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August 27, 2020

Ms. Yanisa G. Angulo, P.E, M.E, CPM
Florida Department of Environmental Protection
Waste Management Division
13051 N. Telecom Parkway
Temple Terrace, FL 33637-0926

Re: 2020 Annual Wetlands Monitoring Report
Lockheed Martin Tallevast Site
FDEP Site No. COM_169624/Project No. 238148
Tallevast, Manatee County, Florida

Dear Ms. Angulo:

This correspondence letter accompanies the referenced electronic email deliverable of the 2020 Wetlands Monitoring Report submitted to the Department of Environmental Protection on August 27, 2020. This report documents the continuation of wetlands monitoring pursuant to the July 2009 Wetlands Monitoring Plan at the Lockheed Martin Tallevast Site (also known as the former American Beryllium Company Site) in Tallevast, Florida.

If you have any questions, please contact me at 240-687-1813, or paul.e.calligan@lmco.com.

Sincerely,

Paul E. Calligan

Paul E. Calligan, P.G.
Project Manager, Environmental Remediation
Lockheed Martin Corporation

cc: Mrs. Mary Ellen Fugate, SWFWMD (electronic email)
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WETLANDS MONITORING REPORT – JUNE 2019 THROUGH JUNE 2020 – TALLEVAST SITE

Prepared for:
Lockheed Martin Corporation

Prepared by:
AECOM Technical Services, Inc.

August 27, 2020

Approved by:
Lockheed Martin, Inc.

FDEP Site No. COM_169624
FDEP Project No. 238148

Revision: _0__

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TABLE OF CONTENTS

Section **Page**

Table of Contents ... i

List of Figures ... ii

List of Tables ... iii

Appendices ... iii

Acronyms and Abbreviations ... iv

Section 1 Introduction ... 1-1

Section 2 Site Background ... 2-1

Section 3 Monitoring Objectives ... 3-1

Section 4 Southwest Florida Water Management District Wetland Assessment Procedure ... 4-1

Section 5 Basis For Wetlands Assessment Procedure Deployment ... 5-1

Section 6 Project Area Setting and Site Conditions ... 6-1

- 6.1 Site Location ... 6-1
- 6.2 Climate ... 6-1
- 6.3 Physical Environment ... 6-4
- 6.4 Aquifer Systems ... 6-5
- 6.5 Surface Water Resources/Watershed ... 6-6
- 6.6 Ecology ... 6-6

Section 7 Wetlands Assessment Procedure Implementation ... 7-1

- 7.1 Transect and Monitoring Locations ... 7-1
- 7.2 Staff Gauges and Monitoring Wells ... 7-2
  - 7.2.1 Groundwater Monitoring Well Information ... 7-2
  - 7.2.2 Staff Gauge Information ... 7-3
- 7.3 Data Logger Deployment ... 7-4
- 7.4 Wetland Telemetry System ... 7-5

Section 8 Description of System Startup and Operations ... 8-1

Section 9 Description of Monitored Wetlands and Evaluation of Operational Conditions ... 9-1

- 9.1 Methodology for Data Collection and Assessment ... 9-1

9.2 General Habitat Conditions 9-6
9.3 Target Wetland 6........ 9-7
9.3.1 Transect Location 9-7
9.3.2 Habitat Description 9-7
9.3.3 Monitoring Well MW-TW-6 Data Assessment........ 9-8
9.3.4 June 2020 Field Observations 9-8
9.4 Reference Wetland 3 9-9
9.4.1 Transect Location 9-9
9.4.2 Habitat Description 9-9
9.4.3 Monitoring Well MW-RW-3 Data Assessment 9-10
9.4.4 June 2020 Field Observations 9-10
9.5 Evaluation of Operational Conditions 9-11
9.5.1 Regional Drought Conditions 9-11
9.5.2 Hydrologic Influence from the GRTS 9-11
Section 10 Summary and Conclusions 10-1
Section 11 References 11-1

LIST OF FIGURES

Figure 1-1 Site Location Map
Figure 3-1 Off-Facility RAPA System Layout
Figure 4-1 Example of Typical WAP Transect (in text)
Figure 6-1 Site Location Map with Bradenton, Florida USGS 7.5-Minute Quadrangle
Figure 6-2 Historical Temperature Trends in the Tallevast Area (in text)
Figure 6-3 Historical Precipitation Trends in the Tallevast Area (in text)
Figure 6-4 Cumulative Monthly Precipitation 2019 through 2020 vs. Historical Monthly Average Sarasota-Bradenton International Airport (SRQ) (in text)
Figure 7-1 Wetland and Transect Locations Map
Figure 7-2 Typical Well Installation Completion Diagram (in text)
Figure 7-3 Typical Staff Gauge Installation Completion Diagram (in text)
Figure 7-4 Wetland Telemetry System (in text)
Figure 8-1 Total Volume of Treated Water Discharged to Infiltration Galleries RC-7001, RC-7002, and RC-7003 (monthly) (in text)
Figure 9-1 Target Wetland 6 – Transect Map
Figure 9-2 Reference Wetland 3 – Transect Map

LIST OF TABLES

Table 2-1 Summary of Wetland Monitoring Activities and Submittals (in text)
Table 6-1 Annual Precipitation Totals at Sarasota-Bradenton International Airport (SRQ), 2009 through 2019 (in text)
Table 7-1 Wetlands Monitoring Report Survey Data
Table 9-1 Summary of Project Wetland Characteristics (in text)
Table 9-2 Summary of Manual Water Level Elevations and Staff Gauge Measurements (in text)
Table 9-3 Summary of WAP Scoring by Cover Type – Baseline to Current Assessment Period (in text)

APPENDICES

Appendix A — NOAA Climate Summary for the Florida Everglades and Southwest Coast
Appendix B — WAP Field Data Sheets
Appendix C — Photographic Documentation
Appendix D — Hydroperiod Graphs

ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
ºC	degrees Celsius
ºF	degrees Fahrenheit
Facility	Lockheed Martin Tallevast Groundwater Recovery and Treatment System
FDEP	Florida Department of Environmental Protection
GRTS	Groundwater Recovery and Treatment System
HNP	Historical Normal Pool
HUC	Hydrologic Unit Code
HWE	historical wetland edge
msl	mean sea level
MW	monitoring well
NAVD	North American Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NP	normal pool
PDSI	Palmer Drought Severity Index
PVC	polyvinyl chloride
RAPA	Remedial Action Plan Addendum
RC	Recharge (infiltration gallery or injection well)
RW	reference wetland
SAS	surficial aquifer system
Site	The “Site” consists of the Tallevast Facility and the surrounding area underlain by groundwater impacted by chemicals of concern
SRQ	Sarasota-Bradenton International Airport
SWFWMD	Southwest Florida Water Management District
TW	target wetland
USGS	United States Geological Survey

WAP	Wetland Assessment Procedure
WMP	Wetlands Monitoring Plan

SECTION 1
INTRODUCTION

This Wetlands Monitoring Report documents the eleventh wetland monitoring event and the seventh that has occurred since the start of active groundwater remedial system operations at the former American Beryllium Company Site, now known as the Lockheed Martin Tallevast Site (Site). The period of performance covered by this report is from June 2019 through June 2020.

A Site location map is presented as Figure 1-1. Tallevast, Florida is a small, unincorporated community situated between Sarasota and Bradenton immediately northeast of the Sarasota-Bradenton International Airport in southwestern Manatee County. Additional details regarding the Site background are provided in Section 2 of this report.

The Site consists of two parts – the Tallevast Facility (referred to as the "Facility" or "on-facility" portion of the Site) located at 1600 Tallevast Road in Tallevast, Manatee County, Florida, and the groundwater and surface water resources in the surrounding area, including monitored wetlands and groundwater impacted by chemicals of concern, referred to as the "off-facility" portion of the Site.

The purpose of this Wetlands Monitoring Report is to report information that includes:

- field observations of vegetative growth, recruitment, and mortality, as well as evidence of changes in land use, disturbance, and indicators of surface hydrology along the established wetland monitoring transects.
- evidence of changes in land use, abandonment, disturbance, or other activities within areas adjacent to the Wetlands Monitoring Plan wetlands that may potentially affect surface hydrology.

- water level data gathered using manual water level measurements from staff gauges and monitoring wells.
- data recorded by transducers installed in the Wetlands Monitoring Plan monitoring wells.
- annual and monthly rainfall data gathered from a monitoring station located at the Sarasota Bradenton International Airport.

SECTION 2
SITE BACKGROUND

The Remedial Action Plan Addendum for the Site was submitted to the Florida Department of Environmental Protection by ARCADIS in 2009. The Florida Department of Environmental Protection approved the Remedial Action Plan Addendum on November 11, 2010. Wetland monitoring was established pursuant to the July 2009 Wetlands Monitoring Plan, which was included as Appendix G of the Remedial Action Plan Addendum (ARCADIS, 2009a). Baseline monitoring assessments were conducted, and reports submitted for 5 years (through June 2013) prior to groundwater extraction associated with startup of the remedial system operations. Groundwater Recovery and Treatment System construction began in February 2011 and was completed in July 2013. Startup and testing occurred in October and November 2013. Groundwater Recovery and Treatment System operation began on November 18, 2013.

The Wetlands Monitoring Plan provides for the establishment, evaluation, and assessment of wetlands pursuant to agency requirements, including establishment of baseline conditions. The purpose of the Wetlands Monitoring Plan is to assist in determining if remedial action associated with the Site is adversely impacting the wetlands. Background resources used in the development of the Wetlands Monitoring Plan include the 1994 United States Geological Survey 7.5-minute Topographic Quadrangle, Bradenton, Florida (USGS, 1994), 2003 aerial orthophotography from the Manatee County Geographic Information System (Manatee County, 2003), and Ecosystems of Florida (Myers and Ewel, 1990).

A summary of historical annual wetland monitoring activities performed to date and their associated submittals are provided in Table 2-1.

TABLE 2-1
Summary of Wetland Monitoring Activities and Submittals

Event	Monitoring Period	Submittal
Wetlands Monitoring Plan	July 2009	July 2009 as Appendix G of the Remedial Action Plan Addendum (ARCADIS, 2009a)
Baseline – Year 1	June 2009 through June 2010	April 2011 (ARCADIS, 2011a)
Baseline – Year 2	June 2010 through June 2011	December 2011 (ARCADIS, 2011b)
Baseline – Year 3	June 2011 through June 2012	August 2012 (ARCADIS, 2012)
Baseline – Year 4	June 2012 through June 2013	August 2013 (ARCADIS, 2013)
Operational Monitoring Report – Year 1	June 2013 through June 2014	August 2014 (AECOM, 2014)
Operational Monitoring Report – Year 2	June 2014 through June 2015	August 2015 (AECOM, 2015)
Operational Monitoring Report – Year 3	June 2015 through June 2016	August 2016 (AECOM, 2016)
Operational Monitoring Report – Year 4	June 2016 through June 2017	August 2017 (AECOM, 2017)
Operational Monitoring Report – Year 5	June 2017 through June 2018	August 2018 (AECOM, 2018)
Operational Monitoring Report – Year 6	June 2018 through June 2019	August 2019 (AECOM, 2019a)

The Operational Monitoring Report – Year 1, and subsequent reports, document wetland conditions after Groundwater Recovery and Treatment System operations began.

The activities detailed in the Wetlands Monitoring Plan initially were to be conducted over a period of 5 years after remedial action startup, following establishment of a baseline consisting of a minimum of 2 years, resulting in a minimum program length of seven years. The actual program length is longer than 7 years because the baseline data collection spanned a 4-year period from June 2009 to June 2013. As described in the Remedial Action Plan Addendum (ARCADIS, 2009a), after 5 years of Groundwater Recovery and Treatment System operation from November 2013 through November 2018 and 5 years of corresponding wetland assessments June 2014 through June 2019, the monitoring plan was re-evaluated to determine the need to continue or modify the monitoring plan. The revised monitoring plan, which included reducing the number of monitored wetlands, as described in the following section, was included in the Remedial Action Status Report submitted to the Florida Department of Environmental Protection and the Southwest Florida Water Management District on October 29, 2019. The Florida Department of Environmental Protection and Southwest Florida Water Management District approved the Remedial Action Status Report on February 25, 2020 and March 25, 2020, respectively.

SECTION 3
MONITORING OBJECTIVES

As part of the selected remedy, the July 2009 Remedial Action Plan Addendum (RAPA) scope (ARCADIS, 2009a) incorporates removal of groundwater impacted by certain chemicals through a series of extraction wells, treatment of the extracted groundwater, and discharge of the treated groundwater using a combination of different disposal options. The purpose of the remedial action is to treat groundwater impacted with chemicals of concern at the Site. The discharge options include:

- recharging on the on-facility portion of the Site through a series of injection wells operating in tandem with on-facility extraction wells in the surficial aquifer, and through on-facility irrigation.
- discharging to the county wastewater collection and treatment system.
- recharging the local surficial aquifer using infiltration systems designed to maintain water levels within designated wetland areas, as explained below.

The RAPA remedy includes the provision that multiple treated groundwater discharge methods will occur simultaneously. The proposed remedial strategy includes extraction to achieve capture; therefore, drawdown of the local surficial aquifer was anticipated due to remedial activities. Because depression of the water level was predicted to occur in the surficial aquifer at nearby wetlands, the Florida Department of Environmental Protection (FDEP) prescribed the use of the Wetland Assessment Procedure (WAP) [SWFWMD, 2005]. Each wetland in the study area was evaluated using the WAP, in accordance with FDEP requirements as part of a June 26, 2008 reconnaissance of the wetland areas (see Section 2.1 of the Wetlands Monitoring Plan [WMP]). Annual wetland monitoring data are collected to assess if remedial action has the potential to impact wetland hydrology in the vicinity of the Site. The WAP specifies the process and technical methods for monitoring groundwater extraction effects on target wetlands (TWs) and for identifying whether mitigation is needed to offset the effects (if any) of such extraction via comparison to reference wetlands (RWs).

In selecting the TWs and RWs for this evaluation, proximity and similarity of classification under the *Florida Land Use, Cover, and Forms Classification System* codes for wetlands (Florida Department of Transportation, 1999) were considered. These codes were developed to classify land use, cover, and forms to provide a uniform standard for description of natural and urban land cover types, including the characteristic vegetative cover types associated with the wetlands that are the focus of this assessment.

Implementation of the WMP (ARCADIS, 2009b) was based on the WAP. Field visits and consultation with the FDEP led to the identification of four TWs (TW-1, TW-2, TW-6, and TW-18) within the area of anticipated hydrologic influence of the Groundwater Recovery and Treatment System (GRTS), defined as being within or near the predicted extent of drawdown in the upper surficial aquifer system from the implemented remedial strategy, and three RWs (RW-1, RW-2, and RW-3) located outside of the area of anticipated hydrologic influence of the GRTS. According to the RAPA (ARCADIS, 2009a), a 5-year monitoring period including quarterly water level monitoring and annual wetland assessments, would be used to determine if the implemented remedial strategy is negatively impacting the TWs. Following the 5-year monitoring period, the FDEP and Southwest Florida Water Management District agreed to reduce the monitoring program to only include two of the seven previously monitored wetlands in accordance with the 2019 Remedial Action Status Report. TW-6 and RW-3 remain in the wetland monitoring program and TW-1, TW-2, TW-18, RW-1, and RW-2 have been removed from the wetland monitoring program (Figure 3-1).

SECTION 4

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT WETLAND ASSESSMENT PROCEDURE

The Wetland Assessment Procedure (WAP) was specified as a condition for the issuance of the consumptive groundwater well authorization, which was required prior to implementing water extraction and disposal that was incorporated within the Remedial Action Plan Addendum. The objective of the WAP is to collect information on vegetation, hydrology, soils, and other pertinent variables in wetlands to accurately characterize the biological condition and health of each monitored wetland at the time of investigation. During the assessment period, this information is used for a variety of water management purposes, including the management of Groundwater Recovery and Treatment System (GRTS) extraction and injection wells and infiltration galleries, development of minimum flows and levels in the target wetlands, and assessment of potential impact or recovery in areas potentially influenced by operation of the GRTS.

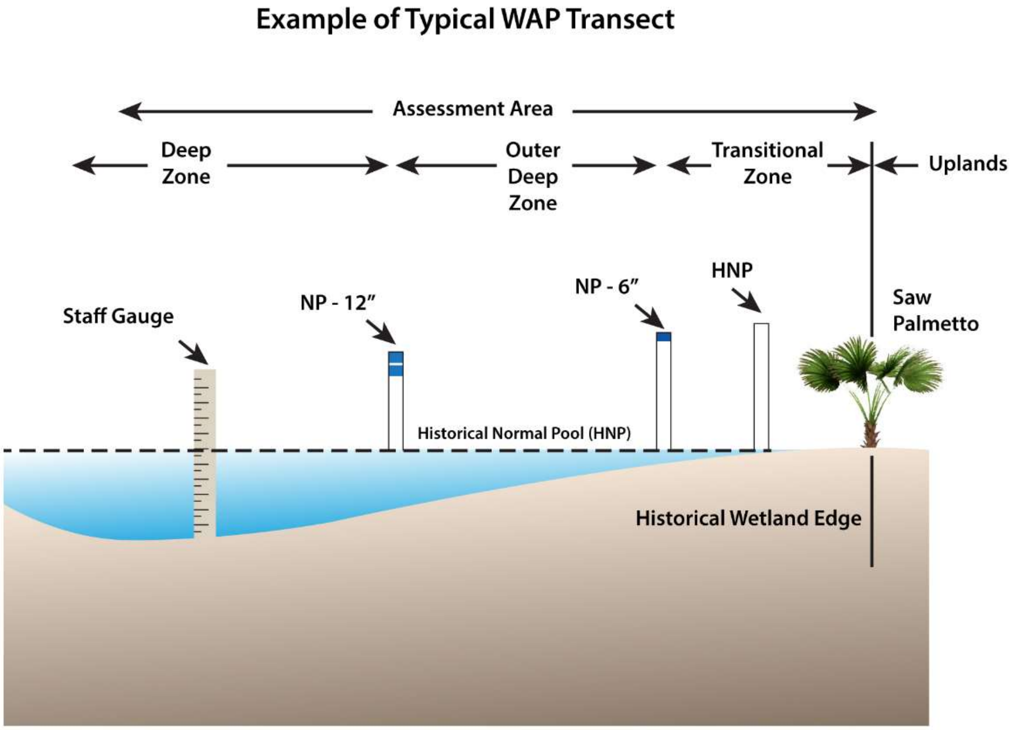
Monitoring transects 10 meters wide are positioned in each wetland to provide a representative cross section from the outermost identified historical wetland edge (HWE) to the innermost portion of the wetland interior (deep zone). Estimated benchmark elevations include the historical normal pool (HNP), as well as elevations 6 inches (normal pool [NP]-6) and 12 inches (NP-12) below the HNP, with the HNP defined as the level that water may rise to under normal conditions.

Outside the HWE is an area generally referred to as uplands. The area between the HWE and NP-6 elevation is referred to as the Transitional Zone. The area between the NP-6 and NP-12 is referred to as the Outer Deep Zone, and the zone below the NP-12 elevation, to the lowest point within the wetland, is simply referred to as the Deep Zone.

A general representation of these locations is illustrated on Figure 4-1.

FIGURE 4-1 Example of Typical Wetland Assessment Procedure (WAP) Transect

Source: Southwest Florida Water Management District (SWFWMD), 2009; blue bands on graphic represent 6 inches



The location of each transect is based on factors such as minimal disturbance to existing vegetation, clear line of sight, and ability to assess characteristics that are representative of the Transitional Zone along a straight line, as well as wetland accessibility. A monument is located at each of the HNP, NP-6, and NP-12 elevations within each transect. The innermost transect point within the deepest portion of the wetland pool is identified by the placement of a staff gauge and surficial aquifer monitoring well (MW), installed to a depth of approximately 8 feet below ground surface (bgs) per the WAP.

Vegetative, hydrologic, and soil data are collected from each transect and photographs are taken at each monument in four cardinal directions: north, east, south, and west. Each MW is surveyed for horizontal and vertical coordinates by a professional land surveyor registered in Florida. During initial and subsequent monitoring events, the provisions of the WAP prescribe that those individuals evaluating the resource should conduct annual assessments by remaining within the established transect as much as possible, while avoiding unnecessary damage to characteristic vegetation. The WAP also incorporates provisions to assess areas throughout the wetland when critical for accurate evaluation of the assessed area.

SECTION 5

BASIS FOR WETLANDS ASSESSMENT PROCEDURE DEPLOYMENT

The results of the Wetlands Monitoring Plan will be used to compare changes from baseline conditions to those that develop during Groundwater Recovery and Treatment System (GRTS) implementation. These comparisons will assess changes in water elevation (surface water or groundwater), periodic inundation, and vegetation, if any, in each wetland zone. As discussed below, changes in wetland conditions due to regional climatic conditions, including persistent drought, will also be considered in the analysis to assess impacts of the GRTS operations on the target wetland (TW) TW-6. The Wetland Assessment Procedure (WAP) contains provisions to document and assess biologic changes caused by the hydrologic effects of groundwater withdrawals. The Southwest Florida Water Management District established the WAP to provide methods to collect information on vegetation, hydrology, soils, and other pertinent variables in monitored wetlands to accurately characterize the ongoing biological condition and health of each wetland.

This assessment also includes documentation and evaluation of other factors that may affect the TW and reference wetland (RW) remaining in the wetland monitoring program, TW-6 and RW-3. These factors include wetland encroachment by land development, land management, historical and current drainage patterns and land use (including cattle/livestock operations), disease, exotic plant species, and other anthropogenic variables that have the potential to affect the biological indicators of hydrologic change that occur in the TW and RW.

The extent to which historical and current land use and vegetative cover variables affected baseline conditions may not be entirely discernible given the localized nature of this assessment. However, wherever feasible, regional climate and land use variables (including floods, drought, and irrigation use) were used to establish the baseline conditions in each wetland. Also considered will be new information collected during ongoing assessments regarding apparent individual or locally occurring changes, as well as the regional conditions that may be affecting (and are subsequently observed in) TW and RW resources.

As determined during consultation with the Florida Department of Environmental Protection, monitoring results are evaluated to assess whether adverse effects from operation of the GRTS are present. The Remedial Action Plan Addendum (ARCADIS, 2009a) includes recharging the surficial aquifer system to mitigate drawdown in wetland areas within or in close proximity to upper surficial aquifer system drawdown resulting from ongoing extraction. Therefore, no net loss of function or acreage is anticipated within the identified TW. Other variables that could affect wetland hydrology include land use changes resulting in increased impervious surfaces (which preclude the infiltration of stormwater runoff), the excavation of borrow pits and ponds, the establishment or maintenance of drainage canals, and extreme climatic events such as heightened tropical weather activity or prolonged drought.

SECTION 6
PROJECT AREA SETTING AND SITE CONDITIONS

This section describes the physical environment, ecology, and water resources influencing the wetlands that were assessed on June 2, 2020, in the Tallevast area.

6.1 SITE LOCATION

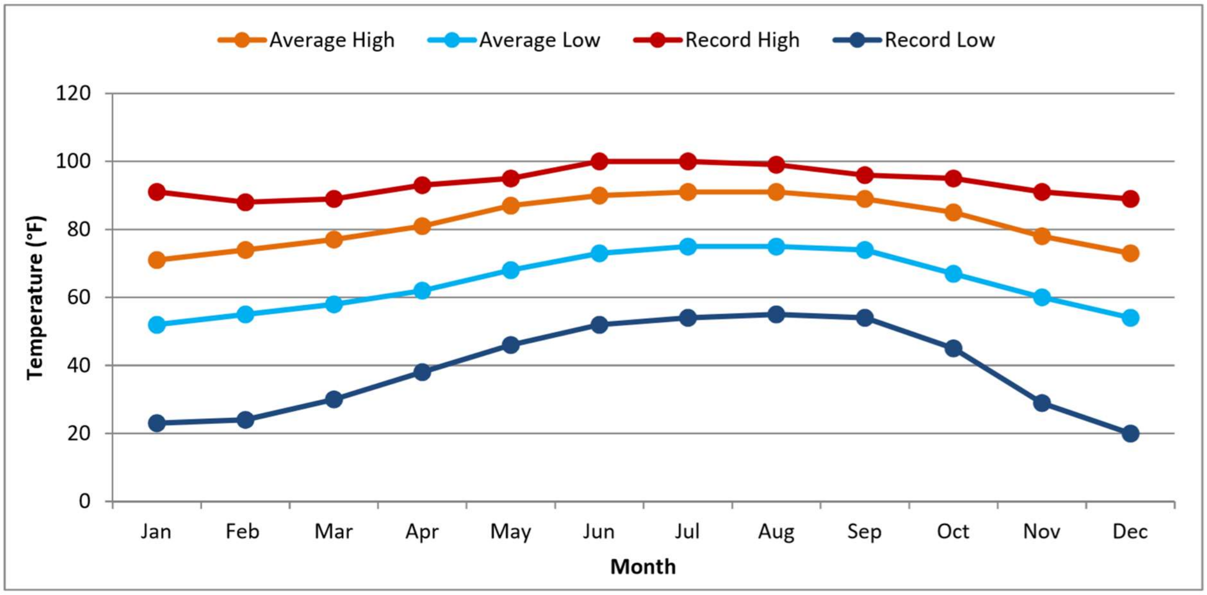
The “Facility” is defined as the approximately 5-acre property located at 1600 Tallevast Road (Facility) is located in the northwest quarter of Section 31, Township 35 South, Range 18 East, as shown on the Bradenton, Florida United States Geological Survey (USGS) 7.5-minute quadrangle (USGS, 1994), shown on Figure 6-1.

6.2 CLIMATE

The Tallevast area is located within the subtropical zone in southwest Florida. Average daytime high temperatures in June and July range from 90 to 91 degrees Fahrenheit (°F; 32 to 33 degrees Celsius [°C]). The average daytime high temperatures during the winter months are in the low 70s (°F) (approximately 21°C). As shown on Figure 6-2 (below), extreme temperature records in the area range from 100°F (38°C) in July to 20°F (-7°C) in December. Average monthly temperatures published by the National Oceanic and Atmospheric Administration (NOAA, 2020) for the Florida Everglades and southwest coast region from January 2009 to April 2020 are provided in Appendix A.

FIGURE 6-2
Historical Temperature Trends in the Tallevast Area

Source: The Weather Channel, 2020, Tallevast, FL



Annual rainfall totals average 52 inches (1.32 meters). The Tallevast area rainy season generally occurs in the summer, with frequent afternoon thunderstorms of short duration. As shown on Figure 6-3 (below), August is usually the wettest month of the year, with an average of 9.81 inches of rain (24.9 centimeters). April is generally the driest month of the year, with an average of 2.15 inches of rain (5.46 centimeters). Hurricane season in Florida occurs from June through the end of November. During the 2019 to 2020 monitoring period, monthly precipitation fluctuated above and below the historical average precipitation. Figure 6-4 (below) shows the total monthly precipitation occurring from June 2019 through June 2020 compared to the historical average monthly precipitation for each month. In addition, average monthly precipitation values published by NOAA for the Florida Everglades and southwest coast region from January 2008 to April 2020 are provided in Appendix A.

FIGURE 6-3

Historical Precipitation Trends in the Tallevast Area

Source: The Weather Channel, 2020

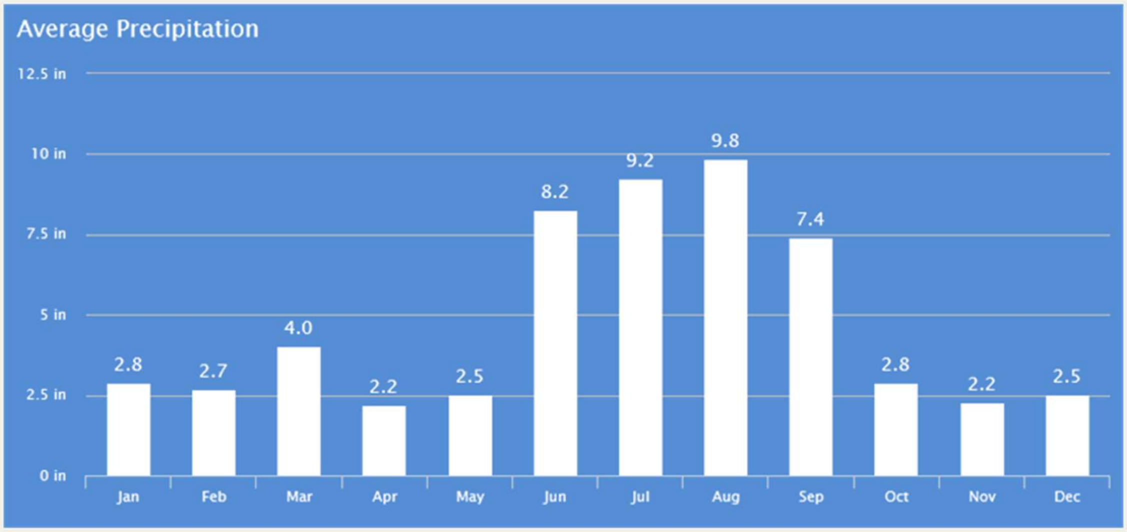
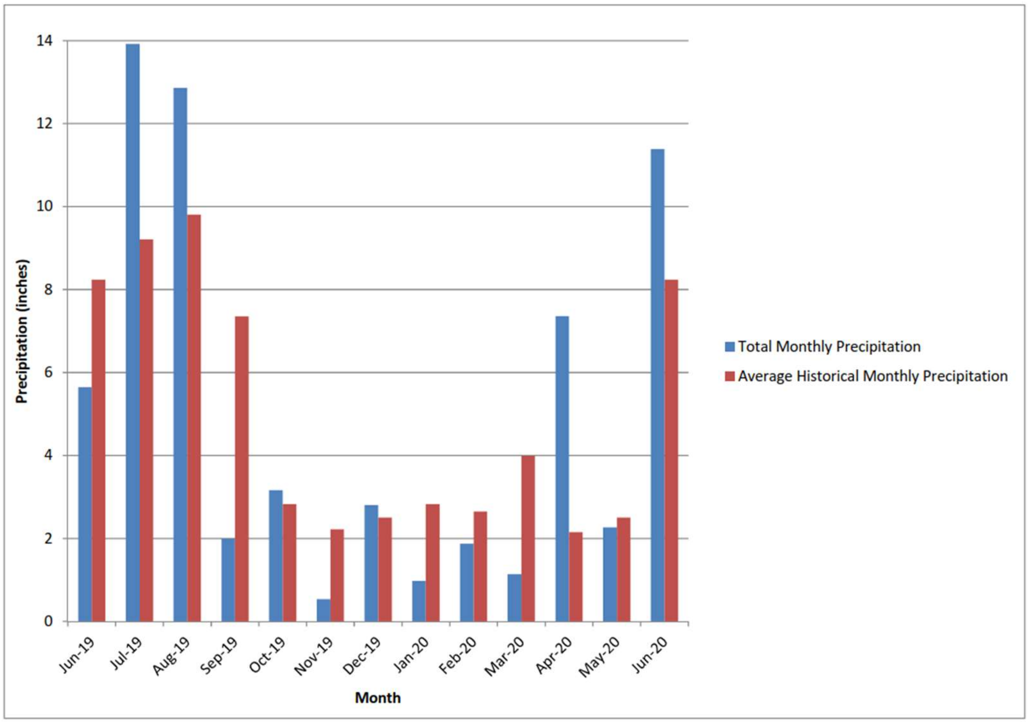


FIGURE 6-4

Cumulative Monthly Precipitation 2019 through 2020 vs. Historical Monthly Average Sarasota-Bradenton International Airport (SRQ)

Source: North Carolina State University, 2020



NOAA publishes a measure of drought conditions known as the Palmer Drought Severity Index (PDSI). These PDSI values are published monthly, and values for the Florida Everglades and southwest coast region from January 2006 to April 2020 are provided in Appendix A. Values ranging from -2 to -4 and lower indicate moderate to severe drought. Values ranging from -2 to 2 indicate a mid-range occurrence. Values ranging from 2 to 4 and higher indicate moderately moist to very moist conditions.

The following regional and local weather details are pertinent to the wetland assessments performed during this period of performance.

- 2020 Wetlands Monitoring Plan Operational Assessment – Monthly temperature values for the region were similar overall to the previous monitoring period. The PDSI values for the region indicate a mid-range occurrence for the majority of the monitoring period. Average precipitation for the region was higher than the previous monitoring period. Annual precipitation totals at the Sarasota-Bradenton International Airport (SRQ) from 2009 through 2019 are presented in Table 6-1 below.

TABLE 6-1
Annual Precipitation Totals at
Sarasota-Bradenton International Airport (SRQ), 2009 through 2019

Annual Precipitation Totals at Sarasota-Bradenton International Airport (50-Year Annual Average – 52.23 inches)										
2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
32.77 inches	42.80 inches	40.10 inches	42.77 inches	56.20 inches	49.78 inches	39.67 inches	52.21 inches	64.05 inches	48.50 inches	49.13 inches

Sources: Source: North Carolina State University, 2020 and NOAA, 2019 (for 50-year annual average)

6.3 PHYSICAL ENVIRONMENT

The Tallevast community is located on the Gulf Coastal Lowlands, a gently sloping plain ranging from approximate elevations of 32 feet above mean sea level (msl) to 15 feet above msl. The area is approximately 1.5 to 2 miles east (inland) of Sarasota Bay and approximately 6 miles from the Gulf of Mexico. The land surface of the Site has very little relief and slopes gently toward the west, south, and east.

The Gulf Coastal Lowlands are situated in the Southwestern Flatwoods physiographic region and consist of rock and sediment ranging from the Miocene to Pleistocene eras (23.8 million to 11,000 years ago). Landforms are characterized by low plateaus and ridges, flatwoods, prairies, rockland/marl plains, and various relict coastal features. Surface materials are dominated by sand with clayey substrata, limestone, and areas of accumulated organic deposits.

The Gulf Coastal Lowlands region and flatwoods soils are moderately to poorly drained, fine-grained, acidic sands with low reserves of available nutrients, low organic matter, and low clay content (often less than 2 percent). These soils may contain a spodic (organic) horizon when organic matter is translocated downward by water percolation. Clay hardpans may also result from transport and accumulation of clays. Many of the soils supporting flatwoods are spodosols, but some variation exists. Soil types in upland areas of the Tallevast Site are largely composed of Eau Gallie fine-grained sand, while soil types in mapped wetlands include complexes of Canova, Anclote, and Okeelanta soils, as well as fine-grained sands of the Floridana-Immokalee-Okeelanta association.

6.4 AQUIFER SYSTEMS

Three aquifer systems that vary in depth underlie the Site: surficial aquifer system (SAS), intermediate aquifer system, and Upper Floridan aquifer. These aquifer systems are described in detail in the 2009 Remedial Action Plan Addendum (ARCADIS, 2009a). The SAS is recharged locally, and the water table contained in this formation fluctuates due to seasonal and climatic variations in rainfall. In addition, artificial factors have produced impacts on groundwater levels in each of the three aquifer systems, including the water table in the SAS. Artificial factors include:

- groundwater pumped from wells in aquifers beneath the SAS is used for irrigation of fields, lawns, and golf course turf. This irrigation predominantly results in higher SAS water table elevations where such activities occur.

- the presence of drainage canals in most cases prevents surficial groundwater elevations in the immediate vicinity from rising during wet periods. Conversely, these canals may sometimes back up during periods of excessive runoff and can cause surficial groundwater elevations to rise.

6.5 SURFACE WATER RESOURCES/WATERSHED

The United States is divided and sub-divided into successively smaller hydrologic units that are classified by the USGS into four levels: regions, sub-regions, accounting units, and cataloging units. These hydrologic units are nested within each other, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified with a unique hydrologic unit code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system. The Tallevast Site is located along the drainage divide between two stream/canal systems, Bowlees Creek and Pearce Canal, within the eight-digit Sarasota Bay watershed, HUC 03100201 (see Figure 1-1). Bowlees Creek, a major tributary of Sarasota Bay, is located approximately 1.25 miles northwest of Tallevast. The Pearce Canal is located southeast (0.75 mile) and east (1 mile) of Tallevast. A ridge (topographical high ground) lies approximately along a north-south axis through the Facility. Surface water on the western portion of the Facility flows west toward Bowlees Creek and the improved drainage features around the SRQ, both of which drain to Sarasota Bay. Surface water on the easternmost portion of the Facility flows toward Pearce Canal, which drains both south into the Sarasota Bay watershed and north into the Manatee River watershed (HUC 03100202). The drainage divide along Pearce Canal is located approximately 1 mile north of the Manatee/Sarasota County line, where the canal crosses U.S. Highway 301, and 1 mile southeast of the Facility.

In addition to drainage facilities (such as Pearce Canal) and consumptive use, groundwater depletion due to other impacts remains an ongoing concern throughout much of west-central Florida. Throughout Florida, broad concerns exist for the reduction of surface water flows, deterioration of wetland water quality, and increased costs to pump needed water resources.

6.6 ECOLOGY

The dominant historical vegetative community in the project area is pine (*Pinus* spp.) flatwoods. The United States Department of Agriculture Natural Resources Conservation Service characterizes flatwood communities in southwest Florida as savannas, an ecotone spanning grasslands to forests. The ecosystems near the assessed wetlands have been converted to pasture are now used extensively as rangeland for cattle grazing. Once the most extensive terrestrial ecosystem in Florida, these historical pine flatwoods evolved under frequent lightning and human-induced fire, seasonal drought, and flooded conditions to accommodate both upland and wetland conditions. Flatwoods are characterized by low, flat topography; relatively poorly drained, acidic, sandy soil; and pine woodlands. This ecosystem historically had open, park-like understories managed by frequent fires.

The dominant tree species of flatwoods in the Tallevast area are limited to South Florida slash pine (*P. elliottii* var. *densa*) and longleaf pine (*P. palustris*). Other infrequently occurring trees include cabbage palm (*Sabal palmetto*) and hardwoods, including live oak (*Quercus virginiana*), water oak (*Q. nigra*), laurel oak (*Q. laurifolia*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and ash (*Fraxinus* spp.). Commonly occurring understory shrub species include saw palmetto (*Serenoa repens*), wax myrtle (*Morella cerifera*), blueberries (*Vaccinium* spp.), and American beautyberry (*Callicarpa 6-7obate6-7na*).

The invasive Brazilian pepper (*Schinus terebinthofolia*) is identified as locally dominant in both the forest understory and open rangeland scrub strata. Distribution of Brazilian pepper occurs throughout the Site. It is an aggressive invader of disturbed habitats, a characteristic that has led to its placement on the Florida Exotic Pest Plant Council list of invasive species as a Category I species. Other nonnative plant species identified in the Tallevast area include camphor tree (*Cinnamomum camphora*), punk tree (*Melaleuca quinquenervia*), primrose willow (*Ludwigia peruviana*), tropical soda apple (*Solanum viarum*), Caesar's weed (*Urena 6-7obate*), and plum (*Syzygium sp.*).

SECTION 7
WETLANDS ASSESSMENT PROCEDURE IMPLEMENTATION

This section describes the implementation of the Wetland Assessment Procedure (WAP) at the Site, including installation of monitoring wells (MW), staff gauges, data loggers, and wetland telemetry systems.

7.1 TRANSECT AND MONITORING LOCATIONS

One target wetland (TW) TW-6 and one reference wetland (RW) RW-3 are currently monitored at the Site. All other TWs and RWs (TW-1, TW-2, TW-18, RW-1, and RW-2) have been removed from the wetland monitoring program in accordance with the 2019 Remedial Action Status Report (AECOM, 2019b) as approved by the Florida Department of Environmental Protection (FDEP) and the Southwest Florida Water Management District (SWFWMD). TW-6 is monitored based on its location within the area of the surficial aquifer system predicted to have drawdown due to implementation of the Groundwater Recovery and Treatment System (GRTS). RW-3 is monitored based on proximity to the Site (but outside the area affected significantly by remediation activities), as well as the similarity of *Florida Land Use, Cover and Forms Classification System* code characteristics to those associated with the TW and the anticipation of being beyond the area of groundwater drawdown from the operational GRTS.

Pursuant to the WAP (SWFWMD, 2005), assessment areas are established in TW-6 and RW-3. As described previously, each assessment area consists of a single transect positioned within a representative 10-meter-wide area in each wetland, from the historical wetland edge (HWE) to the wetland interior. The location of each transect is based on factors including minimizing disturbance to existing vegetation, clear line of sight, ability to assess the aspects representative of each zone along a straight line, and access to the assessment area.

Permanent monuments are located in the field to identify these transects during monitoring of wetland conditions. Monuments composed of steel rebar fitted with a sleeve of polyvinyl chloride (PVC) pipe are installed at the Historical Normal Pool (HNP), as well as elevations 6 inches (normal pool [NP]-6) and 12 inches (NP-12) below the HNP. Transect access locations are shown on Figure 7-1.

Monitoring is conducted within each established transect as much as possible to avoid unnecessary damage to vegetation but may be conducted in selected areas throughout the wetland if critical for an accurate evaluation of wetland conditions.

7.2 STAFF GAUGES AND MONITORING WELLS

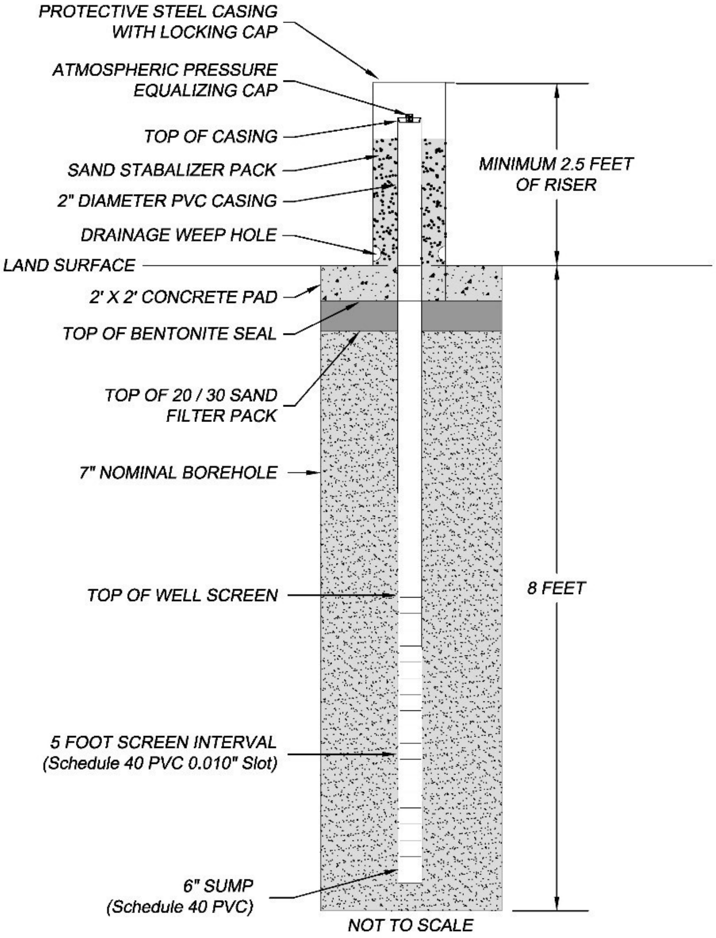
One MW and one staff gauge are located in the Deep Zone of each wetland and along the WAP transect, or within the assessment area. While an upland MW is traditionally recommended under WAP procedures, it is not required. Under the FDEP direction, upland MWs are not located at the HWE in any of the wetlands, due to the relatively small size of the wetlands.

7.2.1 Groundwater Monitoring Well Information

MWs at TW-6 and RW-3 were constructed using 2-inch Schedule 40 PVC and installed to a depth of 8 feet below ground surface (bgs) in compliance with American Society for Testing and Materials Method D-5092. The screened intervals for the MWs are 5 feet long and placed at 3 to 8 feet bgs, and consist of 0.010-slot, 2-inch PVC screen, and 20/30 filter pack. Survey data are shown in Table 7-1. A typical well installation completion diagram for the wetland MWs is shown on Figure 7-2 (below). Lithologic logs, permits, well completion reports, and well development logs were prepared for each MW (included as Appendix A of the Wetlands Monitoring Report – July 2010 through June 2011 [ARCADIS, 2011b]. Borehole logs and well completion diagrams were included as Appendix C of the Wetlands Monitoring Report for July 2011 through June 2012 [ARCADIS, 2012]).

FIGURE 7-2

Typical Well Installation Completion Diagram



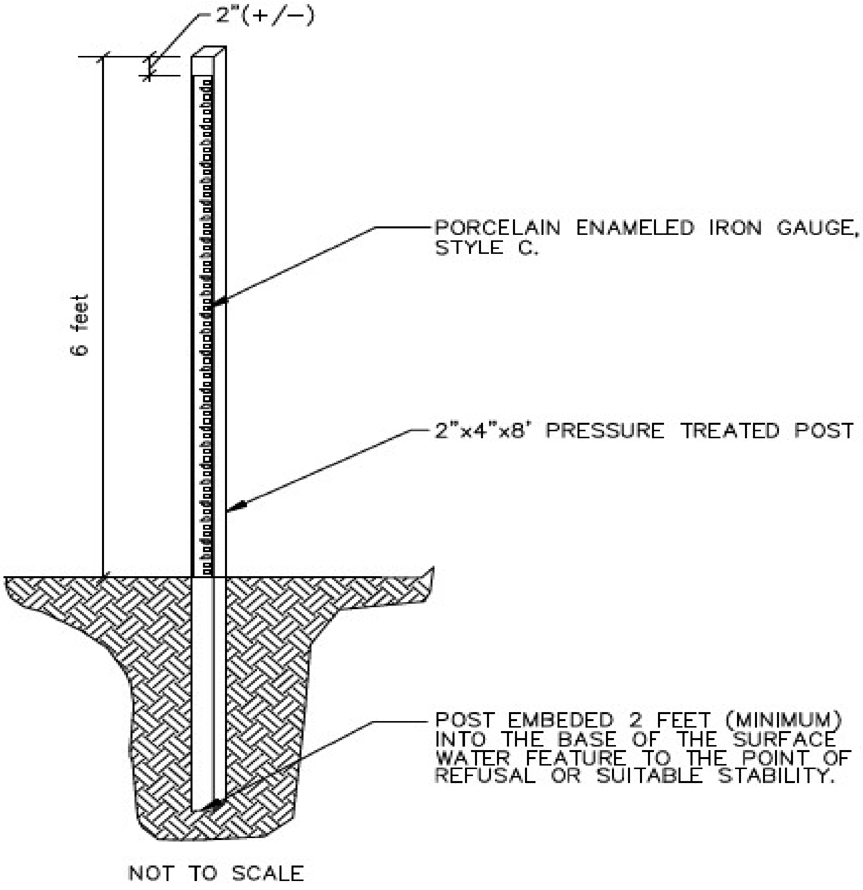
7.2.2 Staff Gauge Information

A porcelain-enameled iron Style C staff gauge is attached to a 2-inch by 4-inch by 8-foot long pressure-treated post at each staff gauge location. The staff gauges enable measuring stage heights in feet and tenths of feet. Survey data are included in Table 7-1.

Staff gauge measurements for TW-6 and RW-3 were collected quarterly during the baseline monitoring period and during the first operational monitoring period. Following the first operational monitoring period, staff gauge measurements have been collected on a semi-annual basis.

Refer to Figure 7-3 below for a cross section of a typical staff gauge.

FIGURE 7-3
Typical Staff Gauge Installation Completion Diagram



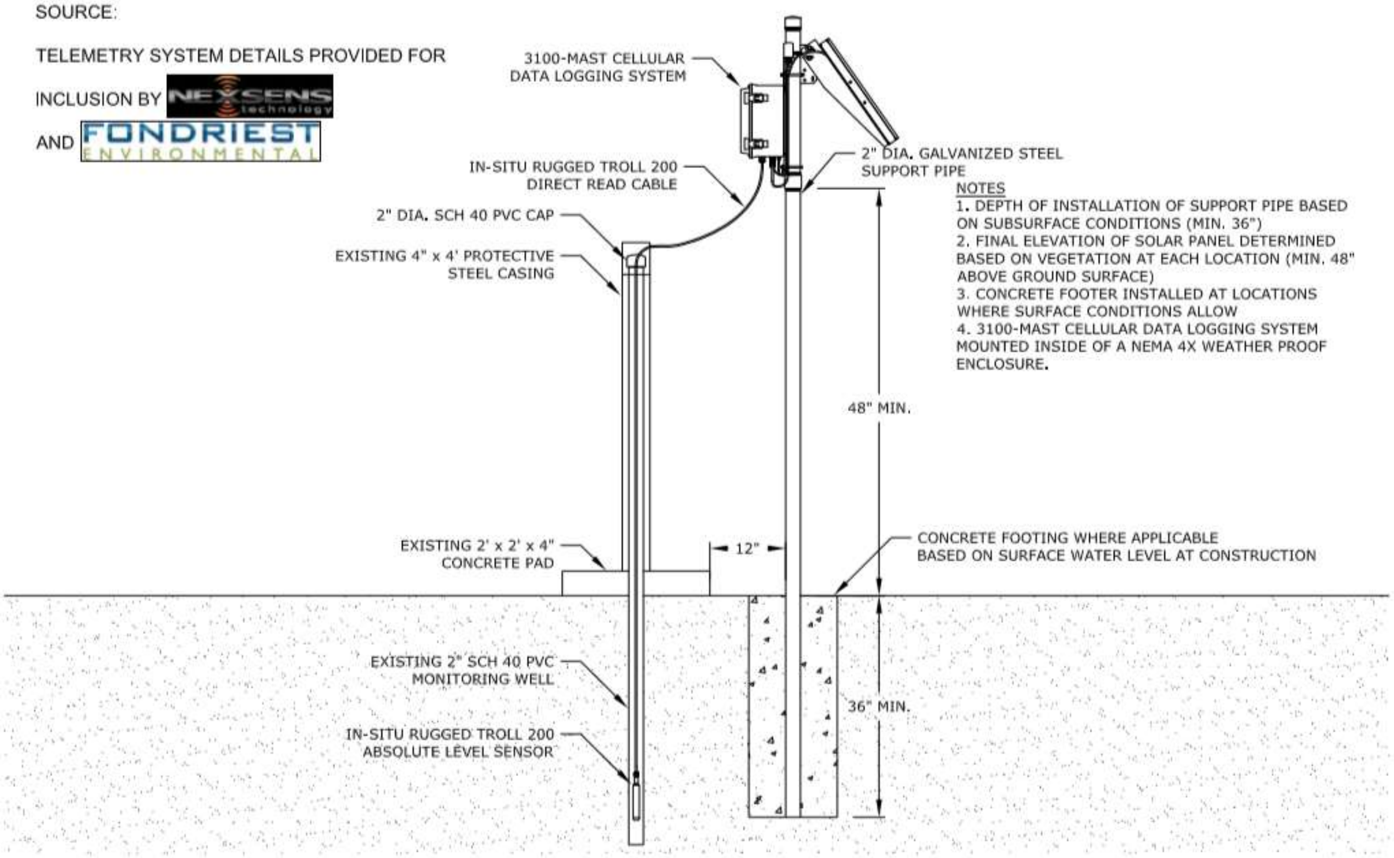
7.3 DATA LOGGER DEPLOYMENT

To facilitate monitoring frequency and accuracy, automatic water level measurement devices (In Situ® brand pressure transducers) with data loggers were originally used to collect real-time water level data in the TW and RW MWs. Data from the data loggers were downloaded after approximately 90 days and then on a quarterly schedule until December 2014, after which the schedule changed to a semi-annual frequency with download events in March and September. The manually downloaded transducers were permanently removed from operation during the June 2016 download event, after which time all data have been obtained via the telemetry system.

7.4 WETLAND TELEMETRY SYSTEM

Wetland telemetry monitoring systems are located adjacent to the two MWs. The telemetry systems enable real-time collection of water levels at TW-6 and RW-3. Water level data are transmitted via cellular signal to a centralized server housed at the “Facility” is defined as the approximately 5-acre property located at 1600 Tallevast Road (Facility). As shown on Figure 7-4, each telemetry system consists of an In-Situ® brand pressure transducer, solar panel, power box, and cellular modem mounted on a 2-inch galvanized steel post installed approximately 3 feet bgs. The telemetry system allows quick access to water level instrumentation to determine status and functionality and allows for the use of real time data for continuous optimization and modification of the GRTS. Data collection using the original (non-telemetered) instruments continued for a period of 2 years to verify the telemetry system data accuracy and reliability. The original instruments were permanently taken out of operation during the June 2016 transducer download event. Water level and staff gauge measurements are still collected manually on a semi-annual basis.

FIGURE 7-4
Wetland Telemetry System



SOURCE:

TELEMETRY SYSTEM DETAILS PROVIDED FOR INCLUSION BY NEXSENS technology AND FONDRIEST ENVIRONMENTAL

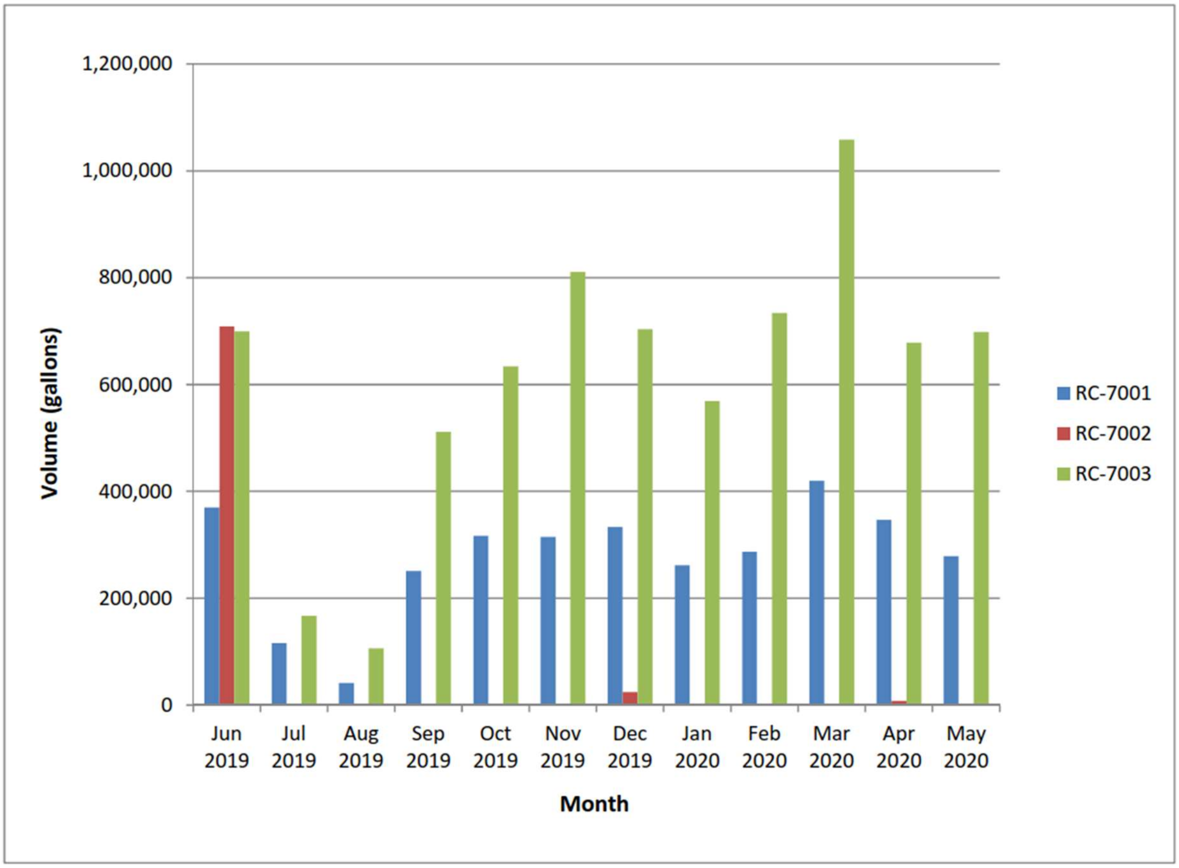
NOTES
1. DEPTH OF INSTALLATION OF SUPPORT PIPE BASED ON SUBSURFACE CONDITIONS (MIN. 36")
2. FINAL ELEVATION OF SOLAR PANEL DETERMINED BASED ON VEGETATION AT EACH LOCATION (MIN. 48" ABOVE GROUND SURFACE)
3. CONCRETE FOOTER INSTALLED AT LOCATIONS WHERE SURFACE CONDITIONS ALLOW
4. 3100-MAST CELLULAR DATA LOGGING SYSTEM MOUNTED INSIDE OF A NEMA 4X WEATHER PROOF ENCLOSURE.

SECTION 8
DESCRIPTION OF SYSTEM STARTUP AND OPERATIONS

Remedial actions as described in the Remedial Action Plan Addendum (RAPA) (ARCADIS, 2009a) began on November 18, 2013. The Groundwater Recovery and Treatment System (GRTS) consists of 77 vertical extraction wells, four horizontal extraction wells, five on-facility injection wells, and three infiltration galleries. A general layout of the GRTS in the Upper Surficial Aquifer System is provided on Figure 3-1. The 77 vertical and four horizontal extraction wells have operated at an average combined extraction rate of approximately 159 gallons per minute during the current monitoring period. Effluent discharge through the five on-facility injection wells began in October 2016, with a cumulative total flow of 6,160,841 gallons as of May 31, 2020.

One infiltration gallery (RC), RC-7002 (Figure 3-1), has been operational since July 2014 to provide additional water in the vicinity of target wetland (TW) TW-6 and help offset potential drawdown affects that may be caused by the nearby horizontal extraction wells EW-2103 and EW-2104. After June 2019, the volume of water discharged to RC-7002 decreased significantly due to the need to increase remedial capture, as stated in the 2019 Remedial Action Status Report (AECOM, 2019b). The other two infiltration galleries, RC-7001 and RC-7003, have been operational since July 2017 to maintain water levels in adjacent wetland TW-18 and in the ornamental pond located on the Waste Pro property (the ornamental pond is not a wetland). Figure 8-1 shows the total volume of treated water discharged to RC-7001, RC-7002, and RC-7003 per month from June 2019 through May 2020. Only 33,400 gallons of treated water were discharged to RC-7002 between July 2019 and May 2020. As of May 2020, a total of 7,199,500 gallons of treated effluent water have been recharged through RC-7001, 43,528,600 gallons recharged through RC-7002, and 18,832,800 gallons recharged through RC-7003.

FIGURE 8-1
Total Volume of Treated Water Discharged to Infiltration Galleries RC-7001, RC-7002, and RC-7003 (monthly)



SECTION 9
DESCRIPTION OF MONITORED WETLANDS AND EVALUATION OF OPERATIONAL CONDITIONS

This section includes the methodology for data collection and assessment, observations from the June 2020 monitoring event, and evaluation of operational conditions.

9.1 METHODOLOGY FOR DATA COLLECTION AND ASSESSMENT

Manual water level measurements were collected at the monitored wetland locations in December 2019 and June 2020. The field portion of the annual wetland assessments was performed on June 2, 2020. During the June 2020 field event, surface water level at target wetland (TW) TW-6 was lower than during the previous May 2019 monitoring event and surface water level at reference wetland (RW) RW-3 was higher than during the previous May 2019 monitoring event. Throughout the monitoring period, surface water levels at the wetland locations were observed to be generally lower than during the previous monitoring period (June 2018 – June 2019). Findings and observations for the monitored wetlands are presented in this section. Specific details of the project wetlands, such as observations of habitat conditions along the selected transects, are presented on the completed Wetland Assessment Procedure (WAP) field data sheets in Appendix B. Other characteristics of these wetlands are provided in Table 9-1.

The WAP requires a thorough assessment of soil conditions every 5 years. Soil conditions were previously evaluated for the wetlands during the 2019 monitoring event and will be evaluated again in 2024. Observations are described for each wetland in the following sections. Photographic documentation of conditions at each wetland for the 2020 assessment is provided in Appendix C. Hydroperiod graphs that display the transducer data are provided in Appendix D. Manual water level elevations and staff gauge measurements collected during wetland transducer downloads between June 2019 and June 2020 are summarized in Table 9-2.

TABLE 9-1
Summary of Project Wetland Characteristics

Wetland ID	TW-6	RW-3
Wetland Type	Emergent/ Forested	Emergent
Estimated* Historical Acreage	3.04	10.45
June 2009 Field Verified Acreage**	1.1	6.3
Historically Inundated	Partially	Yes
Inundated (June 2020)	No	No
Degree of Upland Transition* (June 2020)**	Low	Low
Evidence of Groundwater at the Surface, Comparing Transducer Data to Ground Surface Elevation (During the Current Monitoring Period)	Yes	Yes

Notes: RW – reference wetland

TW – target wetland

* Photo-interpreted using 2003 aerial photographs.

** Photo-interpreted during 2009 agency Site visit and shown on wetland monitoring transect maps. The difference between the estimated historical acreage (2003 aerial interpretation) and the June 2009 Field Verified Acreage appears to demonstrate a pre-baseline trend of wetland diminishment and may be a result of long-term surficial aquifer drawdown that resulted from residential water wells, agricultural consumptive use, and excavation of regional canals and local ditches.

***Degrees of upland transition from June 2009 to the current monitoring period are defined as follows:

- High – greater than 50 percent of the wetland has converted, or exhibits cues of converting, to upland
- Moderate – 25 to 50 percent of the wetland has converted, or exhibits cues of converting, to upland
- Low – less than 25 percent of the wetland has converted, or exhibits cues of converting, to upland

TABLE 9-2
Summary of Manual Water Level Elevations and Staff Gauge Measurements

Wetland	Location	Ground Surface Elevation (ft msl)	Water Level Elevation (ft NAVD)[1]			
			Sept 2019[2]	Dec 2019	Mar 2020[3]	June 2020
RW-3	**SG-RW-3**	20.77	NA	21.50	NA	Dry
	MW-RW-3	20.78	21.93	21.01	16.40	19.53
TW-6	**SG-TW-6**	21.05	NA	Dry	NA	Dry
	MW-TW-6	21.34	22.43	18.32	Dry	16.32

Notes: [1] Surface water elevation calculated as the surveyed staff gauge 3-foot elevation, minus 3 feet, plus the staff gauge readings obtained during the wetland transducer download.

[2] September 2019 Event – DTW measurements provided from telemetry system data collected at 13:00 on September 23, 2019.

[3] March 2019 Event – DTW measurements provided from telemetry system data collected at 13:00 on March 23, 2020.

Blue shading – water level above ground surface
Brown shading – water level below ground surface
Horizontal: North American Datum 1983 State Plane Florida West (ft)
Vertical: NAVD88
ft – feet
msl – mean sea level
MW – monitoring well
NAVD – North American Vertical Datum, 1988
NA – not available
RW – Reference Wetland
SG – staff gauge
TW – target wetland
DTW – depth to water

A rationale for assignment of WAP zone scoring for the vegetative stratum is included in the analysis of wetland conditions. The WAP zone scoring for conditions in each transect is based on a prescribed range from 0 to 5 points by cover type (groundcover, shrubs, trees) in WAP zones presented on Figure 4-1, as detailed in Southwest Florida Water Management District's (SWFWMD's) WAP protocol and the revised ranking scale provided by SWFWMD (SWFWMD, 2008) and summarized in Table 9-3.

- A score of "1" indicates that upland vegetation has moved into the deep zone in high numbers (ranging from 25% for groundcover to greater than 5 to 10 specimens for shrubs, small trees, and trees) and is distributed throughout the wetland.
- A score of "2" indicates that vegetative species have moved into two zones in high numbers (greater than 25% for groundcover and greater than 5 to 10 specimens for shrubs, small trees, and trees) and distribution, and/or some species with an upland classification have moved into the deep zone.
- A score of "3" indicates that vegetative species have moved into one zone in high numbers (greater than 25% for groundcover and greater than 5 to 10 specimens for shrubs, small trees, and trees) and distribution and/or plants have moved into two zones.
- A score of "4" indicates that vegetative species have moved into one zone in enough numbers and distribution to be of concern, and/or species with an adaptive classification are extensive in numbers (greater than 25 percent) and distribution in the transition zone. Plants species that are classified as adaptive are those designated as facultative or upland by the Florida Department of Environmental Protection, but commonly seen in the transition zone in limited numbers.
- A score of "5" represents normal zonation within the wetland, which is defined as a wetland that has had some species migrate into one zone but overall the species observed are small in number and/or are along the zone edge.

TABLE 9-3
Summary of WAP Scoring by Cover Type – Baseline to Current Assessment Period

Vegetation Type	Event Period	Year	TW-6	RW-3
Ground Cover	**B**	**2009**	4	2
		2010	4	3
		2011	4	4
		2012	4	4
		2013	4	3
	O	**2014**	3	5
		2015	3	5
		2016	4	5
		2017	4	5
		2018	4	5
		2019	4	5
		2020	4	5
Shrubs	**B**	**2009**	4	NA
		2010	4	NA
		2011	4	3
		2012	4	3
		2013	4	3
	O	**2014**	4	5
		2015	4	5
		2016	4	5
		2017	4	5
		2018	4	5
		2019	4	5
		2020	4	5
Trees	**B**	**2009**	NA	NA
		2010	NA	NA
		2011	NA	NA
		2012	4	NA
		2013	4	NA
	O	**2014**	4	NA
		2015	4	NA
		2016	4	NA
		2017	4	NA
		2018	4	NA
		2019	4	NA
		2020	4	NA

Note: Assessment scoring is based on a qualitative assessment of vegetation coverage; Qualitative assessments may vary based on the individual assessor.

NA = No score assigned due to lack of vegetation meeting strata requirements.
B = Baseline Period; O = Operational Period
RW = Reference Wetland
WAP = Wetland Assessment Procedure

Ranking Scale

1. Species with an **upland** classification have moved into the **deep zone** in high numbers and distribution.

2. Species have moved in two **zones** in high numbers and distribution, and/or some species with an **upland** classification have moved into the deep zone.

3. Species have moved in one **zone** in high numbers and distribution, and/or some plants have moved in two **zones**.

4.Species have moved in one **zone** in enough numbers and distribution to be of concern, and/or species with an **adaptive** classification are extensive in numbers and distribution in the **transition zone**.

5. Normal **zonation**. Some species may have migrated inward one **zone**, but they are small in number and/or right along the **zone** edge.

9.2 GENERAL HABITAT CONDITIONS

The freshwater wetlands on the Site are similar to those that occur throughout the southwest Florida landscape in concert with pine flatwoods. These shallow marshes (less than 1 meter deep) occur as slight depressions ranging from 10 to a few hundred meters in diameter in the otherwise flat landscape. Flatwood marshes provide an important function as groundwater recharge areas (Myers and Ewel, 1990). The flat topography, soils, and seasonal precipitation of the pine flatwoods strongly influence hydrology in these wetland systems.

During the rainy season, minimal water runoff results in waterlogged and poorly aerated soils and standing water may be present for varying periods of time. During the dry season, high evapotranspiration draws water from upper soil horizons. Water often cannot move upward from lower horizons where there is a natural impermeable hardpan, frequently resulting in drought conditions.

Observations noted during the June 2020 assessment are similar to those made in May 2019. Results of the 2016 assessment indicated that below average precipitation totals resulted in reduced seasonal soil saturation and inundation. The reduced seasonal soil saturation and inundation allowed for seasonal reestablishment of dominant 2009-2010 species associated with dryer conditions, including Caesar’s weed (*Urena lobata*) and dogfennel (*Eupatorium capillifolium*). Results of the 2018 assessment indicated a decrease in these species in some of the monitored wetlands due to wetter conditions. Findings for the current assessment period discussed below indicate the percentage of these species remain similar to the percentage recorded since the 2018 assessment.

Observed evidence of wildlife during the June 2020 assessment was consistent with observations made during the baseline monitoring events and was limited to animals typically found in flatwoods, such as wild hog (*Sus scrofa)*, brown rat (*Rattus norvegicus*), and brown anole (*Anolis sagrei*).

9.3 TARGET WETLAND 6

This section includes the habitat description, monitoring well (MW) data collected throughout the monitoring period, and June 2020 observations at TW-6.

9.3.1 Transect Location

The TW-6 monitoring transect is oriented from southeast to northwest, beginning at the collocated MW/staff gauge (installed November 2, 2009) and extending to the historical wetland edge (HWE), in the north-central portion of the wetland (Figure 9-1).

9.3.2 Habitat Description

A review of available 1970, 1980, and 2003 aerial photography indicated that TW-6 contained an inundated area in its southern sector. This inundated portion of TW-6 was field verified and confirmed with the long-term landowner to be an excavated cattle pond. Historical aerial photographs show that the excavation of this cattle pond occurred between 1951 and 1962. Historical hydrological indicators of TW-6 suggest that this wetland is hydrated by sheet flow runoff. This wetland appears to receive stormwater drainage from Tallevast Road to the north, the residential property to the west, and from the pastureland to the east and south. Additionally, treated effluent water from the Groundwater Recovery and Treatment System (GRTS) has been discharged through a infiltration recharge gallery (RC), RC-7002, located along the south and east sides of the wetland since July 2014. A total of 43,528,600 gallons of treated effluent water have been recharged through RC-7002 since the start of operations in November 2013; however, the majority of treated effluent water was discharged prior to July 2019 and only 33,400 gallons were discharged between July 2019 and May 2020 in an effort to increase remedial capture, as stated in the 2019 Remedial Action Status Report (AECOM, 2019b). This wetland discharges to the east through a drainage ditch along the south side of Tallevast Road. A high point in this roadside ditch, approximately 0.25 miles east of TW-6, appears to control high water levels in this wetland. The four baseline reports indicate that the section of TW-6 north of the historically excavated cattle pond displays evidence of conversion to an upland forested/shrub habitat type and that soils in this area are composed of sand and loamy sand, with marginal hydric soil indicators.

9.3.3 Monitoring Well MW-TW-6 Data Assessment

Water level elevations at MW MW-TW-6 increased to approximately 0 to 1.0 foot above the normal pool (NP) elevation from late July 2019 through September 2019 and then gradually decreased. In October 2019, the water elevation was below ground surface (bgs) elevation and continued to decrease to approximately 6.0 feet below the NP elevation by January 2020. There were three brief periods between January 2020 and June 2020 where the water level fell below the minimum elevation at which the transducer reads, at approximately 17.79 feet North American Vertical Datum (NAVD). Water levels promptly rose above this elevation following rain events. Staff gauge measurements collected in December 2019 and June 2020 indicated no surface water at this location (see Table 9-2 and Appendix B). Groundwater and surface water responses to precipitation events are evident based on the data collected to date (Appendix D).

9.3.4 June 2020 Field Observations

No major alteration or conversion of previously reported land use or vegetative cover types in TW-6 was observed during this monitoring period. Observed hydrology during previous monitoring events suggests that groundwater is a partial source to the pond, but it is also fed by stormwater runoff from nearby Tallevast Road and other sources described previously. Rust, stains, and residues on the staff gauge continue to indicate persistent water volumes in the excavated pond. During the June 2020 assessment, surface water was not observed in the Deep Zone. This wetland was experiencing dry conditions associated with the lack of precipitation prior to the June 2020 assessment. Based on water level data collected during this current monitoring period, the minor amount of treated effluent water recharged to RC-7002 during winter 2019 and spring 2020 augmented groundwater recharge entering TW-6 but did not buffer the wetland from drawdown associated with the GRTS.

During the June 2020 assessment, the vegetation in the excavated portion of TW-6 continued to consist of predominantly Outer Deep Zone species. Vegetation of the wetland area north of the pond continued to be dominated by Outer Deep Zone and Transitional Zone species. Adaptive and Transitional Zone species have historically been noted in the Deep Zone, but no Adaptive or Transitional Zone species were observed within the Deep Zone during the 2020 event. A minor amount of the Upland Zone species, Caesar’s weed, was observed within the Deep Zone during the 2020 event. The herbaceous/groundcover WAP score for the 2020 monitoring event remained a 4, due to species having moved into one zone in enough numbers and distribution to be of concern, and species with an Adaptive classification (i.e., Brazilian pepper) that are extensive in numbers and distribution in the Transitional Zone. The shrub/small tree and tree WAP scores for the 2020 event were consistent with the 2019 monitoring period. A large percentage of Brazilian pepper was observed to have graduated from the shrub and small tree category to the tree category. The shrub/small tree and tree WAP scores for the 2020 event remained a 4 due to species having moved into one zone in enough numbers and distribution to be of concern, and to species with an Adaptive classification (i.e., Brazilian pepper) that are extensive in numbers and distribution in the Transitional Zone.

9.4 REFERENCE WETLAND 3

This section includes the habitat description, MW data collected throughout the monitoring period, and June 2020 observations at reference wetland (RW)-3.

9.4.1 Transect Location

The RW-3 monitoring transect is generally oriented from east to west beginning at the collocated MW/staff gauge (installed November 2, 2009) and extending to the HWE in the northwestern portion of the wetland (Figure 9-2).

9.4.2 Habitat Description

A review of 2003 aerial photography indicated that RW-3 primarily consisted of an emergent wetland that was frequently inundated. Upland pasture and shrub habitat bordered the wetland boundary of RW-3. The outer perimeter of the southern half of RW-3 was bordered by thick shrub and tree vegetation. Hydrological indicators from the 2003 aerial photograph of RW-3 suggested that the water sources for this wetland were primarily groundwater and surface flow from the surrounding drainage basin. The 2003 aerial photograph showed that three quarters of the wetland area was inundated, and the interior of the northern boundary displayed obvious hydrology and vegetative patterns of a shrub wetland. Floating vegetation was prevalent within the upper portion of RW-3 in the 2003 aerial photograph, and rooted vegetation appeared to be depressed or absent within the lower sections, indicating that this wetland was historically inundated throughout much of the growing season. The historical aerial photographs indicate that no significant drainage features exist around this wetland. The northern portion of this wetland was excavated for a cattle pond prior to 1995, as indicated in aerial photography.

9.4.3 Monitoring Well MW-RW-3 Data Assessment

During the current monitoring period (June 2019 through June 2020), water level elevations at MW-RW-3 fluctuated from approximately 0 to 4.0 feet below the NP elevation from June to August 2019. In August 2019, the water level elevation increased to approximately 1.0 foot above the NP elevation before gradually decreasing to 6.0 feet below the NP elevation by April 2020. Surface water was present at the staff gauge in December 2019 (Table 9-2). Staff gauge measurements collected during the annual assessment event in June 2020 (Appendix B) indicated no surface water at this location. Groundwater and surface water responses to precipitation events are evident based on the data collected to date (Appendix D).

9.4.4 June 2020 Field Observations

No major alteration or conversion of previously reported land use or vegetative cover types in RW-3 was observed during this monitoring period. Evidence of prior conversion of RW-3 to upland prairie, as previously reported in the baseline reports, was not observed. The 2013 baseline report indicated that the lower half of RW-3 was rapidly transitioning to upland. This may have been due to hydrologic and vegetative evidence resulting from drought conditions preceding the monitoring event. During the June 2020 monitoring event, this wetland did not contain standing water within the monitoring transect. This wetland was experiencing dry conditions associated with the lack of precipitation prior to the June 2020 assessment. Hydrologic and vegetative evidence indicates WAP scores similar to the previous monitoring event for RW-3. The groundcover WAP score for RW-3 remains a 5, indicating a normal zonation pattern. While there was an absence of woody vegetation in the Outer Deep and Deep Zones, the shrub/small tree WAP score for the June 2020 assessment was 5, indicating a normal zonation pattern. The tree WAP score for the June 2020 assessment was Not Applicable due to the absence of trees in the Transitional, Outer Deep, and Deep Zones.

9.5 EVALUATION OF OPERATIONAL CONDITIONS

TW-6 was monitored due to anticipated hydrologic influence from the GRTS, as it is within the predicted extent of drawdown in the upper surficial aquifer system from the implemented remedial strategy. The results of the June 2020 monitoring event indicate that TW-6 and RW-3 showed evidence of generally lower water levels compared to the previous monitoring period. Groundwater levels recorded at TW-6 and RW-3 were compared to regional climate data collected by National Oceanic and Atmospheric Administration (NOAA) to evaluate the cause of the lower groundwater levels, which is discussed below.

9.5.1 Regional Drought Conditions

Palmer Drought Severity Index (PDSI) values are published by NOAA for the Florida Everglades and southwest coast region (provided in Appendix A). Since the implementation of the GRTS in 2013, the most extreme low PDSI values indicative of severe drought conditions were recorded in 2017. Coinciding with PDSI values, groundwater levels were lowest at RW-3 at this time, at approximately 6 feet NAVD below the NP elevation. TW-6 experienced moderately low groundwater levels at this time, at approximately 1-foot NAVD below the NP elevation. Groundwater levels during this 2017 drought were more moderate at TW-6 than at RW-3 due to water augmentation at TW-6 through infiltration gallery RC-7002 (water elevation data provided on hydroperiod graphs in Appendix D).

PDSI values from 2018 through 2020 do not reflect drought as severe as years prior in the Florida Everglades and southwest coast region; however, the groundwater levels in 2020 at both TW-6 and RW-3 decreased to approximately 6 feet NAVD below the NP elevation. The decrease in water levels observed at RW-3 are comparable to past severe drought conditions. The decrease in water levels at TW-6 are more severe than those observed during previous drought conditions due to the significant decrease of water discharged to RC-7002, which did not effectively buffer the wetland from drawdown associated with the GRTS.

9.5.2 Hydrologic Influence from the GRTS

Water level trends observed in TW-6 indicate that regional drought conditions and precipitation influence wetland water levels. In addition to drought conditions, it is also evident that increased pumping of the GRTS and reduced recharge through RC-7002 are contributing factors to decreased water levels. Groundwater elevations do not necessarily reflect wetland conditions and no major alteration or conversion of previously reported land use or vegetative cover types in TW-6 were observed during this monitoring period. Therefore, the results of the quarterly water level monitoring and annual wetland assessment provide evidence that although TW-6 has experienced drawdown from the GRTS, the vegetation has not been negatively affected by the groundwater withdrawal associated with the GRTS.

SECTION 10
SUMMARY AND CONCLUSIONS

Water levels in target wetland 6 and reference wetland 3 were lower during the June 2019 through June 2020 monitoring period than during the previous monitoring period, June 2018 through June 2019. Water levels trends observed in target wetland 6 and reference wetland 3 indicate that regional drought conditions and precipitation influence wetland water levels. In addition to drought conditions, it is also evident that increased pumping of the treatment system and reduced recharge through infiltration gallery 7002 is a contributing factor to decreased water levels.

The telemetry system installed in June 2014 continues to operate normally, allowing quick access to water level instrumentation to determine status and functionality. Data provided by the telemetry system are used for continuous treatment system optimization, specifically for monitoring and adjusting groundwater extraction and recharge in the vicinity of target wetland 6 when appropriate.

A total of 43,528,600 gallons of treated effluent water have been discharged through infiltration gallery 7002 since it was started in July 2014; however, the volume of water discharged to infiltration gallery 7002 decreased significantly after June 2019 due to the need to increase remedial capture. A total of only 33,400 gallons of treated water were discharged to infiltration gallery 7002 between July 2019 and May 2020. Water levels in target wetland 6 dropped below ground surface in August 2014 and again in October 2019 through June 2020. Based on water level data collected during this current monitoring period, the minor amount of treated effluent water recharged through infiltration gallery infiltration gallery 7002 during winter 2019 and spring 2020 augmented groundwater entering target wetland 6 but did not effectively buffer the wetland from drawdown associated with the Groundwater Recovery and Treatment System.

The results of the quarterly water level monitoring and annual wetland assessment provide evidence that although target wetland 6 has experienced drawdown from the Groundwater

Recovery and Treatment System, vegetation within target wetland 6 has not been negatively affected by the groundwater withdrawal associated with the Groundwater Recovery and Treatment System. No major alteration or conversion of previously reported land use or vegetative cover types in target wetland 6 or reference wetland 3 were observed during this monitoring period. The vegetation in target wetland 6 is similar to that recorded in the baseline monitoring reports and the Wetland Assessment Procedure scores remained the same for target wetland 6 and reference wetland 3 during the current monitoring period. Target wetland 6 and reference wetland 3 will continue to be monitored to further evaluate the effect of groundwater extraction and recharge on target wetland 6 groundwater and surface water elevations.

SECTION 11
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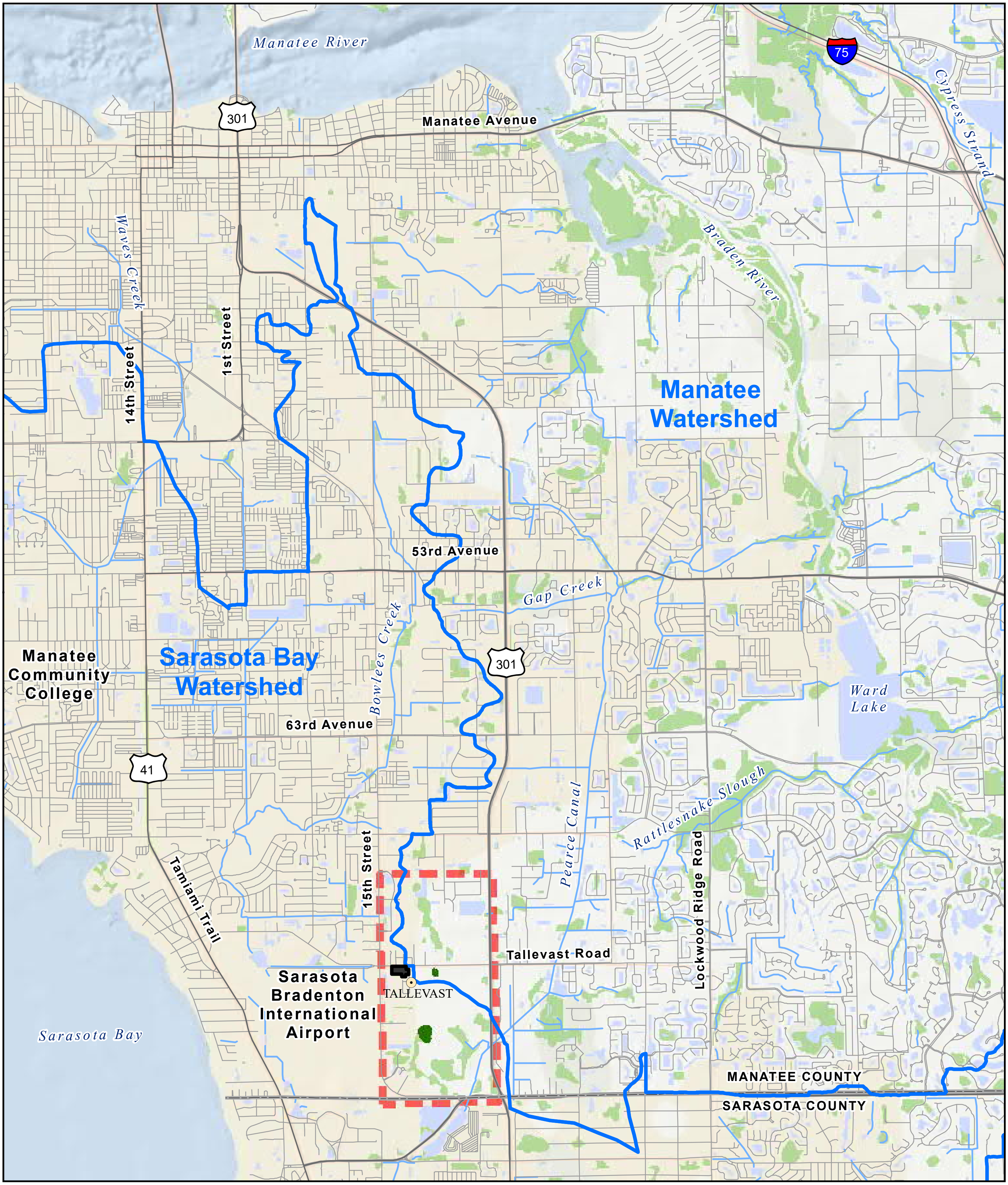
FIGURES

(Figures 4-1, 6-2, 6-3, 6-4, 7-2, 7-3, 7-4 and 8-1 are within report text)

Figure 1-1 Site Location Map



Legend

■	Lockheed Martin Tallevast Facility
☐	Watershed Boundary
⬚	Site Location
🟩	Target and Reference Wetlands

0 1 Miles N

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
WETLAND MONITORING

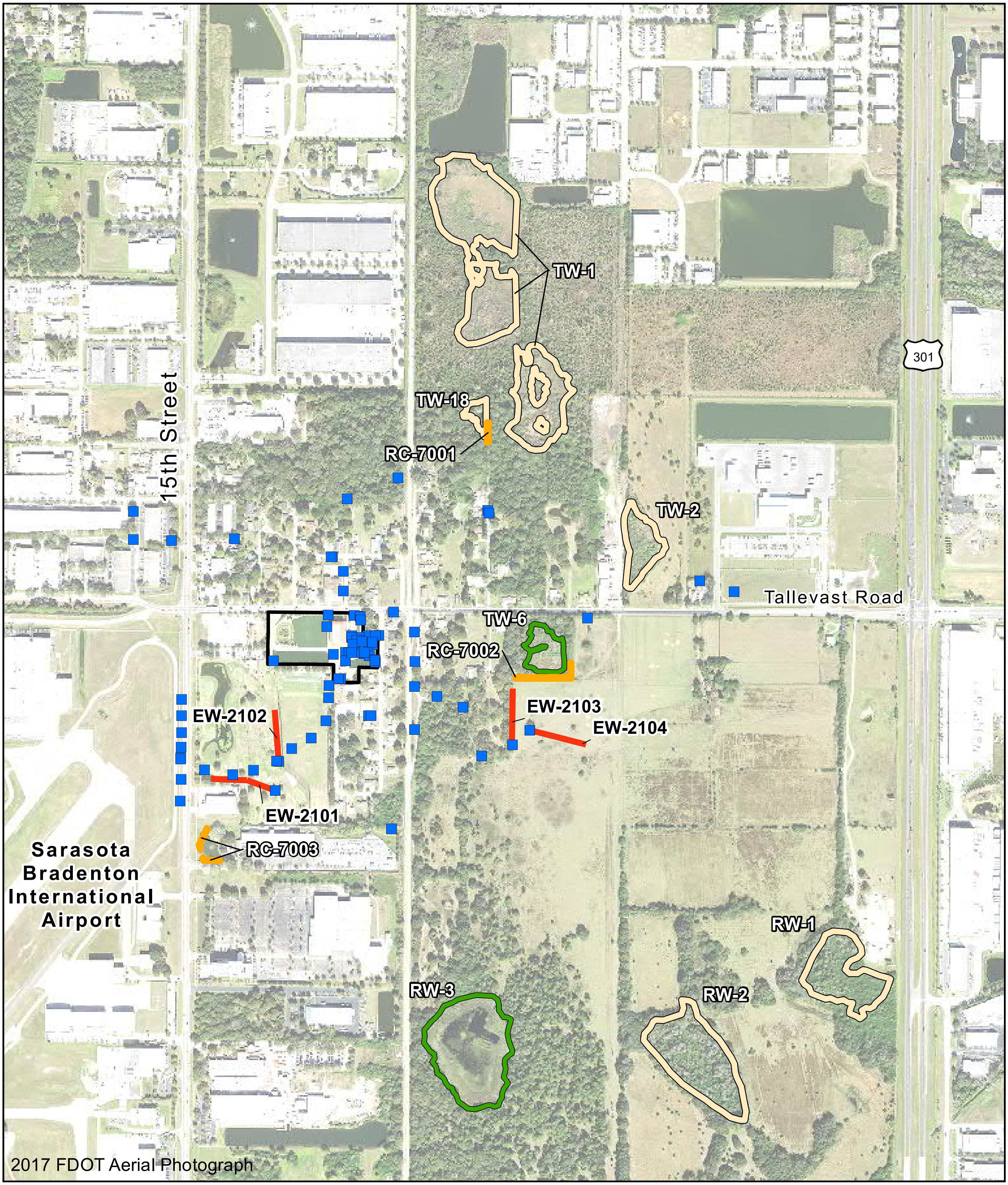
SITE LOCATION MAP

AECOM

FIGURE
1-1

Document Path: P:\DCS\Projects\ENV\Lockheed Martin\Tallevast\60592249 - 2019 to 2023 OMM\900 - CAD\2020 Wetlands Annual Assessment\LMT_WetMon_Fig1_1_LocMap.mxd

Figure 3-1 Off-Facility RAP System Layout



Legend

Off-Facility Extraction Well Locations

- ■ Upper Surficial Aquifer System (USAS) Zone
- RC-7003 Infiltration Gallery
- EW-2104 Horizontal Extraction Trench
- 🟩 Current Target and Reference Wetlands (Historical Wetland Edge)
- ☐ Former Target and Reference Wetlands (Historical Wetland Edge)
- ☐ Lockheed Martin Tallevast Facility

TW - Target Wetland RW - Reference Wetland
RC - Recharge EW - Extraction Well

0 800 Feet

N

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
WETLAND MONITORING

OFF-FACILITY RAPA SYSTEM LAYOUT

AECOM

FIGURE
3-1

Document Path: P:\DCS\Projects\ENV\Lockheed Martin\Tallevast\60592249 - 2019 to 2023 OMM\900 - CAD\2019 Wetlands Annual Assessment\Draft Final\GIS\mxd\LMT_WetMon_Fig3_1_OffFacilityRAPASystemLayout_r1.mxd

Figure 6-1 Site Location Map with Bradenton, Florida USGS 7.5-minute Quadrangle

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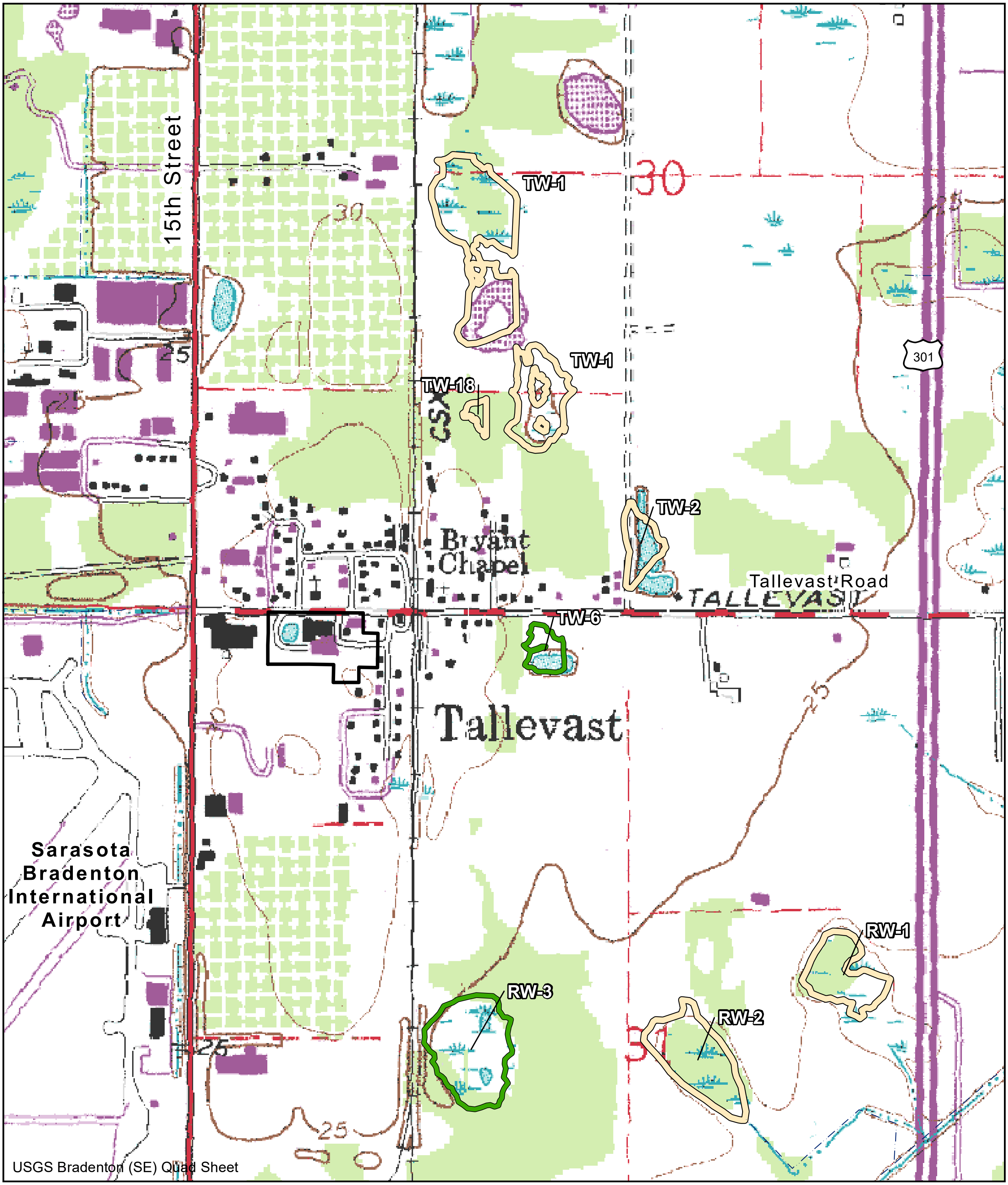


Legend

🟩 Current Target and Reference Wetlands (Historical Wetland Edge)

🟨 Former Target and Reference Wetlands (Historical Wetland Edge)

⬜ Lockheed Martin Tallevast Facility

TW - Target Wetland
RW - Reference Wetland

0 800 Feet

N

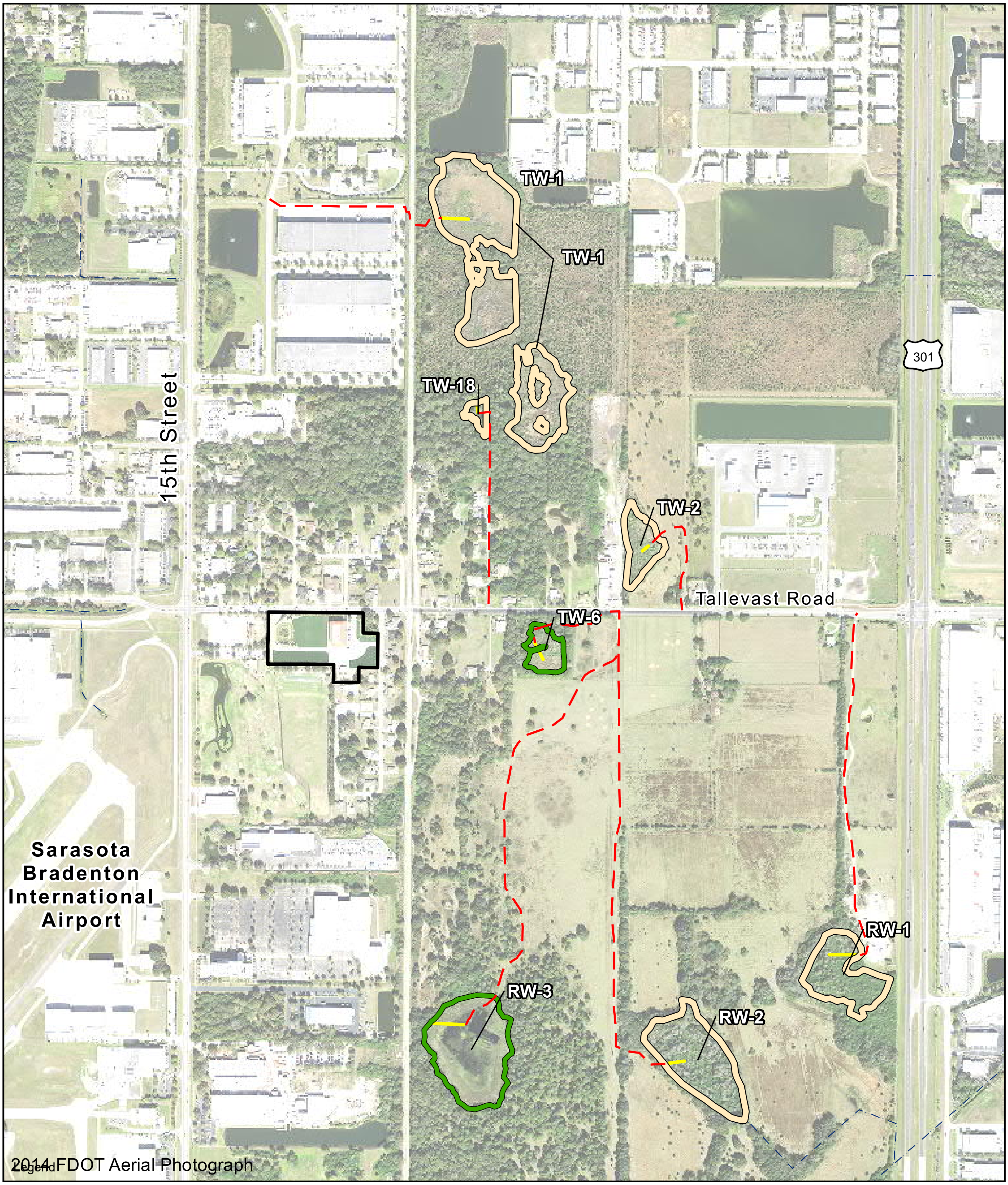
LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
WETLAND MONITORING

SITE LOCATION MAP WITH BRADENTON, FLORIDA USGS 7.5-MINUTE QUADRANGLE

AECOM

FIGURE 6-1

Figure 7-1 Wetland and Transect Locations Map



Legend

🟥 Access

🟨 Transects

🟩 Current Target and Reference Wetlands (Historical Wetland Edge)

▭ Former Target and Reference Wetlands (Historical Wetland Edge)

⬛ Lockheed Martin Tallevast Facility

TW - Target Wetland
RW - Reference Wetland
Aerial Source: FDOT, 2017

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
WETLAND MONITORING

WETLAND AND TRANSECT
LOCATIONS MAP

AECOM

FIGURE
7-1

Figure 9-1 Target Wetland 6 – Transect Map

2014 FDOT Aerial Photograph

Legend

- ● Field Identified Locations
- ⊕ Surface Water Staff Gauge
- ● Wetland Monitoring Well
- ▭ Target and Reference Wetlands (HWE)
- ━ Transects

Note:
HNP - Historical Normal Pool
NP - Normal Pool

0 60 Feet

N

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
WETLAND MONITORING

TARGET WETLAND 6 TRANSECT MAP

AECOM

FIGURE
9-1

Document Path: P:\DCS\Projects\ENV\Lockheed Martin\Tallevast\60592249 - 2019 to 2023 OMM\900 - CAD\2020 Wetlands Annual Assessment\LMT_WetMon_Fig9_1_TargetWetland_6_TransectMap.mxd

Figure 9-2 Reference Wetland 3 – Transect Map

Legend

● Field Identified Locations

⊕ Surface Water Staff Gauge

● Wetland Monitoring Well

▭ Target and Reference Wetlands (HWE)

— Transects

Note:
HNP - Historical Normal Pool
NP - Normal Pool

0 80 Feet

N

LOCKHEED MARTIN
TALLEVAST SITE
TALLEVAST, FLORIDA
WETLAND MONITORING

REFERENCE WETLAND 3 TRANSECT MAP

AECOM

FIGURE
9-2

Document Path: P:\DCS\Projects\ENV\Lockheed Martin\Tallevast\60592249 - 2019 to 2023 OMM\900 - CAD\2020 Wetlands Annual Assessment\LMT_WetMon_Fig9_2_ReferenceWetland_3_Transect.mxd

TABLES

(Tables 2-1, 6-1, 9-1, 9-2, and 9-3 are within report text)

Table 7-1 Wetlands Monitoring Report Survey Data

TABLE 7-1
WETLANDS MONITORING REPORT SURVEY DATA

Wetlands Monitoring Report
Lockheed Martin Tallevast Site
Tallevast, Florida

Description	State Plane North	State Plane East	Top Elevation (ft msl)	Concrete Pad Elevation (ft msl)	Ground Elevation (ft msl)	3' Mark Elevation (ft msl)	1' Mark Elevation (ft msl)	0' Mark Elevation (ft msl)
RW-3								
MW-RW-3	1113699.69	480440.25	25.31	20.89	20.75	NA	NA	NA
SG-RW-3	1113697.44	480440.70	23.73	NA	20.77	23.40	21.40	NA
NP-12-RW-3	1113717.61	480428.18	NA	NA	NA	NA	NA	NA
NP-6-RW-3	1113744.98	480397.51	NA	NA	NA	NA	NA	NA
TW-6								
MW-TW-6	1115977.75	480939.06	25.11	21.25	21.05	NA	NA	NA
SG-TW-6	1115975.49	480938.40	24.28	NA	21.05	23.95	NA	NA
NP-12-TW-6	1115980.54	480935.18	NA	NA	NA	NA	NA	NA
NP-6-TW-6	1115984.11	480933.62	NA	NA	NA	NA	NA	NA

Data Source: ARCADIS, Wetlands Monitoring Report; April 29, 2011

Footnotes:

ft msl - feet mean sea level
MW - Monitoring Well
NA - Not applicable
NP - Normal Pool
RW - Reference Wetland
SG - Staff Gauge
TW - Target Wetland

APPENDICES

Appendix A—NOAA Climate Summary for the Florida Everglades and Southwest Coast

NOAA Logo, National Environmental Satellite, Data, and Information Service.

[National Climatic Data Center, U.S. Department of Commerce]

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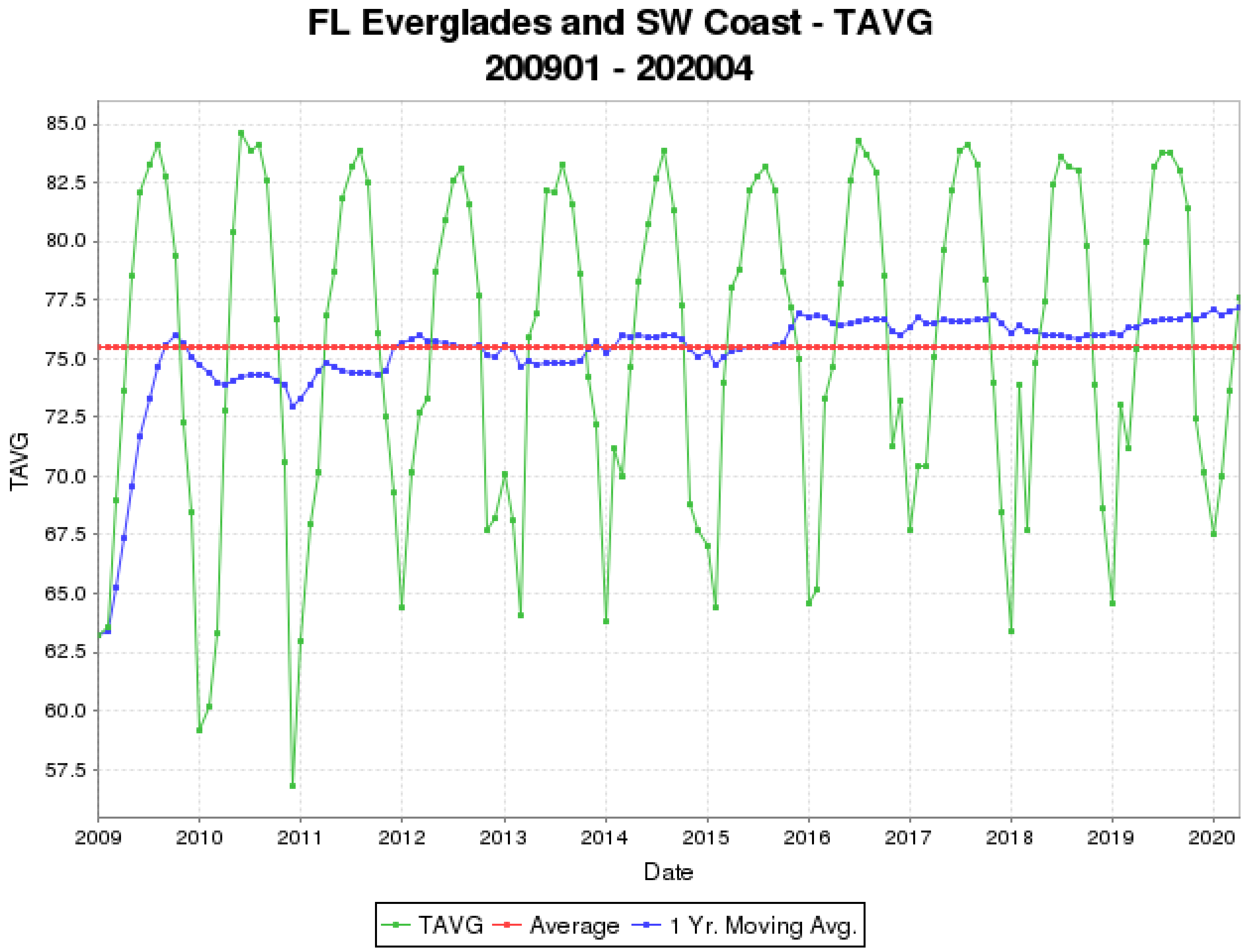
[Land-Based Data] / [NNDC CDO] / [Product Search] / [Help]



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National Climatic Data Center, U.S. Department of Commerce

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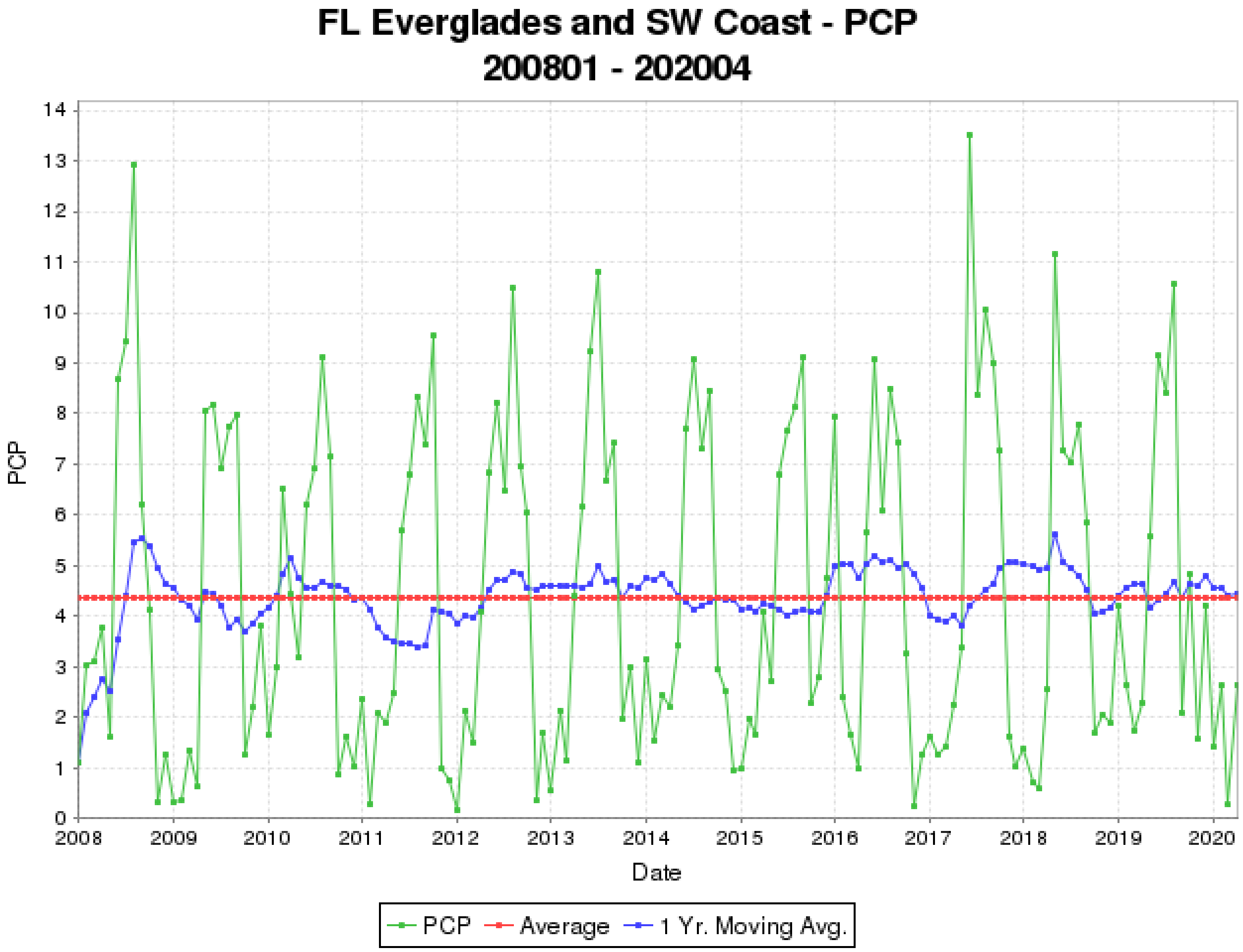
Search Field: Search NCDC

Land-Based Data / NNDC CDO / Product Search / Help



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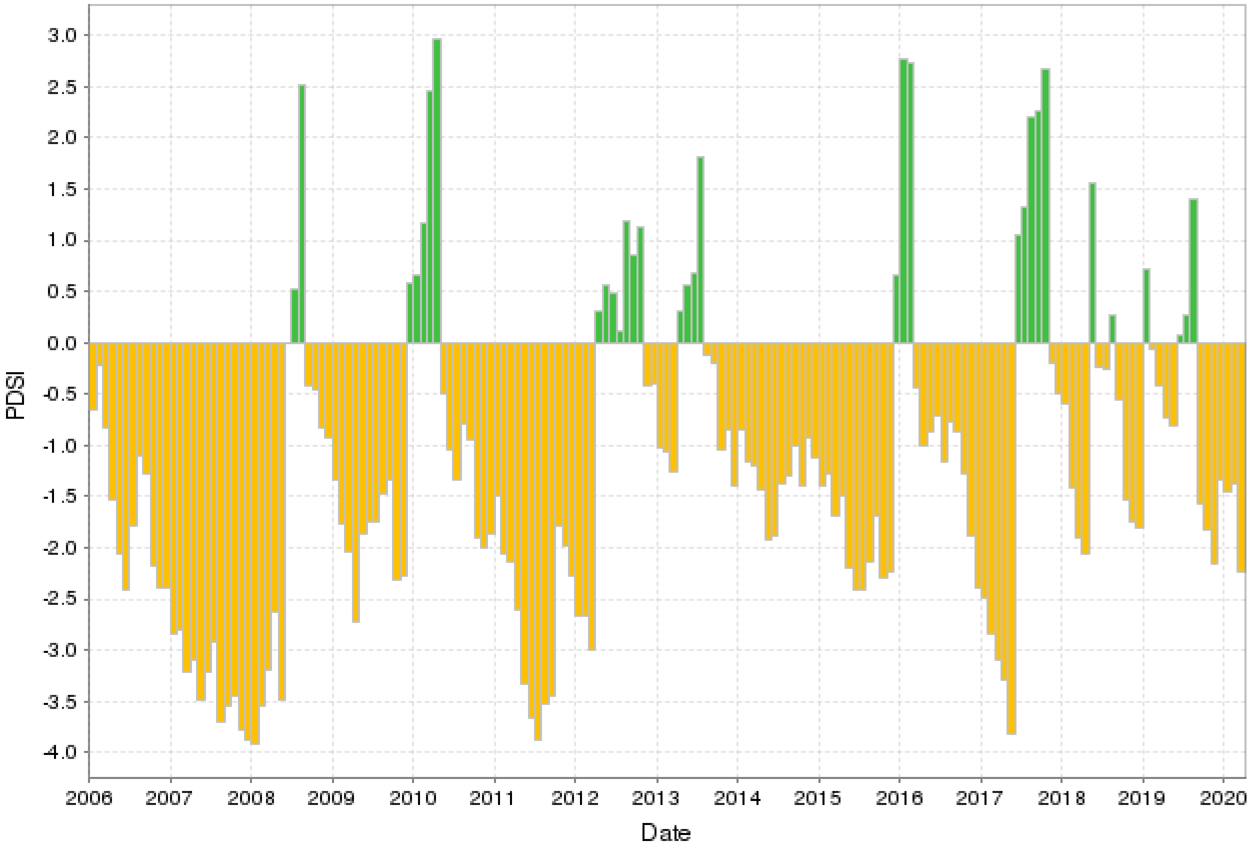
FL Everglades and SW Coast - PDSI
200601 - 202004



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Appendix B—WAP Field Data Sheets

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Target Wetland 6	Emergent/Forested

Wetland ID	Data Owner	Data Source	Personnel	Date	Start/End	
TW-6			B. Bayer & K. Samuels	June 2, 2020	1208	1305

PHOTO-DOCUMENTATION

Frame	Description	Photo Pt.	Direction
17-20	NP-12		N, E, S, W
21-24	NP-6		N, E, S, W
25-28	HNP		N, E, S, W

WATER LEVEL INFORMATION

Dry?	Elevation (ft)	Device	Well/Gage ID
Yes	22.60	SG	SG-TW-6

Description

Water depth from SG = Dry; Well DTW = 8.79 feet below top of casing

Please enter Yes (Y), No (N), or Not Sure (NS) for the following questions and provide comments/explanations.

WETLAND IMPACTS

Wetland edges filled or disturbed?	Yes
Excessive dumping or trash in wetland?	No
Hog disturbance?	No
Signficant impact from cattle (trampling)?	No
Vehicles through wetland (includes bicycles)?	No
Insect damage?	No
Disease?	No

Explanation(s)

Overburden located along southern edge of wetland from livestock pond excavated between 1951 and 1962. Livestock fencing in place excluding cattle from wetland.

WETLAND DRAINAGE

Augmentation equipment in place?	Yes
Augmentation occurring at time of WAP?	No
Clear evidence of direct stormwater inflow?	Yes
Clear evidence of direct drainage from wetland?	Yes
Other drainage activities in area?	No
Borrow pit/retention pond in wetland vicinity?	Yes

Explanation(s)

Cattle pond excavated between 1951 and 1962 in southern portion of wetland. Ditches along Tallevast Road convey stormwater into TW-6 and discharge from TW-6 to east after control elevation near US 301 is reached. RAPA injection gallery (RC-7002) complete and operational during monitoring. RC-7002 start-up initiated 7/9/2014.

Fire

Signs of Fire? No

Explanation (year, expanse, intensity)

Lakes / Docks

Docks completely out of water
Docks touching water or with <50% of dock over water
Docks >50% out of water
[✓ Not Applicable]

Is the littoral zone stranded? ☐

Comments

Soil Subsidence

New signs of oxidation/subsidence? No

Explanation

No subsidence observed.

General Comments/Observations

This wetland appears to have relatively high functional value with relatively appropriate zonation. Signs of hydrology include water stained leaves and lichens 18-20 inches above ground surface.

Future users of this data may not want to analyze / compare this data with other wetlands due to the extensive level of:

☐ non-groundwater withdrawal-related disturbance
☐ soil subsidence

WILDLIFE

Wildlife	Count	Evidence	Wildlife	Count	Evidence	Wildlife	Count	Evidence
Anolis sagrei	Several	Observed						
Rattus norvegicus	1	Observed						

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Target Wetland 6	Emergent/Forested

Wetland ID	Area Assessed	Zone Assessment Notes
TW-6		

GROUNDCOVER

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), % cover (5% or 10-100% in increments of 10%), count (1-4), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Acer rubrum (saplings)	OD	Ind		T
Baccharis halimifolia	AD	5		T
Blechnum serrulatum	D	15		E
Commelina diffusa	T	5		T
Cyperus haspan		5		T
Hydrocotyle umbellata	OD	5		T
Juncus effusus		5		T
Ludwigia peruviana	OD	5		T
Mikania scandens	T	5		T
Nekemias arborea	AD	5		T
Polygonum hydropiperoides	OD	10		T
Schinus terebinthifolius	AD	10		T
Sesbania sp.		Ind		E
Symphyotrichum elliottii	T	20		T
Syzygium sp.		10		T
Thelypteris sp.		30		T
Urena lobata	U	5		T

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Eremochloa ophiuroides		5		T
Eupatorium capillifolium	AD	5		T
Hydrocotyle umbellata	OD	50		T
Ludwigia peruviana	OD	10		T
Solanum americanum		10		T
Urena lobata	U	5		T

DEEP ZONE

deep zone assessed? ☑
check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Hydrocotyle umbellata	OD	20		T
Ludwigia peruviana	OD	20		E
Polygonum hydropiperoides	OD	20		T
Salix caroliniana	OD	5		E
Syzygium sp.		5		T
Urena lobata	U	5		T

Groundcover Comments

ZONATION

Zonation Score: 4 Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in high enough numbers and distribution to be of concern, and/or species with an adaptive classification are in high numbers and distribution in the transition zone.

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Target Wetland 6	Emergent/Forested

Wetland ID	Area Assessed	Zone Assessment Notes
TW-6		

SHRUB / SMALL TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Acer rubrum	OD	5		B
Ludwigia peruviana	OD	Ind		T
Salix caroliniana	OD	10		B
Schinus terebinthifolius	AD	25		T

OUTER DEEP ZONE

outer deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Salix caroliniana	OD	20		T
Schinus terebinthifolius	AD	20		T

DEEP ZONE

deep zone assessed? ☑
check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Ludwigia peruviana	OD	5		T

Shrub/Small Tree Comments

ZONATION

Zonation Score: 4

Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in high enough numbers and distribution to be of concern, and/or species with an adaptive classification are in high numbers and distribution in the transition zone.

STRESS

Signs of stress of appropriate shrubs and small trees (include dead species)

[✓ Few/None]
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate shrubs and small trees (include dead species)

[✓ Few/None]
Noticeable
Significant
Not Applicable

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Target Wetland 6	Emergent/Forested

Wetland ID	Area Assessed	Zone Assessment Notes
TW-6		

TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑

check if no trees ☐

SPECIES	ZONE	%	#	DIST
Acer rubrum	OD	20		E
Quercus virginiana	U	5		E
Salix caroliniana	OD	20		T
Schinus terebinthifolius	AD	25		T

OUTER DEEP ZONE

outer deep zone assessed? ■

check if no trees ☐

SPECIES	ZONE	%	#	DIST
Salix caroliniana	OD	40		T

DEEP ZONE

deep zone assessed? ■

check if no trees ■

SPECIES	ZONE	%	#	DIST

Tree Comments

ZONATION

Zonation Score: 4

Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Species have moved in one zone in enough numbers to be of concern.

STRESS

Signs of stress of appropriate trees (do not include dead species)

[✓ Few/None]
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate trees (include dead species)

Few/None
Noticeable
Significant
[✓ Not Applicable]

RECOVERY

Dead or leaning trees (include standing dead trees and dead trees on ground that are appropriate)

[✓ Few/None]
Noticeable
Significant

Signs of tree recovery

Yes
[✓ No]
Not Sure

Inappropriate vine death suggesting recovery

Yes
[✓ No]
Not Sure

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 3	Emergent

Wetland ID	Data Owner	Data Source	Personnel	Date	Start/End	
RW-3			B. Bayer & K. Samuels	June 2, 2020	1106	1150

PHOTO-DOCUMENTATION

Frame	Description	Photo Pt.	Direction
1-4	MW		N,E,S,W
5-8	NP-12		N,E,S,W
9-12	NP-6		N,E,S,W
13-16	HNP		N,E,S,W

WATER LEVEL INFORMATION

Dry?	Elevation (ft)	Device	Well/Gage ID
Yes	20.99	SG	SG-RW-3

Description

SG = Dry; Well DTW = 5.78 feet below top of casing

Please enter Yes (Y), No (N), or Not Sure (NS) for the following questions and provide comments/explanations.

WETLAND IMPACTS

Wetland edges filled or disturbed?	No
Excessive dumping or trash in wetland?	No
Hog disturbance?	Yes
Signficant impact from cattle (trampling)?	Yes
Vehicles through wetland (includes bicycles)?	No
Insect damage?	No
Disease?	No

Explanation(s)

Yes - Signs of hog and cattle activity observed throughout the wetland; Yes - Recently grazed.

WETLAND DRAINAGE

Augmentation equipment in place?	No
Augmentation occurring at time of WAP?	No
Clear evidence of direct stormwater inflow?	Yes
Clear evidence of direct drainage from wetland?	No
Other drainage activities in area?	No
Borrow pit/retention pond in wetland vicinity?	Yes

Explanation(s)

Yes - This wetland receives storm water inflow from surrounding natural drainage basin and surrounding cattle pastures; Yes - Center of wetland appears to have been historically excavated to provide dry season water source for cattle.

Fire

Signs of Fire? No

Explanation (year, expanse, intensity)

Soil Subsidence

New signs of oxidation/subsidence? No

Explanation

No subsidence observed.

Lakes / Docks

Docks completely out of water
Docks touching water or with <50% of dock over water
Docks >50% out of water
[✓ Not Applicable]

Is the littoral zone stranded? ☐

Comments

General Comments/Observations

This wetland appears to continue to exhibit a relatively high functional value as indicated by high species diversity in the appropriate zones and limited hydrological and topographical impacts.

Future users of this data may not want to analyze / compare this data with other wetlands due to the extensive level of:

☑ non-groundwater withdrawal-related disturbance
☐ soil subsidence

WILDLIFE

Wildlife	Count	Evidence	Wildlife	Count	Evidence	Wildlife	Count	Evidence
Sus scrofa	Many	Rooting						

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 3	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
RW-3		Deepwater herbaceous marsh with significant topographic relief and relatively obvious zonation.

GROUNDCOVER

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), % cover (5% or 10-100% in increments of 10%), count (1-4), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑

check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Centella asiatica	T	5		E
Cirsium horridulum		5		T
Cyperus polystachyos		10		T
Diodia virginiana	OD	5		T
Eleocharis baldwinii	T	5		T
Eupatorium capillifolium	AD	Ind		T
Hydrocotyle umbellata	OD	5		T
Juncus effusus		50		T
Ludwigia decurrens		5		E
Ludwigia peruviana	OD	10		T
Paspalum distichum		5		T
Polygonum hydropiperoides	OD	20		T
Ptilimnium capillaceum	T	5		T
Setaria parviflora	AD	20		T
Solanum viarum	U	5		T
Spartina bakeri		20		T
Thelypteris sp.		10		T
Urena lobata	U	5		T
Vitis rotundifolia	AD	Ind		E
Woodwardia areolata		1		E

OUTER DEEP ZONE

outer deep zone assessed? ☑

check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Cyperus polystachyos		5		T
Eleocharis baldwinii	T	30		T
Eremochloa ophiuroides		10		T
Hydrocotyle umbellata	OD	5		T
Juncus effusus		Ind		T
Ludwigia decurrens		5		T
Ludwigia peruviana	OD	5		T
Panicum hemitomon		20		T
Panicum repens		10		T
Paspalum distichum		20		T
Phyla nodiflora	AD	Ind		T
Polygonum hydropiperoides	OD	20		T
Ptilimnium capillaceum	T	10		T

DEEP ZONE

deep zone assessed? ☑

check if no groundcover ☐

SPECIES	ZONE	%	#	DIST
Equisetum hyemale		5		T
Eremochloa ophiuroides		10		T
Ludwigia decurrens		5		T
Panicum hemitomon		40		T
Panicum repens		20		T
Polygonum hydropiperoides	OD	20		T

Groundcover Comments

ZONATION

Zonation Score: 5

Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Normal zonation - all identified species are within their appropriate zone

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 3	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
RW-3		

SHRUB / SMALL TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑

check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Ludwigia peruviana	OD	30		T
Quercus virginiana	T	10		E
Schinus terebinthifolius	AD	15		E

OUTER DEEP ZONE

outer deep zone assessed? ☑

check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST
Ludwigia peruviana	OD	10		T

DEEP ZONE

deep zone assessed? ☑

check if no shrubs/small trees ☐

SPECIES	ZONE	%	#	DIST

Shrub/Small Tree Comments

ZONATION

Zonation Score: 5

Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

Normal zonation - all identified species are within their appropriate zone

STRESS

Signs of stress of appropriate shrubs and small trees (include dead species)

[✓ Few/None]
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate shrubs and small trees (include dead species)

[✓ Few/None]
Noticeable
Significant
Not Applicable

WETLAND ASSESSMENT PROCEDURE

Wellfield / Property	Wetland Name	Wetland Type
W. Schmid (P-66)	Reference Wetland 3	Emergent

Wetland ID	Area Assessed	Zone Assessment Notes
RW-3		Herbaceous Wetland. No trees

TREES

For each zone assessed, please document the following: species abbreviation, WAP zone (U, AD, T, OD, or D), percent cover (5% or 10-100% in increments of 10%), count (1-50 or ">50"), and distribution (E=edge, B=beyond a few feet, or T=throughout).

TRANSITION ZONE

transition zone assessed? ☑

check if no trees ☑

SPECIES	ZONE	%	#	DIST
Ilex cassine	OD	5		B
Morella cerifera	AD	5		B
Schinus terebinthifolius	AD	5		B

OUTER DEEP ZONE

outer deep zone assessed? ■

check if no trees ■

SPECIES	ZONE	%	#	DIST

DEEP ZONE

deep zone assessed? ■

check if no trees ■

SPECIES	ZONE	%	#	DIST

Tree Comments

ZONATION

Zonation Score: NA Please assign a score of 1 - 5 or 0 and provide an explanation.

Zonation Score Explanation

No score assigned due to lack of vegetation meeting strata requirements.

STRESS

Signs of stress of appropriate trees (do not include dead species)

[✓ Few/None]
Noticeable
Significant
Not Applicable

Signs of stress of inappropriate trees (include dead species)

Few/None
Noticeable
Significant
[✓ Not Applicable]

RECOVERY

Dead or leaning trees (include standing dead trees and dead trees on ground that are appropriate)

[✓ Few/None]
Noticeable
Significant

Signs of tree recovery

Yes
[✓ No]
Not Sure

Inappropriate vine death suggesting recovery

Yes
[✓ No]
Not Sure

Appendix C—Photographic Documentation

North

East

West

South

AECOM Project #60592249
June 2020

Target Wetland (TW) 6 – Normal Pool (NP)-12 Photostation
Tallevast Site
2020 Wetlands Monitoring
Tallevast, Manatee County, Florida

North

East

West

South

AECOM Project #60592249
June 2020

Target Wetland (TW) 6 – Normal Pool (NP)-6 Photostation
Tallevast Site
2020 Wetlands Monitoring
Tallevast, Manatee County, Florida

North

East

West

South

AECOM

AECOM Project #60592249
June 2020

Target Wetland (TW) 6 – Historic Normal Pool (HNP) Photostation
Tallevast Site
2020 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-7

North

East

West

South

AECOM

AECOM Project #60592249
June 2020

Reference Wetland (RW) 3 – Monitoring Well (MW) 3 Photostation
Tallevast Site
2020 Wetlands Monitoring
Tallevast, Manatee County, Florida

North

East

West

South

AECOM

AECOM Project #60592249
June 2020

Reference Wetland (RW) 3 – Normal Pool (NP)-12 Photostation
Tallevast Site
2020 Wetlands Monitoring
Tallevast, Manatee County, Florida

North

East

West

South

Reference Wetland (RW) 3 – Normal Pool (NP)-6 Photostation

Tallevast Site

2020 Wetlands Monitoring

Tallevast, Manatee County, Florida

R625-STA-002274-7

AECOM

AECOM Project #60592249

June 2020

North

East

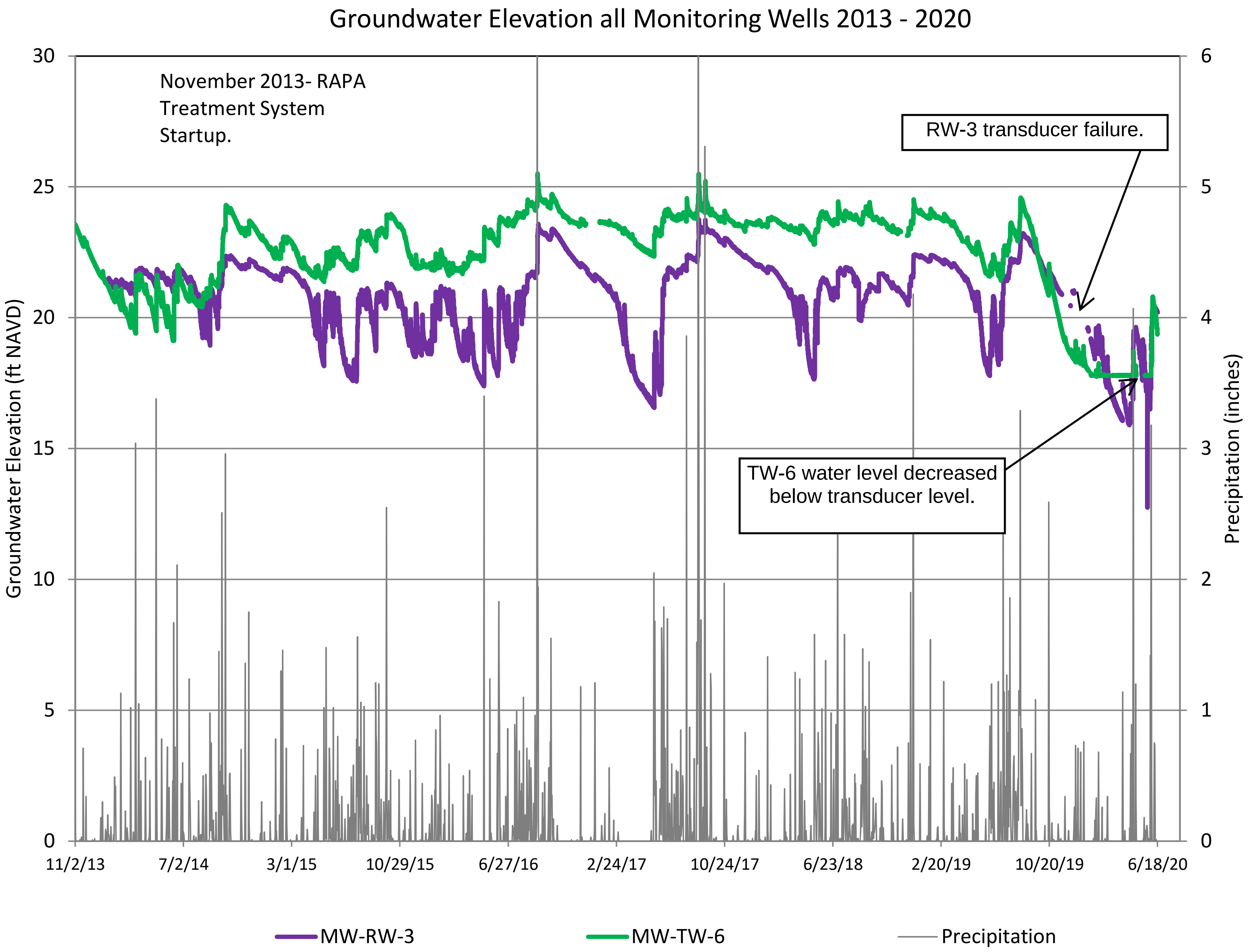
West

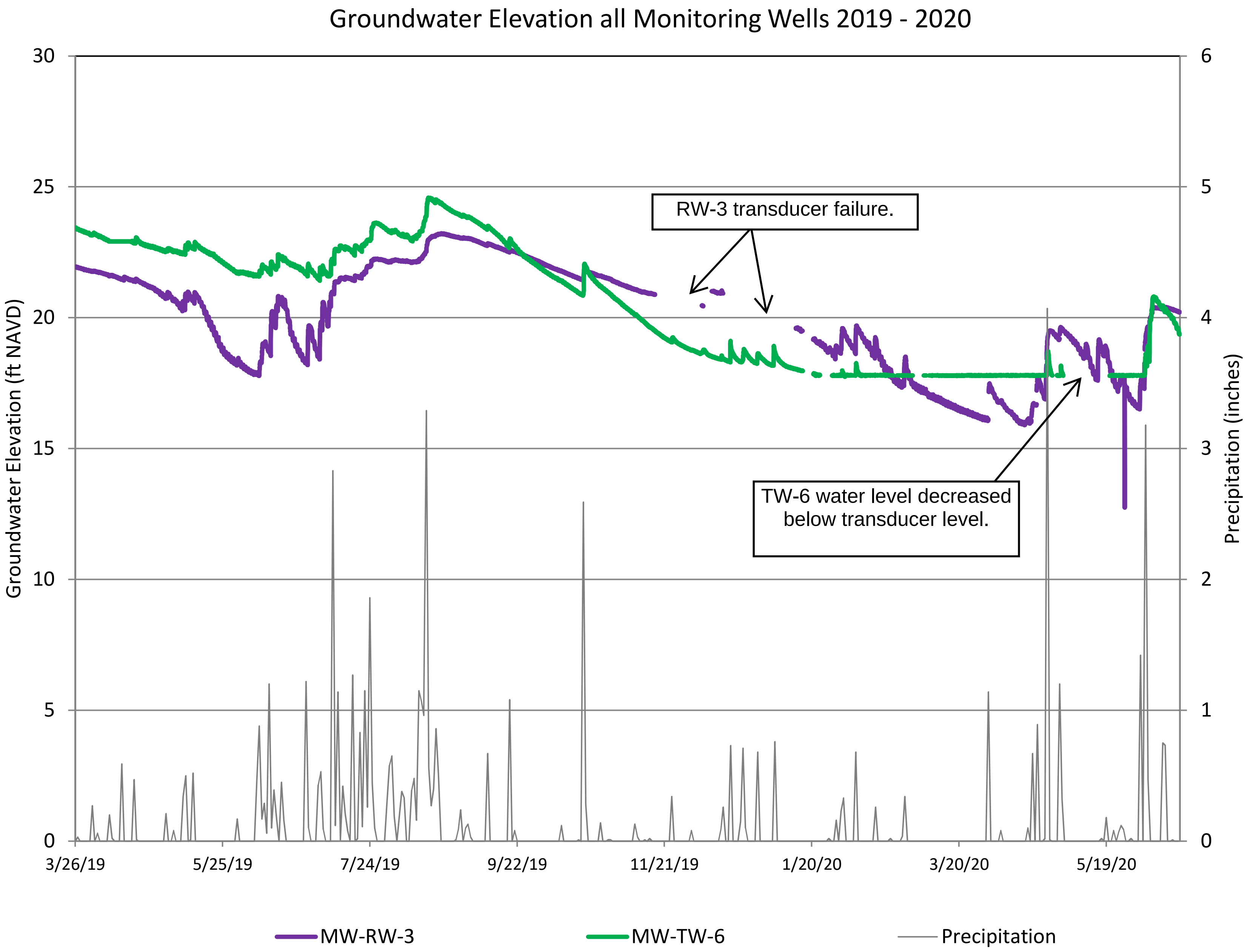
South

AECOM Project #60592249
June 2020

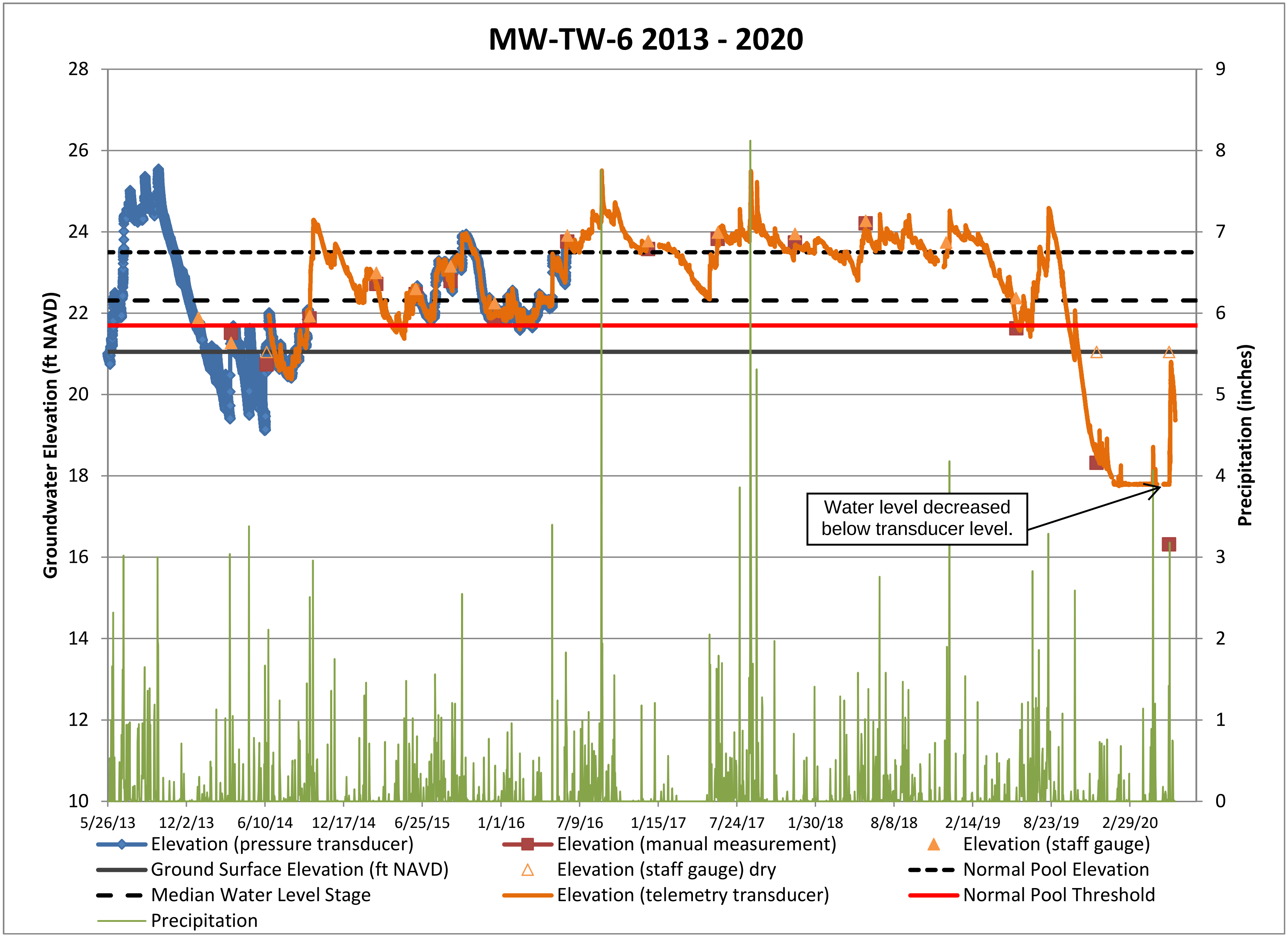
Reference Wetland (RW) 3 – Historic Normal Pool (HNP) Photostation
Tallevast Site
2020 Wetlands Monitoring
Tallevast, Manatee County, Florida
R625-STA-002274-7

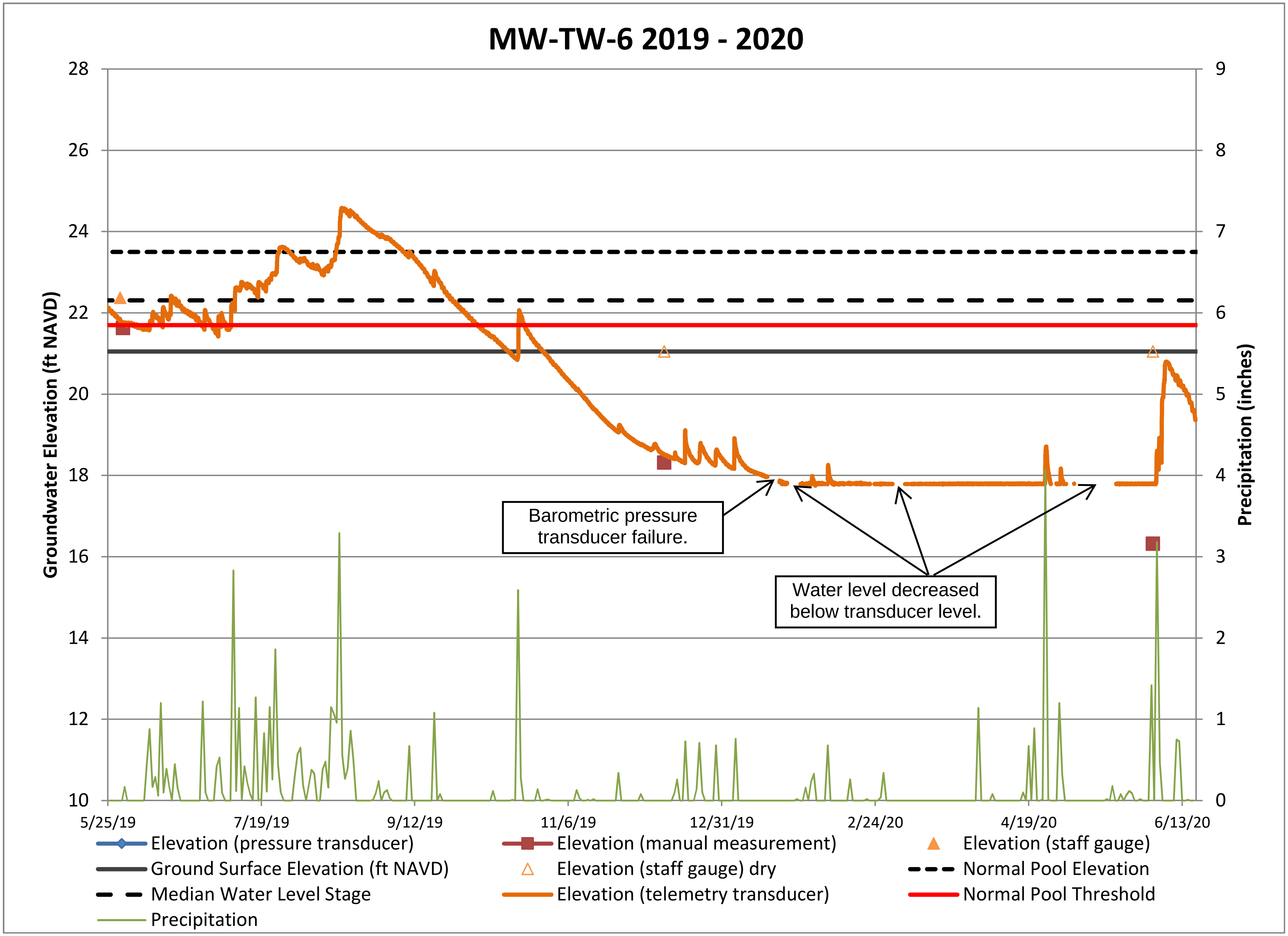
Appendix D—Hydroperiod Graphs

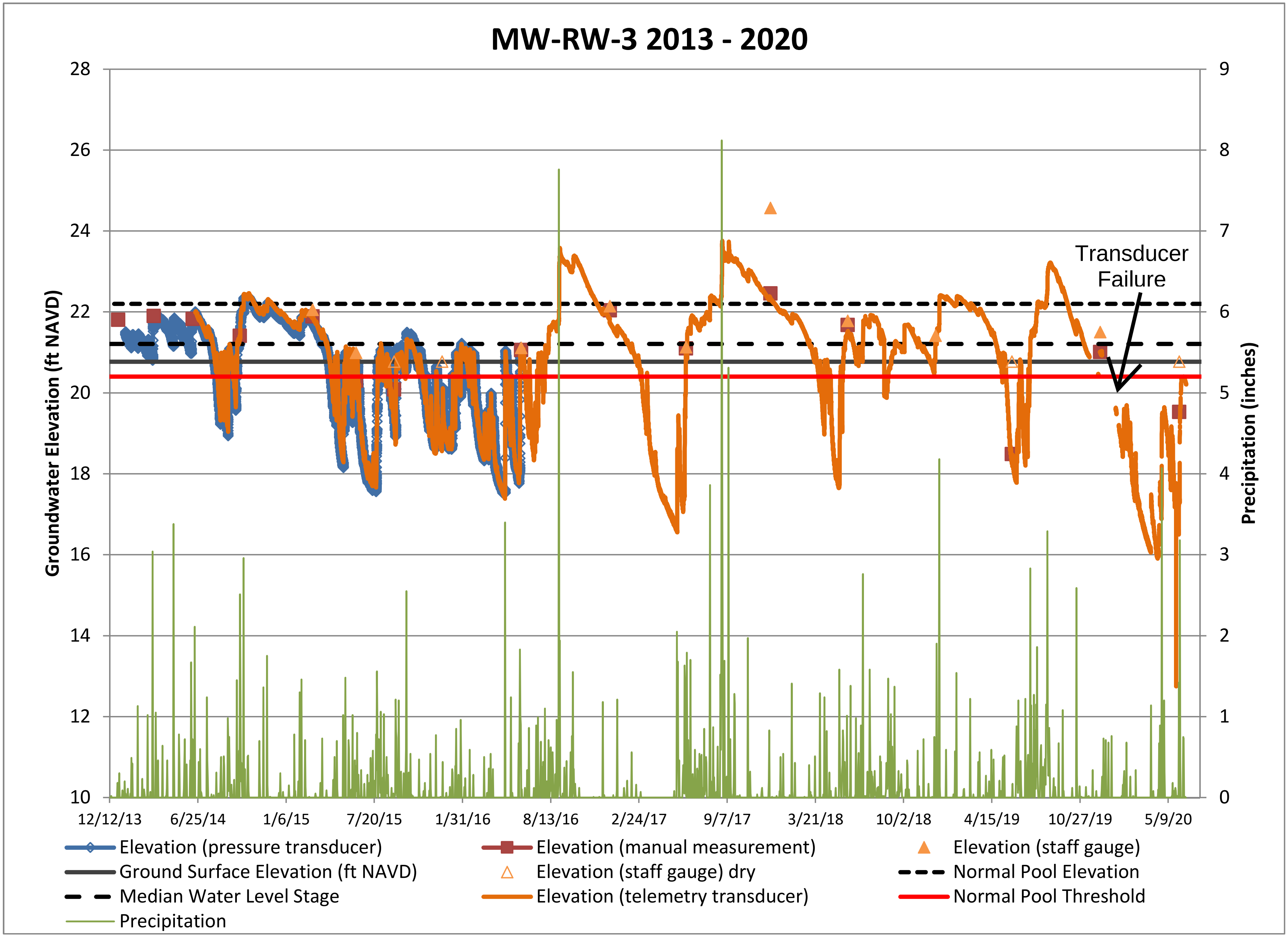

Groundwater Elevation all Monitoring Wells 2013 - 2020
November 2013- RAPA Treatment System Startup.
RW-3 transducer failure.
TW-6 water level decreased below transducer level.
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
25
20
15
10
5
0
6
5
4
3
2
1
0
11/2/13
7/2/14
3/1/15
10/29/15
6/27/16
2/24/17
10/24/17
6/23/18
2/20/19
10/20/19
6/18/20
MW-RW-3
MW-TW-6
Precipitation

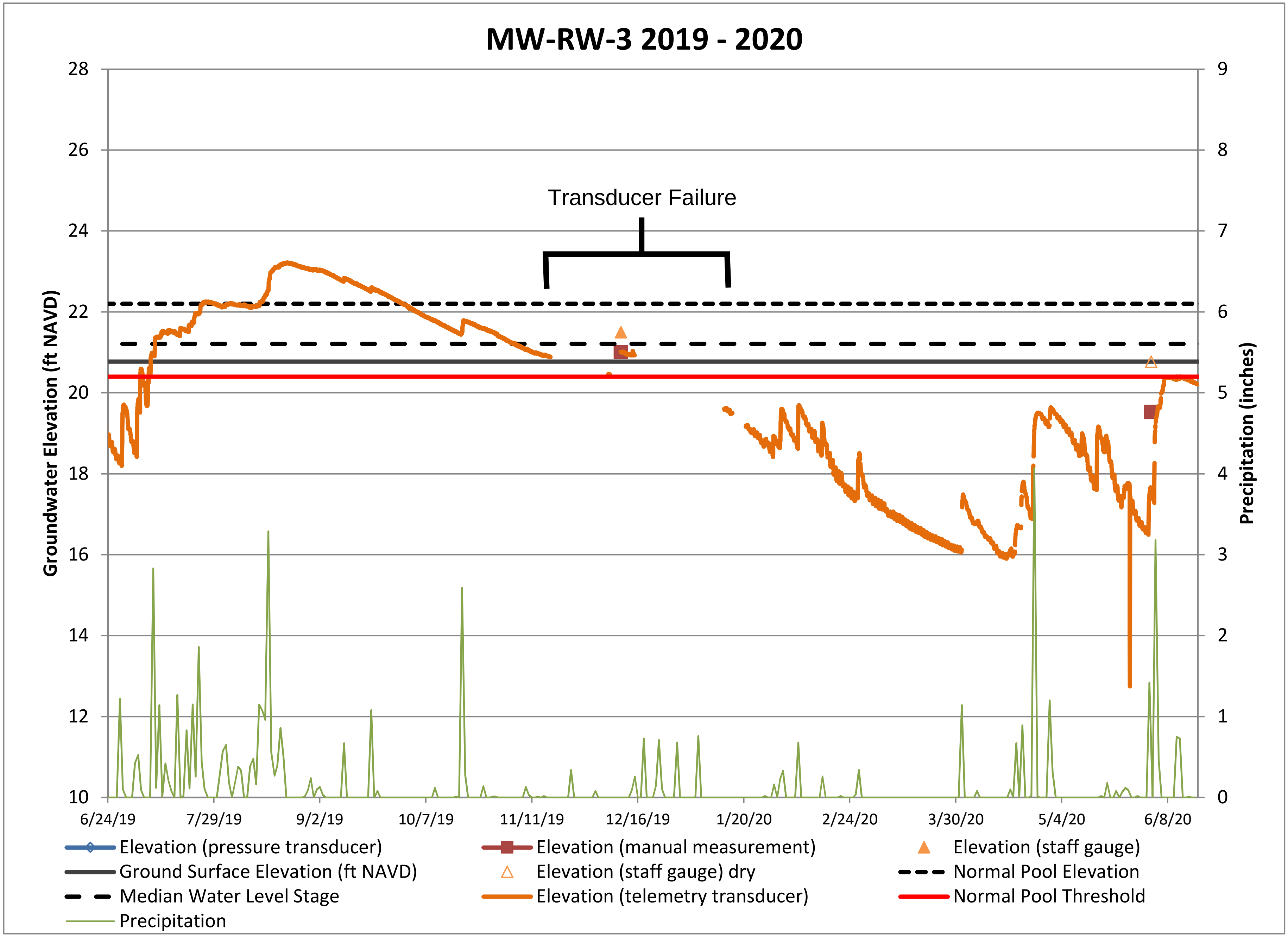


Groundwater Elevation all Monitoring Wells 2019 - 2020
Groundwater Elevation (ft NAVD)
Precipitation (inches)
30
25
20
15
10
5
0
6
5
4
3
2
1
0
3/26/19
5/25/19
7/24/19
9/22/19
11/21/19
1/20/20
3/20/20
5/19/20
RW-3 transducer failure.
TW-6 water level decreased below transducer level.
MW-RW-3
MW-TW-6
Precipitation


MW-TW-6 2013 - 2020
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
9
8
7
6
5
4
3
2
1
0
5/26/13
12/2/13
6/10/14
12/17/14
6/25/15
1/1/16
7/9/16
1/15/17
7/24/17
1/30/18
8/8/18
2/14/19
8/23/19
2/29/20
Water level decreased below transducer level.
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
Ground Surface Elevation (ft NAVD)
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemetry transducer)
Normal Pool Threshold
Precipitation


MW-TW-6 2019 - 2020
Groundwater Elevation (ft NAVD)
28
26
24
22
20
18
16
14
12
10
Precipitation (inches)
9
8
7
6
5
4
3
2
1
0
5/25/19
7/19/19
9/12/19
11/6/19
12/31/19
2/24/20
4/19/20
6/13/20
Barometric pressure transducer failure.
Water level decreased below transducer level.
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
Ground Surface Elevation (ft NAVD)
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemetry transducer)
Normal Pool Threshold
Precipitation


MW-RW-3 2013 - 2020
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
9
8
7
6
5
4
3
2
1
0
12/12/13
6/25/14
1/6/15
7/20/15
1/31/16
8/13/16
2/24/17
9/7/17
3/21/18
10/2/18
4/15/19
10/27/19
5/9/20
Transducer Failure
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
Ground Surface Elevation (ft NAVD)
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemetry transducer)
Normal Pool Threshold
Precipitation


MW-RW-3 2019 - 2020
Transducer Failure
Groundwater Elevation (ft NAVD)
Precipitation (inches)
28
26
24
22
20
18
16
14
12
10
9
8
7
6
5
4
3
2
1
0
6/24/19
7/29/19
9/2/19
10/7/19
11/11/19
12/16/19
1/20/20
2/24/20
3/30/20
5/4/20
6/8/20
Elevation (pressure transducer)
Elevation (manual measurement)
Elevation (staff gauge)
Ground Surface Elevation (ft NAVD)
Elevation (staff gauge) dry
Normal Pool Elevation
Median Water Level Stage
Elevation (telemetry transducer)
Normal Pool Threshold
Precipitation