Technical Memo

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Date: July 28, 2015

Subject: Prairie View Golf Course BMP Performance Analysis

Following our meeting in May, Wenck Associates, Inc. (Wenck) performed a feasibility study to determine best management practices (BMPs) to improve the water quality to Lake Okabena. The study resulted from water quality improvement needs identified in the *Okabena Lake Diagnostic Study* (Wenck, 2015). Since the report, the Prairie View Golf Course was identified as a potential location to make water quality improvements. The golf course is located north of the City of Worthington, MN and is strategically located such that it would treat up to 81% (3,952 acres out of 4,868 acres) of the rural portion of the Okabena Creek watershed, the largest contributing watershed to the lake. Okabena Creek passes through the golf course on its way to Okabena Lake (see Figure 1 in the attachments).

The goal of this study was to determine a suite of BMPs at the Prairie View Golf Course that offer treatment of the total suspended sediment (TSS) and total phosphorus (TP) loading from the Okabena Creek subwatershed within the framework of three scenarios:

- Scenario 1 - Full course playability is maintained,
- Scenario 2 - Partial course decommissioned, and
- Scenario 3 - Full course decommissioned.

Background

In the 2015 *Okabena Lake Diagnostic Study* report, Wenck evaluated the sources of sediment and phosphorus to Okabena Lake for the City and Okabena Ocheda Watershed District. From that study it was determined that the lake has poor water clarity due to TSS and excess nutrients such as TP causing algal growth. The study found that rural runoff contributed the majority of the annual sediment and phosphorus load. The study attributed 72% of the TSS load and 68% of the phosphorus load to rural runoff. Large storm events had high pollutant loads while the creek baseflow had more moderate pollutant loads.

The Prairie View Golf Course is located in the rural portion of the Okabena Creek watershed which attributes to approximately 50% of the overall Lake Okabena TP load (3,026 lb/yr) and 44% of the TSS load (944,200 lb/yr).

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Review of Available Data

The following table shows the various data used for this study and its source.

Table 1: Summary of available data and the data source.

Data	Sources
GIS data (watershed delineations, land use, and soils)	*Okabena Lake Diagnostic Study*
Precipitation Data, Snow Melt, and Temperature (1/1/2004 – 12/31/2014)	*Okabena Lake Diagnostic Study*
As-Built Storm Sewer System Information	City of Worthington
Existing Culvert Sizes and Inverts	City of Worthington
Topography	MnDNR
Aerial Imagery	MnGeo WMS Service (2010)
Water Quality	*Okabena Lake Diagnostic Study*
Existing Models	*Okabena Lake Diagnostic Study*

Methodology

Watershed Delineation:
Using information developed for the *Okabena Lake Diagnostic Study* as a base, Wenck subdivided the Okabena Creek watershed into nine subwatersheds (Figure 2 in the attachments). The newly delineated subwatersheds included the Prairie Links Golf Course and areas tributary to it. The total watershed contributing runoff to the Prairie Links Golf Course was 3,952 acres of mostly agricultural land.

Baseline Conditions Model:
The P8 water quality model developed for the *Okabena Lake Diagnostic Study* was used as a base model. The *Okabena Lake Diagnostic Study* model did not include the stormwater ponds in the golf course. Since this was the primary focus in this study, the bathymetry of the ponds was needed in order for P8 to adequately estimate the water quality removal performance. The as-built drawings provided the bathymetry for the existing stormwater ponds in the golf course, outlet invert elevations, and culvert sizes. A new baseline conditions model was developed with a higher resolution so that the golf course ponds could be isolated. The model was calibrated to the loading rates described in the *Okabena Lake Diagnostic Study.* TSS and TP watershed loadings were adjusted to match the pollutant load downstream of the golf course.

Proposed BMP Development:
Wenck reviewed site topography and the golf course layout for potential BMP opportunities that would improve the creek's water quality. A layout of feasible BMPs for the City to review and a list of BMP options suited to the three scenarios was developed and presented to the City for comment. Based on City comments and further review, a short list of BMPs was developed. The BMPs were designed to a 30% level. They were evaluated for pollutant removal and flood concerns as a system rather than individually efficiencies. Since the

diagnostic study attributed the pollutant loads to large rainfall events and the total phosphorus found was largely particulate, passive treatment options were considered the preferred approach over chemical treatment. Recommended BMPs were sized to the available space, to treat the maximum runoff volume, and draw down within 48 hours.

Proposed Conditions Model Development:
The hydraulics of the proposed BMPs were modeled using HydroCAD, which is capable of developing detailed hydraulic rating curves that can be used in P8 model. The rating curve hydraulics from the HydroCAD models were input to the P8 model BMP devices.

P8 models require inputs of hourly precipitation and daily average temperature for the period of interest. The time period for this study was January 1, 2004 to December 31, 2014. The precipitation and temperature data used for this study were developed for the *Okabena Lake Diagnostic Study.* The first year in the simulation (2004) was used to "prime" the model. Data from that time period were not reported in the model output. The purpose for this is to account for antecedent moisture conditions. The pervious curve number (57) and impervious percent (7%) for each subwatershed were derived from the *Okabena Lake Diagnostic Study*. The runoff routing and total area was the only distinction made between the subwatersheds. For long term simulations P8 reports average annual water quality at specified points within the model.

Cost Estimates:
Several assumptions were made to assign appropriate present value cost estimates to the suggested BMPs. Table 2 shows a list of assumptions made for all cost estimates.

Table 2: Present value cost estimate assumptions.

Item	Assumptions
Mobilization	Cost is spread between multiple projects that will occur at the same time
Berm Construction	- Onsite soils are clayey - Ideal soils are available off-site when onsite excavation does not produce enough volume
Excavation	- All excavated soils can be dispersed on site - Top 6 inches of excavation is topsoil to be salvaged
Underdrain	- 10 foot spacing was necessary otherwise a single row
Wetlands	- Considered as additional projects and costs not factored into the BMP dollar per pound metric - Native seeding without potted plants or plugs - Topsoil borrow from onsite - Wetland construction costs were not considered in overall project costs.

Life cycle cost includes the proposed present value feasibility level engineering cost estimate, cost of construction, annual maintenance, periodic repairs/upgrades, and material replacement (where needed) for a period of 30 years. A discount rate of 3.5% and inflation rate of 2.3% was assumed for life cycle costs. A detailed cost estimate for each proposed BMP is attached. Life cycle cost estimate assumptions are included in Table 3.

Table 3: Life cycle cost estimate assumptions.

Item	Assumptions
Ponds	Annual maintenance and removal of accumulated sediment every 10 years
Filter Basins and Benches	Annual maintenance and replacement of top 2 inches of sand every 10 years
Wetlands	Annual maintenance and removal of accumulated sediment every 10 years
Saturated buffers	Annual inspections and removal of sediment every 10 years

One of the metrics used for BMP efficiency is the cost per pound of total phosphorus removed per year ($/lb-TP/year). This metric is calculated by dividing the life cycle cost by period (30 years) then dividing the result by the total average annual total phosphorus loading.

Results

Throughout the following section, Wenck evaluates the proposed BMPs as a system within the framework of the three scenarios for their effect on water quality and life cycle cost. Each BMP is presented individually but the calculated removal efficiency is linked to the other BMPs in the scenario.

Existing Condition: Under existing conditions two large stormwater ponds (North and South) are in line with the creek. This system discharges into a small pond immediately upstream of Palm Ave. where the creek discharges from the golf course (Figure 1). The P8 model estimates that:

North Pond removes:

- 350,000 pounds of TSS annually
- 229 pounds of TP annually

South Pond removes:

- 311,000 pounds of TSS annually
- 349 pounds of TP annually

Palm Ave. Pond removes:

- 28,000 pounds of TSS annually
- 26 pounds of TP annually

The existing stormwater ponds in the Prairie Links Golf Course reduce some of the pollutant load headed to the downstream Okabena Lake.

Existing Conditions Summary:

Total TSS Load Reduction
– 689,000 lbs/yr
– 47%
Total TP Load Reduction
– 604 lbs/yr
– 13%

Discharged downstream:
- 767,000 lbs TSS/yr
– 4,200 lbs TP/yr

However, the runoff discharged from the site still contains TSS and TP loads above the desired level.

Full Course Playability: Full playability is maintained in this scenario by implementing BMPs that fit the existing landscape and manage stormwater runoff. Each proposed BMP can be implemented individually or in combination with the others. However, the removals presented herein are based on total system performance. The following breakdown of BMPs is identified in Figure 3 (attachments).

1 - Palm Ave Pond Expansion:

TSS Reduction:	17,000 lbs/yr
TP Reduction:	24 lbs/yr
Construction Cost:	$66,000
Life Cycle Cost:	$102,000
Cost per TP Reduction:	$139/lb/yr

The existing Palm Ave. Pond is expanded into the fairway of hole 16. The expanded pond increases trap efficiency and the course's difficulty by adding a larger water trap. Hole 16 is short (about 160 yards) so the pond expansion shouldn't interfere with the course playability. Overall the pond footprint is expanded by 30,000 square feet. The expansion of this pond also provides a good opportunity to remove accumulated sediment to further increase trap efficiency.

2 - South Pond Filter Bench:

TSS Reduction:	156,000 lbs/yr
TP Reduction:	380 lbs/yr
Construction Cost:	$328,000
Life Cycle Cost:	$391,000
Cost per TP Reduction:	$34/lb/yr

This scenario also proposes expansion of the South Pond and installing a filter bench. There is a low lying area on the north side of the pond that can be excavated to increase the pond's retention volume. A filter bench on the southeast border of the pond is the primary discharge. The filter bench is 1.5 feet of sand media at the pond's normal water level. When the water level rises, water covers the filter and passes through the sand and is collected in underdrains. Raising the existing outlet structure invert will force runoff to pass through the filter. The outlet structure will operate as an overflow for the pond to prevent flooding. The filter area is designed to fit the landscape without interfering with course playability. The total footprint of the filter is 37,000 square feet.

3 - North Pond Saturated Buffers:

TSS Reduction:	96,000 lbs/yr
TP Reduction:	133 lbs/yr
Construction Cost:	$77,000
Life Cycle Cost:	$102,000
Cost per TP Reduction:	$26/lb/yr

Saturated buffers are perforated pipes installed in the bank of the creek. Water in the upstream North Pond discharges to two catch basin manholes at the normal water level (1603 ft). The catch basins discharge to saturated buffers and the water is filtered through native soil back into the creek. The perforated pipes need periodic cleaning using a vacuum truck or jetting sediment through installed cleanouts. There are two proposed saturated buffers on the North Pond, each 300 feet of 24" CMP. Flow through the normal outlet is controlled by the filtration rate of the native soils. To prevent flooding, the pond has a weir overflow at 1604 that discharges downstream.

4 - Driving Range Filter Basin:

TSS Reduction:	47,000 lbs/yr
TP Reduction:	352 lbs/yr
Construction Cost:	$731,000
Life Cycle Cost:	$794,000
Cost per TP Reduction:	$75/lb/yr

A filter basin replaces a portion of the driving range in this scenario. Storm sewer collects runoff from the upstream Pond 1 and discharges to the filter basin. The basin is approximately 76,000 square feet of sand filter media and 4 feet of storage depth. Soil excavated during construction is used to create a berm that increases the available storage depth. The filter media is 1.5 feet deep with underdrains that collect the filtered water.

5 - West Branch Filter Terrace:

TSS Reduction:	101,000 lbs/yr
TP Reduction:	186 lbs/yr
Construction Cost:	$329,000
Life Cycle Cost:	$392,000
Cost per TP Reduction:	$70/lb/yr

Discharge from the west branch of Okabena Creek is known to contain large volumes of sediment in rainfall events. The creek is mostly a dry bed until a rainfall event. At the mouth of the west branch a set of sand filter terraces are proposed. For the purposes of the golf course, these filters could be sand traps. Runoff from the west branch passes through the sand media and discharged downstream. A riprap channel in the center of the filter provides energy dissipation and promotes flow dispersion over the sand media. Flow enters the western-most of the three terraces first. When the storage volume is exceeded, runoff overflows to the next filter and again to the next filter and ultimately discharges downstream if all three filters reach capacity. The three filters have a total footprint of 39,000 square feet.

6 - Pond 1 Saturated Buffers:

TSS Reduction:	185,000 lbs/yr
TP Reduction:	108 lbs/yr
Construction Cost:	$53,000
Life Cycle Cost:	$88,000
Cost per TP Reduction:	$27/lb/yr

There is an existing crossing upstream of the hole 1 green. In this scenario an earth berm is constructed at the crossing to pond water in the natural channel. The resulting pond discharges to two catch basin manholes with saturated buffers. The earth berm is 100 feet long trapezoidal section with a 12' access road along the top. The saturated buffers each have 150 feet of perforated 24" CMP.

7 - Creek Bend:

TSS Reduction:	141,000 lbs/yr
TP Reduction:	121 lbs/yr
Construction Cost:	$52,000
Life Cycle Cost:	$87,000
Cost per TP Reduction:	$24/lb/yr
Wetland Cost:	$8,000
Life Cycle Cost:	$48,000
Combined Cost per TP:	$37/lb/yr

There is a natural creek meander near the tee box of hole 12. A basin or wetland is proposed at this bend in the creak to slow the flow of the creek and settle out particulates. Wetlands can operate as a source or a sink for phosphorous, but typically, newly reconstructed wetlands will trap phosphorus. The design includes a 100 foot earth berm to pool water and regrading the area. The practice will occupy a footprint of 50,000 square feet in the fairway of hole 7. Regular maintenance will be needed to prevent propagation of invasive species and ensure functionality is being maintained. If a wetland is established periodic sediment removal, replanting, or regrading may be needed.

An existing crossing near the hole 4 green is similarly used to pond water. An earth berm is installed at the crossing to pond water in the natural channel. The resulting pond discharges to two catch basin manholes with saturated buffers. The earth berm is a 100 foot long trapezoidal section with a 12 foot access road at the top. The saturated buffers include a total of 470 feet of perforated 24" CMP.

8 - Pond 2 Saturated Buffers:	
TSS Reduction:	99,000 lbs/yr
TP Reduction:	112 lbs/yr
Construction Cost:	$69,000
Life Cycle Cost:	$103,000
Cost per TP Reduction:	$31/lb/yr

Partial course decommissioning: The partial course decommission includes closing holes 10 through 18 (the back nine) to accommodate stormwater management. The BMPs shown in this scenario (Figure 4 of the attachments) utilize the space available in the decommission holes and show alternative means of stormwater management. BMPs proposed in the previous scenario can be implemented alongside these practices as well.

The existing stormwater ponds on site are combined in this scenario by retrofitting the discharge point at Palm Avenue. A 72" catch basin manhole is installed where Palm Avenue crosses Okabena Creek as an overflow for the pond. The manhole raises the normal water level to 1604.5 thus connecting the three existing ponds and increasing the pond volume. Filter benches are installed along the perimeter of the pond at the normal water level and operate as the primary pond discharge. The pond footprint is increased to 630,000 square feet and the filter benches have a footprint of 45,000 square feet. Re-grading portions of the back nine holes increases the pond's footprint and accommodates 100,000 square feet of wetlands. Although it was not evaluated for this project, this pond could be supplemented with an alum treatment system which could increase the pollutant removal of the pond; however, alum treatment is typically used for systems that are less flashy and have higher dissolved phosphorus contents. Systems with higher particulates are typically better treated with settling and filtration.

9 - Combined Pond:	
TSS Reduction:	434,000 lbs/yr
TP Reduction:	1,200 lbs/yr
Construction Cost:	$425,000
Life Cycle Cost:	$547,000
Cost per TP Reduction:	$15/lb/yr

Two basin areas are proposed inline with the creek to take advantage of the site's natural topography. To increase the footprint, some earthwork is required. The excavated soil can be used to create the berms needed that pool water over the landscape. The south (Basin 1) and north (Basin 2) basins have a combined footprint of 300,000 square feet. Construction within the county that disturbs wetlands can reconstruct wetlands on the golf course according to local requirements.

10 - Basin 1:	
TSS Reduction:	86,000 lbs/yr
TP Reduction:	109 lbs/yr
Construction Cost:	$73,000
Life Cycle Cost:	$108,000
Cost per TP Reduction:	$65/lb/yr
Wetland Cost:	$64,000
Life Cycle Cost:	$103,000
Combined Cost per TP:	$65/lb/yr

11 – Basin 2:	
TSS Reduction:	415,000 lbs/yr
TP Reduction:	348 lbs/yr
Construction Cost:	$105,000
Life Cycle Cost:	$140,000
Cost per TP Reduction:	$13/lb/yr
Wetland Cost:	$121,000
Life Cycle Cost:	$161,000
Combined Cost per TP:	$29/lb/yr

Full course decommissioning:

This option transitions the golf course to focus fully on stormwater management. The design relies on the natural topography of the golf course and some earthwork to create a series of stormwater ponds (Figure 5 of the attachments). It also incorporates a perimeter of wetlands that can be used as a wetland bank to offset costs. As the wetlands are constructed, creek flow should be routed through the wetlands instead of the ponds. Routing the water through the wetlands retards flow and promotes the deposition of suspended sediment.

The southern-most pond (Pond 1) is created by retrofitting the discharge point at Palm Avenue. A 72" catch basin manhole would be installed where Palm Avenue crosses Okabena Creek as an overflow for the pond. The manhole raises the normal water level to 1604 and spreads stormwater over the existing landscape. The revised pond outlet leaves 3 feet of freeboard between the road and the normal water level. The surrounding wetlands require grading the ground surface to within 0.5 feet of the pond's normal water level. The wetlands offer additional flood volume but have little effect on water quality. Excavated soil is moved to the perimeter of the property to create a berm that protects neighboring properties from flooding. The pond area has a footprint of 290,000 square feet and the wetland floodplain increases the footprint by 400,000 square feet.

12 - Pond 1:	
TSS Reduction:	134,000 lbs/yr
TP Reduction:	279 lbs/yr
Construction Cost:	$38,000
Life Cycle Cost:	$75,000
Cost per TP Reduction:	$9/lb
Wetland Cost:	$632,000
Life Cycle Cost:	$671,000
Combined Cost per TP:	$89/lb/yr

Pond 2 is created by installing an 800 foot long earth berm along the western edge of the driving range that crosses the creek toward the clubhouse. The earth berm raises the normal water level to 1610 and increases the pond footprint to 350,000 square feet. The surrounding wetlands, again, require grading the surface to within 0.5 feet of the pond's normal water level. The earth berms are constructed to route normal creek flow to the north and through the wetlands. This will further disperse flow and increase pollutant removal.

13 - Pond 2:	
TSS Reduction:	260,000 lbs/yr
TP Reduction:	365 lbs/yr
Construction Cost:	$191,000
Life Cycle Cost:	$227,000
Cost per TP Reduction:	$21/lb
Wetland Cost:	$421,000
Life Cycle Cost:	$461,000
Combined Cost per TP:	$63/lb/yr

Pond 3 is created by installing a 400 foot long earth berm perpendicular to the creek. The earth berm will be constructed to route normal creek flow to the west and through the wetlands. This will further disperse flow and increase pollutant removal. The earth berm raises the normal water level to 1612 and increases the pond footprint to 260,000 square feet. The surrounding wetlands, again, require grading the

14 - Pond 3:	
TSS Reduction:	116,000 lbs/yr
TP Reduction:	200 lbs/yr
Construction Cost:	$62,000
Life Cycle Cost:	$99,000
Cost per TP Reduction:	$16/lb
Wetland Cost:	$321,000
Life Cycle Cost:	$271,000
Combined Cost per TP:	$62/lb/yr

surface to within 0.5 feet of the pond's normal water level and increase the floodplain by 150,000 square feet. East of the pond there is potential of flooding the neighboring property so it is necessary to create an earthen berm along the perimeter of the property. Runoff from the farm will follow the natural topography to the east and ultimately discharge to Pond 2.

15 - Pond 4:

TSS Reduction:	569,000 lbs/yr
TP Reduction:	614 lbs/yr
Construction Cost:	$319,000
Life Cycle Cost:	$356,000
Cost per TP Reduction:	$19/lb
Wetland Cost:	$627,000
Life Cycle Cost:	$666,000
Combined Cost per TP:	$55/lb/yr

The furthest north pond (Pond 4) is created by installing a 400 foot long earth berm perpendicular to the creek. An earth berm will be constructed to route normal creek flow to either side of the pond through the wetlands. This will further disperse flow and increase pollutant removal. The earth berm raises the normal water level to 1618 and increases the pond footprint to 420,000 square feet. The surrounding wetlands require grading the surface to within 0.5 feet of the pond's normal water level and increase the floodplain by 400,000 square feet. By raising the normal water level the neighboring farm to the east is susceptible to flooding. Several options were reviewed that would prevent flooding and maintain drainage of the farm. To address the issue, raising the surface elevation of the farm was chosen as the most cost effective option and is represented in the estimates above. Soil excavated on-site is used to fill a low-lying area on the farm which will prevent flooding and maintain drainage. The additional excavation and placement of soil increases the pond's cost. Other options considered include creating a series of ditches along the perimeter of the golf course to route runoff from the farm further downstream and installing draintile in the low lying areas to collect excess runoff and discharge it to the south.

Summary and Conclusion

The *Okabena Lake Diagnostic Study* found that Okabena Lake receives 2,140,000 pounds of the TSS and 6,068 pounds of TP discharged to the lake annually. The diagnostic study concluded that the system as a whole is flashy; receiving most of its total sediment and particulate phosphorus during large events. The composition of total phosphorus was found to be predominantly particulate phosphorus. The Okabena Creek watershed contributes to 44% (944,000 lb/yr) and 50% (3,952 lb/yr) of the total loading for TSS and TP, respectively.

Given the event based loading and predominantly particulate fraction of TP, settling and filtration BMPs were considered within the framework of the three scenarios. All of the scenarios analyzed in this study offer reductions in TSS and TP loading to the lake given that the Okabena Creek Watershed is such a significant portion of the overall loading. Table 4 summarizes the information presented in the results section of this document.

The overall reduction in TSS to the lake provided by the three scenarios is 58%, 64%, and 74% for Scenarios 1, 2 and 3, respectively. The overall reduction in TP to the lake provided by the three scenarios is 30%, 34%, and 30% for Scenarios 1, 2 and 3, respectively. Though all of the options are viable options in terms of their ability to make an impact to the overall water quality delivered to the lake, partially decommissioning the course (without wetland construction) has the lowest $/lb removal of TP at $16/lb. Fully decommissioning the golf course without wetland construction is the next most cost effective option followed by the full playability option. One consideration is the revenue generated from the golf course will offset some of the construction and maintenance costs under the partial and full playability options. The gold course revenue was not included in the cost estimates for BMPs.

The BMP scenarios are presented in this report as part of a system within the framework of each scenario. However, each BMP is designed such that the City can choose from the range of options. Individual BMPs can function independently of the others and can be constructed in sequence. Sequential construction may help optimize funding sources and achieve long term water quality goals for the downstream Okabena Lake. The efficiency of each individual BMP as a singular project can be evaluated easily with the models developed in this study.

Table 4: Summary of proposed practices, cost estimates, and potential pollutant removal.

Project Summary									
#	BMP	Present Value Cost	Life Cycle Cost	TSS Removal Efficiency	TSS Removed (lb/yr)	TP Removal Efficiency	TP Removed Per Year (lb/yr)	Life Cycle Cost Per TP Removal
Full Course Playability									
1	Palm Ave Pond Expansion	$66,000	$102,000	3%	17,000	1%	24	$142
2	South Pond Filter Bench	$328,000	$391,000	20%	156,000	10%	380	$34
3	North Pond saturated Buffers	$77,000	$102,000	13%	96,000	5%	133	$26
4	Driving Range Filter Basin	$731,000	$794,000	30%	47,000	22%	352	$75
5	West Branch Filter Terrance	$329,000	$392,000	28%	101,000	16%	186	$70
6	Pond 1 Saturated Buffers	$53,000	$88,000	18%	185,000	3%	108	$27
7	Creek Bend	$52,000	$87,000	17%	141,000	4%	121	$24
	Wetland Conversion	$8,000	$48,000					$37
8	Pond 2 Saturated Buffers	$69,000	$104,000	14%	99,000	3%	112	$31
Summary w/o Wetlands		**$1,705,000**	**$2,060,000**	**58%**	**842,000**	**30%**	**1,416**	**$48**
Summary w/ Wetlands		**$1,713,000**	**$2,108,000**					**$50**
Partial Course Decommissioning									
9	Combined Pond	$425,000	$547,000	46%	434,000	28%	1,200	$15
10	Basin 1	$73,000	$108,000	14%	87,000	4%	109	$33
	Wetland Conversion	$64,000	$103,000					$65
11	Basin 2	$105,000	$140,000	40%	415,000	10%	348	$13
	Wetland Conversion	$121,000	$161,000					$29
Summary w/o Wetlands		**$603,000**	**$795,000**	**64%**	**936,000**	**34%**	**1,657**	**$16**
Summary w/ Wetlands		**$788,000**	**$1,059,000**					**$21**
Full Course Decommissioning									
12	Pond 1	$38,000	$75,000	26%	134,000	8%	279	$9
	Wetland Addition	$632,000	$671,000					$89
13	Pond 2	$191,000	$227,000	35%	260,000	9%	365	$21
	Wetland Addition	$421,000	$461,000					$63
14	Pond 3	$62,000	$99,000	24%	116,000	7%	200	$17
	Wetland Addition	$231,000	$271,000					$62
15	Pond 4	$319,000	$356,000	54%	569,000	18%	614	$19
	Wetland Addition	$627,000	$666,000					$55
Summary w/o Wetlands		**$610,000**	**$757,000**	**74%**	**1,079,000**	**30%**	**1,458**	**$17**
Summary w/ Wetlands		**$2,521,000**	**$2,826,000**					**$65**

Figures