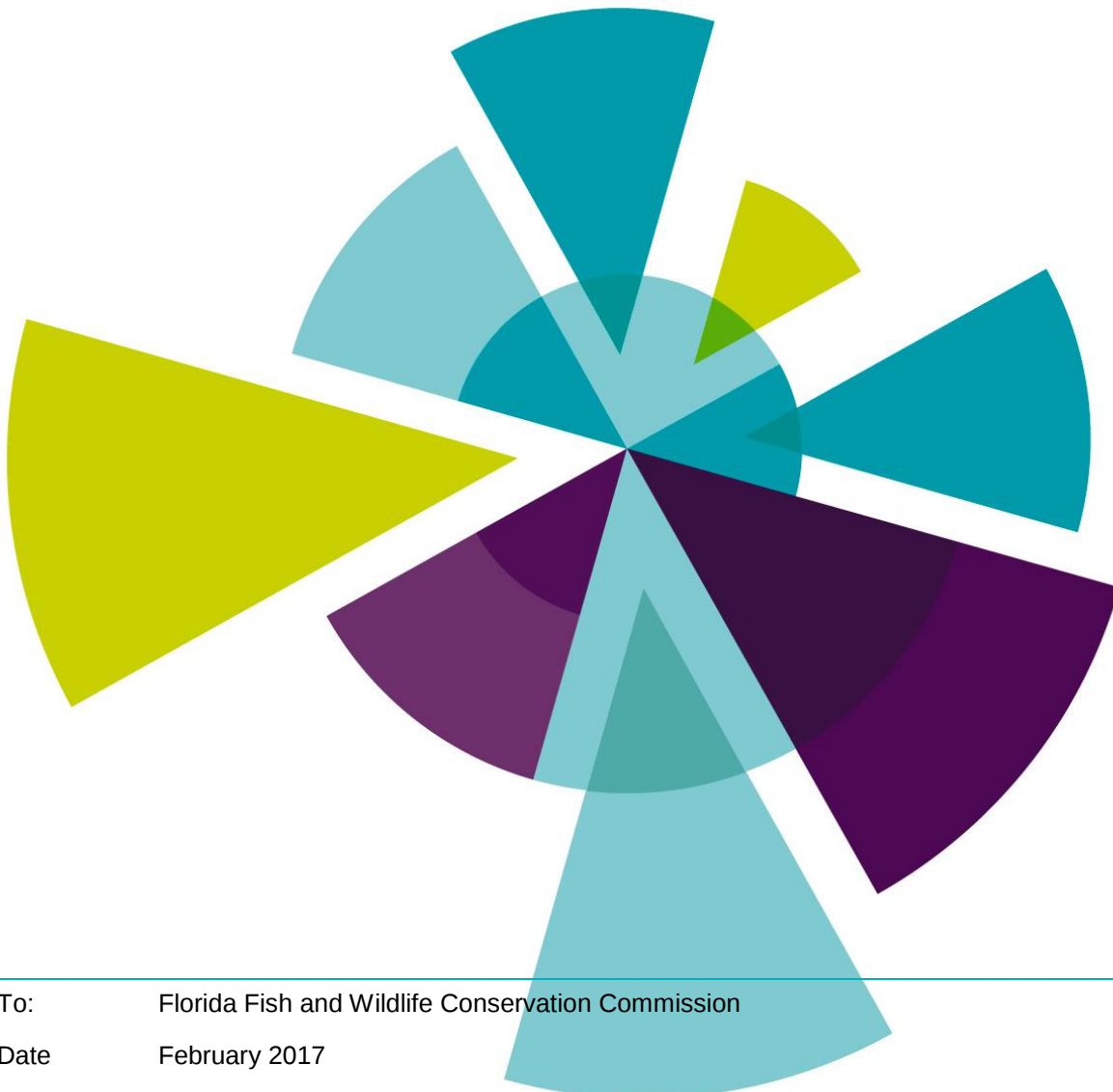




HYDROLOGIC DATA MONITORING PLAN

MK Ranch Hydrological Assessment and Restoration

Draft



To: Florida Fish and Wildlife Conservation Commission

Date: February 2017

From: Amec Foster Wheeler Environment & Infrastructure, Inc.



**MK RANCH HYDROLOGICAL ASSESSMENT AND RESTORATION
HYDROLOGIC DATA MONITORING PLAN**

Prepared for

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
Division of Habitat and Species Conservation
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1.0 INTRODUCTION

1.1 Project Background

MK Ranch consists of approximately 6,409 acres of tidal marsh and forest lands in the lower Apalachicola River Basin. MK Ranch is located in the Apalachicola River Wildlife Environmental Area (ARWEA). The ARWEA is a 63,257-acre portion of the lower Apalachicola River basin and associated upland habitats. The area was purchased by the State of Florida and is managed by the Florida Fish and Wildlife Conservation Commission (FWC) to provide protection and preservation of the Apalachicola River and Bay estuarine system.

The Lower Saul Creek Unit is located in the southwest corner of the ARWEA, and acts as a filter and storage area for water flowing from upland sites to the creeks, rivers, and eventually Apalachicola Bay and Lake Wimico. Historic land uses significantly altered the hydrologic conditions within the area, converting natural systems into agricultural production areas. The dredging and dike construction resulted in an extensive loss of wetland habitat and change of wetland community structure.

Following the execution of a 1982 Final Consent Decree by the U.S. Environmental Protection Agency (EPA) in the early 1980's, hydrologic restoration work was conducted on MK Ranch with the placement of ditch plugs and culverts and breaching of dikes. It is unknown if documentation exists regarding the extent and condition of the restoration work previously conducted.

1.2 Project Purpose and Scope

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) understands that the goal of the MK Ranch Hydrological Assessment and Restoration project is to restore historical wetland and stream structure and function by reconnecting the natural drainage pathways within the watershed on the Lower Saul Creek Unit. The objectives of Amec Foster Wheeler's scope of services are to provide a comprehensive assessment of the Lower Saul Creek Unit to determine the effectiveness of prior restoration activities and present conceptual design options and associated cost estimates for completing hydrologic restoration. This complete package will allow for the use of Gulf Restoration/Oil spill funding/NFWF funding to complete the entire restoration. The assessment will focus on Areas 1, 2 and 3 depicted in the attachments to the 1982 EPA Final Consent Decree requiring hydrologic restoration of MK Ranch.

Amec Foster Wheeler's scope of services for the project involves a field investigation, review and synthesis of available geographic information system (GIS) data, surveying of hydrologically significant components of the site, development of a surface water modeling tool to evaluate the effectiveness of the prior restoration work and develop conceptual restoration options, preparing a surface water monitoring plan, providing and deploying monitoring equipment, preparing restoration conceptual design options and associated cost estimates, and preparation of a project report. This hydrologic data monitoring plan is provided in fulfillment of the contracted scope of services. The scope of this hydrologic data monitoring plan is to describe the monitoring locations, parameters, and frequency of monitoring and provide information regarding the equipment installed on MK Ranch by Amec Foster Wheeler staff.

Amec Foster Wheeler has installed five monitoring stations, three rain gauges and five staff gauges that will record parameters of the surface water at the site. The data that is being collected will be used to create a model of the site to help understand the hydrology of the site and develop a plan to restore the hydrologic profile of the site.

2.0 FIELD INVESTIGATION, STATION INSTALLATION, AND SURVEY

In accordance with the project scope of services, Amec Foster Wheeler staff conducted a field investigation of MK Ranch in cooperation with FWC staff in October 2016 in order to gain an understanding of the hydrology, biology, topography, flow patterns, and historic restoration work. During the field investigation, Amec Foster Wheeler staff also reviewed candidate sites for location of hydrologic data collection stations. FWC staff provided a paper map showing potential monitoring sites within the southern portion of the project area.

Following the field investigation, Amec Foster Wheeler ordered, constructed, and installed the hydrologic monitoring stations. Station installation occurred on November 14 through 16, 2016.

Southeastern Surveying and Mapping, subcontractors to Amec Foster Wheeler, conducted surveying on MK Ranch in the fall of 2016 and installed vertical control points at strategic locations, including near each hydrologic data monitoring station. Each of the vertical control points is referenced to the North American Vertical Datum of 1988 (NAVD88). Following establishment of the vertical control points, Amec Foster Wheeler staff returned to MK Ranch to calibrate the automated hydrologic monitoring stations to the vertical control points and install and calibrate the manual-read staff gauges on December 20 through 21, 2016.

Reference **Appendix A** for a table of vertical control points near each hydrologic data monitoring station.

3.0 HYDROLOGIC MONITORING STATIONS

3.1 Hydrologic Monitoring Objective

The objective of the hydrologic data monitoring on the MK Ranch project area is to establish a representative data collection program on the project area to support long-term assessment of hydrologic restoration effectiveness. It is Amec Foster Wheeler's understanding that there has been no historic hydrologic data collection on the MK Ranch property. The monitoring program will initiate data collection to develop a database of existing conditions. The existing conditions data collection commenced in November 2016 with the installation of five hydrologic monitoring stations. Hydrologic data collection should continue through and following hydrologic restoration activities in order to enable comparison of hydrology prior to and following restoration.

3.2 Location

MK Ranch consists of approximately 6,409 acres of land. The property is approximately 6.8 miles long in a north to south direction and 2.3 miles wide in an east to west direction at its widest location. In order to satisfy the objective of collecting representative data over the property in a cost-efficient manner, the following criteria were established:

- The data collection stations must be accessible by an existing road to allow FWC staff to access the stations for data download, stations maintenance, and for fire protection during prescribed burning.
- The water level transducers should be located in an area where continuous inundation is expected to ensure proper function.

- The three automated precipitation gages are located as far across the property from north to south as practicable in order to capture data to represent spatial variability in precipitation.

Reference the figure in **Appendix B** depicting the locations of the five hydrologic monitoring stations.

3.3 Parameters

Each of the five hydrologic data monitoring stations are equipped to collect surface water elevation and water temperature. Three of the monitoring stations are also equipped with tipping bucket rain gauges. Each monitoring station also has a manual-read staff gauge that has been installed in close proximity to the automated stations. The purpose of the manual-read staff gages is to provide a reference point to ensure the water surface elevation readings from the automated stations are maintaining calibration. A manual staff gage reading with date and time noted should be taken each time data is downloaded from each automated monitoring station.

3.4 Frequency

Upon installation, the monitoring stations were programmed to collect data for surface water elevation, water temperature and rainfall in 10-minute intervals and daily average values. Collecting data in 10-minute intervals allows for detection and characterization of temporal variability in parameters. Data can be processed and compiled into longer time intervals useful for modeling time steps.

3.5 Equipment

The monitoring stations installed at MK Ranch consist of a Campbell Scientific CR300 data logger that is powered by a 12-volt battery and solar panel. The data logger collects data from a water level transducer and a thermistor that is mounted in a well screen below the water surface. In addition, three of the five monitoring stations are equipped with a tipping bucket rain gauge. All of the equipment is housed inside of a water-resistant stainless steel box that is mounted to a galvanized pole driven into the ground and leveled. Along with monitoring stations, five manual-read staff gauges were installed in the vicinity of the monitoring stations. The staff gauges are used to initially calibrate the monitoring stations and to check the integrity and community of the water level data being collected throughout the lifespan of the monitoring station.

Reference **Appendix C** for a photograph log of the hydrologic data monitoring stations.

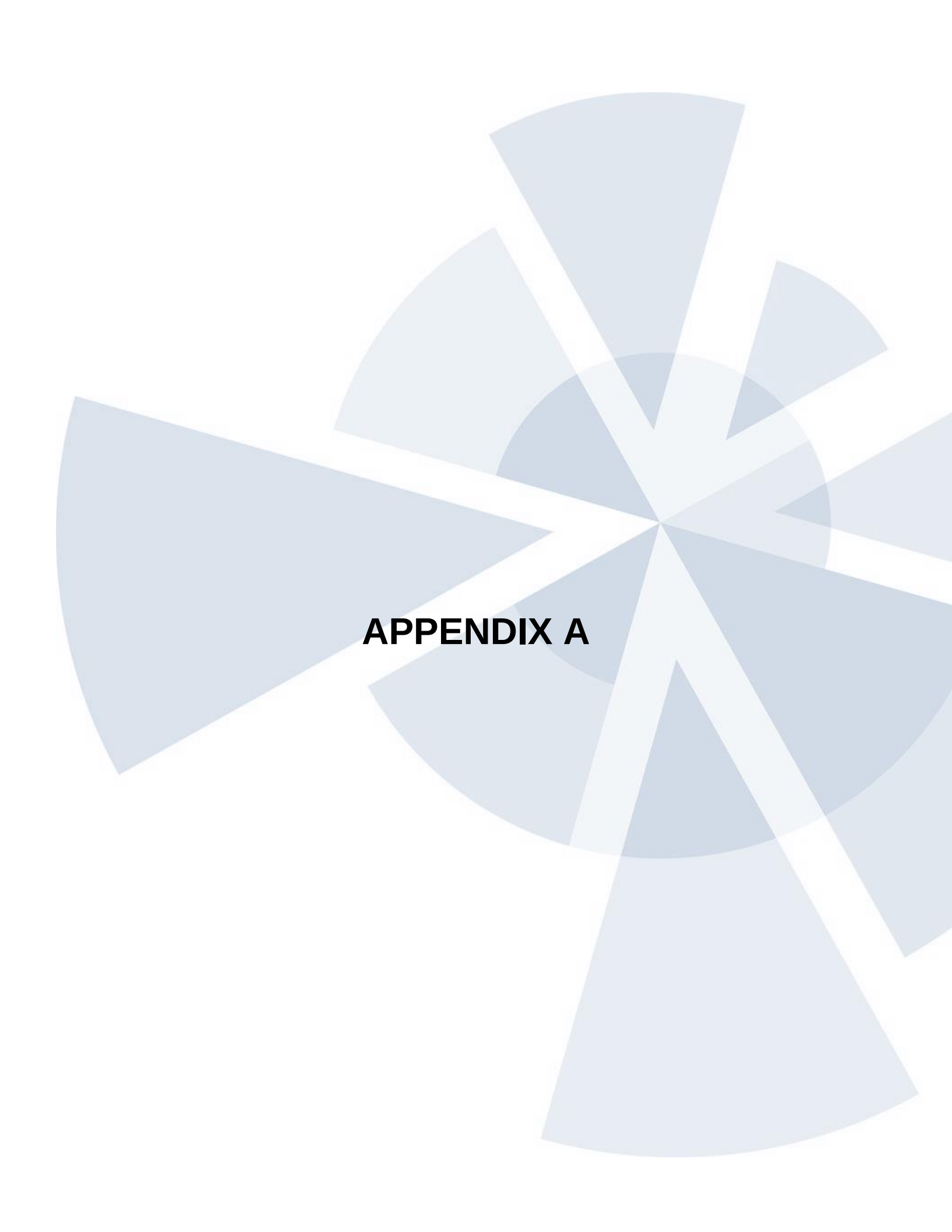
4.0 DATA MANAGEMENT

4.1 Data Download

Amec Foster Wheeler staff noted a lack of reliable cellular signal reception in the MK Ranch project area. Accordingly, manual download of the data from each of the five data loggers will be necessary. A FWC staff member will mobilize to each station and connect a laptop via USB port to the data logger. Once that data is collected it will be erased from the data logger to ensure space additional data. It is recommended to collect data on a bi-weekly basis to ensure data integrity, continuity, and equipment status and performance. If reliable cellular signal becomes available at one or more of the monitoring station locations, then FWC may wish to consider installation of cellular modems for automated data transmission.

4.2 Data Quality Assurance and Quality Control

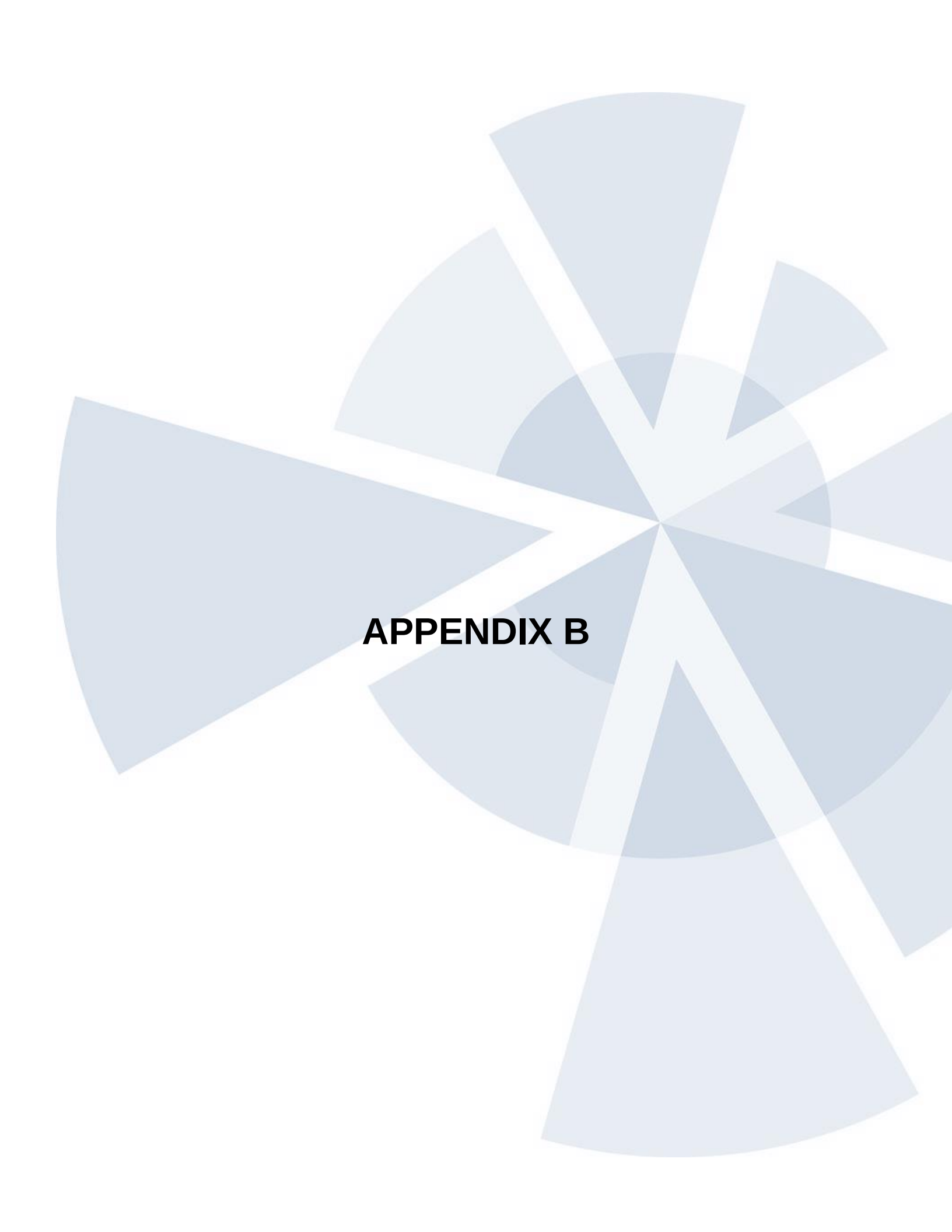
Once the data is collected from the automated monitoring stations it should receive a quality assurance and quality control (QA/QC) check to ensure that the data does not have any apparent errors or gaps. Water levels from the automated monitoring stations should be checked against the manual read staff gages for the date and time of collection to ensure station calibration is being maintained. Downloaded data should be checked for correct data and time stamps and time intervals. QA/QC should be performed with each series of collected data to ensure prompt detection of problems that can be immediately addressed. Data integrity will be essential for calibration of modeling tools and prediction of effectiveness of planned hydrologic restoration activities.



APPENDIX A

APPENDIX A
Monitoring Station Control Points

CONTROL POINT NAME	NORTHING (NAD83/2011)	EASTING (NAD83/2011)	ELEVATION (NAVD88)	DESCRIPTION AND MONITORING STATION PROXIMITY
8	288011.466	1784047.859	2.39'	SET 1/2" REBAR AND CAP STAMPED "SSMC TRAV PT" @ MONITORING STATION #1
16	304630.433	1789101.896	6.81'	SET 1/2" REBAR AND CAP STAMPED "SSMC TRAV PT" @ MONITORING STATION #4
218	293831.390	1789545.781	7.21'	SET 1/2" REBAR AND CAP STAMPED "SSMC TRAV PT" @ MONITORING STATION #3
236	295764.413	1784117.852	3.10'	SET 1/2" REBAR AND CAP STAMPED "SSMC TRAV PT" @ MONITORING STATION #2
277	314603.815	1781904.744	8.16'	SET 1/2" REBAR AND CAP STAMPED "SSMC TRAV PT" @ MONITORING STATION #5



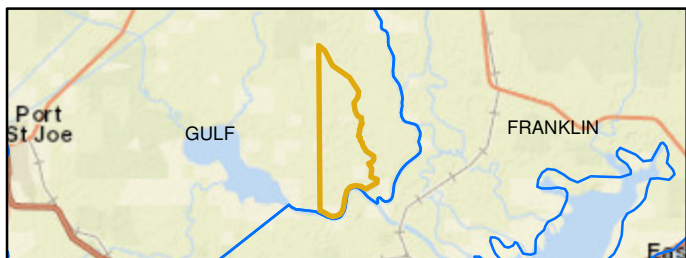
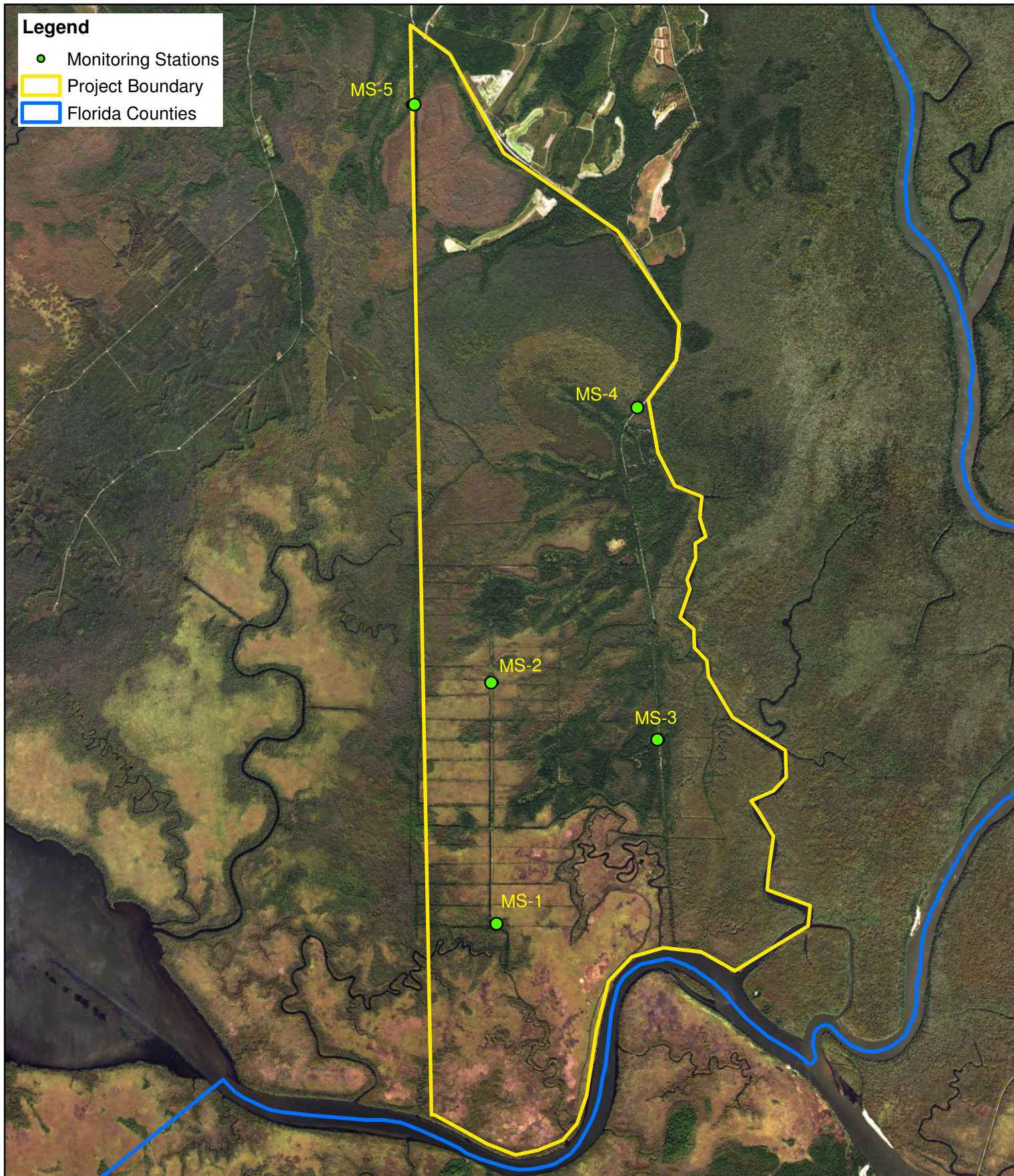
APPENDIX B

APPENDIX B

Figure with Hydrologic Monitoring Station Locations

Legend

- Monitoring Stations
- Project Boundary
- Florida Counties



Monitoring Station Locations (November 14-16, 2016)

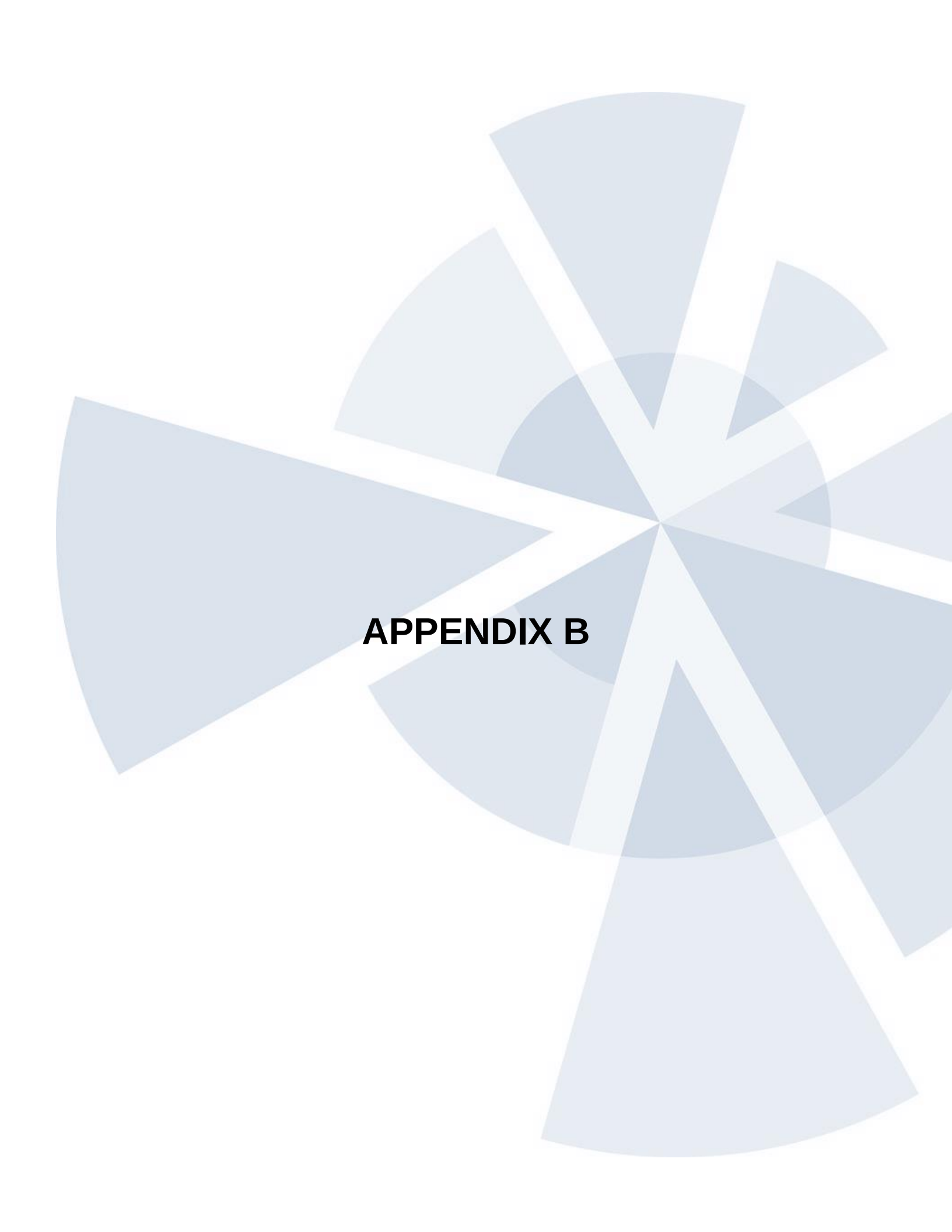
Amec Foster Wheeler Tallahassee - FWC MK Ranch



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amec foster wheeler





APPENDIX B

APPENDIX C
Photograph Log of Hydrologic Monitoring Stations

Facility: MK Ranch		
Photo No.: Monitoring Station 1		
Date: 11/14/2016		
Description: View of MS-1		
Facility: MK Ranch		
Photo No.: Monitoring Station 1		
Date: 12/20/2016		
Description: View of Staff Gauge location at MS-2.		

Facility: MK Ranch	
Photo No.: Monitoring Station-2	
Date: 11/15/2016	
Description: View of MS-2.	
Facility: MK Ranch	
Photo No.: Monitoring Station-2	
Date: 11/15/2016	
Description: View of mounted transducer and thermistor submerged under water at MS-2.	

Facility: MK Ranch	
Photo No.: Monitoring Station-2	Date: 12/20/2016
Description: View of Staff Gauge location at MS-2.	



Facility: MK Ranch	
Photo No.: Monitoring Station-2	Date: 11/15/2016
Description: View of inside of stainless steel housing, monitoring station components typical with tipping bucket rain gauge.	



Facility: MK Ranch	
Photo No.: Monitoring Station-3	Date: 11/15/2016
Description: View of MS-3.	



Facility: MK Ranch	
Photo No.: Monitoring Station-3	Date: 11/15/2016
Description: View of mounted transducer and thermistor submerged under water at MS-3.	



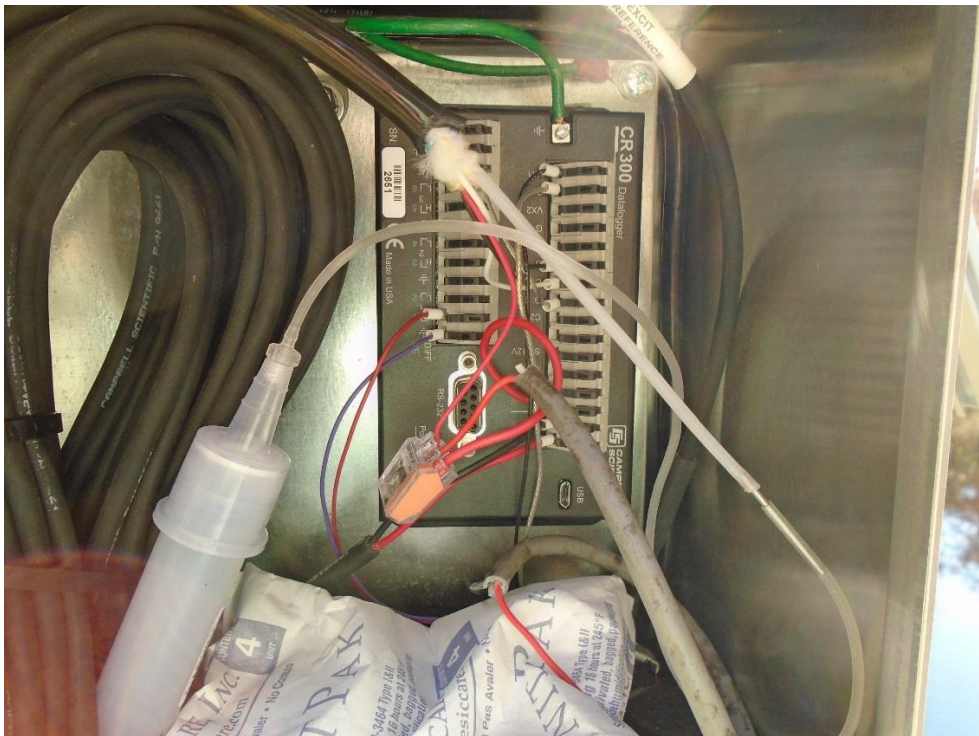
Facility: MK Ranch		
Photo No.: Monitoring Station-3	Date: 12/20/2016	
Description: View of Staff Gauge location at MS-3.		

Facility: MK Ranch		
Photo No.: Monitoring Station-3	Date: 11/15/2016	
Description: View of inside of stainless steel housing, monitoring station components typical without tipping bucket rain gauge		

Facility: MK Ranch	
Photo No.: Monitoring Station-4	
Date: 11/15/2016	
Description: View of MS-4.	
Facility: MK Ranch	
Photo No.: Monitoring Station-4	
Date: 11/15/2016	
Description: View of area where transducer and thermistor were mounted for MS-4. (Equipment and Well Screen not shown in Picture)	

Facility: MK Ranch		
Photo No.: Monitoring Station-4	Date: 12/20/2016	
Description: View of Staff Gauge location at MS-4.		

Facility: MK Ranch		
Photo No.: Monitoring Station-5	Date: 11/15/2016	
Description: View of MS-5.		

Facility: MK Ranch Photo No.: Monitoring Station-5 Date: 12/20/2016 Description: View of Staff Gauge location at MS-5.	
Facility: MK Ranch Photo No.: Monitoring Station-5 Date: 11/16/2016 Description: View of MS-5 inside of stainless steel housing, showing data logger.	

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