## 2015

Saganashkee Slough McMahon Woods Section 506 Great Lakes Fishery \& Ecosystem Restoration Study

Appendix B - Civil Design


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## INTRODUCTION

## General

1. The purpose of this volume is to present the civil engineering analysis for the formation of FEASIBILITY STUDY plans for the various ecosystem restoration measures that make up the Saganashkee Slough and McMahon Woods project. The project was revised and now consists of the Fen Area just north of the Cal-Sag Channel, referred to as McMahon Woods. $104^{\text {th }}$ Avenue serves as the western edge of the site, which extends north of $107^{\text {th }}$ St.

## Purpose and Scope

2. The purpose of this section is to: 1) describe design criteria, engineering methods and procedures that were used to layout and perform preliminary design analysis of the measures; 2) present the methods used and calculations developed for quantities 3) present the requirements for the real estate needed; 4) present criteria and requirements for utility interferences; and 5) discuss the engineering design analysis requirements for the next phase of the project.

## Previous Investigations

3. A Preliminary Restoration Plan (PRP)/Federal Interest Determination (FID) report by the US Army Corps of Engineers, Chicago District titled "Saganashkee Slough and Fen Restoration - PRELIMINARY RESTORATION PLAN Great Lakes Fishery \& Ecosystem Restoration (Section 506 WRDA 2000)", was completed in August 2011.

## PROJECT AREA

## General

4. In the PRP report, several ecosystem habitat types were identified by USACE biologists for restoration. These habitats or measures cover 860 acres of Cook County Forest Preserve of which 376 acres are occupied by an open water pond. The Slough Area includes the 376 acres of open water. All acreage quantities were taken from ArcMap measurements. Tree and brush clearing quantities were developed from norms (quantities per acre) provided by the Planning Branch as were the planting and plugging quantities. Quantities for a short length of levee are discussed in paragraph 8 of this appendix. (See Attachments B-2.) The coordinate data used in this study are the North American Vertical Datum 1988 and the North American Datum 1983. The Slough portion of the project was broken off from the

Fen portion for final feasibility, due to the inefficient costs of restoration. The resulting project area is approximately 415 acres.

## Fen Area

5. The Fen Area contains a small stream called Crooked Creek. This creek empties into the Slough pond. Crooked Creek is susceptible to frequent bank over-topping rain events that threaten to significantly erode the Hine's Emerald dragonfly habitat mentioned in the main report. Project actions at Crooked Creek and in the dragonfly habitat are discussed below. The project will also install a new 60 inch round reinforced concrete box culvert (RCP) under $107^{\text {th }}$ Street at approximately 950 feet east of $104^{\text {th }}$ avenue. This culvert conveys Crooked Creek and is estimated to be 60 feet long.
6. Most of the Fen Area is comprised of Wet Mesic Woodland which measures approximately 376 acres. Except as otherwise indicated in this appendix, the work activities within the Wet Mesic Woodland will be invasive plant eradication, tree and brush clearing, plugging and planting
7. Within the central part of the Wet Mesic Woodland exists the identified habitat for the endangered Hines Emerald Dragonfly. The project will construct a berm/levee parallel to the south bank of Crooked Creek within a saddle area. The saddle high points are at elevation 612.0 (NAVD 1988) at either end. This levee will minimize the above mentioned over-topping and protect the dragonfly habitat.
8. The 100-year flood stage is estimated by Hydraulics and Hydrology (HH) Section at elevation 610.0. Adding the typical two feet of freeboard gives a design elevation of 612.0. The estimated levee bottom is at elevation 608.0. The straight line distance between the high points is approximately 645 feet. The average levee height is 2.8 feet with 1:3 side slopes and a 10 foot crest width. The material for the levee will be obtained from excavations into the original bottom of the Slough pond. Levee fill volume was calculated with InRoads (902 cy) and by hand taking elevations and distances from ArcMap (1,020 cy). The latter quantity was used for the cut and fill balance. Additional site visits and surveys will be required for design plans and specifications.
9. Rain water run-off has also caused numerous rivulets to form. These rivulets have resulted in extensive erosion in the Hines Emerald Dragonfly habitat and will be filled with natural rounded stone. These rivulets have been surveyed and located within the project area. Sections of these rivulets that have eroded will be filled with rock and cobble, as shown on Plate 3. The exact dimensions and quantities of stone, as well as geotextile for additional erosion control, will be determined during the design phase.
10. Within the mesic prarie area are patches of marsh habitat totally 30.1 acres, as shown on Plate 3. Additionally, the northern portion of the site contains areas of oak savannah habitat totally 4.5 acres. These will both be treated with plant eradication, tree and brush clearing, plugging and planting according to their habitat type.

## Real Estate

11. The Local Sponsor (LS) owns all portions of the project areas including staging, storage and access points. Consequently, there are zero real estate issues anticipated.

## Utilities

12. It is not believed that any utilities conflicts exist. However, this will need to be verified with additional field visits and research.

# MCMAHON WOODS ECOSYSTEM RESTORATION <br> FEASIBILITY STUDY 

## APPENDIX B

CIVIL DESIGN

ATTACHMENT B-1 FINAL QUANTITIES

Bid Item 0005 - Clearing and Grubbing
Clearing and Grubbing: all trees over $10^{\prime \prime}$ in DBH will be surveyed. Trees within the geo-contouring area will be removed to facilitate grading. Trees under $10^{\prime \prime}$ in DBH will be removed. All other trees to be removed are $\square$





# MCMAHON WOODS ECOSYSTEM RESTORATION FEASIBILITY STUDY 

## APPENDIX B

 CIVIL DESIGNATTACHMENT B-2<br>LEVEE QUANTITY CALCULATION - INROADS

## Earthwork Quantities Report

Report Created: 3/18/2014
Time: 2:33pm

Cross Section Set Name: levee
Alignment Name: levee
Input Grid Factor: 1.000000 All units in this report are in feet, square feet and cubic yards unless specified otherwise.

| Baseline Station | Cut Shrink/ Swell Factor | StationCutArea | StationCutVolume | Adjusted Station Cut | Fill Shrinkl Swell Factor | Station Fill Area | $\begin{array}{\|l\|} \text { Station } \\ \text { Fill } \\ \text { Volume } \end{array}$ | Adjusted Station Fill | ----- - Added Quantities |  |  |  | Mass Ordinate |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  | Cut | Adjusted Cut | Fill | Adjusted Fill |  |
| 0+00.00 | 1.00 | 0.00 | 0.0 | 0.0 | 1.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |  |
|  | Station Total: |  |  | 0.0 |  |  |  | 0.0 |  | 0.0 |  | 0.0 | 0.0 |
| 1+00.00 | 1.00 | 0.00 | 0.0 | 0.0 | 1.00 | 28.86 | 53.5 | 53.5 | 0.0 | 0.0 | 0.0 | 0.0 |  |
|  | Station Total: |  |  | 0.0 |  |  |  | 53.5 |  | 0.0 |  | 0.0 | -53.5 |
| 2+00.00 | 1.00 | 0.00 | 0.0 | 0.0 | 1.00 | 47.70 | 141.8 | 141.8 | 0.0 | 0.0 | 0.0 | 0.0 |  |
|  | Station Total: |  |  | 0.0 |  |  |  | 141.8 |  | 0.0 |  | 0.0 | -195.2 |
| $3+00.00$ | 1.00 | 0.00 | 0.0 | 0.0 | 1.00 | 88.00 | 251.3 | 251.3 | 0.0 | 0.0 |  | 0.0 |  |
|  | Station Total: |  |  | 0.0 |  |  |  | 251.3 |  | 0.0 |  | 0.0 | -446.5 |
| 4+00.00 | 1.00 | 0.00 | 0.0 | 0.0 | 1.00 | 32.00 | 222.2 | 222.2 | 0.0 | 0.0 | 0.0 | 0.0 |  |
|  | Station Total: |  |  | 0.0 |  |  |  | 222.2 |  | 0.0 |  | 0.0 | -668.7 |
| 5+00.00 | 1.00 | 0.00 | 0.0 | 0.0 | 1.00 | 32.00 | 118.5 | 118.5 | 0.0 | 0.0 | 0.0 | 0.0 |  |
|  | 1.00 Station Total: |  |  | 0.0 |  |  |  | 118.5 |  | 0.0 |  | 0.0 | -787.3 |
| 6+00.00 | 1.00 | 0.00 | 0.0 | 0.0 | 1.00 | 21.53 | 99.1 | 99.1 | 0.0 | 0.0 |  | 0.0 |  |
|  | Station Total: |  |  | 0.0 |  |  |  | 99.1 |  | 0.0 |  | 0.0 | -886.4 |
| $6+40.57$ | 1.00 | 0.00 | 0.0 | 0.0 | 1.00 | 0.47 | 16.5 | 16.5 | 0.0 | 0.0 | 0.0 | 0.0 |  |
|  | Station Total: |  |  | 0.0 |  |  |  | 16.5 |  | 0.0 |  | 0.0 | -902.9 |
| Grand Total: |  |  | 0.0 |  |  |  | 902.9 | 902.9 | 0.0 |  | 0.0 | 0.0 |  |

# MACMAHON WOODS ECOSYSTEM RESTORATION FEASIBILITY STUDY 

## APPENDIX B <br> CIVIL DESIGN

## ATTACHMENT B-3 <br> PLATES

Plate $1 \quad$ Real Estate Map
Plate $2 \quad$ Plate Key Map
Plate 3 Restoration Measures
Plate 4 Saddle Area Levee Plan View
Plate 5 Levee Cross Sections






