Drainage System Analysis and Recommendations Report

Prepared for
Okeechobee County School Board

Serving

Okeechobee County High School and Surrounding Controlled Areas

OKEECHOBEE COUNTY, FLORIDA

Prepared By:

MDO ENGINEERING, INC.

PO BOX 1001
OKEECHOBEE, FL 34973

September 2019

Marcos Monte De Oca, P.E.
PE No. 63897
Certificate of Authorization No. 29880

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Overall Sites

The overall site focus was to basically include the Okeechobee County High School and adjacent controlled areas, including all the sports and practice fields. The expansion of this report added some recommendations on the west side of Highway 441 as well within the Agricultural education portion for improved drainage on onsite storage.

The purpose of this report was to identify problematic areas of drainage, areas of drainage concerns and potential remedies, conveyance improvements as well as proposed minor recommendations for additional onsite stormwater storage.

The high school site, along the east of Highway 441, with sport fields as shown below consists of 50.2 +/- acres. Currently very minor storage and water quality components are located onsite. Conveyance swales and existing grading are the sole facilities. It is important to note, 2 onsite dry detention areas are onsite, however their size and location are not conducive to either expansion or adding additional flow towards them. These facilities are at the south end of the football field and flow stormwater offsite to the south. See Exhibit A.

The agricultural education area on the west of Highway 441, consists of approximately 31.5+/- acres, however the focus of this report will be the 4.0+/- acres along Highway 441 and seen below. During the preparation of this report, high levels of stormwater were encountered and this project area was added to this report with a recommendation for additional storage. See Exhibit B.

High School Conveyance Restrictions and Recommendations
Restrictions during discussion with staff include grading within buildings, existing elevations of buildings and retaining all sports fields and open areas in as utilizable condition possible. The existing above is also coupled with cost restrictions and would be in order of most efficient for dollars spent.

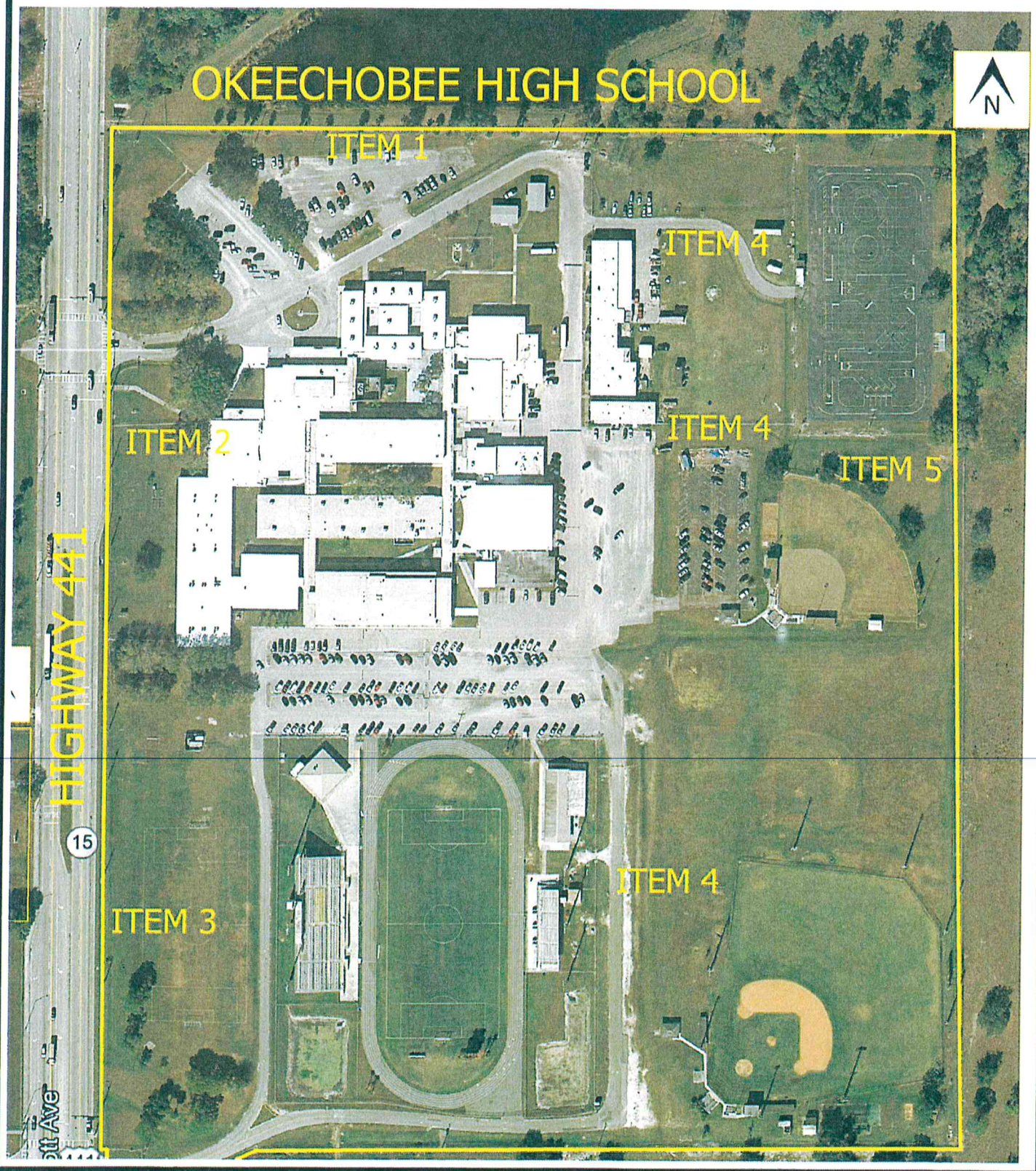
Each recommendation was evaluated to provide water quality, conveyance or onsite storage. Most of the recommendations did not generate large storage components, but do provide conveyance. The area re-grading also in the post construction conditions are not anticipated to generate any more volumetric or peak flows to the adjacent facilities and/or right of ways.

Recommendations for each area are noted with a proposed to be construction section if applicable for the area.

The parking area to the north, Item 1 on the aerial of High School
The parking area appears to be graded to northern swale. The swale does convey offsite and appears to have additional capacity. The swale that borders this area should be re-graded and extended to the limits as shown below. The swale can provide dry pre-treatment for water quality and conveyance to the offsite facilities in a more efficient manner than in the current condition. This area and section can be seen on the attached Exhibit Item 1, with section view for construction. This grading option not only provides conveyance but additional storage of 0.27 acre feet.

Exhibit A – OHS Main Campus

Exhibit A - OHS MAIN CAMPUS



MDO ENGINEERING, INC.

PO BOX 1001
OKEECHOBEE, FL 34973
TEL: (863) 634-2131
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OKEECHOBEE HIGHSCHOOL
OVERALL AERIAL

EXHIBIT 1 SCALE 1:200

Onsite swales and grading along Highway 441, Items 2 & 3 on the aerial of the High School
Item 2, consists of re-grading the area from the parking area and existing classrooms to the north, to the main entrance to provide positive drainage and additional storage for the site. A section appears as the old entrance, lined with oak trees, can be modified to allow flow to the existing facilities on Highway 441 and additional flows from the football practice field, Item 3 on the aerial.

Item 3 consists of the football practice field and the additional roadway along the west of the football grandstands. The roadway and existing water quality / conveyance swale can remain, however the field appears to have low areas adjacent to Highway 441, and can be re-graded to alleviate these areas as well as provide a conveyance or pipe system through to the north.
Combining Items 2 and 3, can convey additional flows to the offsite by re-grading and adding conveyance swales would also contribute to additional water quality and onsite storage. Please refer to Exhibit Items 2&3 for section and area of re-grading.

Combined storage for this modification could provide approximately 0.61 Ac-ft. Each contributes 0.38 Ac-ft and 0.23 Ac-ft respectively.

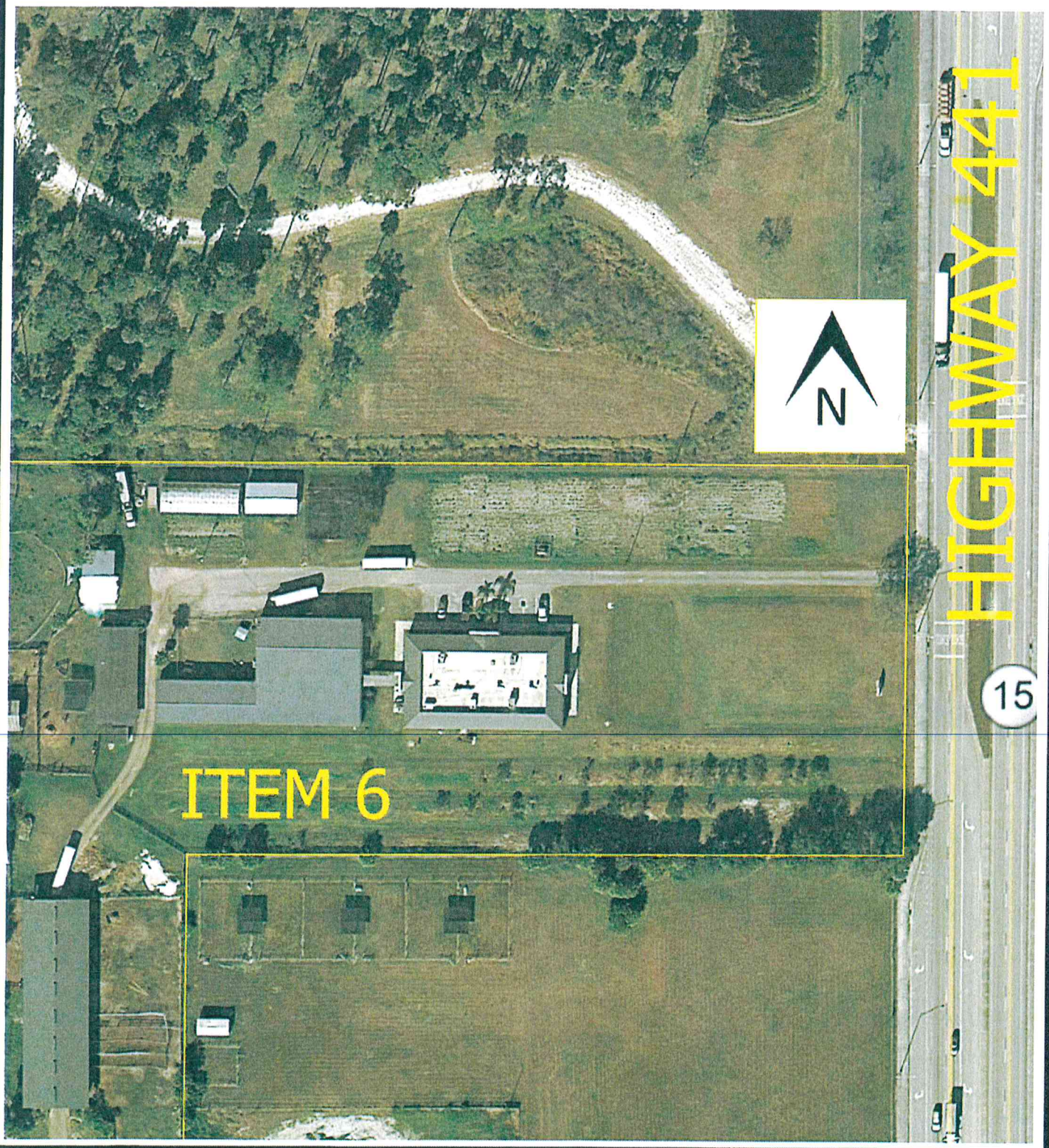
Swale Conveyance Expansion Item 4
This would be the re-grading of the existing swales denoted from the main school areas to the west along the roadway to the driver's education course as well as the north border of the existing baseball field and along the roadway from the southern entrance along the baseball fields. The swale can be potentially expanded and modified to the section shown below to have additional conveyance, provide additional water quality and additional storage onsite. The storage component for this is an approximation at 0.1-0.4 Ac-ft the additional capacity for conveyance and potential to increase gradient could be utilized. Please refer to the Exhibit Item 4 – Swale Expansion for detailed locations. Swales included total approximately 2,400 linear feet.

Construction of Dry retention area Item 5
Although could be omitted due to construction costs would provide the most storage of the onsite remediation items discussed. The site is limited to the east flow by the adjacent land elevation. A large portion of the high school does drain to the east via overland flow. This area does flow into Taylor creek and topographic information also denotes this. The flows from the expanded swales could be directed to a dry retention area with an overflow trench, to insure non-erosive velocities, while providing onsite water quality treatment and storage. The onsite dry retention area, as denoted would be on the north of the baseball field and south of the driver's education course. This area is limited in use currently and is a low point for a portion of the site. This area would not provide a true positive drainage outfall, however the proposed storage area could up to 0.3 +/- acres. The outflow would remain at the same overflow area and elevation. The area would provide approximately 0.28 Ac-ft of storage as well for the site. It is also important to note, it does not appear that areas offsite flow toward the controlled area at the high school.

Items such as creating wet detention areas, large dry detention area, exfiltration trenching under asphalt areas, underground storage containers and/or other means of storage and treatment were omitted due to construction cost constrains and/or loss of existing utilization of facilities or sports fields. Please refer to the Exhibit Item 6 for detailed location and section for construction.

Exhibit B – OHS AG Teaching Area

Exhibit B - OHS AG TEACHING AREA



MDO ENGINEERING, INC.

PO BOX 1001
OKEECHOBEE, FL 34973
TEL: (863) 634-2131
FL ENGINEERING BUSINESS NO. 29880
MARCOS@MDO-ENGINEERING.COM

OKEECHOBEE HIGHSCHOOL
AG EDUCATION AREA

EXHIBIT 1 SCALE 1:100

Agricultural Education Area, Item 6

Additional storage component for this area was added as previously explained and a construction section for the construction of a wet detention area in included. Please refer to the section below for the detention facility and location. The location denoted is based upon a meeting with staff onsite during the period of inundation at the facility. The detention area will not provide positive outfall, but will provide additional storage. Please note the section has been sloped to a 1 to 5 Horizontal to vertical component to a longer length of the slope to better provide a safer detention area onsite. The overall area as discussed is 0.2 acres. Additional criteria could be applied for onsite storage and create an above ground impoundment. The determination of the required storage could be conducted once the project was to move to forward. The area can also be converted to rowed orange grove with the above ground impoundment would be utilized as both water quality and quantity storage as well as irrigation water. The smaller scale for this area may not cause for the storage above ground however. Refer to Exhibit Item 6 for construction section. The anticipated storage would be approximately 0.4 Ac-ft.

Report Summary

This report should be utilized as a guide to create and improve the onsite drainage with minor onsite inconvenience and without completing a major onsite disturbance. The area which is pumped within the main building complex was not modified as the pumps have been changed and the elevation restriction coupled with greater costs of implementing a piped system to the perimeter areas.

Each of the specific items presented targeted an area of concern or creates an area to provide relief for water stacking concerns. Each item presented contributes a portion, with totals of storage increases for all areas reaching 1.74 Ac-ft, of which 1.34 Ac-ft would be on the main campus area. The storage component correlates to an additional rainfall storage component to 0.3 inches over the entire 50.2 acres. Although the storage component appears minor, to the overall system, the capability to convey to offsite areas holds the most benefit. The reduction in stacked water and pockets of inundation with no conveyance in the noted problematic areas would be conveyed to the outfalls.

Engineer's Estimate of Probable Cost

Below is a summary of both storage and anticipated costs for each of the improvements. Please note if multiple projects are selected savings are anticipated for every aspect of each of the included items.

ENGINEER'S ESTIMATE OF PROBABLE COST AND QUANTITIES
Okeechobee County School Board

High School Project

Summary of Recommendations	Survey & Turbidty Control	Grading of area $6.50 / (CY)	Stabilization $0.20 / SF	Mobilization Est at 5%	Total Estimate Cost
- Pakring area to North (Item 1)	$ 650.00	$ 722.22	$ 600.00	$ 132.22	$ **2,104.44**
- Onsite swales and grading alone 441 (Item 2 & 3)	$ 750.00	$ 4,333.33	$ 3,000.00	$ 733.33	$ **8,816.67**
- Swale Conveyance (Item 4)	$ 750.00	$ 3,177.78	$ 4,800.00	$ 797.78	$ **9,525.56**
- Construction of Dry Detention area (Item 5)	$ 500.00	$ 7,235.80	$ 2,003.76	$ 923.96	$ **10,663.52**
- Agricultural Education Area (item 6)	$ 650.00	$ 25,561.25	$ 2,178.00	$ 2,773.93	$ **31,163.18**
	If multiple projects are selected, costs maybe reduced				$ **62,273.36**

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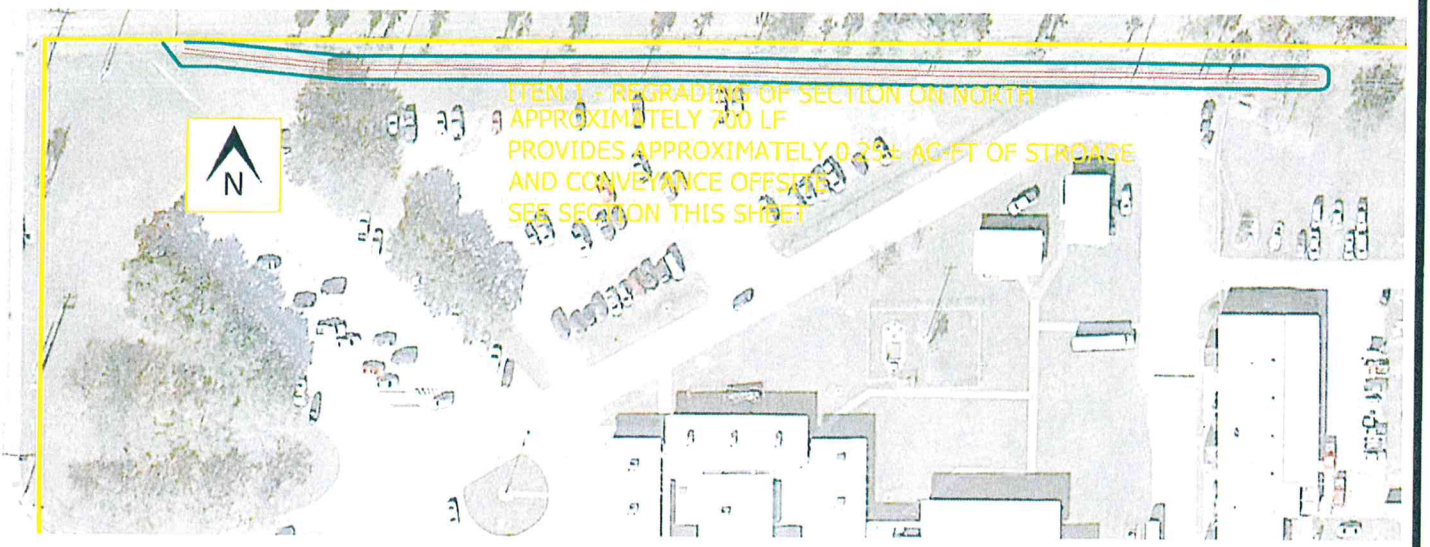
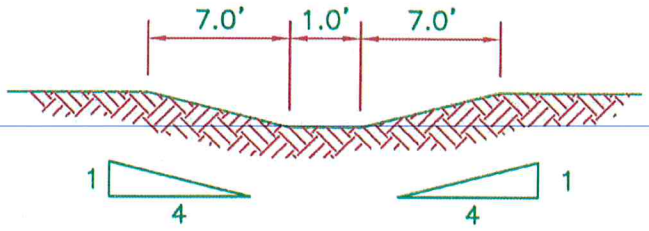
Construction Section Exhibits

OKEECHOBEE HIGHSCHOOL
EXHIBIT ITEM 1 - NORTH SWALE REGRADE



CONVEYA



SWALE SECTION
GRADE FOR EAST TO WEST CONVEYANCE

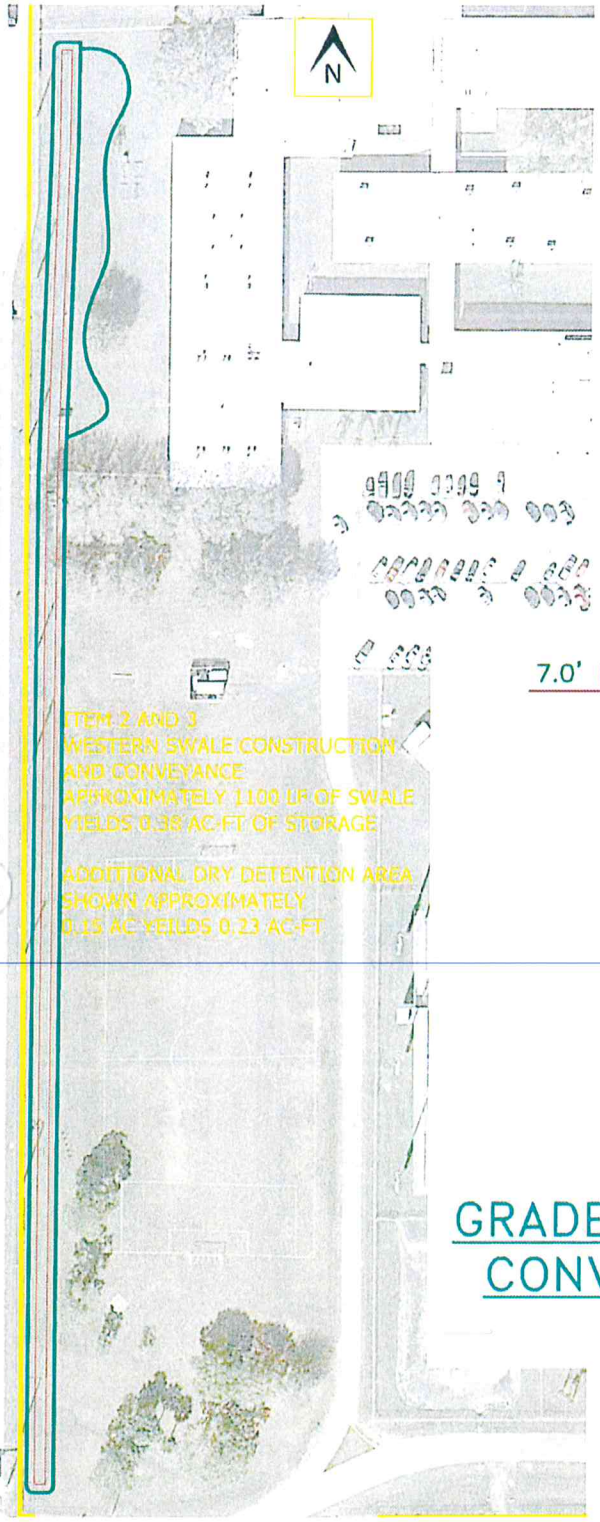
NOT TO SCALE

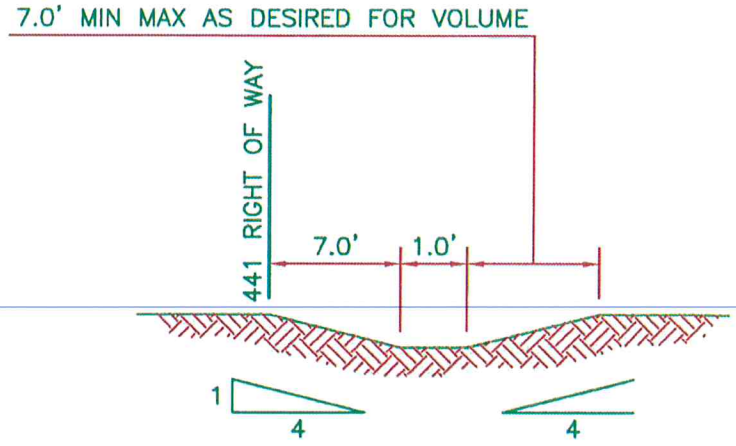
MDO ENGINEERING, INC.

PO BOX 1001
OKEECHOBEE, FL 34973
TEL: (863) 634-2131
FL ENGINEERING BUSINESS NO. 29880
MARCOS@MDO-ENGINEERING.COM

OKEECHOBEE HIGHSCHOOL
ITEM 1 - SWALE REGRADE
NOT TO SCALE

OKEECHOBEE HIGHSCHOOL
EXHIBIT ITEMS 2 & 3 - WEST SWALE REGRADE





SWALE SECTION
GRADE FOR SOUTH TO NORTH CONVEYANCE AND STORAGE

NOT TO SCALE

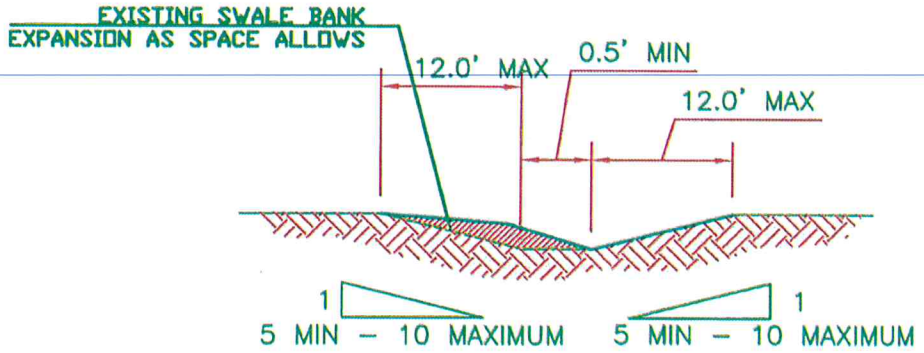
MDO ENGINEERING, INC.

PO BOX 1001
OKEECHOBEE, FL 34973
TEL: (863) 634-2131
FL ENGINEERING BUSINESS NO. 29880
MARCOS@MDO-ENGINEERING.COM

OKEECHOBEE HIGHSCHOOL
ITEM 2 & 3 - WEST SWALE

NOT TO SCALE

OKEECHOBEE HIGHSCHOOL
EXHIBIT ITEM 4 - SWALE EXPANSIONS / REGRADING



TYPICAL SWALE
EXPANSION / REGRADING SECTION

NOT TO SCALE

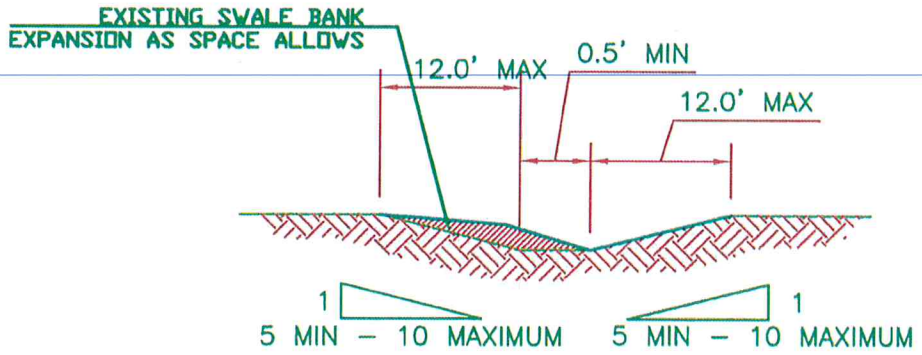
MDO ENGINEERING, INC.

PO BOX 1001
OKEECHOBEE, FL 34973
TEL: (863) 634-2131
FL ENGINEERING BUSINESS NO. 29880
MARCOS@MDO-ENGINEERING.COM

OKEECHOBEE HIGHSCHOOL
ITEM 4 - SWALE EXPANSION

NOT TO SCALE

OKEECHOBEE HIGHSCHOOL
EXHIBIT ITEM 4 - SWALE EXPANSIONS / REGRADING



TYPICAL SWALE
EXPANSION / REGRADING SECTION
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MDO ENGINEERING, INC.

PO BOX 1001
OKEECHOBEE, FL 34973
TEL: (863) 634-2131
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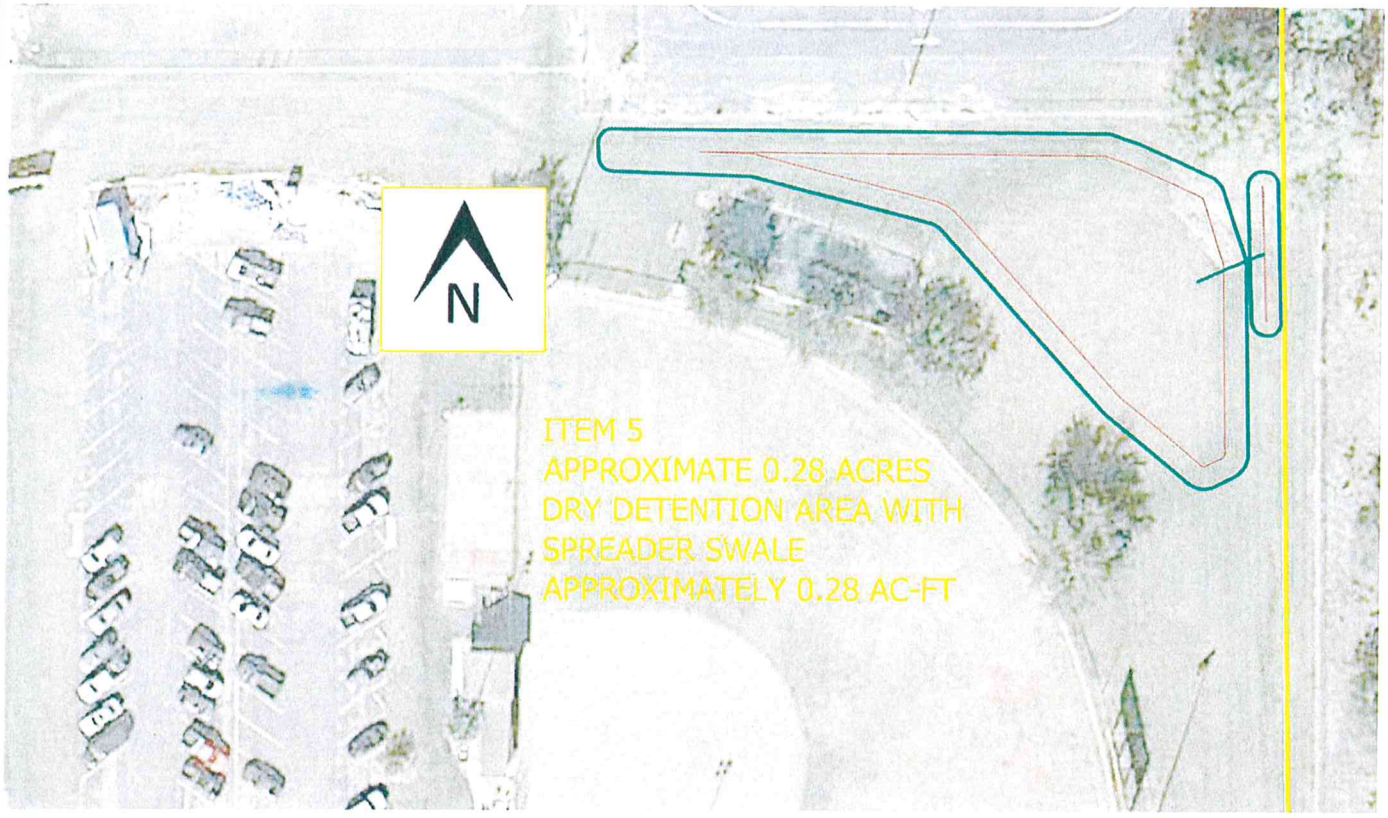
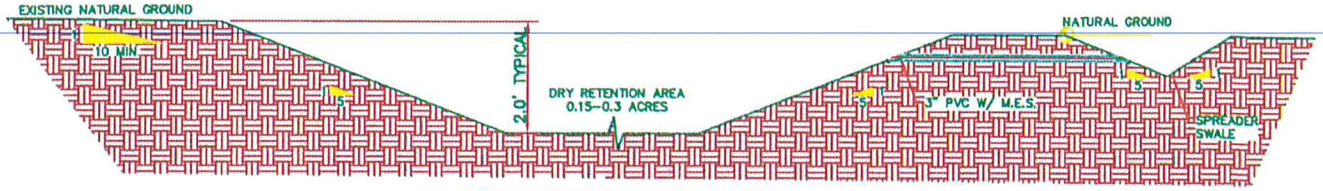
MARCOS@MDO-ENGINEERING.COM

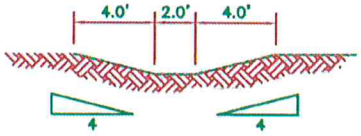
OKEECHOBEE HIGHSCHOOL
ITEM 4 - SWALE EXPANSION
NOT TO SCALE

OKEECHOBEE HIGHSCHOOL
EXHIBIT ITEM 5 - DRY DETETNION AREA CREATION





DRY RETENTION AREA
WITH OVERFLOW
NOT TO SCALE



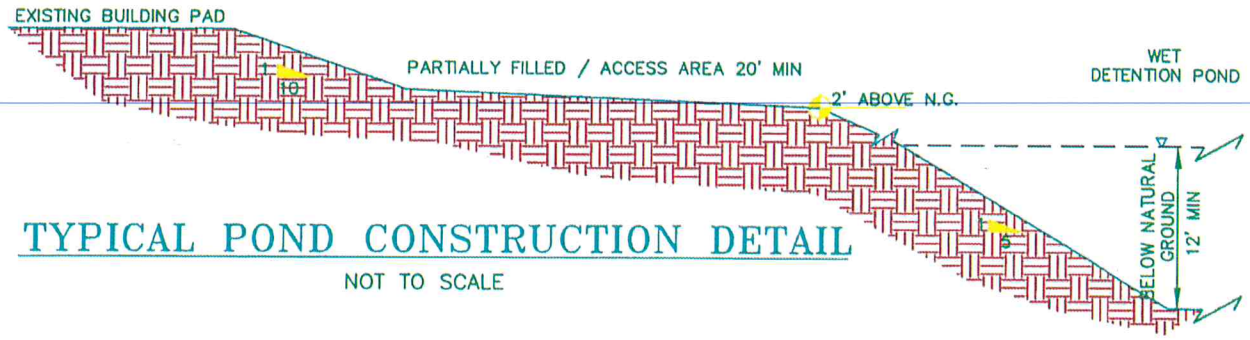
TYPICAL
SPREADER SWALE SECTION
NOT TO SCALE

MDO ENGINEERING, INC.

PO BOX 1001
OKEECHOBEE, FL 34973
TEL: (863) 634-2131
FL ENGINEERING BUSINESS NO. 29880
MARCOS@MDO-ENGINEERING.COM

OKEECHOBEE HIGHSCHOOL
ITEM 5 - DRY DETENTION
NOT TO SCALE

OKEECHOBEE HIGHSCHOOL
ITEM 6 - WET DENTETION



TYPICAL POND CONSTRUCTION DETAIL

NOT TO SCALE

MDO ENGINEERING, INC.

PO BOX 1001
OKEECHOBEE, FL 34973
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MARCOS@MDO-ENGINEERING.COM

OKEECHOBEE HIGHSCHOOL
ITEM 6 - WET DENTETION
NOT TO SCALE