to tens of parts per million should also be regulated or suppressed in a sedimentary environment. Arsenic, cadmium, chromium, copper, lead, nickel, and zinc occur in the Royal Marina sediments in this range, and will be investigated as to mobilization.

4) Requests hazardous materials sediment analysis for material dredged from Royal Marina, and detailed projections of contaminants that could be removed based on specific hazardous materials present in sediments.

See response to C)1) of US Fish and Wildlife Service, dated 18 November 1997.

5) Requests information regarding pollutants that might be released by decaying plant matter during winter months. Will plant matter be harvested in fall to eliminate recontaminating sediments? Further define salt marsh maintenance plan.

- Although pollutant uptake by salt marshes is partitioned between the sediments and the living plant material, the majority of pollutants, particularly metals, are sequestered by the sediments themselves, and not the plant matter, and hence would not be re-released as vegetation decays during winter, with exceptions noted below. Quantifying the fates of these pollutants throughout the seasons, however, will be a major thrust of research associated with this project.

  Ammonia and BOD would be released by plant matter as it decays in winter. A substantial fraction of this BOD would be removed by microbial communities, even in winter months. All told, the marsh would be sink for BOD in terms of yearly average. Some ammonia would be nitrified. Most would be exported to surrounding waters during winter. Denitrification would probably not occur at any substantial rate where water temperatures approach 40°F. Some metals would be mobilized into plants, and released to the environment, especially iron, manganese, copper, and zinc, from available evidence, in this order (see Technical Appendix #1). No plan is presently in place to harvest these plants to protect the estuary from these metals at present. Plantings and plant and macrofaunal recruitment will be quantified, and three years of monitoring will follow the planting of the 1.5 acre constructed marsh cell. The Pelham Project plans to test metals release and uptake hypotheses and compare quantities mobilized and sequestered to pools in surrounding wetlands and fluxes in the water column.

- During the 3 year research period, the salt marsh will be maintained by the research team.

6) Requests information on nature of hydrophobic pollutants which may be constrained in sediments and unable to migrate through vegetation. What is the potential for contaminated sediments to escape from the site.

- Some gasoline derivatives are in the sediments in the parts per billion range. A number of polynuclear aromatic hydrocarbons are present in the hundreds of parts per billion range. In both cases, the redox states established by marsh vegetation and the accompanying microbial communities are likely to provide conditions necessary to

mineralize these materials. Marsh development will also reduce the Reynolds number by orders of magnitude, with a concomitant decrease in turbulence and erosion of sediments under the developing marsh. While some sediments will escape from the creeks as they begin to develop between the tidal inputs into the containment facility and the interior marsh, by coupling plantings of salt marsh cordgrass on creek edges with ribbed mussel habitat, the byssal strands of the mussels will greatly increase the resistance to erosion of the creek edge, and the mussels and plant stems will slow down tidal flow along these edges. Seeding creek beds with oysters and oyster shells to initiate oyster reef formation to minimize creek bed erosion will have a similar effect on this habitat (see Technical Appendix for description & citations). In any event, these creed areas are only expected to impact ≥ 3% of the marsh surface, and 0.003% of the marsh volume, providing a two to three order of magnitude reduction in contaminant concentration for any sediments released. Hydrodynamic models, measures, and design features will be used to explore means of further diminishing this potential export.

While it is expected that sediments will, in fact, be imported into the constructed marsh, this matter will be intensively investigated in the three year course of research on the Pelham Project.