Year 8 Monitoring Report

Mallard Creek Wetland Mitigation

February 2006

S&EC Project No. 9441.D1
EEP Project No. 00060

Designed by: NCDOT

Prepared for

Ecosystem Enhancement PROGRAM

NCEEP, 1652 Mail Service Center, Raleigh, NC 27699-1652

Table of Contents

I. Executive Summary / Project Abstract

The Mallard Creek Mitigation Site, a ten-acre wetland restoration site, was designed by the North Carolina Department of Transportation (NCDOT) in cooperation with Mecklenburg County. The site served as mitigation for the construction of the Charlotte Outer Loop and will be incorporated into the city's greenway system. This report serves as the Year 8 (2005) Annual Monitoring Report.

The wetland restoration area was planted with appropriate bottomland hardwood forest tree species. Six (6) vegetation plots were established onsite by NCDOT. These plots are shown on the Monitoring Plan View (Sheet 1). Success criteria require a minimum of 320 live stems per acre for three consecutive years. A review of the sample plots reveals a current (2005 – Year 8) site density of approximately 413 stems per acre, which exceeds established success criteria.

Ten (10) groundwater gauges were established onsite. Eight (8) of the ten (10) gauges onsite achieved wetland success criteria of saturation for 12.5% of the growing season (29 days). The two (2) gauges that did not meet criteria failed not from a lack of hydrology, but due to the gauges malfunctioning. Based on our observations of the site and general site conditions, it is our opinion that had data been recorded, both malfunctioning gauges would have met hydrology requirements. Therefore, we have concluded that the site is functioning as desired.

The Mallard Creek Wetland Restoration site has maintained wetland functions of hydrology and vegetation for Monitoring Year 8 (2005). S&EC recommends that monitoring be discontinued.

II. Project Background

The background information for this report is referenced from previous monitoring reports submitted by the North Carolina Department of Transportation (NCDOT) Office of Natural Environment and Roadside Environmental Unit.

A. Location and Setting

The Mallard Creek Mitigation Site, located in Mecklenburg County, NC, consists of two sites which are separated by Mallard Creek Church Road (SR 2833), just east of its intersection with US 29. From Interstate 85, take Exit # 46 onto Mallard Creek Church Road and turn left. Continue traveling south on Mallard Creek Church Road as it crosses US 29. The site entrance is on the left hand side of the road. The site location is shown in Figure 1.

B. Structure and Objectives

The site was designed in cooperation with Mecklenburg County, with plans to incorporate the mitigation sites into a greenway plan for the area. A boardwalk has been constructed on Site 2 as part of the Mecklenburg Parks and Recreation system. An additional boardwalk through Site 1 has been proposed upon completion of the Mallard Creek Church Road widening.

Table I: Project Structure Table
Mallard Creek Wetland Mitigation Site (EEP Project # 00060)

Segment/Reach ID	Linear Feet or Acreage
Site 1	2.8 acres
Site 2	7.2 acres

Table II: Project Contact Table
Mallard Creek Wetland Mitigation Site (EEP Project # 00060)

Segment/Reach ID	Objectives	Linear Feet or Acreage	Comment
Site 1	Restoration/Creation	2.8	Mitigation for Charlotte Outer Loop
Site 2	Restoration/Creation	7.2	Mitigation for Charlotte Outer Loop

C. Project History and Background

The site serves as mitigation for wetland impacts associated with the Charlotte Outer Loop (R-211 DA, USACE Action ID 199200013). The project has restored 10 acres of bottomland hardwood forested wetlands. The site was initially constructed and planted in 1994. After 2 years of monitoring, it was concluded that hydrologic and vegetative conditions were not suitable. In order to ensure hydrologic success, the

site was regraded and replanted in 1997. Additional details regarding the timeline of the project are included as Table III.

Table III: Project Activity and Reporting History
Mallard Creek Wetland Mitigation Site (EEP Project # 00060)

Activity or Report	Calendar Year of Completion or Planned Completion	Actual Completion Date
Site 1& 2: Grading Construction	1994	Oct-94
Site 2 Planted	1995	Feb-95
Year 1 Monitoring	1995	Nov-95
Year 1 Vegetation Monitoring	1995	Sep-95
Year 2 Vegetation Monitoring	1996	Sep-96
Site 1& 2: Remediation, Grading Construction	1997	Oct-97
Boardwalk Construction	1998	Feb-98
Site 1 & 2: Tree Planting	1998	Feb-98
Gauges Installed	1998	May-98
Initial-Year 1 Monitoring	1998	Nov-98
Year 1 Vegetation Monitoring	1998	Sep-98
Year 2 Monitoring	1999	Nov-99
Year 2 Vegetation Monitoring	1999	Sep-99
Year 3 Monitoring	2000	Nov-00
Year 3 Vegetation Monitoring	2000	Sep-00
Water Main Fixed Adjacent to Site 1	2000	Dec-00
Year 4 Monitoring	2001	Nov-01
Year 4 Vegetation Monitoring	2001	Jun-01
Year 5 Monitoring	2002	Nov-02
Year 5 Vegetation Monitoring	2002	Aug-02
Year 6 Monitoring	2003	Nov-03
Year 6 Vegetation Monitoring	2003	Oct-03
Year 7 Monitoring	2004	Nov-04
Year 7 Vegetation Monitoring	2004	Aug-04
Year 8 Monitoring	2005	Nov-05
Year 8 Vegetation Monitoring	2005	May-05

The project was designed by NCDOT. Monitoring activities for Year 8 were performed by S&EC.

Table IV: Project Contact Table
Mallard Creek Wetland Mitigation Site (EEP #00060)

Designer	NCDOT, Mecklenburg County
Monitoring Performers	Soil & Environmental Consultants, PA 11010 Raven Ridge Road Raleigh, NC 27614
Vegetation Monitoring POC	Jessica Regan, S&EC

The project is located within Mecklenburg County, portions of which are located within the Charlotte Belt of the Piedmont of North Carolina. The site is located within a moderately urban area. Additional information regarding the site is included in Table V.

Table V: Project Background Table
Mallard Creek Wetland Mitigation Site (EEP# 00060)

Project County	Mecklenburg
Stream Order	N/A
Physiographic Region	Piedmont
Ecoregion	Charlotte Belt
Rosgen Classification of As-Built	N/A
Cowardin Classification	Palustrine
Dominant Soil Types	Monacan, Wilkes, Enon
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	N/A
% of project easement fenced	0

D. Monitoring Plan View

A series of monitoring devices were previously established onsite. Two (2) vegetation monitoring plots are located within the restored wetlands on Site 1 while four (4) are located on Site 2, for a total of six (6) vegetation monitoring plots. Permanent photo points were established at each vegetation plot.

Ten (10) electronic groundwater monitoring gauges were previously installed on both sites. Three (3) of the gauges are located on Site 1, the remaining seven (7) gauges

are located on Site 2. The gauges have been configured to record daily groundwater levels. Also present on-site are a rain-gauge and two (2) surface water gauges.

The locations of all monitoring devices are shown on Sheet 1 – Monitoring Plan View.

II. Project Condition and Monitoring Results

A. Vegetation Assessment

The wetland restoration area was planted with appropriate bottomland hardwood forest tree species. Six (6) vegetation plots were established onsite by NCDOT. These plots are shown on the Monitoring Plan View (Sheet 1). Success criteria require a minimum of 320 live stems per acre for three consecutive years.

1. Soil Data

Soils onsite consist primarily of Monacan soils, which are found on floodplains along streams and drainageways. Small areas of Wilkes loam and Enon soils are found on the periphery of Site 1 along Tryon Road. A small area of Wilkes loam is also found on the eastern edge of Site 2. The physical properties of these soils are listed in Table VI below.

Table VI: Preliminary Soil Data
Mallard Creek Wetland Mitigation Site (EEP Project #00060)

Series	Max Depth (in.)	% Clay on Surface	K	T	OM %
Monacan (MO)	80	7-27	0.43	5	0.0-3.0
Wilkes loam, 8-15% slopes (WkD)	48	5-20	0.24	2	0.0-2.0
Wilkes loam, 15-25% slopes (WkE)	48	5-20	0.24	2	0.0-2.0
Enon, (EnD)	72	5-20	0.24	5	0.0-2.0

2. Problem Areas Plan View (vegetation)

During a field inspection on May 27, 2005, no vegetative problem areas were identified.

3. Stem Counts

The following tree species were planted in the Wetland Creation Area: *Fraxinus pennsylvanica* (Green Ash), *Nyssa sylvatica* var. *sylvatica* (Black Gum), *Quercus lyrata* (Overcup Oak), *Quercus nigra* (Water Oak). There are six vegetation monitoring plots onsite, two (2) on Site 1 and four (4) on Site 2. On May 27,

2005, S&EC conducted vegetation counts within each plot. The results of this survey are shown below in Table VIII.

Table VIII: Stem Counts for Each Species Arranged by Plot
Mallard Creek Wetland Mitigation Site (EEP Project #00060)

Species	Plots						Year 8 Totals
	1	**2**	**3**	**4**	**5**	**6**	
***Fraxinus pennsylvanica* (Green Ash)**	11*	9*	12*	7*	18*	18*	**81**
Nyssa sylvatica* var. *sylvatica* *(Black Gum)	7*	3*	7*		*	2	
***Quercus lyrata* (Overcup Oak)**	2	12	7	3	1		**29**
***Quercus nigra* (Water Oak)**		1		2	1		**4**
Year 8 Totals	**20**	**25**	**26**	**12**	**20**	**20**	**123**
Year 7 Totals	20	25	26	23	26	21	
Initial Totals	*31*	*27*	*35*	*31*	*38*	*36*	
Live Stem Density	*439*	*630*	*408*	*263*	*357*	*378*	
Average Live Stem Density	**413**						
Survival % Per Plot	**65%**	**93%**	**74%**	**39%**	**53%**	**56%**	
Survival % From Year 7-Year 8	100%	100%	100%	52%	77%	95%	

* Numerous volunteers

The average stems per plot is 20 stems. A review of the sample plots reveals a current (2005 – Year 8) site density of approximately 413 stems per acre.

As shown in Table VIII, four (4) plots have shown a survival rate of less than 80%. However, while not quantified in the above table, every plot has shown a large number of volunteers in addition to the original planted stems. If these new plants are taken into consideration, survival rate would be equal to or greater than 80%.

The Mallard Creek Wetland Mitigation site has met vegetation success criteria for Monitoring Year 8 (2005). The site has maintained successful vegetation density for the past three years (508 stems per acre in 2003 and 490 stems per acre in 2004).

4. Vegetation Photo Plots

Photos taken during the May 27, 2005 Vegetation Sampling event are included as Appendix A. Photos were all taken from the southernmost corner of each vegetation plot.

B. Wetland Assessment

Ten (10) groundwater monitoring gauges along with a surface gauge and a rain gauge were installed onsite in May 1998. The original rain gauge was replaced in May 2000. An additional surface gauge was installed on Site 2 in April 2003. The groundwater gauges record daily readings of groundwater depth.

Success criteria for wetland hydrology require that the area be inundated or saturated within 12" of the ground surface for a period of 12.5% of the growing season. The growing season in Mecklenburg County begins March 22 and ends November 11 (235 days). In order to attain hydrologic success, saturation within 12" of the ground surface is required for 29 consecutive days.

1. Problem Areas Plan View (Wetland)

An assessment of the stability of the wetland was performed by S&EC during monthly visits that occurred from May through December 2005. Groundwater gauges were downloaded monthly. Several gauges experienced data loss due to gauge and battery malfunctions. Although batteries were changed frequently throughout the monitoring year, several gauges experienced data loss. These malfunctions are shown on the hydrographs included as Appendix B.

As shown on the Problem Area Plan View (Sheet 2), eight (8) of the ten (10) gauges on site achieved wetland success criteria of saturation for 12.5% of the growing season (29 days). The two (2) gauges did not meet criteria due to lack of hydrology, but to the malfunction of the gauge. MC-5 and MC-8 were reset monthly, however, they did not retain any data. It is our opinion that if data had been recorded, both malfunctioning gauges would have met hydrology requirements.

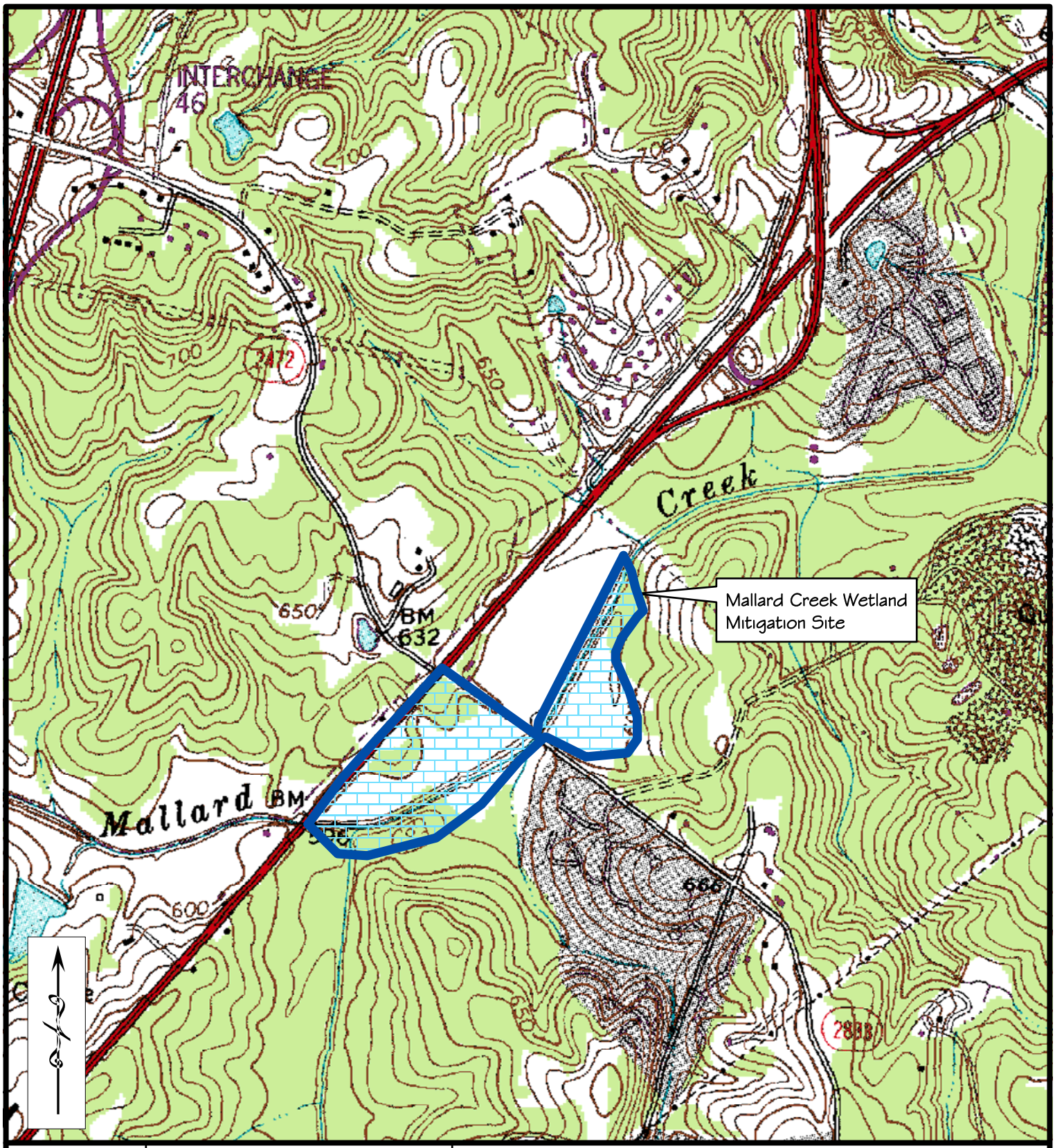
The Mallard Creek Wetland Mitigation site has met hydrology success criteria for Monitoring Year 8 (2005).

2. Wetland Criteria Attainment

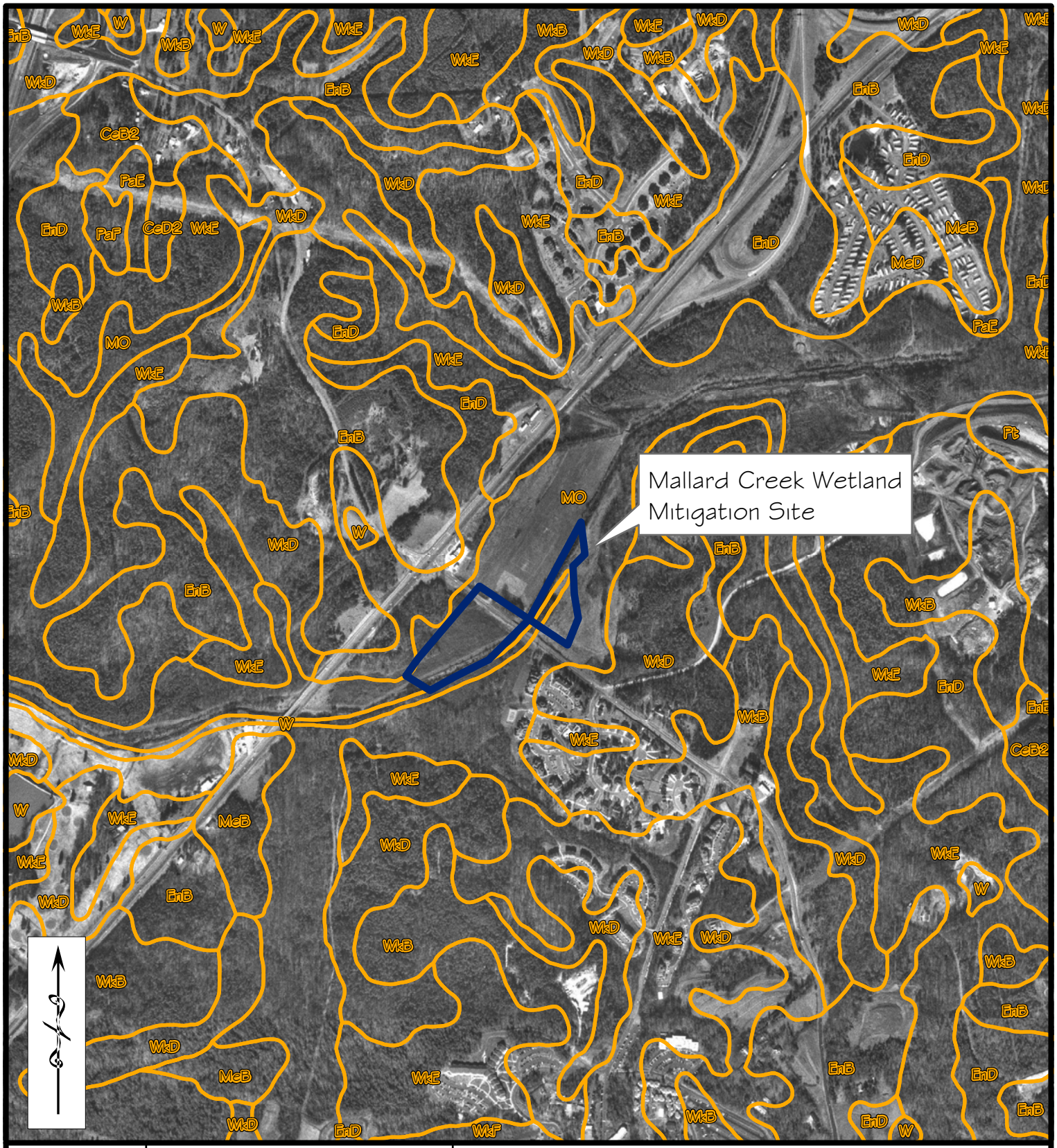
Table XIII: Wetland Criteria Attainment Mallard Creek Wetland Mitigation Site (EEP Project # 00060)			
Well ID	**Well Hydrology Threshold Met?**	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**
MC-1	Yes	Plot 1	Y
MC-2	Yes	Plot 2	Y
MC-3	Yes	Plot 3	Y
MC-4	Yes	Plot 4	Y
MC-5	N/A	Plot 5	Y
MC-6	Yes	Plot 6	Y
MC-7	Yes		
MC-8	N/A		
MC-9	Yes		
MC-10	Yes		

III. Methodology Section

No unavoidable deviations from initially prescribed methodologies were implemented as a part of monitoring Year 8 activities.



Project No. 9441.D1	Figure 1 - Vicinity Map Mallard Creek- Wetland Mitigation Site NCEEP Year 8 of 5 Mecklenburg County, NC	S&EC Soil & Environmental Consultants, PA 11010 Raven Ridge Rd. • Raleigh, NC 27614 (919) 846-5900 • (919) 846-9467 Web Page: www.SandEC.com
Project Mgr.: JR		
Scale: 1" = 1,000'		
12/08/05	Harrisburg Quadrangle	Ecosystem Enhancement Program



Project No. 9441.01	Figure 2 - Soils Map Mallard Creek Wetland Mitigation Site NCEEP Year 8 of 5 Mecklenburg County, NC	
Project Mgr.: JR		
Scale: 1" = 1,000'		
12/08/05	Mecklenburg County Soil Survey	

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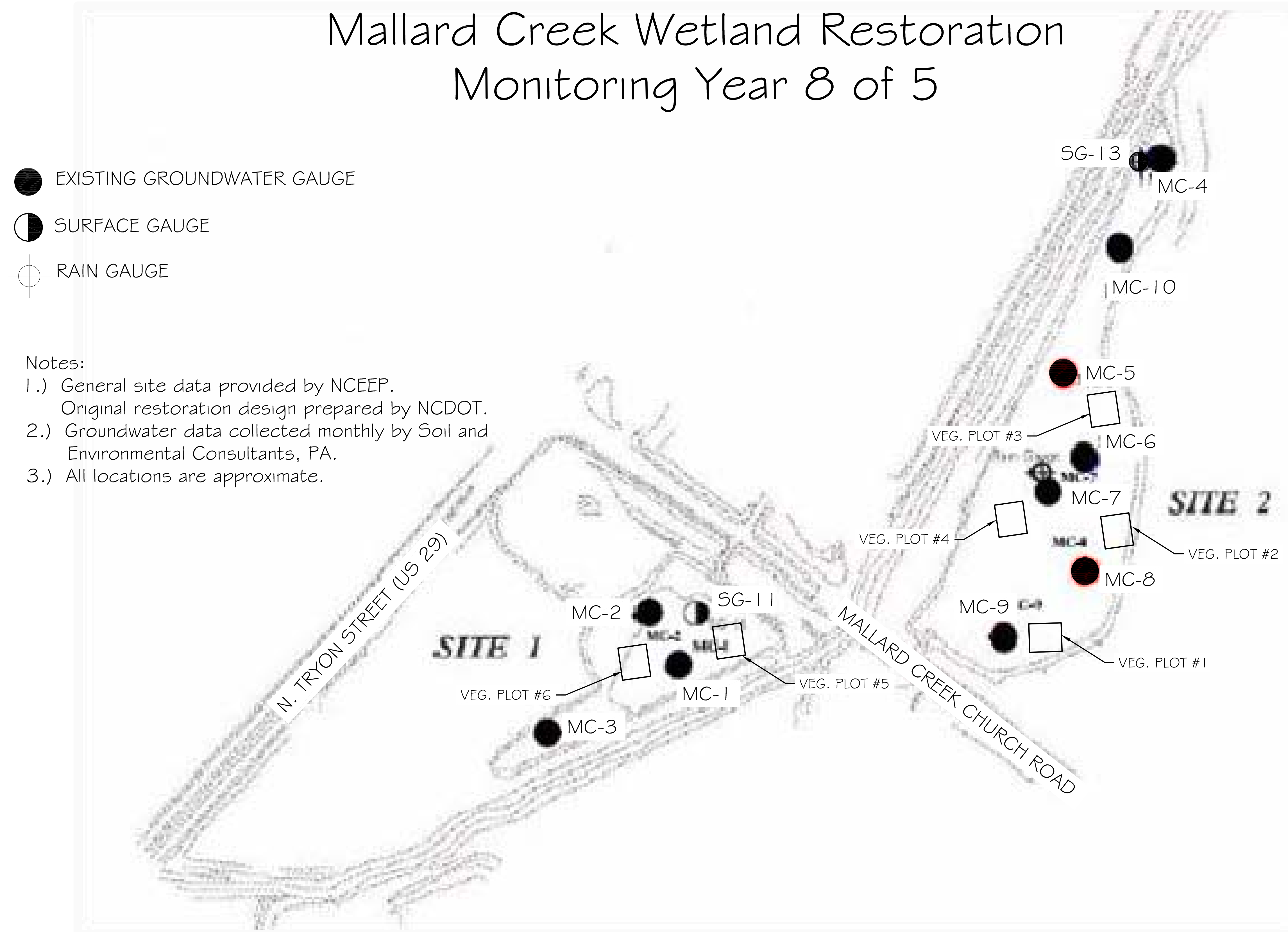
Mallard Creek Wetland Restoration
Monitoring Year 8 of 5



Notes:
1.) General site data provided by NCEEP. Original restoration design prepared by NCDOT.
2.) Groundwater data collected monthly by Soil and Environmental Consultants, PA.
3.) All locations are approximate.

NORTH

NOT TO SCALE

MONITORING PLAN VIEW

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Ecosystem Enhancement Program

Project:	MALLARD CREEK WETLAND RESTORATION
Location:	MECKLENBURG CO.
Client:	NC ECOSYSTEM ENHANCEMENT PROGRAM
Sheet Title:	MONITORING PLAN VIEW
Project No.:	9441.D1
Proj. Mgr.:	PKS
Drawn:	JER
Scale:	NO SCALE
Sheet No.:	1 of 2

File: Sec\Jobs7-9k\9441.D1\MALLARD CREEK PAPV.DWG

EXISTING GROUNDWATER GAUGE - MET HYDROLOGY

EXISTING GROUNDWATER GAUGE - DID NOT MEET HYDROLOGY

SURFACE GAUGE

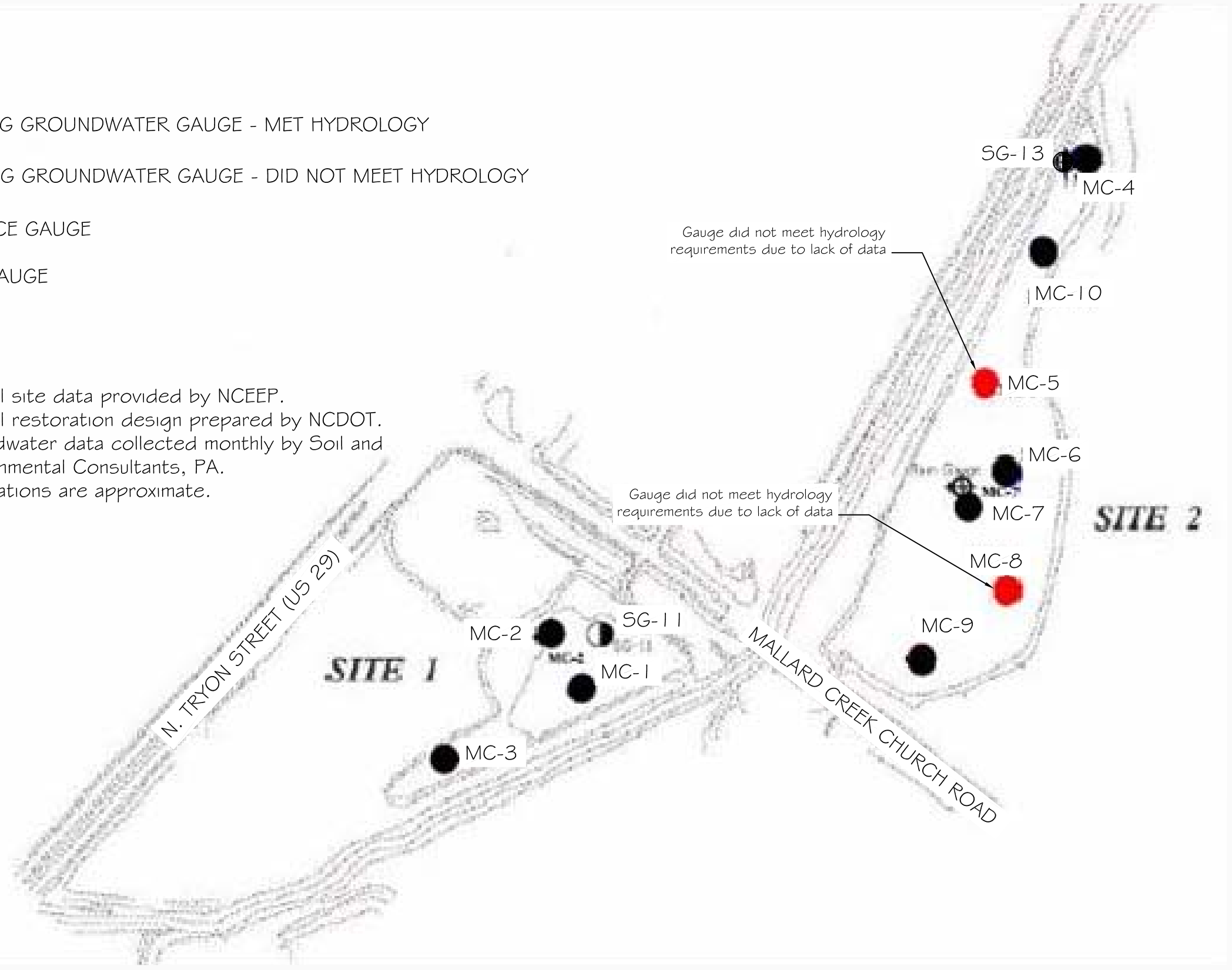
RAIN GAUGE

Notes:

1.) General site data provided by NCEEP.
Original restoration design prepared by NCDOT.

2.) Groundwater data collected monthly by Soil and Environmental Consultants, PA.

3.) All locations are approximate.



NORTH

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PROBLEM AREA PLAN VIEW

Project: MALLARD CREEK WETLAND RESTORATION
Location: MECKLENBURG CO.
Client: NC ECOSYSTEM ENHANCEMENT PROGRAM
Sheet Title: PROBLEM AREA PLAN VIEW
Project No.: 9441.01
Proj. Mgr.: PKS
Drawn: JER
Scale: NO SCALE
Sheet No.: 2 of 2

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File: S:\Jobs\7-9\9441.01\MALLARD CREEK PARV.DWG

APPENDIX A

APPENDIX A –

Vegetation Survey Data Tables

Table VIII: Stem Counts for Each Species Arranged by Plot
Mallard Creek Wetland Mitigation Site (EEP Project #00060)

Species	Plots						Year 8 Totals
	1	**2**	**3**	**4**	**5**	**6**	
***Fraxinus pennsylvanica* (Green Ash)**	11	9	12	7	18	18	**81**
Nyssa sylvatica* var. *sylvatica* *(Black Gum)	7	3	7			2	
***Quercus lyrata* (Overcup Oak)**	2	12	7	3	1		**29**
***Quercus nigra* (Water Oak)**		1		2	1		**4**
Year 8 Totals	**20**	**25**	**26**	**12**	**20**	**20**	**123**
Year 7 Totals	20	25	26	23	26	21	
Initial Totals	*31*	*27*	*35*	*31*	*38*	*36*	
	439	*630*	*408*	*263*	*357*	*378*	
	413						
Survival % Per Plot	**65%**	**93%**	**74%**	**39%**	**53%**	**56%**	
Survival % From Year 7-Year 8	100%	100%	100%	52%	77%	95%	

EEP Stem Count Data Sheet

EEP Project #:		**Date:**	27-May-05
Project Name:	**Mallard Creek**	**Staff Name**	Jessica Regan
Monitoring Contractor:	**S&EC**	**Staff Name**	David Gainey
County:	**Mecklenberg**		
8 Digit Catalog Unit			
Stream/Wetland Name:	**Mallard Creek**		

Plot Location

Plot ID	Species	Stem #
3	Green Ash	12
3	Black Gum	7
3	Overcup Oak	7
3	Water Oak	0
3	Green Ash - recruit	29
3	Black Gum - recruit	4
3	Overcup Oak - recruit	0

Plot Location

Plot ID	Species	Stem #
4	Green Ash	7
4	Black Gum	0
4	Overcup Oak	3
4	Water Oak	2
4	Green Ash - recruit	5
4	Black Gum - recruit	0
4	Overcup Oak - recruit	0

Plot Location

Plot ID	Species	Stem #
2	Green Ash	9
2	Black Gum	3
2	Overcup Oak	12
2	Water Oak	1
2	Green Ash - recruit	5
2	Black Gum - recruit	3
2	Overcup Oak - recruit	0

Plot Location

Plot ID	Species	Stem #
1	Green Ash	11
1	Black Gum	7
1	Overcup Oak	2
1	Water Oak	0
1	Green Ash - recruit	19
1	Black Gum - recruit	7
1	Overcup Oak - recruit	1

Plot Location

Plot ID	Species	Stem #
5	Green Ash	18
5	Black Gum	0
5	Overcup Oak	1
5	Water Oak	1
5	Green Ash - recruit	109
5	Black Gum - recruit	27
5	Overcup Oak - recruit	0

Plot Location

Plot ID	Species	Stem #
6	Green Ash	18 (77)
6	Black Gum	2
6	Overcup Oak	0
6	Water Oak	0
6	Green Ash - recruit	84
6	Black Gum - recruit	0
6	Overcup Oak - recruit	0

APPENDIX A –

Vegetation Monitoring Plot Photos

Appendix A

Year 8 - Vegetation Plot 1 – 5/27/2005

Year 8 – Vegetation Plot 2 – 5/27/2005

Year 8 – Vegetation Plot 3 – 5/27/2005

Year 8 – Vegetation Plot 4 – 5/27/2005

Year 8 – Vegetation Plot 5 – 5/27/2005

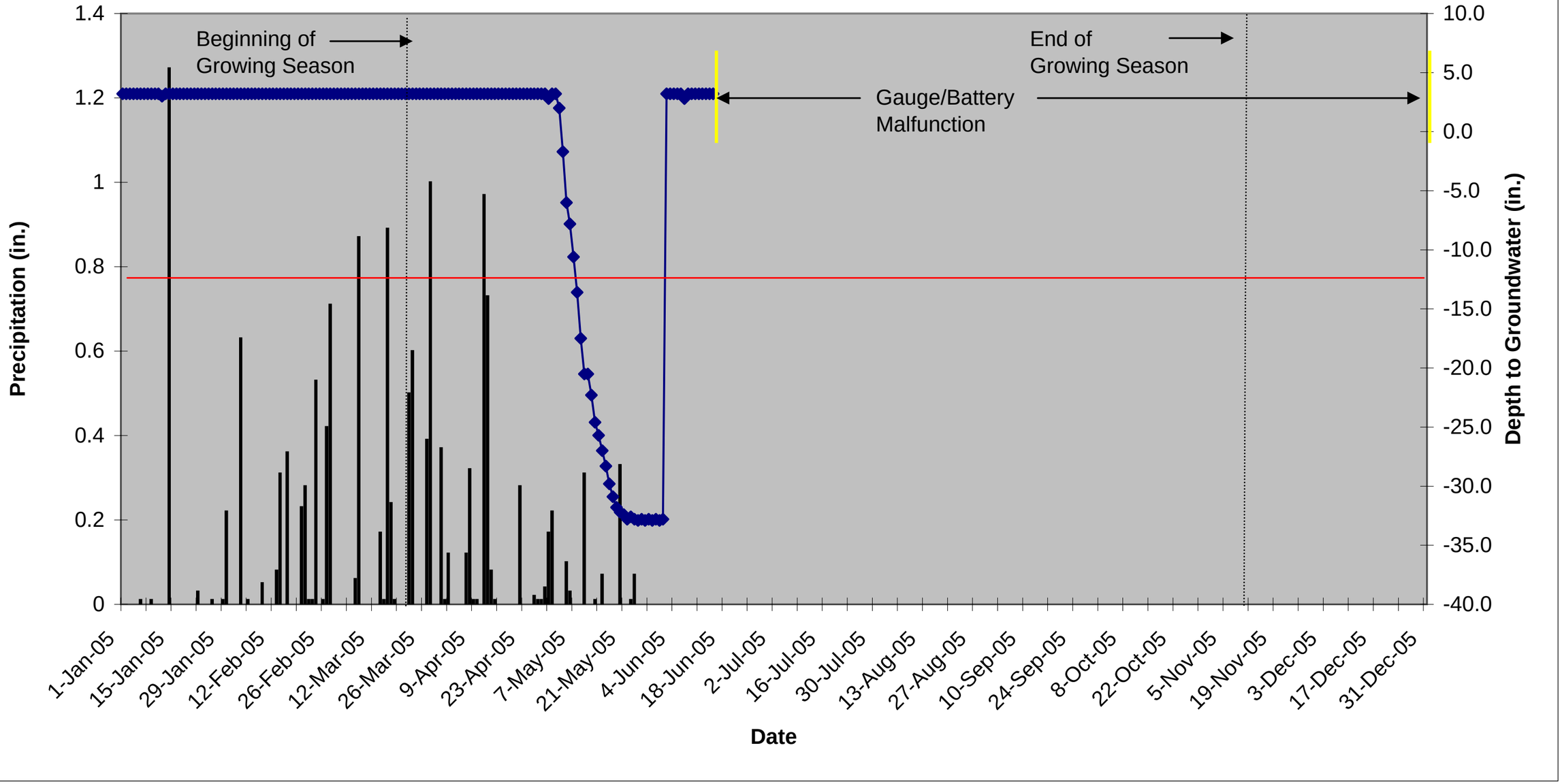
Year 8 – Vegetation Plot 6 – 5/27/2005

APPENDIX B

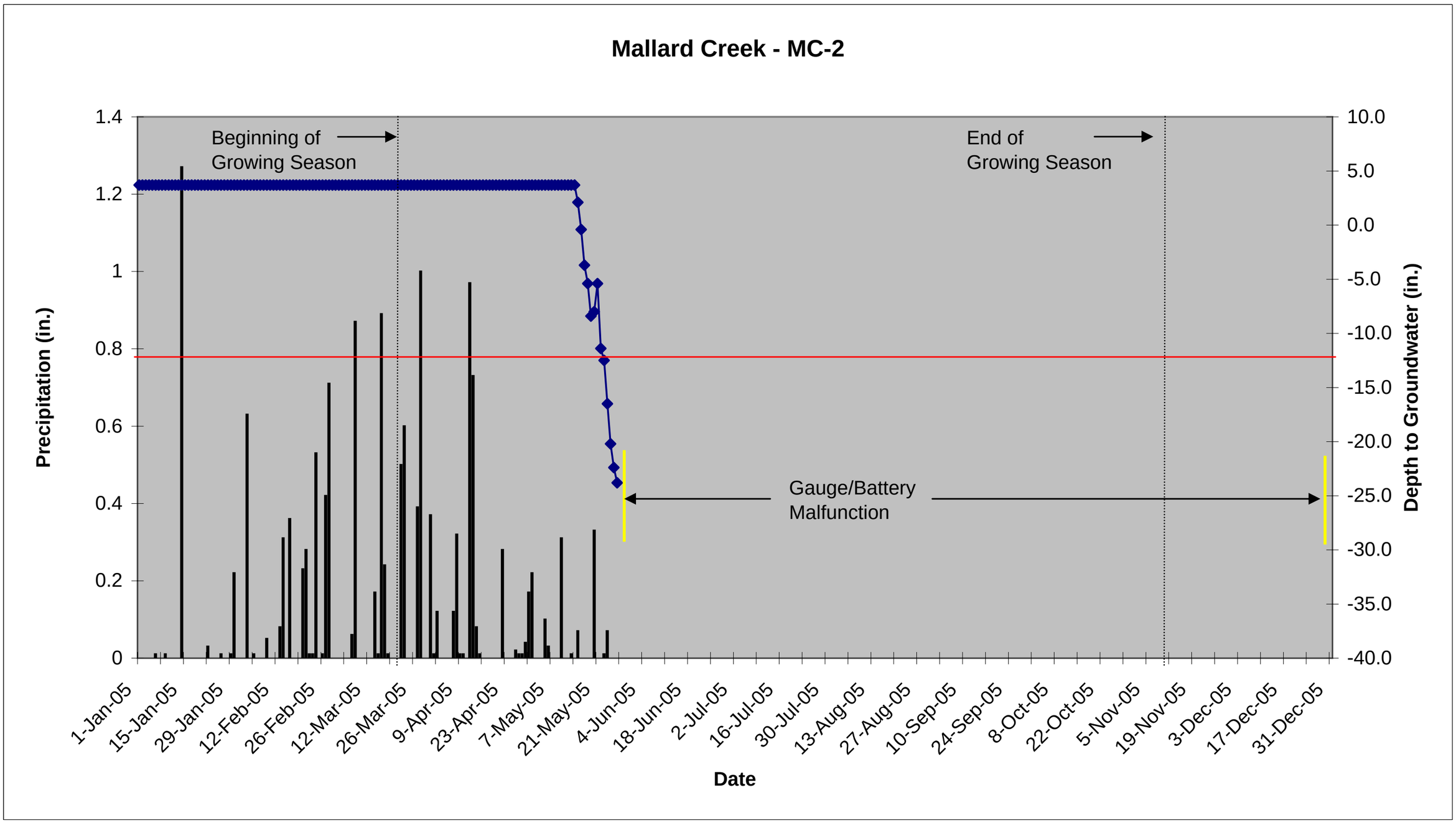
APPENDIX B –

Groundwater Gauge Summary Information

Mallard Creek - MC-1



Mallard Creek - MC-2



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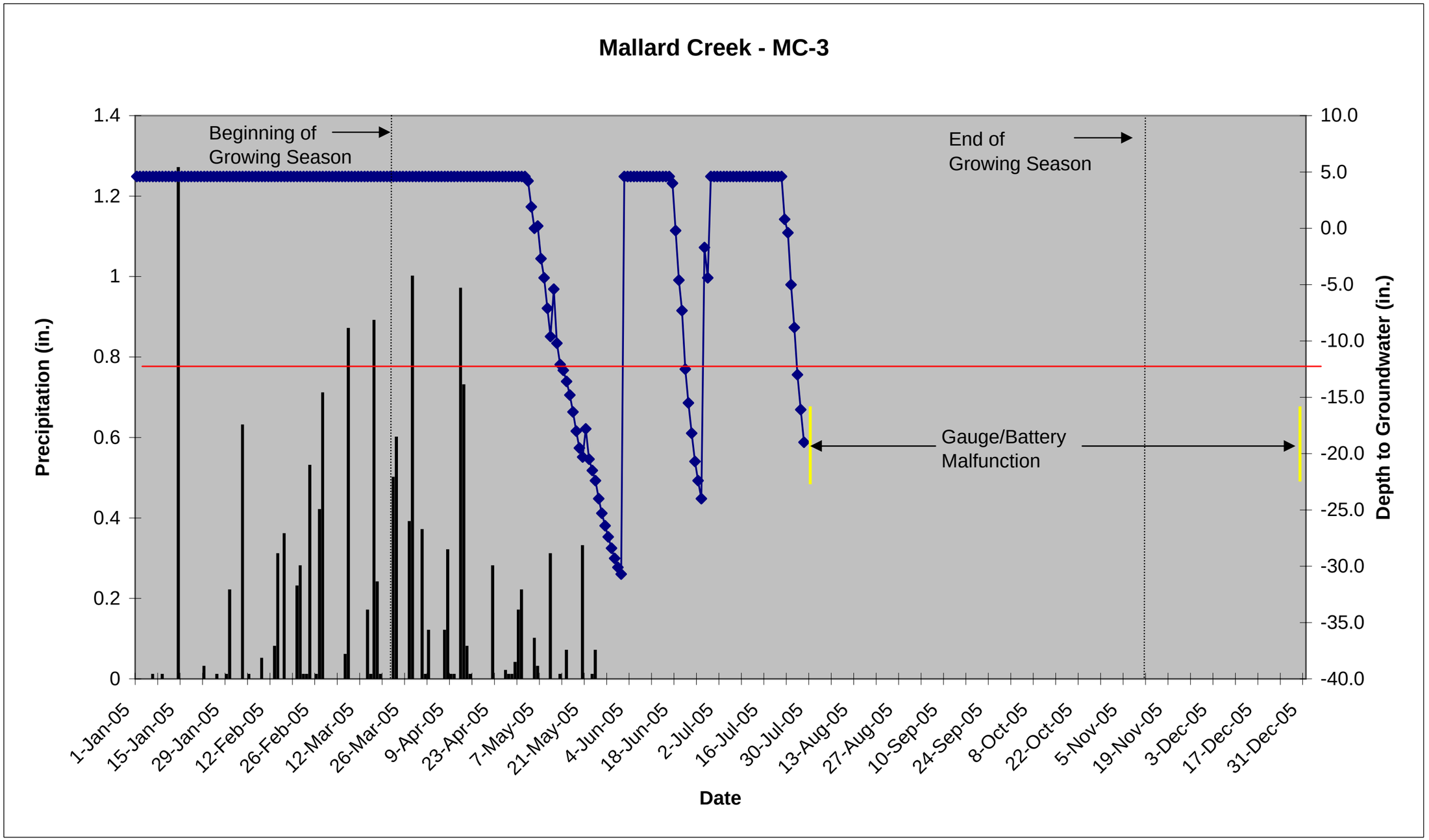
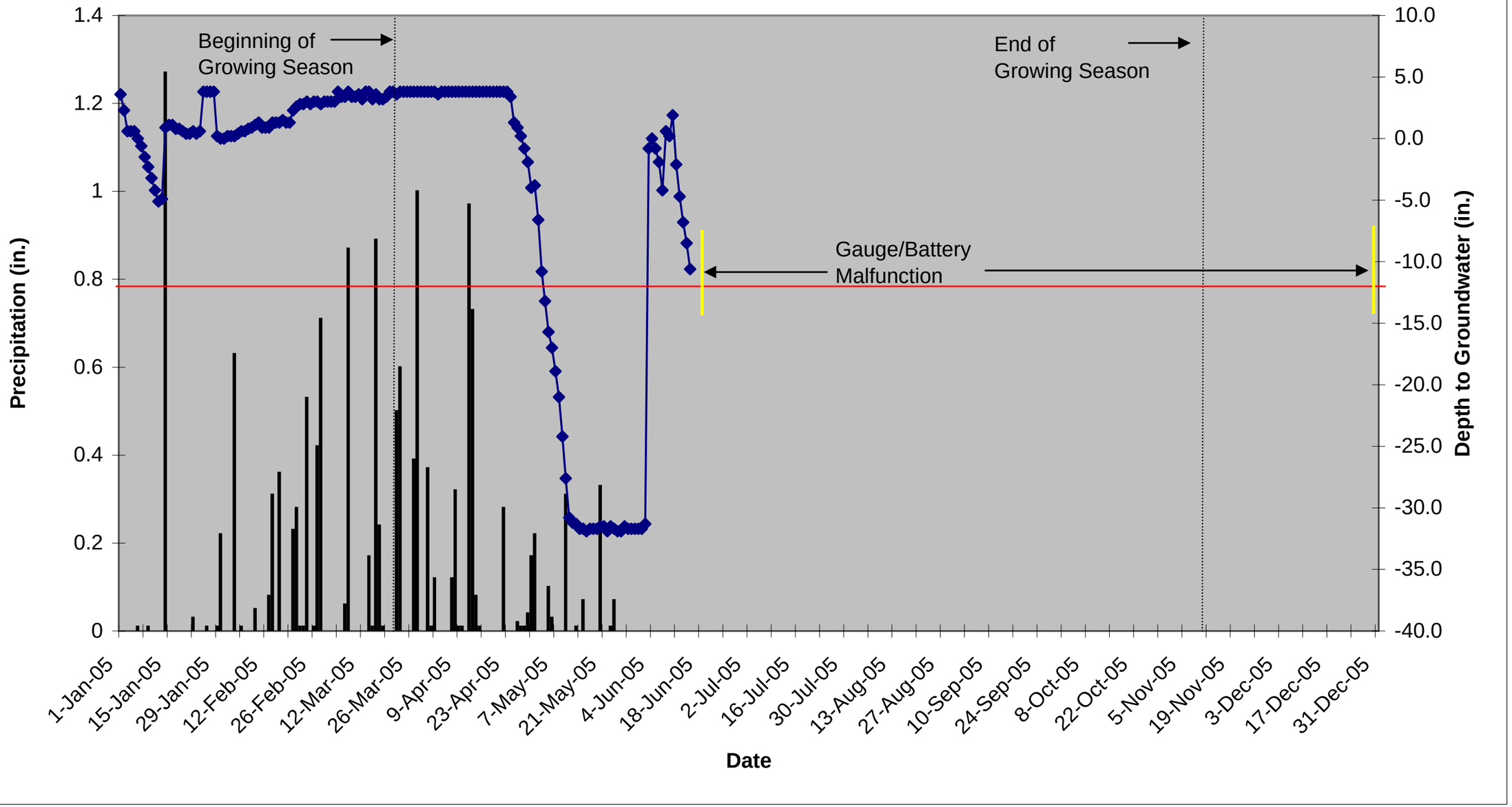


Mallard Creek - MC-4



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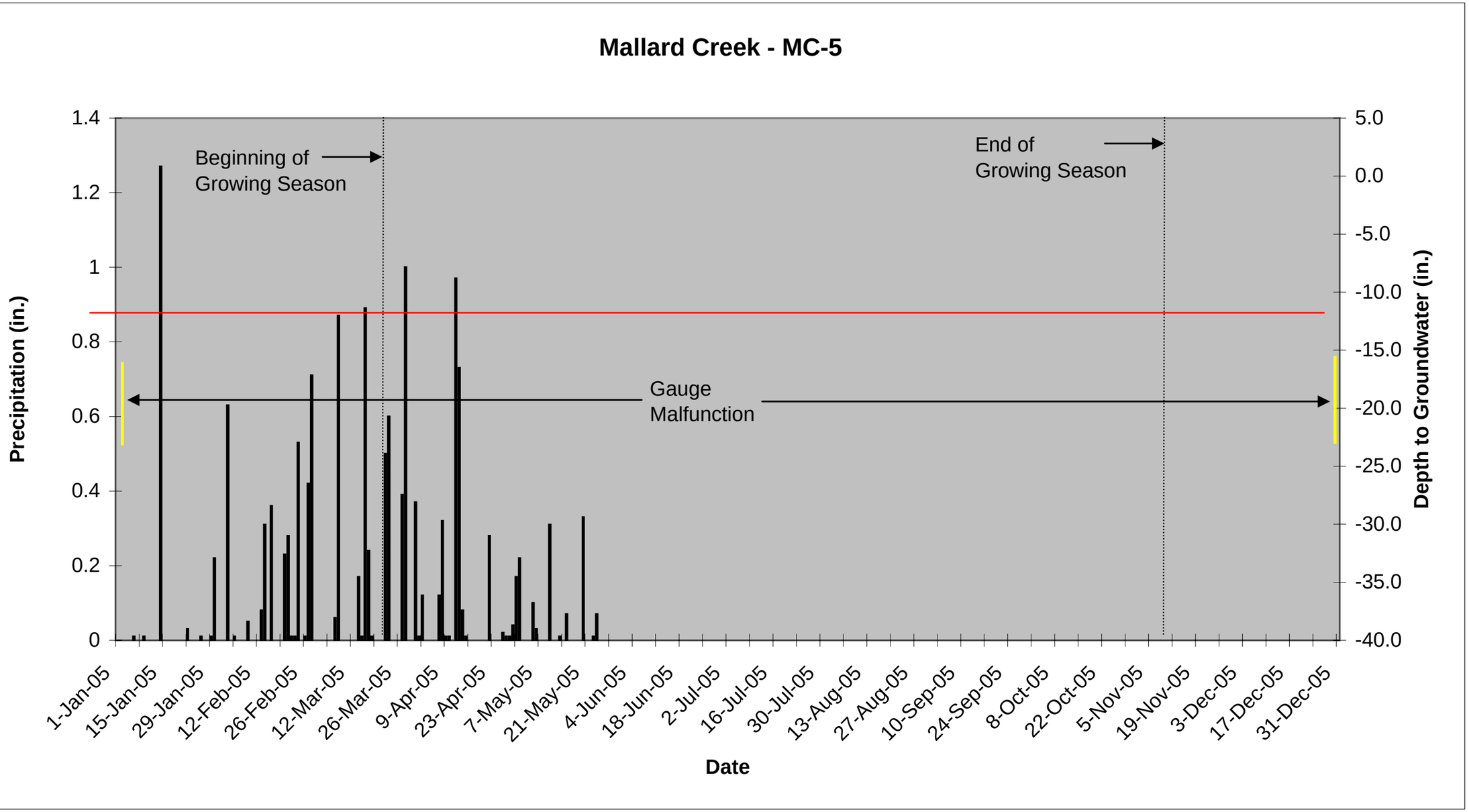

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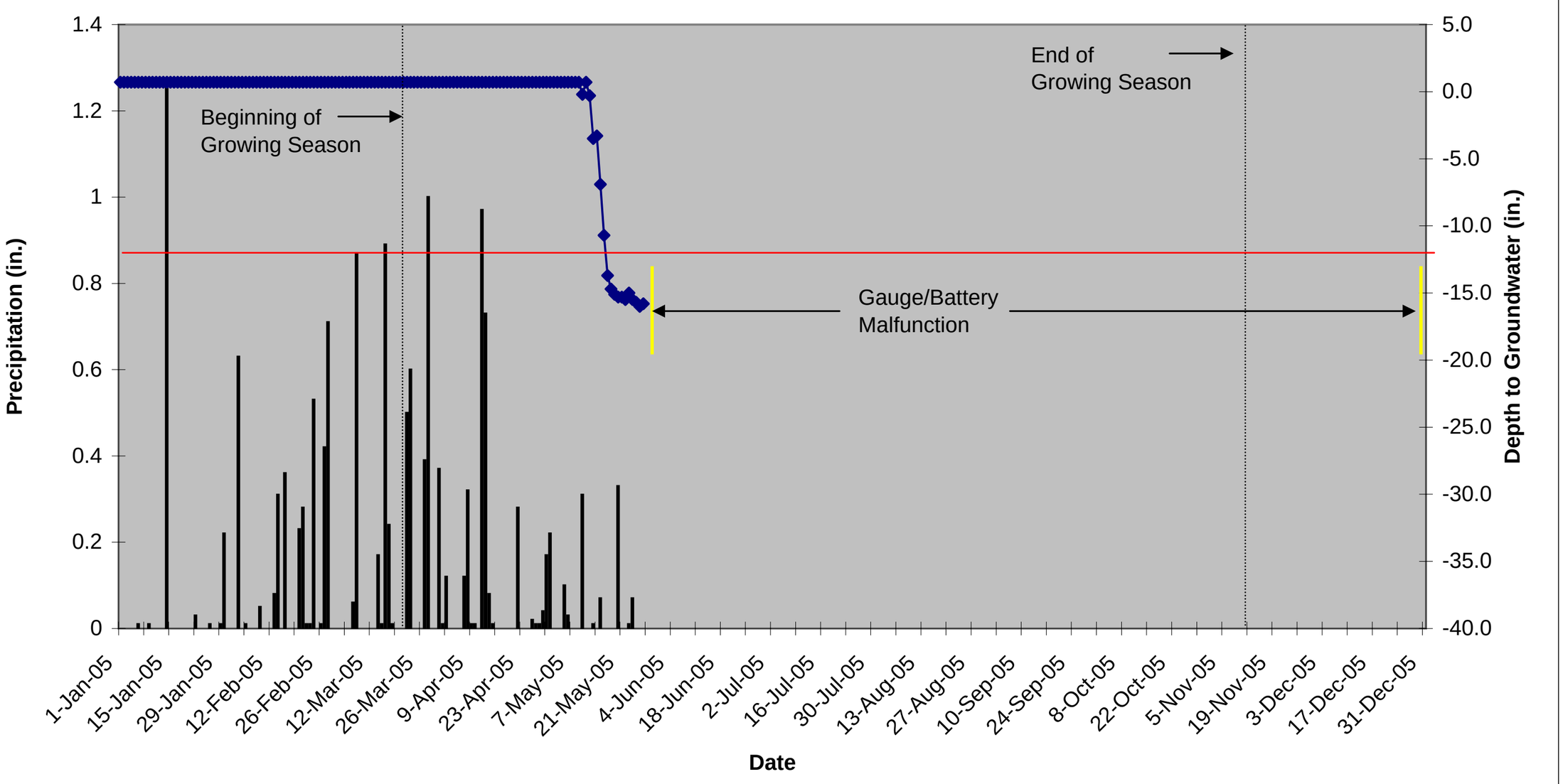
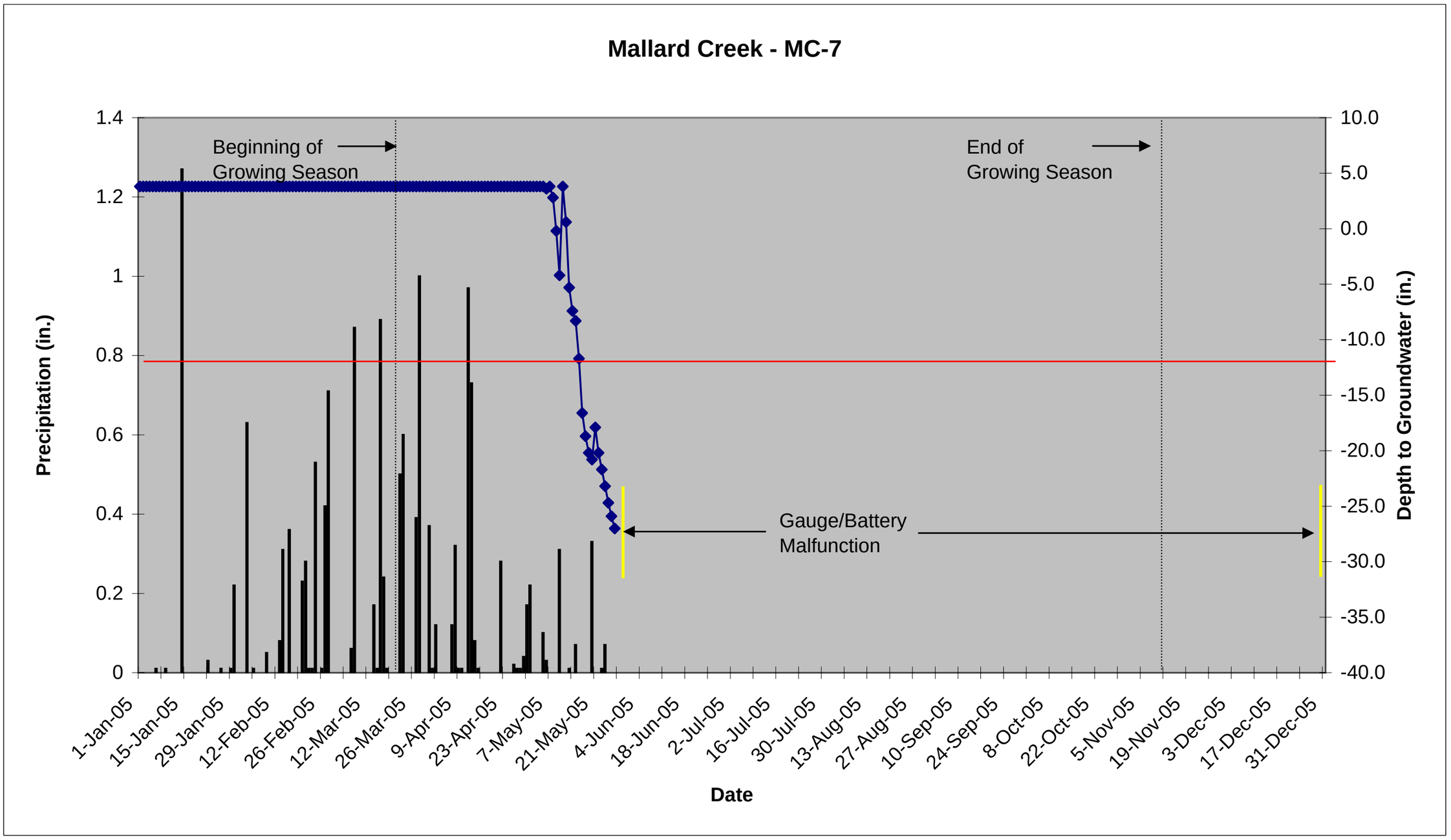
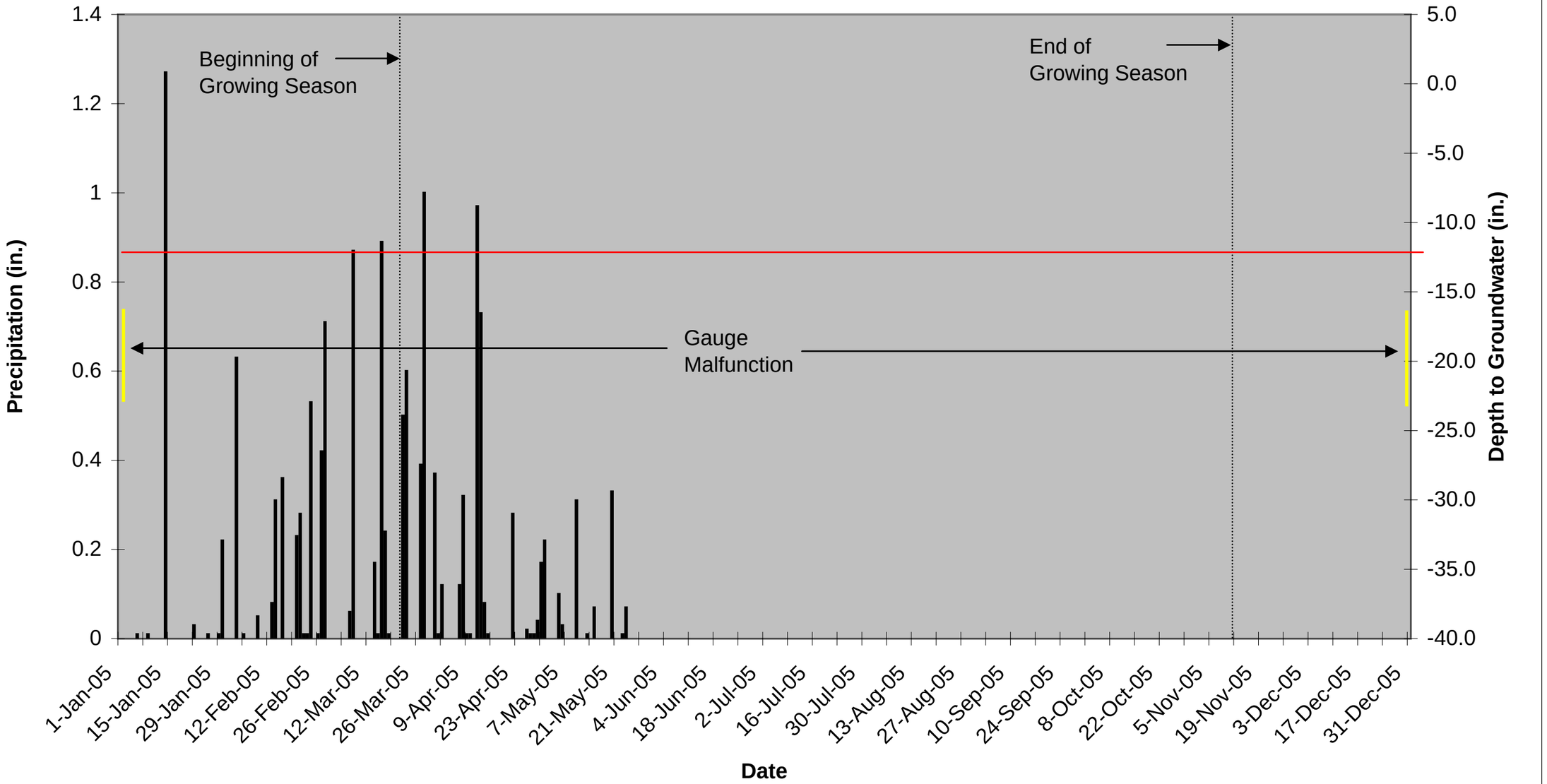


Mallard Creek - MC-7



Mallard Creek - MC-8



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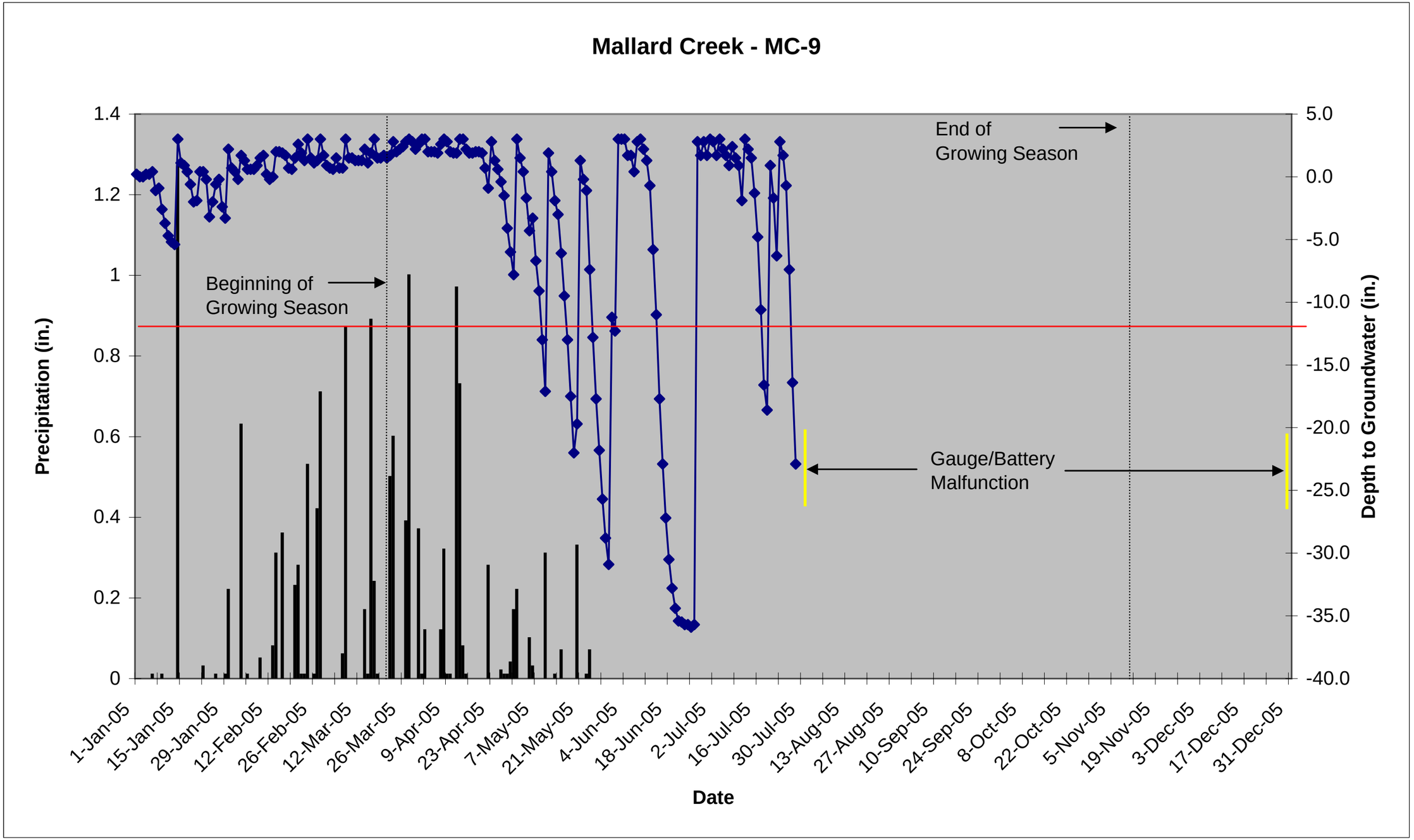

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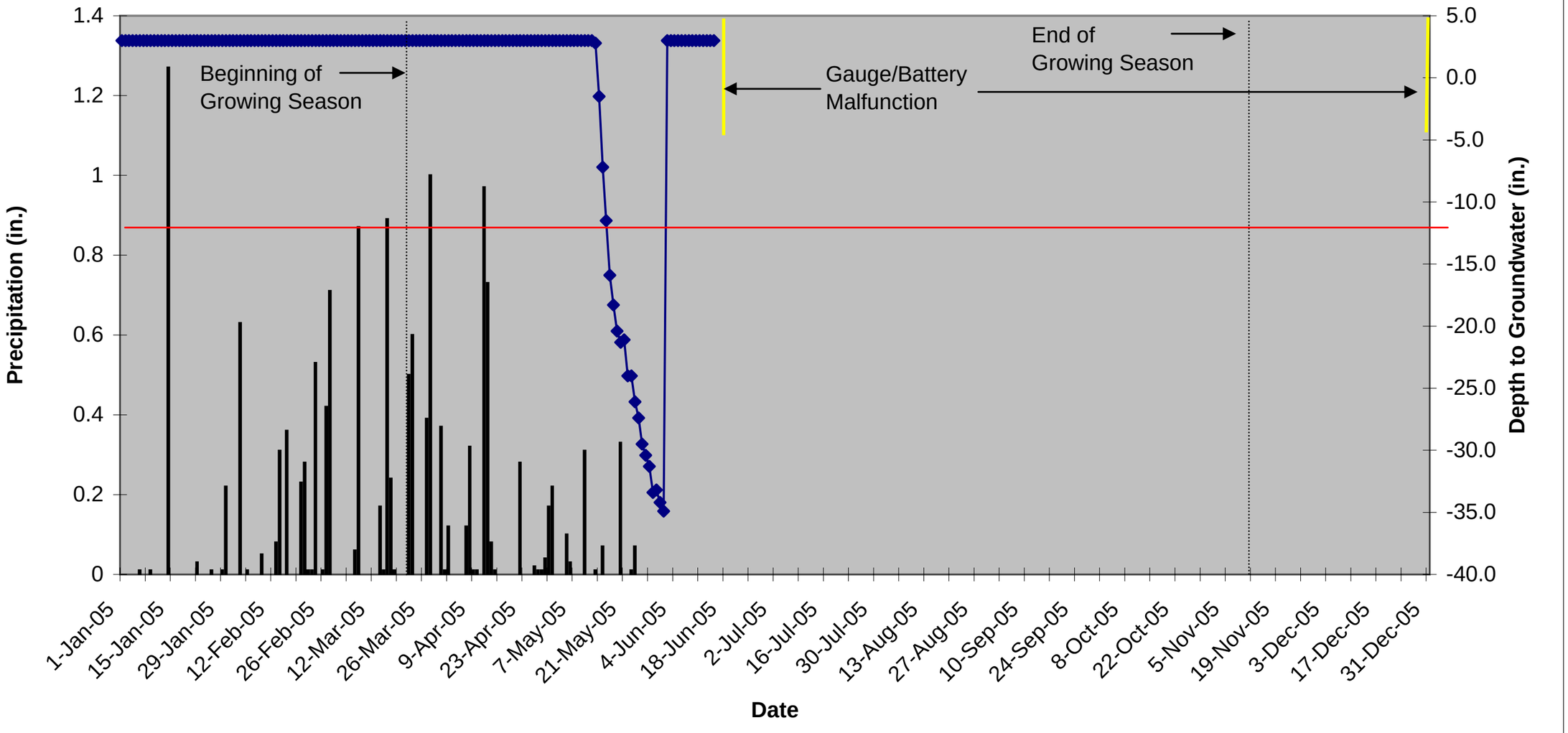

Mallard Creek - MC-11