Application for Section 401 Water Quality Certification
Project: Euclid Beach/Villa Angela Improvements
Applicant: The Cleveland Metropolitan Park District
Site Address: Euclid Beach/Villa Angela Park, Lake Shore Boulevard, Cleveland, Ohio
KS Project No: 14242-1

Item 5
Proposed Project Antidegradation Analysis

1. Project Description

   a. Preferred Design Alternative: The proposed project includes the construction of two new submerged breakwater sills to connect existing detached breakwaters at Euclid Beach/Villa Angela Park. The sills will be constructed between the 4th to 5th and 5th to 6th detached breakwaters (counting from the west). The submerged sills will be constructed with a single layer of 4 to 6-ton limestone armor units placed over a concrete rubble core at a 1.5 horizontal to 1 vertical slope to a crest elevation of 567.5 feet IGLD 1985. The preferred design alternative is to construct the submerged sills with a 40-foot crest width. The proposed project also includes re-grading the existing beach profile to reduce beach slopes and water depths in the swim area. The existing sand resources will be supplemented with an additional 2,011 cubic yards of sand pre-fill.

      The design objective is to improve swimming conditions at the east end of the beach at Euclid Beach/Villa Angela Park. The preferred alternative is intended to meet the design objective by reducing the wave energy reaching the beach resulting in a decrease in sand transport and a more stable beach profile landward of the existing detached breakwaters. The preferred alternative will also include re-grading the existing beach to produce slopes and water depths more favorable for a public swim area. Producing the desired beach grade will require the placement of approximately 2,011 cubic yards of sand pre-fill.

      The crest elevation was selected to provide the maximum reduction in wave energy while still allowing water to flush from landward of the existing breakwaters during periods of low water levels. The 40-foot crest width selected for the preferred alternative is estimated to allow a maximum of a 3.2-foot transmitted wave at average water levels (assumed to be 571.5 feet IGLD 1985).

      Fill Materials: 6382 cubic yards below Ordinary High Water including 5,354 cubic yards of armor stone (limestone) and 1,028 cubic yards of concrete rubble. The project also includes the installation of 2,011 cubic yards of sand pre-fill as beach nourishment.

   b. Minimum Degradation Alternative: The proposed project includes the construction of two new submerged breakwater sills to connect existing detached breakwaters at Euclid Beach/Villa Angela Park. The sills will be constructed between the 4th to 5th and 5th to 6th detached breakwaters (counting from the west). The submerged sills will be constructed with a single layer of 4 to 6-ton limestone armor units placed over a concrete rubble core at a 1.5 horizontal to 1 vertical slope to a crest elevation of 567.5 feet IGLD 1985. The minimum degradation alternative is to construct the submerged sills with a 20-foot crest width. The proposed project also includes re-grading the existing beach profile to reduce beach slopes and water depths in the swim area. The existing sand resources will

be supplemented with an additional 2,115 cubic yards of sand pre-fill.

This alternative meets the design objectives by reducing wave energy and sand transport resulting in a more stable beach profile landward of the existing detached breakwaters. The submerged sills are similar to the structures proposed in the preferred alternative but with a minimized crest width. The 20-foot crest width proposed for the minimum degradation alternative is estimated to allow a maximum of a 3.9-foot transmitted wave at average water level conditions (assumed to be 571.5 feet IGLD 1985). The 1.5 horizontal to 1 vertical side slopes for the submerged sills are also the minimum customarily allowed based on structural stability.

Fill Materials: 2,480 cubic yards below Ordinary High Water including 1,930 cubic yards of armor stone and 550 cubic yards of concrete rubble. The project also includes the installation of 2,115 cubic yards of sand pre-fill as beach nourishment.

c. Non-Degradation Alternative: The project would not be constructed leaving the existing steep beach slopes and deep water depths throughout the swim area at Euclid Beach/Villa Angela Park.

It is not practicable to construct a project to reduce wave energy and sand transport landward of the existing detached breakwaters without placing fill.

Fill Materials: 0 cubic yards below Ordinary High Water.

2. Avoidance

The design objectives of improving swim conditions at Euclid Beach/Villa Angela park could not be achieved without a minimal effect on water resources. There is no feasible design alternative available for a re-design that will meet the project objectives with less impact in terms of fill quantities (as compared to the minimal degradation alternative). The crest width of the submerged sills has been minimized to provide less than a 3.9-foot transmitted wave height at average water levels (571.5 feet IGLD 1985).

No other sites were considered for this project as the purpose of the is to improve the swim area at a specific property. Also, no other geographical areas were searched for alternative sites and no other non-wetland sites are available for proposed project.

The consequences of not constructing the project are that the beach slopes and water depths would remain in the existing conditions and the beach at Euclid Beach/Villa Angela Park would remain closed to public swimming.

There are logistical concerns to consider in the construction of the proposed improvements at the site. Due to the deep water depths between the existing detached breakwaters, construction will need to be performed from a barge or floating platform. Materials and equipment for the

construction of the submerged sills will also likely need to be transported by barge. Sand pre-fill and beach grading equipment will likely be able to be transported to the site land. Any limitations or logistical concerns in construction will be similar for both the preferred and minimum degradation alternatives.

3. Minimization

The design of the project was modified to minimize impacts to water resources at the site by the development of the Minimal Degradation Alternative as compared to the Preferred Alternative. The minimal degradation alternative reduces the crest width of the submerged sills from 40 feet to 20 feet. Larger submerged sills will be more effective at dissipating wave energy. Therefore, criteria needed to be established regarding wave transmission beyond the structures. This was accomplished by a literature review. The sills proposed in the minimum degradation alternative are designed to be the minimum structures to result in an estimated transmitted wave of less than 3.9 feet. This criterion was derived from "Waterfront Developments in Harmony with Nature" by Mangor et al. (2008).

The side slopes of the submerged sills are also the minimum customarily allowed considering structural stability.

4. Magnitude of the Proposed Lowering of Water Quality

There is no known medium or long term lowering of water quality due to the placement of the proposed materials into the waters of Lake Erie. There will be a temporary, short term, increase in turbidity levels during construction. There will also be an increase in fish habitat in the new submerged sills and an increase in shallow nearshore habitat due to the beach grading and sand pre-fill. These benefits will be similar for both the Proposed and Minimum Degradation Alternatives.

5. Technical Feasibility and Cost Effectiveness

All three alternatives have been designed to be technically feasible and construction materials are readily available. However, the Non-Degradation Alternative would not produce the benefits of the project including: reduction of wave energy reaching the beach, reduction of sand transport landward of the existing detached breakwaters, stabilizing the beach profile and improving swimming conditions at the park.

Construction costs are estimated to be greatest for the Preferred Alternative and reduced for the Minimum Degradation Alternative. Accurate construction costs will not be available until a guaranteed maximum price is secured from the Contractor responsible for constructing the improvements.

6. Economic Considerations

Construction of the Preferred or Minimal Degradation Alternatives will likely employ 6 to 8 workers

for a period of about 6 weeks. This will provide a benefit to the local and regional economy. The local economy on the east side of Cleveland will also be improved due to the investments at Euclid Beach/Villa Angela Park. The use of the park will likely increase if public swimming is permitted. Increased visitors to the park are also expected to benefit the local economy. These benefits are expected to be similar for the Preferred and Minimum Degradation Alternative. The Non-Degradation Alternative will result in no change.

7. Cumulative Impact

The project area includes a filled sand beach stabilized by detached breakwaters. The beach is separated from surrounding nearshore areas by the former Euclid Beach Pier and tombolo at the west end of the site and the Euclid Creek jetties and Wildwood Marina at the east end of the site. These structures prevent longshore sand transport into or out of the beach. Cross shore sand transport is impeded by the existing detached breakwaters and deep water depth lakeward of the beach. Therefore, the beach at Euclid Beach/Villa Angela Park is considered a separate littoral cell and is largely independent of nearshore processes to the east or west. Constructing submerged sills to reduce wave energy and sand transport landward of the breakwaters will have negligible impacts on surrounding areas.

Both the Preferred and Minimal Degradation Alternatives have been designed to be held back from the property lines and littoral rights partition lines to prevent any impacts on adjacent properties.

The Non-Degradation Alternative will result in no change.

8. Indirect Impacts

The Preferred and Minimal Degradation Alternatives are not expected to create a barrier to the movement of aquatic organisms, cause changes to drainage patterns or impact downstream water bodies. The submerged sills, beach grading and beach nourishment are intended to cause measurable changes to the lakebed slope and cross section areas along the shore in order to stabilize the beach profile. The proposed project will result in minimal impacts lakeward of the existing detached breakwaters. Indirect impacts of the project are expected to be minimal. The Non-Degradation Alternative will result in no change.

9. Construction Storm Water Management Plans

No water pollution controls are planned for either the Preferred or Minimal Degradation Alternatives since the fill materials do not pollute the water resource. Storm Water Pollution Prevention Plans are not required because of the small size of the project and are impractical as most of the proposed construction will occur under water. The Non-Degradation Alternative will result in no change.

10. Post-Construction Storm Water Management Plans

No post-construction storm water impacts are expected. There will be no change in the Non-Degradation Alternative.