Memo

Date: August 7, 2021
To: QCDD Board of Supervisors
From: Albert Lopez
Re: Lake Repairs Initial Programming Report
CPH Job No.: Q0504

CPH has previously completed and distributed to the CDD its May 2021 “Stormwater Lakes Annual Assessment Report” (Assessment Report). Within that report were findings of deficiencies in the 30 lakes within the CDD ownership and jurisdiction. The Board has budgeted for repairs this upcoming fiscal year. As requested by the District, CPH has herein identified schematic improvement solutions.

The decision process is not an exact or certain process as the large variation in water levels make the selection and viability of littorals as an option, uncertain. We have attached photos of the various littorals proposed for visual consideration.

A 12’ wide littoral planting is proposed for erosion control in key locations around the ponds. The littoral planting will extend horizontally from 4’ upland of the pond control elevation to 8’ horizontally on the wetland side of the pond control elevation (CE). CPH is proposing four planting zones; the high elevation planting zone, 1’ above the CE, the mid elevation planting zone at CE, the low elevation planting zone 1-18” below CE and the deep planting zone from 18” -2’ below CE. All of the recommended plant species are native to South Florida and aggressive growers.

The high elevation planting zone, consists of sand cordgrass and muhly grass in an alternating pattern. Both are readily available in 1 gallon container size. We are recommending a minimum of 1 gallon container size, to create an immediate visible edge to the planting at the top of the slope. The sand cordgrass and muhly grass can take partial inundation until the pond levels drop to the CE level.
Soft rush and the native canna lily are proposed for the mid elevation level. They can take water inundation to a 6” depth, plus. The native canna lily is similar to the ornamental variety, and has yellow flowers in spring and early summer. The broad light green leaves will contrast nicely with the thin dark green leaves of the soft rush. The canna lily is proposed in 1 gallon pots, while the soft rush is proposed in 2” liners.

The lower level planting extends from 1’ to 18” below CE. Pickeral weed is proposed for the 1’ depth, and arrowhead/duck potato, is proposed for the 1’-18” depth. Pickeral weed has blue-violet flowers in spring and summer. It is a striking backdrop to the canna lily. The arrowhead is proposed in an alternating patter, with the pickerel weed at the 1’ level, than the arrowhead wraps around the pickerel weed to the 18” depth. The pickerel weed has a white tree petal flower, on long stems that will appear above the pickerel weed flowers, in the spring and summer, and may continue in the fall. Both plants are proposed in 2” liners at 18” centers. The plants will be staggered to reduce the surface spacing between plants.

Bulrush is proposed for the deep elevation zone as it can take water inundation to a 24” depth. It is a very aggressive grower for erosion control and provides a wonderful habitat for aquatic life.

Picture have been provided below for your reference, and consideration.

<table>
<thead>
<tr>
<th>Sand Cordgrass</th>
<th>Muhly grass</th>
<th>Canna Lily</th>
<th>Soft Rush</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pickeral Weed</td>
<td>Arrowhead</td>
<td>Bulrush</td>
<td>Canna, Pickeral Weed &amp; Arrowhead</td>
</tr>
</tbody>
</table>

A bio-degradable erosion control blanket is recommended if planting is near or during the rainy season, to provide cover until the planting can take root and grow.
While we have specified what we believe to be the appropriate native plants, most adaptable to the circumstances and water level fluctuation, we are concerned about a significant investment in a littoral planting solution without the benefit of a pilot project to confirm viability, such as was proposed for the cancelled Quarry Golf Club hole #14 project this past May-June.

The District may elect one option over another given the visibility and consistency of materials at each repair location. The Quarry Golf Club may not want a riprap solution vs. a vegetated solution at prominent locations.

CPH has prepared three potential lake bank treatment options for the QCDD Board of Supervisors review and recommendations. These options are identified as:

Option 1 – Full riprap treatment from one foot above control elevation to ± four feet below control elevation.
   • Pros – Prevents erosion under almost any circumstances, long lasting, short installation time, low maintenance, increases property value.
   • Cons – Typically costs more and is less attractive than native planting.

Option 2 – Littoral planting one foot above and two feet below control elevation for a total of twelve feet of littoral planting depth, with riprap starting two feet below control elevation, extending ± two feet below lower littoral elevation.
   • Pros – Provides shade, shelter and food for shallow water fish and other aquatic life, provides habitat for various forms of wildlife, creates a privacy buffer.
   • Cons (all related to littoral plantings) – High maintenance cost the first few years, requires continuous littoral weed control maintenance, additional irrigation cost in drastic water fluctuation areas, breeding ground for unwanted pests or insects, rarely does it help property value, and may even lower property value if not maintained properly.

Option 3 – Littoral planting one foot above and two feet below control elevation with compacted fill material below littoral planting.
   • Pros and Cons – same as Option 2 plus potential for erosion at low water season.

All areas preliminarily identified by CPH as potential Option 1 and Option 2 treatment areas are identified on the Initial Repairs Programming Exhibits.
(attached). Option 3 has not been applied to any of the areas and requires further coordination. CPH has also prepared a preliminary programing cost estimate for each lake based on 2021 dollars which is reflected on the updated “Deficiencies Summary Report” (attached), whose origin and source information can be found in the aforementioned Assessment Report.

Although these are all considered suitable repair options, each one has an associated cost that could potentially limit the amount of repairs that can be done per fiscal year. CPH recommends the implementation of a pilot project to test the efficiency of Options 2 and 3 before a full repair plan is considered.

Once the Board of Supervisors has reviewed and approved the desired treatment option for each lake, CPH will need to know the spending limit set for fiscal year 2021 in order to prepare a proposal for final design and construction inspection services.

Note:
Each repair option provided has an approximate linear cost based on a 16’ to 20’ of width:

Option 1 = $135.00 per LF
Option 2 = $115.00 per LF
Option 3 = $100.00 per LF

We request the District consider and decide the following items as programming continues to be refined for this and future fiscal year projects:

1. Should the 2021-2022 initial project be a full budget project or merely a lesser scoped pilot project to confirm viability and results?
2. Given the programming budget of $1.8M +/- to complete the entire repair identified in the Assessment Report, how much does the District wish to budget each year in order to complete the project over a predetermined number of years? There are efficiencies in costs when construction occurs in larger projects.
3. Does the District wish to modify irrigation in either the pilot project or permanent projects?
4. Does the District prefer one treatment option over another and what criteria should be used to make selections?
5. Other items to consider in advancing a programming effort?
6. When would the District wish to have design complete in order to bid and award a contractor in order to beat the seasonal demand for contractors? When would the optimal time to commence construction occur?

We hope to discuss this report and receive direction from the District at the upcoming meeting on August 16, 2021.
NOTE:
LAKES 57, 59 AND 64 ARE OWNED BY THE QUARRY GOLF CLUB AND ARE NOT INCLUDED ON THIS PROGRAMMING REPORT.
PROPOSED NEW FILL MATERIAL
4:1 MAXIMUM SLOPE @ 95% COMPACTION

PROPOSED NEW SOD UP TO 12" ABOVE C.E.

20' MAINTENANCE EASEMENT

GOLF COURSE / RESIDENTIAL / R.O.W. EXISTING GRADE

12' OF 6" RIPRAP WITH MARAFI 140 OR APPROVED EQUAL UNDERLAYMENT

CONTROL ELEVATION (NGVD) = VARIES (12.5' - 14.00')

LOW SEASONAL WATER LEVEL = ± 4'

12" x 12" MINIMUM GEOTEXTILE COVER 1" BELOW CONTROL ELEVATION.

PROPOSED ANTI-SCOUR KEYWAY

EXISTING GRADE

EXISTING LAKE BOTTOM

OPTION 1 - TYPICAL EROSION TREATMENT DETAIL

NTS
PROPOSED NEW FILL MATERIAL
4:1 MAXIMUM SLOPE @ 95% COMPACTION

PROPOSED NEW SOD UP TO 12" ABOVE C.E.

20' MAINTENANCE EASEMENT
GOLF COURSE / RESIDENTIAL / R.O.W.
EXISTING GRADE

12" x 12 MINIMUM GEOTEXTILE COVER
1' BELOW CONTROL ELEVATION.

PROPOSED ANTI-SCOUR KEYWAY

LITTORAL PLANTING (H) HIGH ELEVATION -1' ABOVE C.E.:
SAND CORDGRASS
MUHY GRASS

(M) MID ELEVATION - AT C.E.:
SOFT RUSH
CANNA LILY

(L) LOWER ELEVATION -1' -1.5' BELOW C.E.:
PICKEREL WEED
ARROWHEAD

(L1) LOWER ELEVATION -1.5' -2' BELOW C.E.:
BULRUSH

(OR APPROVED EQUAL) UNDERLAYMENT

12" OF 6" RIPRAP WITH MARAFI 140
12" x 12 MINIMUM GEOTEXTILE COVER
1' BELOW CONTROL ELEVATION.

PLANT MATERIAL:
- SAND CORDGRASS 1 GAL 24" O.C. STAGGERED
- SOFT RUSH 2" LINERS 24" O.C. STAGGERED
- MUHY GRASS 1 GAL 24" O.C. STAGGERED
- CANNA LILY 2" LINERS 18" O.C. STAGGERED (NATIVE)
- PIckerel WEED 2" LINERS 18" O.C. STAGGERED
- ARROWHEAD 2" LINERS 18" O.C. STAGGERED
- BULRUSH 2" LINERS 24" O.C. STAGGERED

OPTION 2 - TYPICAL EROSION TREATMENT DETAIL WITH LITTORALS

LITTORAL PLANTING PATTERN - PLAN VIEW

MUHY GRASS
SOFT RUSH
CANNA LILY
PIckerel WEED
ARROW HEAD
BULRUSH

RIPRAP MATERIAL

TYPICAL LITTORAL PLANTING PATTERN - PLAN VIEW
PROPOSED NEW FILL MATERIAL.
4:1 MAXIMUM SLOPE @ 95% COMPACTION

PROPOSED NEW SOD UP TO 12" ABOVE C.E.

20' MAINTENANCE EASEMENT

GOLF COURSE / RESIDENTIAL / R.O.W.
EXISTING GRADE

LITTORAL PLANTING
(H) HIGH ELEVATION - 1' ABOVE C.E.: SAND CORDGRASS
MUHLY GRASS

(M) MID ELEVATION - AT C.E.: SOFT RUSH
CANNA LILY

(L) LOWER ELEVATION - 1' - 1.5' BELOW C.E.: PICKEREL WEED
ARROWHEAD

(L1) LOWER ELEVATION - 1.5' - 2' BELOW C.E.: BULRUSH

(OPTIONAL) BIO-DEGRADABLE EROSION BLANKET.
BOTH ENDS BURIED 12' UNDER SOIL

EXISTING GRADE

EXISTING LAKE BOTTOM

PLANT MATERIAL:
- SAND CORDGRASS 1 GAL 24" O.C. STAGGERED
- SOFT RUSH 2" LINERS 24" O.C. STAGGERED
- MUHLY GRASS 1 GAL 24" O.C. STAGGERED
- CANNA LILY 2" LINERS 18" O.C. STAGGERED (NATIVE)
- PICKEREL WEED 2" LINERS 18" O.C. STAGGERED
- ARROWHEAD 2" LINERS 18" O.C. STAGGERED
- BULRUSH 2" LINERS 24" O.C. STAGGERED

4:1 MAXIMUM SLOPE @ 95% COMPACTION

CONTROL ELEVATION (NGVD) = VARIES (12.5' - 14.00')

LOW SEASONAL WATER LEVEL ± 4'

OPTION 3 - TYPICAL EROSION TREATMENT DETAIL WITH LITTORALS

TYPICAL LITTORAL PLANTING PATTERN - PLAN VIEW
## The Quarry CDD - Deficiencies Summary

### Combined Shoreline

<table>
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<th>Lake #</th>
<th>Lake Perimeter LF</th>
<th>Perimeter Adjacent to Golf Course LF</th>
<th>Adjacent to Residential / Preserve/ R.O.W. LF</th>
<th>Priority #1 LF</th>
<th>Priority #2 LF</th>
<th>*Priority #3 LF</th>
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<th>Lake Bank Slope</th>
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### Golf Course Owned Lakes (For Information Only)

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*Priority #3 refers to those areas requiring minimal erosion repair work or close monitoring to avoid future erosion issues.

*Lake Bank Slope: 4:1

8/05/2021
Preliminary OPC

8/05/2021
109,243.20
194,008.80
156,702.00
$1,799,027.80

(382.23 AC.)
(382.62 AC.)
OPTION 1 TREATMENT EXAMPLE

OPTION 3 TREATMENT EXAMPLE