MONITORING YEAR 6 ANNUAL REPORT
FINAL

DEVIL'S RACETRACK MITIGATION SITE
Johnston County, NC
NCDEQ Contract 003989
DMS Project Number 95021
USACE Action ID Number 2012-00810
NCDWR Project Number 12-0747

Data Collection Period: March - November 2019
Draft Submission Date: December 20, 2019
Final Submission Date: February 20, 2020

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Mitigation Project Name	**Devil's Racetrack**	**County**	**Johnston**	**USACE Action ID**	2012-00810
DMS IMS ID	**95021**	**Date Project Instituted**	**7/27/2011**	**NCDWR Permit No**	2012-0747
River Basin	**Neuse**	**Date Prepared**	**5/15/2019**		
Cataloging Unit	**03020201**				

Credit Release Milestone	Stream Credits						Wetland Credits							
	Scheduled Releases (Stream)	Warm	Cool	Cold	Anticipated Release Year (Stream)	Actual Release Date (Stream)	Scheduled Releases (Forested)	Riparian Riverine	Riparian Non-riverine	Non-riparian	Scheduled Releases (Coastal)	Coastal	Anticipated Release Year (Wetland)	Actual Release Year (Wetland)
Potential Credits (Mitigation Plan)		**18,215.100**						**55.200**						
Potential Credits (As-Built Survey)		**18,380.338**						**62.100**						
Potential Credits (IRT Approved)*		**18,215.100**						**62.100**						
Total Unrealized Credits (Permanent Reduction)		**N/A**						**3.600**						
Revised Potential Credits (IRT Approved)*		**18,215.100**						**58.500**						
1 (Site Establishment)	**N/A**				N/A	N/A	**N/A**				**N/A**		N/A	
2 (Year 0 / As-Built)	**30%**	5,514.101			2014	6/5/2014	**30%**	18.630			**30%**		2014	6/5/2014
3 (Year 1 Monitoring)	**10%**	1,838.034			2015	4/23/2015	**10%**	6.210			**10%**		2015	4/23/2015
4 (Year 2 Monitoring)	**10%**	1,838.034			2016	4/25/2016	**10%**	6.210			**15%**		2016	4/25/2016
5 (Year 3 Monitoring)	**8%**	1,470.427			2017	10/20/2017	**10%**	6.210			**20%**		2017	10/20/2017
IRT Adjustment*		-112.362				10/20/2017								
Adjustment for Unrealized Credits								-2.160						
5 (Year 3 Monitoring) - Resubmitted	**2%**	364.302			2017	5/13/2019	**5%**	2.925					2017	5/13/2019
6 (Year 4 Monitoring) - Resubmitted	**5%**	910.755			2018	5/13/2019	**5%**	2.925			**10%**		2018	5/13/2019
7 (Year 5 Monitoring)	**10%**	1,821.510			2019	5/13/2019	**10%**	5.820			**15%**		2019	5/13/2019
7 (Year 5 Monitoring) - Not Released							**5%**	2.950					2019	
8 (Year 6 Monitoring)	**5%**				2020		**5%**				**N/A**		2020	
9 (Year 7 Monitoring)	**10%**				2021		**10%**				**N/A**		2021	
Stream Bankfull Standard	**10%**	1,838.034			2016	4/25/2016	**N/A**				**N/A**			
Total Credits Released to Date		**15,482.835**						**46.770**						

NOTES:

10/20/2017: *NOTE: Adjustment required due to IRT concerns on how the as-built credits were calculated.

4/2/2019: Adjustment required due to permanent reduction of anticipated wetland credits. DMS will utilize the revised potential credits to calculate the amount for future releases. The adjustment amount is needed to bring the project back in line with the revised potential credits.

5/13/2019: Based on site visit, IRT authorized the release of all stream and wetland credits on hold from Year 3 and 4 monitoring. Year 5 stream credits were approved for release but 2.95 of the wetland credits would remain on hold.

CONTINGENCIES:

Signature of Wilmington District Official Approving Credit Release

27 Sept 2019

Date

1 - For DMS, no credits are released during the first milestone

2 - For DMS projects, the second credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the NCIRT by posting it to the NCEEP Portal, provided the following criteria have been met:

1) Approval of the final Mitigation Plan
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan
4) Reciept of necessary DA permit authorization or written DA approval for porjects where DA permit issuance is not required

3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met

Mitigation Project Name	**Devil's Racetrack**		**County**	**Johnston**	**USACE Action ID**	2012-00810
DMS IMS ID	**95021**		**Date Project Instituted**	**7/27/2011**	**NCDWR Permit No**	2012-0747
River Basin	**Neuse**		**Date Prepared**	**5/15/2019**		
Cataloging Unit	**03020201**					

DEBITS (released credits only)

	Ratios	1.00986	1.5	2.5	5	1.01932	3	2	5	1	3	2	5	1	3	2	5
		Stream Restoration	Stream Enhancment I	Stream Enhancement II	Stream Preservation	Riparian Restoration	Riparian Creation	Riparian Enhancement	Riparian Preservation	Nonriparian Restoration	Nonriparian Creation	Nonriparian Enhancement	Nonriparian Preservation	Coastal Marsh Restoration	Coastal Marsh Creation	Coastal Marsh Enhancement	Coastal Marsh Preservation
IRT Approved Amount - feet and acres		**18,282.000**	**75.000**	**154.000**		**63.300**											
Mitigation Ratios		**1.0098590**	**1.500**	**2.500**		**1.01932**											
IRT Approved Amounts - Credits		**18,103.500**	**50.000**	**61.600**		**62.100**											
Credits Unrealized (Permanent Reduction)						**3.600**											
Percentage Released		**85%**	**85%**	**85%**		**85%**											
Released Amounts (feet / acres)		**15,539.700**	**63.750**	**130.900**		**50.686**											
Released Amounts (credits)		**15,387.975**	**42.500**	**52.360**		**49.725**											
NCDWR Permit	USACE Action ID	Project Name															
Remaining Amounts (feet / acres)		**15,539.700**	**63.750**	**130.900**		**50.686**											
Remaining Amounts (credits)		**15,387.975**	**42.500**	**52.360**		**49.725**											

February 20, 2020

Jeremiah Dow
NCDEQ Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

RE: Monitoring Year 6 Report Comments for Devil's Racetrack Mitigation Site (95021)
Neuse River Basin – CU# 03020201; Johnston County, North Carolina
Contract No. 003989

Dear Mr. Dow,

We have reviewed the comments on the Monitoring Year 6 Report for the above referenced project dated February 17, 2020 and have revised the report based on these comments. The revised documents are submitted with this letter. Below are responses to each of your comments. For your convenience, the comments are reprinted with our response in italics.

1. Section 1.2.4

   a. It may not be appropriate to remove sediment from Southeast Branch in MY7. The source of the sediment (farm field) and cause (above average rainfall) are factors that will persist after closeout, and the stream should be assessed on its ability to respond to storms and resulting sediment pulses.

   We understand your concern and that this will likely be a concern raised during IRT review. However, this is the first time since construction sediment has deposited in the upper section of Southeast Branch. It was due to a single slope failure in the adjacent farm field which caused a large slug of sediment to aggrade the upper 100 feet of channel. While the channel was beginning to process the sediment and move it downstream, we excavated some material with shovels to help speed the process. We believe this aggradation is not a common occurrence and thought it was appropriate to remove the excess sediment. We have added language clarifying the scope of the aggradation and sediment removal.

2. Section 1.2.5

   a. 2nd paragraph: Please add a sentence briefly summarizing prior monitoring years' achievement of success criteria for the three flow gauges referenced.

   A sentence was added to Section 1.2.5 summarizing prior years monitoring data for the three referenced flow gauges.

3. Section 1.2.6

   a. First paragraph: Please add a sentence discussing removal of groundwater gage 34 in MY6. Also, please clarify the last sentence that states "…beginning of the growing season was extended by 20 days from March 21 to March 1…" Extended compared to MY5 or NRCS WETS data?

   Two sentences were added discussing the removal of groundwater gage 34 in monitoring year 6.

   The last sentence of the first paragraph was updated to clarify the growing season start date was adjusted from the NRCS WETS start date based on soil temperature data.

4. Appendix 1

   a. Figure 3.1 & 3.2: Please show flow gauge and crest gauge locations on the CCPVs.

   Flow gauges and crest gauges were added to the CCPV maps.

   b. Table 6: It seems likely that Devils Racetrack East could be a potential candidate for inclusion in this table for continuing concern regarding bare areas and/or poor growth rates, specifically since these concerns were referenced in the Maintenance Plan section.

   The area east of Devil's Racetrack Road was added to areas of poor vigor due to the smaller than expected tree height during monitoring year 6.

5. Appendix 4

   a. Some cross sections are missing the bankfull line (hardcopy only, electronic copy has all bankfull lines).

   Bankfull lines are now present on all hardcopy cross sections.

6. Appendix 5

   a. Table 13: This table should be cumulative for prior years. We also recommend adding a cumulative flow gauge table.

   Table 13 was updated to be cumulative for prior years of bankfull event data. A cumulative flow gauge table was added to Appendix 5.

7. Based on groundwater gauge data and the hydric soils delineation by Mr. Kevin Martin, it seems possible that additional wetland credits could be unrealized in the area of gauge 26.

   Two additional groundwater wells were placed in the area of groundwater well 26 to gain a better understanding of this area. We recognize that some portion of this area may not ultimately achieve wetland success and have added the wells to attempt to minimize credit loss.

If you have any questions, please contact me by phone (919) 851-9986, or by email (jlorch@wildlandseng.com).

Sincerely,

Jason Lorch, *Monitoring Coordinator*

PREPARED BY:

Wildlands Engineering, Inc.
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Jason Lorch
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EXECUTIVE SUMMARY

Wildlands Engineering (Wildlands) completed a full-delivery project for the North Carolina Division of Mitigation Services (DMS) to restore and enhance a total of 18,748 linear feet (LF) of stream and restore 59.70 acres (ac) of wetlands in Johnston County, North Carolina. The project streams consist of five unnamed tributaries (UTs) to the Neuse River. The largest of these streams, Devil's Racetrack Creek (East and West), drains directly to the Neuse River. The other four streams are small headwater tributaries to Devil's Racetrack Creek (Southwest Branch, Middle Branch, Southeast Branch, and North Branch). The project proposes to provide 18,215 stream mitigation units (SMU's) and 58.50 wetland mitigation units (WMU's). At the downstream limits of the project, the drainage area is 831 acres (1.30 square miles).

The Devil's Racetrack Mitigation Site, hereafter referred to as the Site, is located in eastern Johnston County along Devil's Racetrack Road just east of its intersection with U.S. Highway 701 and approximately one mile east of Interstate 95 (Figure 1). The Site is located in the western portion of the Inner Coastal Plain Physiographic Province (USGS, 1998) within the North Carolina Division of Water Resources (NCDWR) subbasin 03-04-02 of the Neuse River Basin (United States Geological Survey (USGS) Hydrologic Unit 03020201140010).

Prior to construction activities, the streams had been relocated and channelized and the surrounding wetland complex had been drained for agricultural purposes. The primary objectives of the project were to re-establish wetland hydrology, restore a Coastal Plain Small Stream Swamp wetland community, restore a Coastal Plain stream system to promote hydrologic connectivity with the floodplains and wetlands, stabilize stream banks, promote instream habitat and aeration, restore riparian buffers, and further improve water quality through removing existing agricultural practices. Figure 2 and Table 1 present the restoration and enhancement design for the Site.

The following project goals were established to address the effects listed above from watershed and project site stressors:

- Restore a large wetland complex to a naturally occurring community to improve riparian habitat and water quality;
- Restore a network of badly degraded stream channels, including multiple headwater streams, to create aquatic habitat and further improve water quality to receiving waters; and
- Restore riparian buffers along stream corridors for additional habitat and water quality benefits.

Stream and wetland restoration and enhancement construction efforts were completed in February 2014. Baseline as-built monitoring activities (MY0) were completed between January and February 2014. A conservation easement is in place on 96.065 acres of restored wetland and riparian stream corridors to protect them in perpetuity.

Monitoring Year 6 (MY6) assessment and site visits were completed between the months of March and November 2019 to assess the conditions of the project. Overall, the Site has met the required vegetation, hydrology, and stream success criteria for MY6. The overall MY6 average planted stem density for the Site is 557 planted stems per acre, which is greater than the year seven density requirement of 210 stems per acre. All restored and enhanced streams are stable and functioning as designed. Southeast Branch, Southwest Branch, and Middle Branch all had pressure transducers installed to monitor stream flow. All three stream gages met the hydrologic criteria for MY6. Of the 37 groundwater monitoring wells on the Site, 31 met the success criteria (water table with 12 inches of the ground surface for 8.5% of the growing season consecutively), three gages malfunctioned during the early part of the growing season, and three

did not met criteria. Out of the three groundwater wells that didn't meet success criteria for MY6, two were within wetland areas determined to be at risk. Invasive and undesired competing vegetation will continue to be monitored and treatments will be applied if necessary. The vegetation on the east side of Devil's Racetrack has improved drastically.

DEVIL'S RACETRACK MITIGATION SITE
Monitoring Year 6 Annual Report

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Section 1: PROJECT OVERVIEW

The Devil's Racetrack Mitigation Site, hereafter referred to as the Site, is located in eastern Johnston County within the Neuse River Basin (USGS Hydrologic Unit 03020201) near the town of Four Oaks, North Carolina. The Site is located along Devil's Racetrack Road just east of its intersection with U.S. Highway 701 and approximately one mile east of Interstate 95. The Site is in the western portion of the Inner Coastal Plain Physiographic Province (USGS, 1998). The project watershed consists primarily of agricultural lands and forest. The only significant development in the watershed is a campground adjacent to Devil's Racetrack Creek on the western portion of the project site, a middle school in the upper portion of the watershed, a low-density subdivision with single family homes, and a small section of I-95. The drainage area for the project site is 831 acres (1.30 square miles) at the lower end of Devil's Racetrack Creek (East).

The project stream reaches include Devil's Racetrack Creek (East and West), Southwest Branch, Middle Branch, Southeast Branch, and North Branch (stream restoration and/or enhancement level I/II approach). Mitigation work within the Site included restoration and enhancement of 18,748 linear feet (LF) of perennial and intermittent stream channel and restoration of 59.7 acres (ac) of riparian wetlands. The stream and wetland areas were also planted with native vegetation to improve habitat and protect water quality. The final mitigation plan was submitted and accepted by the DMS in January of 2013. Construction activities were completed by Land Mechanic Designs, Inc. (East Side) and Fluvial Solutions (West Side) in February 2014. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in February 2014. Baseline monitoring (MY0) was conducted between December 2013 and February 2014. Annual monitoring will be conducted for seven years with the close-out anticipated to commence in 2021 given the success criteria are met. Appendix 1 provides more detailed project activity, history, contact information, and watershed/site background information for this project.

A conservation easement has been recorded and is in place along the stream and wetland riparian corridors to protect them in perpetuity; 96.065 ac (Deed Book 4221, Page 419-433) within two tracts owned by Nell Howell Revocable Trust. The project provides 18,215 stream mitigation units (SMU's) and 58.50 wetland mitigation units (WMU's). Directions and a map of the Site are provided in Figure 1 and project components are illustrated in Figures 2a and 2b.

1.1 Project Goals and Objectives

Prior to construction activities, the streams had been relocated and channelized with the surrounding wetland complex drained for agricultural purposes. Stream valleys and other low areas were filled to raise wet areas and level the fields. At the same time the streams were straightened, and riparian vegetation was also removed. The project area west of Devil's Racetrack Road was used for row crop agriculture and the eastern portion was used for timber production.

The channelization of streams on the Site resulted in severely over-enlarged channels that were extremely deep in many locations. The alterations of the Site to promote farming practices resulted in complete elimination of the ecological function of this small stream/wetland complex. Specifically, functional losses at the Site include degraded aquatic habitat, altered hydrology (related to loss of floodplain connection and lowered water table), and reduction of amount and quality of riparian wetland habitats and related water quality benefits. Ongoing bank erosion was also occurring at some locations due to high, overly steep banks and lack of bank vegetation. Table 4 in Appendix 1 and Tables 10a through 10f in Appendix 4 present the pre-restoration conditions in detail.

The Site was designed to meet the over-arching goals as described in the Mitigation Plan (Wildlands, 2013). The project is intended to provide numerous ecological benefits within the Neuse River Basin. While many of these benefits are limited to the Devil's Racetrack Creek Site project area, others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects. The following project specific goals established in the Mitigation Plan include:

- Restore a large wetland complex to a naturally occurring community to improve riparian habitat and water quality;
- Restore a network of badly degraded stream channels, including multiple headwaters streams, to create aquatic habitat and further improve water quality to receiving waters; and
- Restore riparian buffers along stream corridors for additional habitat and water quality benefits.

Secondary project goals established in the Mitigation Plan were to restore fish passage from the Neuse River to Devil's Racetrack Creek. This is a secondary goal because success will not be measured during monitoring.

The primary project goals were addressed through the following project objectives:

- Promote wetland hydrology by raising channelized stream beds and filling drainage ditches;
- Plant wetland areas with native tree species to restore a Coastal Plain Small Stream Swamp – Blackwater Subtype community;
- Reconstruct stream channels to have the appropriate slope, planform, and cross-sectional geometry for the region of the Coastal Plain in which the project is located;
- Size reconstructed stream channels to flood floodplains and wetlands frequently;
- Stabilize stream banks using bioengineering, natural channel design techniques, and grading to reduce bank angles and bank height;
- Install in-stream structures and woody debris to promote aeration of water, create habitat, and influence the creation of bed forms commonly found in sand bed channels;
- Restore riparian buffer areas with native tree species to stabilize channels, filter flood flows and runoff, and supplement wetland plantings; and
- Remove project area from agricultural production further improving water quality.

The design streams and wetlands were restored to the appropriate type based on the surrounding landscape, climate, and natural vegetation communities but also with strong consideration to existing watershed conditions and trajectory. The mitigation project was developed to restore a large stream/wetland complex directly adjacent to the Neuse River to a naturally occurring community to create riparian and wetland habitat and improve water quality. Other intentions of the design were to create stable habitats, improve riparian buffers, and restore the natural migration patterns for anadromous and other fish for spawning.

1.2 Monitoring Year 6 Data Assessment

Annual monitoring and quarterly site visits were conducted during MY6 to assess the condition of the project. The stream and wetland mitigation success criteria for the Site follow the approved success criteria presented in the Mitigation Plan.

1.2.1 Vegetative Assessment

A total of 51 10-meter by 10-meter vegetation plots were established within the Site during baseline monitoring. The final vegetation success criteria is the survival of 210 planted stems per acre averaging 10 feet in height at the end of the seven year monitoring period (MY7).

The MY6 vegetative survey was completed in August 2019. The 2019 vegetation monitoring data suggests a site wide average planted stem density of 557 stems per acre which is greater than the MY7 requirement of 210 stems per acre, but approximately 21% less than the stem density recorded in MY0. Individual plot data suggests planted stem density ranges from 162 to 769 planted stems per acre. When including volunteer stems, the site wide average number of stems per acre is 781. This is above the MY7 requirement. Fifty of the 51 vegetation plots met success criteria for MY6 and are on track to meet the success criteria required for MY7 (Table 9, Appendix 3). Vegetation Plot 49 averaged 162 planted stems per acre; however, when volunteer stems are included the density is 243 stems per acre which is above the final success criteria of 210 planted stems per acre. Refer to Appendix 2 for vegetation plot photographs and the vegetation condition assessment table and Appendix 3 for vegetation data tables.

1.2.2 Vegetation Areas of Concern

Even though vegetation plot 49 does not meet the final success criteria, when including volunteer species this plot meets the final success criteria of 210 stems per acre. Therefore, no remedial actions are proposed in this area at this time.

The restoration area east of Devil's Racetrack Road continued to receive significant treatment to improve the soil quality and herbaceous cover. Approximately 5,000 pounds of fertilizer and 32,000 pounds of pelletized lime were applied across the area during MY6. Additionally, the area was seeded with over 100 pounds of a native seed mix and live stakes were planted along Devil's Racetrack (East). Herbaceous cover and tree densities are sufficient; however, tree vigor is lower than expected for monitoring year 6. This area has drastically improved and will continue to be monitored and remedial actions will be taken as necessary.

An area of Chinese privet (*Ligustrum sinense*) on the west side of the project between Devil's Racetrack (West) and North Branch was treated in September 2019. The contractor is scheduled to conduct a second treatment on this area in the winter of 2019/2020. Scattered, low densities of Chinese privet were also treated across the Site and will be assessed to determine if further treatment is necessary during the winter. The Current Condition Plan View in Appendix 2 shows vegetation areas of concern.

Loblolly pine (*Pinus taeda*) has continued to volunteer across the site. In January of 2019, pines were cut across the site to keep them from competing with desirable vegetation. Wildlands will continue to monitor and treat loblolly pine as necessary during subsequent monitoring years.

1.2.3 Stream Assessment

Morphological surveys for MY6 were conducted in April 2019. All streams within the Site are stable and met success criteria for MY6. In general, cross sections for all streams showed little to no change in bankfull area, maximum depth ratio, or width-to-depth ratio. Cross section surveys show that the bank height ratios remain at or very near 1.0. Entrenchment ratios vary slightly from year to year due to minor changes in bankfull widths. Small adjustments in width occur due to vegetation, sediment deposition, and many other factors. These minor changes do not indicate channel instability. Surveyed riffle cross sections fell within the parameters defined for channels of the appropriate Rosgen stream type.

Cross section 8 on Devil's Racetrack (West) has maintained a consistent bankfull width but has increased in depth and area. This is due to the location of the cross section within the shallow. The shallow was built with logs buried perpendicular to the stream banks at the stream bed elevation to provide grade control. These logs create micro pools within the shallow. Cross section 8 was placed downstream of a log in a micro pool. Cross section 8 is representative of micro pools and is stable and performing as expected, even though there is an increase in depth and area.

Longitudinal profile surveys are not required on the project unless visual inspection indicates reach wide vertical stability concerns. Refer to Appendix 2 for the visual stability assessment table, the CCPV map, and reference photographs. Refer to Appendix 4 for the morphological data and plots.

1.2.4 Stream Areas of Concern

The upper most one hundred feet of Southeast Branch aggraded with sediment from the upstream agricultural field during MY6. This happened over the winter when the farm field did not have a cover crop and above average rainfall occurred. A single slope failed in the adjacent farm field which caused a large slug of sediment to aggrade in the channel. While the channel was beginning to process the sediment and move it downstream, some material was excavated with shovels to help speed up the process. This area will be monitored during MY7 and remedial actions will be taken if necessary.

At the end of 2018 several beaver dams were observed along Devil's Racetrack (West). The USDA removed beaver from the Site and there were no signs of beaver activity during 2019. The site will be monitored for future beaver activity during subsequent monitoring years.

1.2.5 Hydrology Assessment

At the end of MY7, two or more bankfull events must have occurred during separate years within the restoration reaches. Multiple bankfull events were recorded on all the streams with crest gages and pressure transducers during the MY6 data collection. All streams on the Site had multiple bankfull events during MY1, MY2, MY3, MY4, and MY5. Therefore, the Site has met the required bankfull flow success criterion.

Flow Gauges were installed on Southwest Branch, Southeast Branch, and Middle Branch to measure stream flow. These pressure transducers were installed to show that the streams have adequate flow for a portion of the year and are not ephemeral ditches. Per discussion with the Interagency Review Team (IRT), continuous flow must be documented for at least 30 consecutive days during normal precipitation circumstances on these streams. Stream flow must be documented to occur intermittently in all months other than July through September. Southwest Branch showed consistent flow throughout MY6. Middle Branch showed consistent flow for 276 consecutive days despite a gage malfunction from October to early December. Southeast Branch maintained flow for 117 consecutive days, from the beginning of the year until the end of April. All three streams have met the flow success criterion for MY6. All three streams have easily exceeded stream flow criteria in all previous monitoring years except Southeast Branch during MY2 when the gage malfunctioned most of the year. Refer to Appendix 5 for hydrologic data.

1.2.6 Wetland Assessment

Thirty-four groundwater monitoring gages were established during the baseline monitoring, four additional gages were added during MY2, and three gages were added during MY5. Groundwater gage 34 was removed during MY6 due to poor performance. The area around gage 34 is already categorized as wetland credits at risk and likely won't generate wetland credits. Groundwater gages 8, and 32 were placed outside of wetland boundaries to capture the extent of the wetlands and were removed during

MY5. Groundwater gage 10 performed poorly and was removed during MY4. The wetland area around groundwater gage 10 was adjusted during MY4 as well. All the gages were installed at appropriate locations so that the data collected will provide an indication of groundwater levels throughout the Site. To provide data for the determination of the growing season, three soil temperature probes (2 on the west side and 1 on the east side) have been installed at a depth of twelve inches. A barotroll logger (to measure barometric pressure used in the calculations of groundwater levels with well transducer data) was also installed on the Site. All monitoring gages were downloaded and maintained on an as needed basis. The success criterion for wetland hydrology is there must be a free groundwater surface within 12 inches of the ground surface for a consecutive 8.5 percent of the growing season, during normal precipitation conditions. During MY1 NRCS WETS Data was used to determine the growing season for the Site. After discussions with the United States Army Corps of Engineers (USACE), it was agreed to use on-site soil temperature data to determine the beginning of the growing season and use NRCS WETS data to determine the end of the growing season. During MY6 the beginning of the growing season was extended by 20 days from the NRCS WETS start date of March 21 to March 1 based on soil temperatures staying above 41 degrees Fahrenheit at 12 inches below the ground surface.

The USACE requested pre-construction groundwater well data be overlaid on hydrographs with the current monitoring year groundwater well data to see how groundwater levels are recharging after rain events on the Site. Wildlands overlaid the pre-construction groundwater well data with the closest monitoring groundwater well data and rain data. These plots suggest that the Site drained more rapidly and to greater depths prior to restoration. Refer to Appendix 5 for pre and post construction groundwater gage comparison plots.

Of the 37 groundwater monitoring wells on the Site, 31 met the success criteria (water table within 12 inches of the ground surface for 8.5% of the growing season consecutively), three gages malfunctioned in the spring when they are most likely to meet wetland success criterion, and three gages did not meet the success criterion. Of the 31 wells that met the success criterion, hydroperiods ranged from 11.5% to 29.5%. Groundwater wells 7, 21, and 22 malfunctioned during the spring of 2019. Wells 7 and 21 have met success criteria every year in the past and well 22 met 4 of the past 5 monitoring years. These three wells most likely would have met success criteria if they did not malfunction. Of the three wells that did not meet success criteria two are in wetland areas at risk. Wells 20 and 23 are along the Site boundary near North Branch. The eastern property boundary in this area is an open ditch that was not filled during construction due to hydrologic trespass constraints. This ditch may be partially draining the groundwater in this area. Wells 40 and 41 were added during MY5 to measure wetland hydroperiod farther west of the ditch. Both of these wells recorded hydroperiods well in excess of the criterion threshold during MY5 and MY6. Well 26 recorded a hydroperiod of 7.3% during MY6 which does not meet the wetland success criterion. The hydroperiod recorded at well 26 met the success criterion during MY1 – MY3 but has not met success criterion during MY4-MY6. The landscape around this well is no different than other groundwater wells in the area, however it is located within the area used for staging equipment during construction. This old staging area likely has compacted soils that may be limiting groundwater from freely moving to the ground surface, but it is not obvious if this is causing the poor performance of well 26. An additional groundwater well will be added outside the limits of the old staging area near well 26 to help determine if the compacted soils from the old staging area are affecting groundwater in this area.

During MY6 a licensed soil scientist observed soil profiles in proximity to groundwater wells that were marginal in attaining the success criterion. The purpose of this investigation was to document the presence or absence of soil-based indicators of a contemporary, persistent high water table in these questionable areas. The study areas are denoted by the orange boundary on the LSS report figure. The detailed report is attached in Appendix 5. Evidence of contemporary wetland hydrology was observed

throughout the westernmost study area with the exception of a previous haul road which was slightly elevated. A portion of this area was classified as wetland credit at risk. Boring 10 was located within the at risk area, and evidence of a contemporary wetland hydrology regime was observed. Evidence of persistent saturation was also observed throughout the entire study area surrounding GW5 and GW6. The at risk study area surrounding boring 05, boring 06, and GW 34 exhibited only weak evidence of saturation. This area may not have a persistent wetland hydrology regime. Evidence of a contemporary wetland hydrology regime was observed throughout the entirety of the study area surrounding GW13 and boring 01, including the at risk area that lies within. All soil profiles observed within the study area surrounding borings 02, 03, 04, and GW24 exhibited evidence of contemporary wetland hydrology. The area surrounding boring 08 and GW 26 contained a potential upland area with non-hydric soil. The remainder of this study area contained evidence of contemporary wetland hydrology. A potential upland area was identified within the study area surrounding GW20 and GW23 which generally corresponds with the area previously placed at risk. The entire study area east of Devil's Racetrack road exhibited contemporary evidence of a persistent high water table.

1.2.7 Maintenance Plan

Privet will be treated for on the Site during the winter of 2019/2020, especially in the area along North Branch. Pines, and sweetgum will be monitored during subsequent monitoring years and will be treated as necessary. Beaver activity will be monitored and dealt with as necessary.

Wildlands will monitor the soil quality of the eastern side of the Site by taking regular soil samples. Additional amendments will be applied based on the results of these soil tests. This area will also be monitored for areas with low herbaceous cover and re-seeded if necessary.

1.3 Monitoring Year 6 Summary

Vegetation plot data suggests the Site is on track to meeting the MY7 success criteria. Only one plot fell short of the planted stem density criterion, but this plot exceeds the criterion threshold when including volunteer stems. All streams within the Site are stable and functioning as designed. Each stream documented multiple bankfull events during MY6. Of the 37 groundwater monitoring wells on the Site, 31 met the success criteria (water table with 12 inches of the ground surface for 8.5% of the growing season consecutively), three of the gages malfunctioned, two were in areas of wetlands deemed to be at risk for credit, and one didn't met success criteria. Invasive and undesired competing vegetation will continue to be monitored and treatments will be applied if necessary. The vegetation on the east side of Devil's Racetrack has improved drastically. Soil samples will be taken regularly on the east side of the project and additional lime and fertilizer will be applied based on the results of the soil tests.

Summary information and data related to the success of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Mitigation Plan documents available on DMS's website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 2: METHODOLOGY

Geomorphic data was collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All the Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Crest gages and pressure transducers were installed in surveyed riffle cross sections and monitored quarterly. Hydrology attainment installation and monitoring methods are in accordance with the USACE (2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-DMS Level 2 Protocol (Lee et al., 2008).

Section 3: REFERENCES

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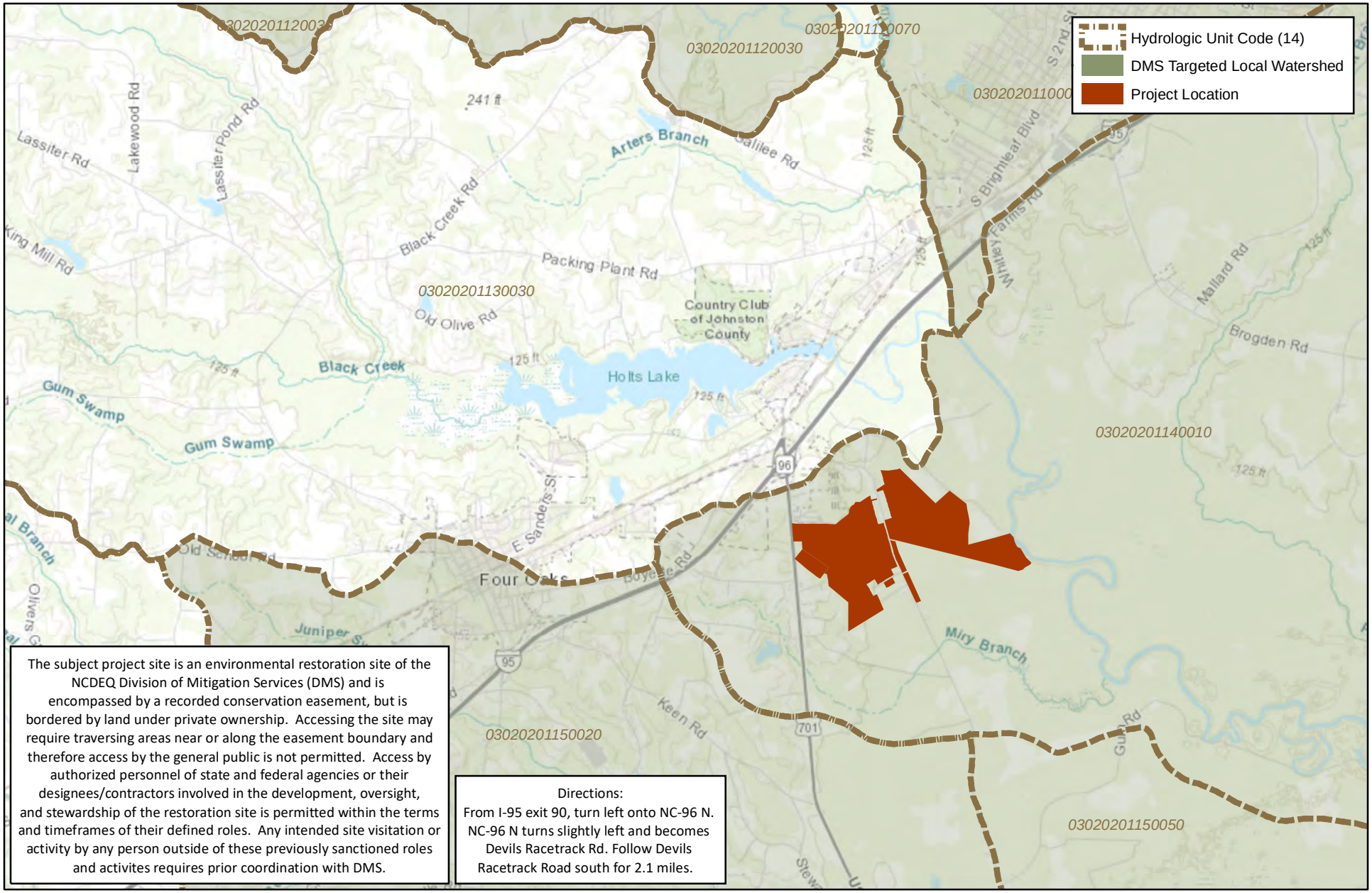
Winter, Thomas C., Harvey, Judson W., Franke, O. Lehn, Alley, William M. 1998. Ground Water and Surface Water: A Single Resource.

APPENDIX 1. General Tables and Figures



The subject project site is an environmental restoration site of the NCDEQ Division of Mitigation Services (DMS) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight, and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activites requires prior coordination with DMS.

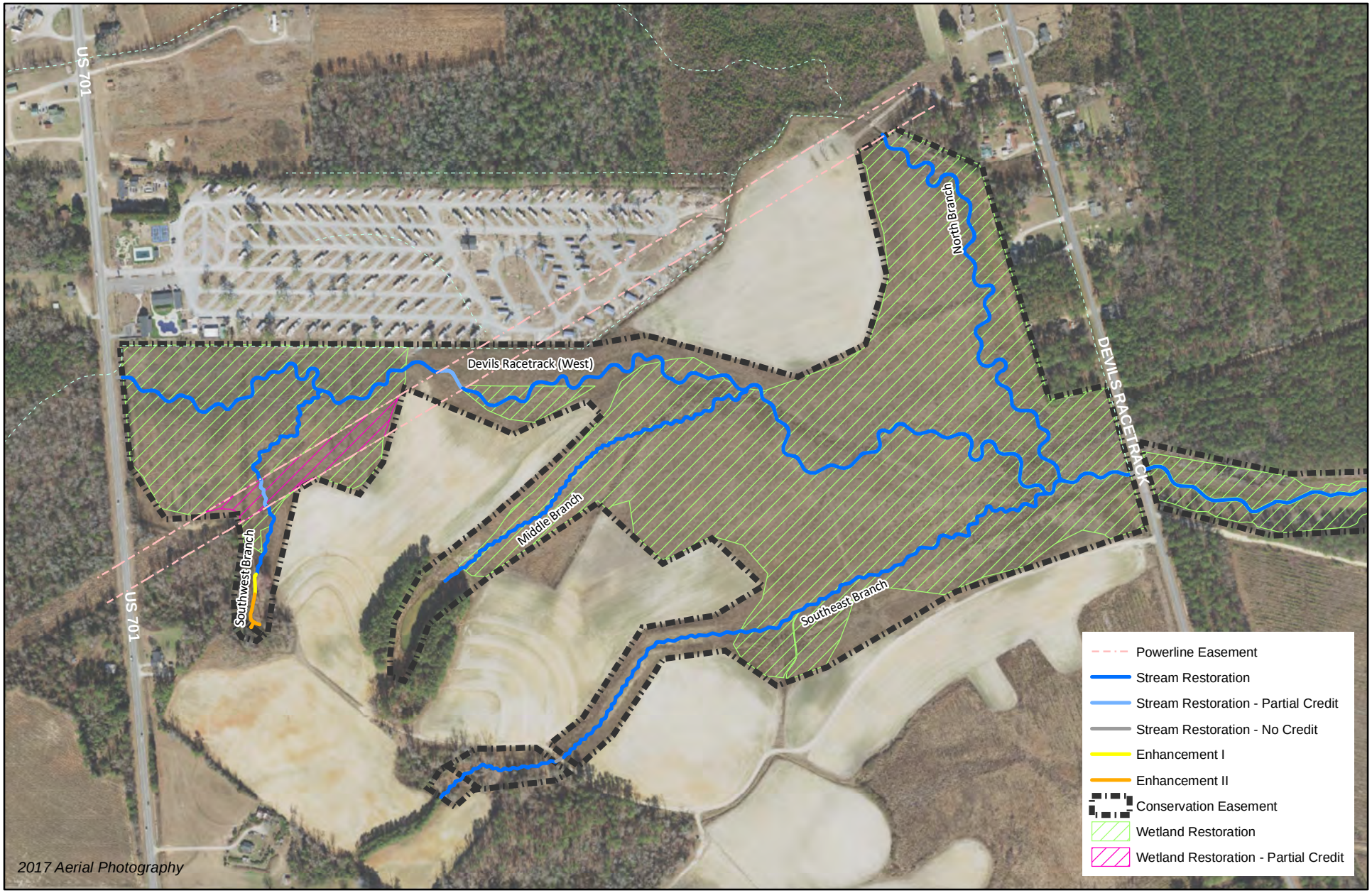
Directions:
From I-95 exit 90, turn left onto NC-96 N. NC-96 N turns slightly left and becomes Devils Racetrack Rd. Follow Devils Racetrack Road south for 2.1 miles.

WILDLANDS ENGINEERING

0 0.5 1 Miles

N

Figure 1. Project Vicinity Map
Devil's Racetrack Mitigation Site
DMS Project No. 95021
Monitoring Year 6 - 2019
Johnston County, NC

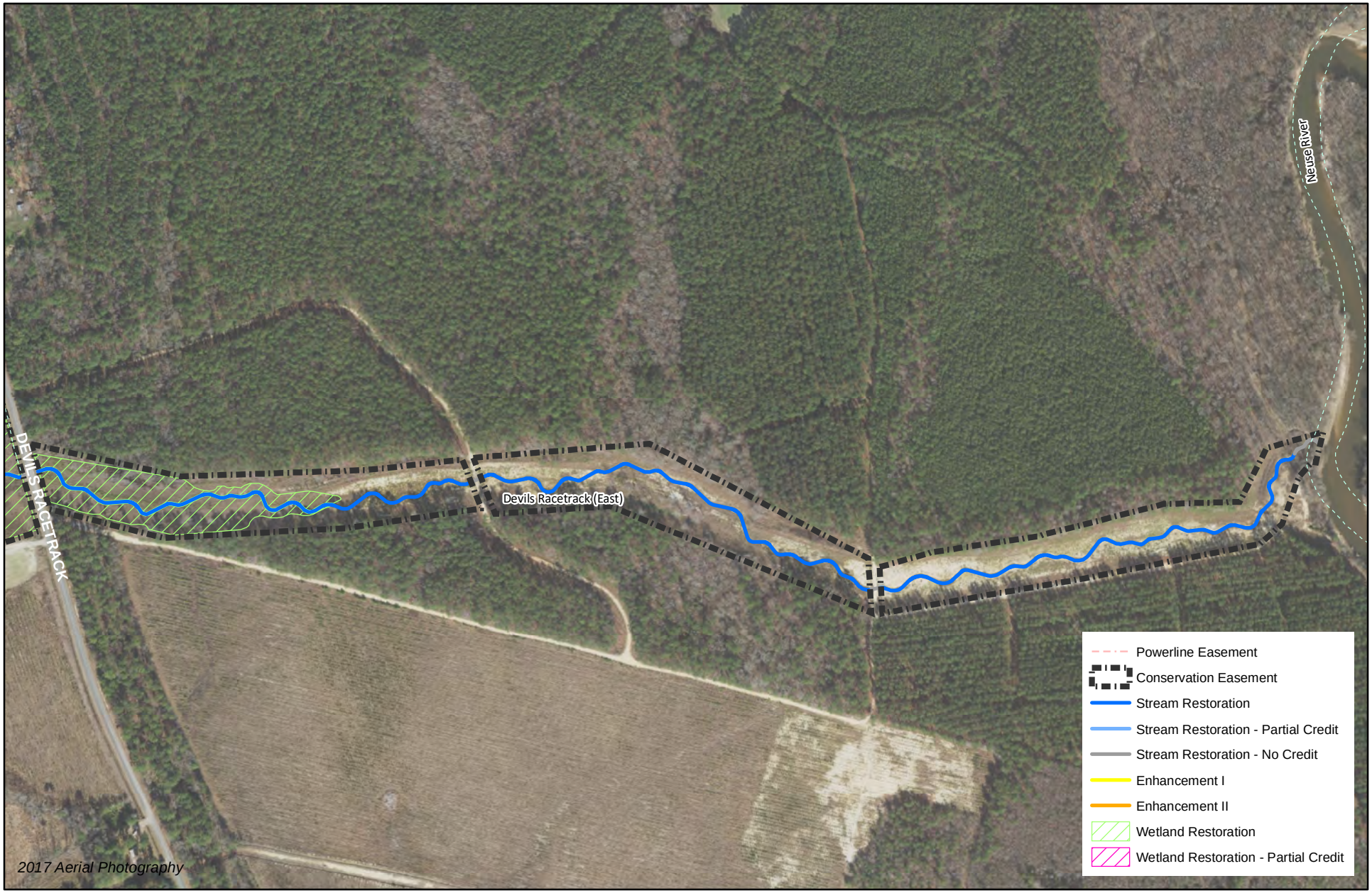


WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 2a. Project Component/Asset Map
Devil's Racetrack Mitigation Site
DMS Project No. 95021
Monitoring Year 6 - 2019
Johnston County, NC



WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 2b. Project Component/Asset Map
Devil's Racetrack Mitigation Site
DMS Project No. 95021
Monitoring Year 6 - 2019
Johnston County, NC

Table 1. Project Components and Mitigation Credits
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Mitigation Credits

	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	18,215	0	55.53	0	N/A	N/A	N/A	N/A	N/A
Totals	**0**	**0**	**2.97**	**0**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Project Components

Reach ID	As-Built Stationing/ Location	Existing Footage/ Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage/ Acreage	Mitigation Ratio	Credits (SMU/ WMU)
Streams							
Devil's Racetrack Creek (West) (DOT ROW)	0+00-0+20	20 LF	P1	Restoration (No Credit)	20	N/A	N/A
Devil's Racetrack Creek (West)	0+20-16+26 & 17+50-52+05	4,755 LF	P1	Restoration	5,061	1:1	5,061
Devil's Racetrack Creek (West) (Power Line Easement)	16+26-17+50	196 LF	P1	Restoration (Partial Credit)	124	4:1[1]	31
Devil's Racetrack Creek (West) (DOT ROW)	52+05-52+11	5 LF	P1	Restoration (No Credit)	6	N/A	N/A
Devil's Racetrack (East) (DOT ROW)	52+59-52+65	5 LF	P1	Restoration (No Credit)	6	N/A	N/A
Devil's Racetrack (East)	52+65-70+73 71+03-88+00	4,778 LF	P1/2	Restoration	3,509	1:1	3,509
Devil's Racetrack (East)	88+31-106+85		P1/2	Restoration	1,854	1:1	1,854
Devil's Racetrack (East) (Easement Break)	70+73-71+03	30 LF	P1/2	Restoration (No Credit)	30	N/A	N/A
Devil's Racetrack (East) (Easement Break)	88+00 to 88+31	31 LF	P1/2	Restoration (No Credit)	31	N/A	N/A
Devil's Racetrack (East)	106+85-107+97	0 LF	P1/2	Restoration (No Credit)	112	N/A	N/A
Southwest Branch	500+00-501+31 600+00-600+23	154 LF	EII	Enhancement	154	2.5:1	61.6
Southwest Branch	501+31-502+06	75 LF	EI	Enhancement	75	1.5:1	50
Southwest Branch	502+06-504+85 505+99-511+32	740 LF	P1/2	Restoration	812	1:1	812
Southwest Branch (Power Line Easement)	504+85-505+99	111 LF	P1/2	Restoration (Partial Credit)	114	4:1[1]	28.5
Middle Branch	200+00-204+10	410 LF		Headwater Wetland	410	1:1	410
Middle Branch	204+10-219+06	1,326 LF	P1/2	Restoration	1,496	1:1	1,496
Southeast Branch	300+00-305+03 305+35-328+92	2,946 LF	P1	Restoration	2,860	1:1	2,860
Southeast Branch (Easement Break)	305+03-305+35	30 LF	P1	Restoration (Partial Credit)	32	N/A	N/A
North Branch	403+76-424+18	---	P1	Restoration	2,042	1:1	2,042
Wetlands							
Riparian Wetlands (West)	N/A	0.0 ac	N/A	Restoration	51.70	1:1	51.70
Riparian Wetlands (West) (Power Line Easement)	N/A	0.0 ac	N/A	Restoration (Partial Credit)	1.53	4:1	0.38
Riparian Wetlands (East)	N/A	0.0 ac	N/A	Restoration	3.45	1:1	3.45
Riparian Wetlands (West)	**N/A**	**0.0 ac**	**N/A**	**Restoration**	**2.95**	**1:1**	**2.95**
Riparian Wetlands (West) (Power Line Easement)	**N/A**	**0.0 ac**	**N/A**	**Restoration (Partial Credit)**	**0.07**	**4:1**	**0.02**

Component Summation

Restoration Level	Stream (LF)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Buffer(square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	18,519	56.68	-	-	-	-
Restoration At Risk		**3.02**	-	-	-	-
Enhancement I	75					
Enhancement II	154					
Creation		-	-	-		
Preservation	-	-	-	-		-

N/A: not applicable
1. Ratio of 4:1 based on an expected 75% reduction in credits for stream restoration with shrub buffer zone in power line easements
* Stream credit calculations were originally calculated along the as-built thalweg and updated to be calculated along stream centerlines for Monitoring Year 4 after discusions with NC IRT.
** Riparian Wetlands (West) credit calculations were updated for Monitoring Year 4 based on the performance of groundwater well 10.
Red denotes credits at risk.

Table 1A. Project Mitigation Credit History
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Mitigation Credits										
Reach ID	**Approach**	**Mit Plan Credits (SMU/WMU)**	**MY0 Credits (SMU/WMU)**	**MY1 Credits (SMU/WMU)**	**MY2 Credits (SMU/WMU)**	**MY3 Credits (SMU/WMU)**	**MY4 Credits (SMU/WMU)**	**MY5 Credits (SMU/WMU)**	**MY6 Credits (SMU/WMU)**	**Notes**
Streams										
Devil's Racetrack Creek (West)	P1	5,061	5,061	5,122	5,122	5,122	5,061	5,061	5,061	2, 4
Devil's Racetrack Creek (West) (Power Line Easement)	P1	31	31	32	32	32	31	31	31	2, 4
Devil's Racetrack Creek (East)	P1/2	5,363	5,461	5,364	5,364	5,364	5,363	3509/**1,854**	5,363	1, 2, 4, 6, 11
Southwest Branch	EII	62	61.60	62	62	62	61.6	61.6	61.6	2, 5
Southwest Branch	EI	50	50.67	51	51	51	50	50	50	2, 4
Southwest Branch	P1/2	812	811	829	829	829	812	812	812	1, 2, 4
Southwest Branch (Power Line Easement)	P1/2	29	28.50	29	29	29	28.5	28.5	28.5	5
Middle Branch	Headwater Wetland	410	400	410	410	410	410	410	410	1, 2
Middle Branch	P1/2	1,496	1,506	1,505	1,505	1,505	1,496	1,496	1,496	1, 2, 4
Southeast Branch	P1	2,860	2,848	2,919	2,916	2,916	2,860	2,860	2,860	1, 2, 3, 4
North Branch	P1	2,042	2,418	2,050	2,050	2,050	2,042	2,042	2,042	1, 2, 4
Total		**18,216**	**18,677**	**18,373**	**18,370**	**18,370**	**18,215**	**18,215**	**18,215**	
Wetlands										
Riparian Wetlands (West)	N/A	51.4	57.9	57.9	57.9	57.9	54.65	51.70/**2.95**	51.70/**2.95**	5, 7, 8, 9, 10
Riparian Wetlands (West) (Power Line Easement)	N/A	0.4	0.4	0.4	0.4	0.4	0.40	0.38/**0.02**	0.38/**0.02**	5
Riparian Wetlands (East)	N/A	3.4	3.8	3.8	3.8	3.8	3.45	3.45	3.45	5, 8, 9, 10
Total		**55.2**	**62.1**	**62.1**	**62.1**	**62.1**	**58.50**	**58.50**	**58.50**	

Red denotes credits at risk.

1. As-Built credit calculations were not calculated correctly.
2. During MY1 credits were updated based on as-built thalweg alignments.
3. During MY2 a section of Southeast Branch was removed from credit because it was an easement crossing and not part of the powerline easement.
4. During MY4 credits were updated based on stream centerlines and Mitigation Plan credits after discussions with the IRT.
5. During MY4 DMS requested mitigation credits be calculated to 3 decimal places.
6. Durining MY5 the IRT categorized the lower section of Devil's Racetrack Creek (East) as credits at risk due to the lack of vegetation.
7. Wetland credits were miscalculated in the Mitigation Plan on the west side of the project. The IRT was sent a formal letter describing this and approved it.
8. As-Built wetland credits were based on anticipated wetland boundaries which included stream channels. The stream channel areas were removed during MY4. During as-built two small wetland areas not included in Mitigation Plan were added, but removed during MY4.
9. During MY4 wetland credits were reverted back Mitigation Plan credits after discussions with the IRT, and the area around groundwater well 10 was removed.
10. Durining MY5 the IRT categorized a few areas as credits at risk based on groundwater well performance and soil conditions.
11. Durining MY6 site walk the IRT removed the lower section of Devil's Racetrack Creek (East) from credits at risk due to sufficient vegetation growth.

Table 2. Project Activity and Reporting History
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Activity or Report		Date Collection Complete	Completion or Scheduled Delivery
Mitigation Plan		September 2011-March 2012	January 2013
Final Design - Construction Plans		September 2011-March 2012	August 2013
Construction		December 2013-February 2014	February 2014
Temporary S&E mix applied to entire project area[1]		February 2014	February 2014
Permanent seed mix applied to reach/segments		February 2014	February 2014
Bare root and live stake plantings for reach/segments		February 2014	February 2014
Baseline Monitoring Document (Year 0)	Stream Survey	February 2014	May 2014
	Vegetation Survey	February 2014	
Year 1 Monitoring	Stream Survey	July 2014	December 2014
	Vegetation Survey	September 2014	
Minor Stream Repairs			May 2014
Year 2 Monitoring	Stream Survey	April 2015	December 2015
	Vegetation Survey	June 2015	
Minor Stream Repairs & Soil Amendments			April 2015
Year 3 Monitoring	Stream Survey	April 2016	December 2016
	Vegetation Survey	June 2016	
Soil Amendments			June 2016
Beaver Dam Removal			September 2016
Year 4 Monitoring	Stream Survey	May 2017	December 2017
	Vegetation Survey	August 2017	
Pine Tree Removal			February 2017
Hugel Beds Installed			May 2017
Soil Amendments			November 2017
Year 5 Monitoring	Stream Survey	April 2018	December 2018
	Vegetation Survey	August 2018	
Soil Amendments			September 2018
Invasive Treatment			October - November 2018
Beaver Removal			December 2018
Pine Tree Removal			January 2019
Year 6 Monitoring	Stream Survey	April 2019	December 2019
	Vegetation Survey	August 2019	
Soil Amendments			August & October 2019
Live Stake Planting			March 2019
Invasive Treatment			September 2019
Year 7 Monitoring	Stream Survey	2020	December 2020
	Vegetation Survey	2020	

[1]Seed and mulch is added as each section of construction is completed.

Table 3. Project Contact Table
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Designer	**Wildlands Engineering, Inc.**
Jeff Keaton, PE	312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor (East Side)	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Construction Contractor (West Side)	**Fluvial Solutions** P.O. Box 28749 Raleigh, NC 27611
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seed Mix Sources	**Green Resource, LLC**
Nursery Stock Suppliers **Bare Roots** **Live Stakes**	**Dykes and Son Nursery and NC Forest Service (Claridge Nursery)** **Bruton Natural Systems, Inc**
Monitoring Performers	**Wildlands Engineering, Inc.**
Stream, Vegetation, and Wetland Monitoring, POC	Jason Lorch 919.851.9986, ext. 107

Table 4. Project Information and Attributes
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Project Information						
Project Name	Devil's Racetrack Mitigation Site					
County	Johnston County					
Project Area (acres)	96.065 ac					
Project Coordinates (latitude and longitude)	35° 27'01.58" N, 78° 23' 18.08" W					
Project Watershed Summary Information						
Physiographic Province	Upper Coastal Plain					
River Basin	Neuse					
USGS Hydrologic Unit 8-digit	03020201					
USGS Hydrologic Unit 14-digit	03020201140010					
DWR Sub-basin	03-04-02					
Project Drainage Area (acres)	831 ac					
Project Drainage Area Percentage of Impervious Area	<1%					
CGIA Land Use Classification	62% forest/wetland, 34% farm land, 4% developed					
Reach Summary Information						
Parameters	**Southwest Branch**	**Middle Branch**	**Southeast Branch**	**North Branch**	**Devil's Racetrack Creek (west)**	**Devil's Racetrack Creek (east)**
Length of reach (linear feet) - Post-Restoration	1,155	1,906	2,892	2,042	5,211	5,542
Drainage area (acres)	20.6	10.8	69.9	49.9	493.5	831.4
NCDWR stream identification score	34.5 - 37	30	29 - 30.75	32	38	37.5
NCDWR Water Quality Classification	C/NSW					
Morphological Desription (stream type)	P	P	P/I	P	P	P
Evolutionary trend (Simon's Model) - Pre- Restoration	---	---	---	---	---	---
Underlying mapped soils	Altavista fine sandy loam, Bibb sandy loam, Cecil loam, Goldsboro sandy loam, Leaf silt loam, Lynchburg sandy loam, Nason silt loam, Norfolk loamy sand, and Rains sandy loam.					
Drainage class	---	---	---	---	---	---
Soil Hydric status	---	---	---	---	---	---
Slope	---	---	---	---	---	---
FEMA classification	None					
Native vegetation community	Coastal Plain bottomland riparian forest					
Percent composition exotic invasive vegetation -Post-Restoration	0%					

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	X	X	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885.
Waters of the United States - Section 401	X	X	
Division of Land Quality (Dam Safety)	N/A	N/A	N/A
Endangered Species Act	X	X	Devils Racetrack Mitigation Plan; Wildlands determined "no effect" on Johnston County listed endangered species.
Historic Preservation Act	X	X	No historic resources were found to be impacted (letter from SHPO dated 7/20/2011).
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A	N/A	N/A
FEMA Floodplain Compliance	N/A	N/A	The project streams do not have an associated regulatory flooplaing; however the downstream end of Devil's Racetrack Creek is located within the floodwasy and flood fringe of the Neuse River (FEMA Zone AE, FIRM panel 1680).
Essential Fisheries Habitat	N/A	N/A	N/A

APPENDIX 2. Visual Assessment Data

Sheet 1

Sheet 2

Devil's Racetrack (West)

North Branch

Middle Branch

Southwest Branch

Southeast Branch

Devil's Racetrack (East)

Neuse River

US 701

Devil's Racetrack Road

*2017 Aerial Photography

Legend

- Stream Restoration
- Stream Restoration - Partial Credit
- Stream Restoration - No Credit
- Enhancement I
- Enhancement II
- Conservation Easement
- Powerline Easement
- Wetland Restoration
- Wetland Restoration - Partial Credit

WILDLANDS ENGINEERING

0 500 1,000 Feet

N

Figure 3.0 Integrated Current Condition Plan View (Key)
Devil's Racetrack Mitigation Site
DMS Project No. 95021
Monitoring Year 6 - 2019

Johnston County, NC

WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 3.1 Integrated Current Condition Plan View
(Sheet 1 of 2)
Devil's Racetrack Mitigation Site
DMS Project No. 95021
Monitoring Year 6 - 2019
Johnston County, NC

Devil's Racetrack (East)

Devil's Racetrack Road

Neuse River

*2017 Aerial Photography

Legend

- Crest and Flow Gage
- Crest Gage
- Cross-Section (XS)
- Photo Point (PP)

Groundwater Gage (GW) Condition-MY6

- Criteria Met
- Criteria Not Met
- Soil Temperature Probe
- Barotroll
- Stream Restoration
- Stream Restoration - Partial Credit
- Stream Restoration - No Credit
- Enhancement I
- Enhancement II
- Conservation Easement
- Powerline Easement
- Wetland Restoration
- Wetland Restoration - Partial Credit
- Wetland Partial Credit at Risk (0.07Ac)
- Wetland Restoration at Risk (2.95Ac)
- Low Tree Vigor

Vegetation Plot Condition-MY6

- Critera Met
- Critera Not Met

WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 3.2 Integrated Current Condition Plan View
(Sheet 2 of 2)
Devil's Racetrack Mitigation Site
DMS Project No. 95021
Monitoring Year 6 - 2019
Johnston County, NC

Table 5a. Visual Stream Morphology Stability Assessment Table

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Devil's Racetrack (West) (5,211 LF)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	74	74			100%			
	3. Meander Pool Condition	Depth Sufficient	74	74			100%			
		Length Appropriate	74	74			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	74	74			100%			
		Thalweg centering at downstream of meander bend (Glide)	74	74			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	6	6			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 5b. Visual Stream Morphology Stability Assessment Table

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Devil's Racetrack (East) (5,542 LF)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	85	85			100%			
	3. Meander Pool Condition	Depth Sufficient	85	85			100%			
		Length Appropriate	85	85			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	85	85			100%			
		Thalweg centering at downstream of meander bend (Glide)	85	85			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	17	17			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	17	17			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	17	17			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	17	17			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	17	17			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 5c. Visual Stream Morphology Stability Assessment Table

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Southeast Branch (2,892 LF)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			1	100	97%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	121	121			100%			
	3. Meander Pool Condition	Depth Sufficient	120	120			100%			
		Length Appropriate	120	120			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	120	120			100%			
		Thalweg centering at downstream of meander bend (Glide)	120	120			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	67	67			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	67	67			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	65	67			97%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	67	67			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	67	67			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 5d. Visual Stream Morphology Stability Assessment Table

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Middle Branch (1,906 LF)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	79	79			100%			
	3. Meander Pool Condition	Depth Sufficient	78	78			100%			
		Length Appropriate	78	78			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	78	78			100%			
		Thalweg centering at downstream of meander bend (Glide)	78	78			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	52	52			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	52	52			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	52	52			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	52	52			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	52	52			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 5e. Visual Stream Morphology Stability Assessment Table

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Southwest Branch (1,155 LF)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	48	48			100%			
	3. Meander Pool Condition	Depth Sufficient	47	47			100%			
		Length Appropriate	47	47			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	47	47			100%			
		Thalweg centering at downstream of meander bend (Glide)	47	47			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	28	28			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	28	28			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	28	28			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	28	28			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	28	28			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 5f. Visual Stream Morphology Stability Assessment Table

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

North Branch (2,042 LF)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	35	35			100%			
	3. Meander Pool Condition	Depth Sufficient	34	34			100%			
		Length Appropriate	34	34			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	34	34			100%			
		Thalweg centering at downstream of meander bend (Glide)	34	34			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	10			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	10	10			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6. Vegetation Condition Assessment Table
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Planted Acreage **96**

Vegetation Category	Definitions	Mapping Threshold (Ac)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.1	0	0.0	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	0	0.0	0.0%
		Total	**0**	**0.0**	**0.0%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 Ac	3	22.7	23.6%
		Cumulative Total	**0**	**22.7**	**23.6%**

Easement Acreage **96**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Planted Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1,000	0	0	0.0%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0%

STREAM PHOTOGRAPHS

PHOTO POINT 1 DRT West - upstream *(04/30/2019)*	**PHOTO POINT 1 DRT West** - downstream *(04/30/2019)*
PHOTO POINT 2 DRT West - upstream *(06/11/2019)*	**PHOTO POINT 2 DRT West** - downstream *(06/11/2019)*
PHOTO POINT 3 DRT West - upstream *(06/11/2019)*	**PHOTO POINT 3 DRT West** - downstream *(06/11/2019)*

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PHOTO POINT 37 DRT East - upstream *(06/11/2019)*	**PHOTO POINT 37 DRT East** - downstream *(06/11/2019)*

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PHOTO POINT 39 DRT East - upstream *(06/11/2019)*	**PHOTO POINT 39 DRT East** - downstream *(06/11/2019)*
PHOTO POINT 40 DRT East - upstream *(06/11/2019)*	**PHOTO POINT 40 DRT East** - downstream *(06/11/2019)*

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PHOTO POINT 42 DRT East - upstream *(06/11/2019)*	**PHOTO POINT 42 DRT East** - downstream *(06/11/2019)*
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PHOTO POINT 54 DRT East - upstream *(06/20/2019)*	**PHOTO POINT 54 DRT East -** downstream *(06/20/2019)*
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PHOTO POINT 94 North Branch - upstream *(06/11/2019)*

PHOTO POINT 94 North Branch - downstream *(06/11/2019)*

VEGETATION PHOTOGRAPHS

VEG PLOT 1 *(08/07/2019)*

VEG PLOT 2 *(08/07/2019)*

VEG PLOT 3 *(08/07/2019)*

VEG PLOT 4 *(08/07/2019)*

VEG PLOT 5 *(08/07/2019)*

VEG PLOT 6 *(08/07/2019)*

VEG PLOT 7 *(08/07/2019)*

VEG PLOT 8 *(08/07/2019)*

VEG PLOT 9 *(08/07/2019)*

VEG PLOT 10 *(08/07/2019)*

VEG PLOT 11 *(08/07/2019)*

VEG PLOT 12 *(08/07/2019)*

VEG PLOT 13 *(08/07/2019)*

VEG PLOT 14 *(08/01/2019)*

VEG PLOT 15 *(08/01/2019)*

VEG PLOT 16 *(08/01/2019)*

VEG PLOT 17 *(08/01/2019)*

VEG PLOT 18 *(08/01/2019)*

VEG PLOT 19 *(08/01/2019)*

VEG PLOT 20 *(08/01/2019)*

VEG PLOT 21 *(08/07/2019)*

VEG PLOT 22 *(08/07/2019)*

VEG PLOT 23 *(08/29/2018)*

VEG PLOT 24 *(08/29/2018)*

VEG PLOT 25 *(08/29/2018)*

VEG PLOT 26 *(08/01/2019)*

VEG PLOT 27 *(08/01/2019)*

VEG PLOT 28 *(08/01/2019)*

VEG PLOT 29 *(08/01/2019)*

VEG PLOT 30 *(08/01/2019)*

VEG PLOT 31 *(08/01/2019)*

VEG PLOT 32 *(08/01/2019)*

VEG PLOT 33 *(08/01/2019)*

VEG PLOT 34 *(08/01/2019)*

VEG PLOT 35 *(08/01/2019)*

VEG PLOT 36 *(08/01/2019)*

VEG PLOT 37 *(08/08/2018)*

VEG PLOT 38 *(08/01/2019)*

VEG PLOT 39 *(08/01/2019)*

VEG PLOT 40 *(08/01/2019)*

VEG PLOT 41 *(08/01/2019)*

VEG PLOT 42 *(08/01/2019)*

VEG PLOT 43 *(08/01/2019)*

VEG PLOT 44 *(08/01/2019)*

VEG PLOT 45 *(08/01/2019)*

VEG PLOT 46 *(08/01/2019)*

VEG PLOT 47 *(08/01/2019)*

VEG PLOT 48 *(08/01/2019)*

VEG PLOT 49 *(08/01/2019)*

VEG PLOT 50 *(08/01/2019)*

VEG PLOT 51 *(08/01/2019)*

APPENDIX 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Plot	Success Criteria Met (Y/N)	Tract Mean
1	Y	
2	Y	
3	Y	
4	Y	
5	Y	
6	Y	
7	Y	
8	Y	
9	Y	
10	Y	
11	Y	
12	Y	
13	Y	
14	Y	
15	Y	
16	Y	
17	Y	
18	Y	
19	Y	
20	Y	
21	Y	
22	Y	
23	Y	
24	Y	
25	Y	
26	Y	98%
27	Y	
28	Y	
29	Y	
30	Y	
31	Y	
32	Y	
33	Y	
34	Y	
35	Y	
36	Y	
37	Y	
38	Y	
39	Y	
40	Y	
41	Y	
42	Y	
43	Y	
44	Y	
45	Y	
46	Y	
47	Y	
48	Y	
49	N	
50	Y	
51	Y	

Table 8. CVS Vegetation Table - Metadata

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Database name	Devils Racetrack MY6 cvs-eep-entrytool-v2.3.1.mdb
Database location	F:\Projects\005-02129 Devil's Racetrack\Monitoring\Monitoring Year 6\Vegetation
Computer name	CARLYNN-PC
File size	62914560
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	95021
project Name	Devils Racetrack Mitigation Site
Description	Stream and Wetland Mitigation
River Basin	Neuse
Sampled Plots	51

Table 9. Planted and Total Stem Counts
Devil's Racetrack Mitigation Site (DMS Project Code 95021)
Monitoring Year 6 - 2019

			Current Plot Data (MY6 2019)																					
			VP 1			VP 2			VP 3			VP 4			VP 5			VP 6			VP 7		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree									1												
Alnus serrulata	hazel alder	Shrub																					
Baccharis halimifolia	eastern baccharis	Shrub			2									2									
Betula nigra	river birch	Tree	1	1	1	1	1	1	3	3	3	2	2	2	2	2	2	5	5	5	6	6	6
Cephalanthus occidentalis	common buttonbush	Shrub																					
Fraxinus pennsylvanica	green ash	Tree	3	3	3	4	4	4	3	3	3	1	1	1	2	2	2	2	2	2	1	1	1
Ligustrum sinense	Chinese privet	Exotic																					
Liquidambar styraciflua	sweetgum	Tree			4			47			2			19			3			7			1
Liriodendron tulipifera	tuliptree	Tree																			3	3	3
Mimosa	sensitive plant	Exotic			1																		
Morella cerifera	wax myrtle	Shrub																					
Nyssa biflora	swamp tupelo	Tree				1	1	1												1			
Nyssa sylvatica	blackgum	Tree	3	3	3	1	1	1	2	2	2												
Pinus	pine	Tree									4			5			9						8
Platanus occidentalis	American sycamore	Tree	2	2	2	2	2	4	2	2	2	3	3	3				2	2	2	2	2	2
Prunus serotina	black cherry	Tree																					
Pyrus calleryana	Callery pear	Exotic																					
Quercus laurifolia	laurel oak	Tree																					
Quercus michauxii	swamp chestnut oak	Tree	3	3	3							1	1	1	2	2	2	1	1	1			
Quercus pagoda	cherrybark oak	Tree										1	1	1	1	1	1						
Quercus phellos	willow oak	Tree	3	3	3	4	4	4	1	1	1			1									
Quercus rubra	northern red oak	Tree																					
Rhus copallinum	flameleaf sumac	Shrub																					
Salix nigra	black willow	Tree																					
Salix sericea	silky willow	Shrub																					
Sambucus	elderberry	Shrub																					
Taxodium distichum	bald cypress	Tree	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	5	5	5			
Ulmus	elm	Tree																					
Ulmus alata	winged elm	Tree																					
Ulmus americana	American elm	Tree																					
		Stem count	17	17	21	16	16	65	14	14	17	11	11	31	11	11	14	15	15	23	12	12	13
		size (ares)	1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	7	7	10	7	7	8	6	6	9	6	6	10	5	5	7	5	5	7	4	4	6
		Stems per ACRE	688	688	850	647	647	2,630	567	567	688	445	445	1,255	445	445	567	607	607	931	486	486	526

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of Planted stems excluding live stakes
P-all: Number of planted stems including live stakes,
T: Total Stems

Table 9. Planted and Total Stem Counts
Devil's Racetrack Mitigation Site (DMS Project Code 95021)
Monitoring Year 6 - 2019

			Current Plot Data (MY6 2019)																				
			VP 8			VP 9			VP 10			VP 11			VP 12			VP 13			VP 14		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree			1			4						1			2			3			1
Alnus serrulata	hazel alder	Shrub																					
Baccharis halimifolia	eastern baccharis	Shrub			1																		
Betula nigra	river birch	Tree	2	2	2	2	2	2	1	1	1	2	2	2	1	1	1	2	2	2			
Cephalanthus occidentalis	common buttonbush	Shrub																					
Fraxinus pennsylvanica	green ash	Tree	4	4	4	1	1	1	3	3	3	5	5	5	4	4	4				2	2	2
Ligustrum sinense	Chinese privet	Exotic															2			1			
Liquidambar styraciflua	sweetgum	Tree															7			2			15
Liriodendron tulipifera	tuliptree	Tree																					
Mimosa	sensitive plant	Exotic																					
Morella cerifera	wax myrtle	Shrub																					
Nyssa biflora	swamp tupelo	Tree				1	1	1										1	1	1			
Nyssa sylvatica	blackgum	Tree												6									
Pinus	pine	Tree			34			4						17			2						
Platanus occidentalis	American sycamore	Tree	1	1	1	5	5	6	5	5	6	2	2	2	5	5	5	3	3	3	3	3	3
Prunus serotina	black cherry	Tree																					
Pyrus calleryana	Callery pear	Exotic			2																		
Quercus laurifolia	laurel oak	Tree																					
Quercus michauxii	swamp chestnut oak	Tree																1	1	1			
Quercus pagoda	cherrybark oak	Tree	1	1	1																		
Quercus phellos	willow oak	Tree				2	2	2							4	4	4	4	4	4			5
Quercus rubra	northern red oak	Tree																					
Rhus copallinum	flameleaf sumac	Shrub																					
Salix nigra	black willow	Tree									1												
Salix sericea	silky willow	Shrub																					
Sambucus	elderberry	Shrub																					
Taxodium distichum	bald cypress	Tree	4	4	4	5	5	5	3	3	3	2	2	2	2	2	2	5	5	5	10	10	10
Ulmus	elm	Tree																					
Ulmus alata	winged elm	Tree																					
Ulmus americana	American elm	Tree																					
		Stem count	12	12	13	16	16	21	12	12	14	11	11	18	16	16	25	16	16	21	15	15	36
		size (ares)	1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	9	6	6	8	4	4	5	4	4	7	5	5	9	6	6	9	3	3	6
		Stems per ACRE	486	486	526	647	647	850	486	486	567	445	445	728	647	647	1,012	647	647	850	607	607	1,457

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of Planted stems excluding live stakes
P-all: Number of planted stems including live stakes,
T: Total Stems

Table 9. Planted and Total Stem Counts
Devil's Racetrack Mitigation Site (DMS Project Code 95021)
Monitoring Year 6 - 2019

			Current Plot Data (MY6 2019)																				
			VP 15			VP 16			VP 17			VP 18			VP 19			VP 20			VP 21		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree																					
Alnus serrulata	hazel alder	Shrub																					
Baccharis halimifolia	eastern baccharis	Shrub									3			1			1			8			
Betula nigra	river birch	Tree				6	6	6	2	2	2										3	3	3
Cephalanthus occidentalis	common buttonbush	Shrub																					
Fraxinus pennsylvanica	green ash	Tree	1	1	1	3	3	3	2	2	2	1	1	1	2	2	2				5	5	5
Ligustrum sinense	Chinese privet	Exotic																					
Liquidambar styraciflua	sweetgum	Tree			3			5			5			6			3			6			
Liriodendron tulipifera	tuliptree	Tree																					
Mimosa	sensitive plant	Exotic																					
Morella cerifera	wax myrtle	Shrub																					
Nyssa biflora	swamp tupelo	Tree				3	3	3				2	2	2	2	2	2	2	2	2			
Nyssa sylvatica	blackgum	Tree																					
Pinus	pine	Tree									3			1						2			1
Platanus occidentalis	American sycamore	Tree	4	4	4	1	1	1	1	1	1							4	4	4			
Prunus serotina	black cherry	Tree																					
Pyrus calleryana	Callery pear	Exotic																					
Quercus laurifolia	laurel oak	Tree																					
Quercus michauxii	swamp chestnut oak	Tree	2	2	2										5	5	5	1	1	1			
Quercus pagoda	cherrybark oak	Tree	1	1	1										1	1	1						
Quercus phellos	willow oak	Tree				1	1	1				4	4	4				1	1	1			
Quercus rubra	northern red oak	Tree							1	1	1												
Rhus copallinum	flameleaf sumac	Shrub																					4
Salix nigra	black willow	Tree			10																		
Salix sericea	silky willow	Shrub																					
Sambucus	elderberry	Shrub																					1
Taxodium distichum	bald cypress	Tree	7	7	7				10	10	10	5	5	5	4	4	4	7	7	7	5	5	5
Ulmus	elm	Tree																					
Ulmus alata	winged elm	Tree																					
Ulmus americana	American elm	Tree																					
		Stem count	15	15	28	14	14	19	16	16	21	12	12	18	14	14	17	15	15	21	13	13	18
		size (ares)	1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	7	5	5	6	5	5	8	4	4	7	5	5	7	5	5	8	3	3	6
		Stems per ACRE	607	607	1,133	567	567	769	647	647	850	486	486	728	567	567	688	607	607	850	526	526	728

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of Planted stems excluding live stakes
P-all: Number of planted stems including live stakes,
T: Total Stems

Table 9. Planted and Total Stem Counts
Devil's Racetrack Mitigation Site (DMS Project Code 95021)
Monitoring Year 6 - 2019

			Current Plot Data (MY6 2019)																				
			VP 22			VP 23			VP 24			VP 25			VP 26			VP 27			VP 28		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree						1															
Alnus serrulata	hazel alder	Shrub																					
Baccharis halimifolia	eastern baccharis	Shrub												2			2			4			
Betula nigra	river birch	Tree				2	2	2				2	2	2	2	2	2				2	2	2
Cephalanthus occidentalis	common buttonbush	Shrub																					
Fraxinus pennsylvanica	green ash	Tree	3	3	3				6	6	6	3	3	3	4	4	4	1	1	1	1	1	1
Ligustrum sinense	Chinese privet	Exotic																					3
Liquidambar styraciflua	sweetgum	Tree												1			1						
Liriodendron tulipifera	tuliptree	Tree																					
Mimosa	sensitive plant	Exotic																					
Morella cerifera	wax myrtle	Shrub																					
Nyssa biflora	swamp tupelo	Tree													1	1	1				2	2	2
Nyssa sylvatica	blackgum	Tree																					
Pinus	pine	Tree			1									8			1			6			
Platanus occidentalis	American sycamore	Tree	1	1	1	7	7	7	4	4	4	4	4	4	1	1	1	1	1	1	3	3	3
Prunus serotina	black cherry	Tree																					
Pyrus calleryana	Callery pear	Exotic																					
Quercus laurifolia	laurel oak	Tree																					
Quercus michauxii	swamp chestnut oak	Tree							2	2	2							4	4	4			
Quercus pagoda	cherrybark oak	Tree	3	3	3																		
Quercus phellos	willow oak	Tree	2	2	2	2	2	3	1	1	1							1	1	1	5	5	5
Quercus rubra	northern red oak	Tree																					
Rhus copallinum	flameleaf sumac	Shrub																					
Salix nigra	black willow	Tree						1						2									3
Salix sericea	silky willow	Shrub																					
Sambucus	elderberry	Shrub																					
Taxodium distichum	bald cypress	Tree	7	7	7	3	3	3	4	4	4	6	6	6	3	3	3	8	8	8	1	1	1
Ulmus	elm	Tree																					
Ulmus alata	winged elm	Tree																					
Ulmus americana	American elm	Tree																					
		Stem count	16	16	16	14	14	17	17	17	17	15	15	18	11	11	12	15	15	15	14	14	17
		size (ares)		1			1			1			1			1			1			1	
		size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02	
		Species count	5	5	6	4	4	6	5	5	5	4	4	8	5	5	8	5	5	7	6	6	8
		Stems per ACRE	647	647	647	567	567	688	688	688	688	607	607	728	445	445	486	607	607	607	567	567	688

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of Planted stems excluding live stakes
P-all: Number of planted stems including live stakes,
T: Total Stems

Table 9. Planted and Total Stem Counts
Devil's Racetrack Mitigation Site (DMS Project Code 95021)
Monitoring Year 6 - 2019

			Current Plot Data (MY6 2019)																					
			VP 29			VP 30			VP 31			VP 32			VP 33			VP 34			VP 35		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree															5						
Alnus serrulata	hazel alder	Shrub															1						
Baccharis halimifolia	eastern baccharis	Shrub												1						2			
Betula nigra	river birch	Tree	1	1	1	1	1	1	4	4	4				3	3	3	3	3	3	4	4	4
Cephalanthus occidentalis	common buttonbush	Shrub																					
Fraxinus pennsylvanica	green ash	Tree				1	1	1	1	1	1	7	7	8	2	2	2	2	2	2	2	2	2
Ligustrum sinense	Chinese privet	Exotic																		2			
Liquidambar styraciflua	sweetgum	Tree															8			3			
Liriodendron tulipifera	tuliptree	Tree																					
Mimosa	sensitive plant	Exotic																					
Morella cerifera	wax myrtle	Shrub																					
Nyssa biflora	swamp tupelo	Tree	2	2	2				2	2	2	1	1	1	2	2	2	4	4	4	3	3	3
Nyssa sylvatica	blackgum	Tree																					
Pinus	pine	Tree																		2			5
Platanus occidentalis	American sycamore	Tree	1	1	1				4	4	4	2	2	2	4	4	4	1	1	1	7	7	7
Prunus serotina	black cherry	Tree																					
Pyrus calleryana	Callery pear	Exotic																					
Quercus laurifolia	laurel oak	Tree												1									
Quercus michauxii	swamp chestnut oak	Tree	1	1	2																		
Quercus pagoda	cherrybark oak	Tree				7	7	7	2	2	2	2	2	2	1	1	1	4	4	4			
Quercus phellos	willow oak	Tree	1	1	1	4	4	4	1	1	1				2	2	2						
Quercus rubra	northern red oak	Tree																					
Rhus copallinum	flameleaf sumac	Shrub												5									
Salix nigra	black willow	Tree			1						3			2									
Salix sericea	silky willow	Shrub																					
Sambucus	elderberry	Shrub																					
Taxodium distichum	bald cypress	Tree	6	6	6	3	3	3	2	2	2	7	7	7	4	4	4	2	2	2	2	2	2
Ulmus	elm	Tree																					
Ulmus alata	winged elm	Tree																					
Ulmus americana	American elm	Tree																					
		Stem count	12	12	14	16	16	16	16	16	19	19	19	28	18	18	32	16	16	19	18	18	18
		size (ares)	1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	6	6	7	5	5	5	7	7	8	5	5	9	7	7	10	6	6	10	5	5	6
		Stems per ACRE	486	486	567	647	647	647	647	647	769	769	769	1,133	728	728	1,295	647	647	769	728	728	728

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of Planted stems excluding live stakes
P-all: Number of planted stems including live stakes,
T: Total Stems

Table 9. Planted and Total Stem Counts
Devil's Racetrack Mitigation Site (DMS Project Code 95021)
Monitoring Year 6 - 2019

			Current Plot Data (MY6 2019)																								
			VP 36			VP 37			VP 38			VP 39			VP 40			VP 41			VP 42			VP 43		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree												1								4			3
Alnus serrulata	hazel alder	Shrub																							
Baccharis halimifolia	eastern baccharis	Shrub																				3			
Betula nigra	river birch	Tree	4	4	4	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	2	2	2	3
Cephalanthus occidentalis	common buttonbush	Shrub																								
Fraxinus pennsylvanica	green ash	Tree	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2				4	4	4
Ligustrum sinense	Chinese privet	Exotic						1																		
Liquidambar styraciflua	sweetgum	Tree												1			1					3			2
Liriodendron tulipifera	tuliptree	Tree																								
Mimosa	sensitive plant	Exotic																								
Morella cerifera	wax myrtle	Shrub																								
Nyssa biflora	swamp tupelo	Tree	1	1	1	2	2	2										1	1	1	6	6	6	2	2	4
Nyssa sylvatica	blackgum	Tree																								
Pinus	pine	Tree			14						5			5			5			2						
Platanus occidentalis	American sycamore	Tree	2	2	2	2	2	2				6	6	6	5	5	5	3	3	3						
Prunus serotina	black cherry	Tree																								
Pyrus calleryana	Callery pear	Exotic																								
Quercus laurifolia	laurel oak	Tree																								
Quercus michauxii	swamp chestnut oak	Tree																								
Quercus pagoda	cherrybark oak	Tree	1	1	2										1	1	2						1			
Quercus phellos	willow oak	Tree	5	5	5	1	1	1				1	1	2	4	4	4	2	2	2	3	3	3			
Quercus rubra	northern red oak	Tree																								
Rhus copallinum	flameleaf sumac	Shrub																				1				
Salix nigra	black willow	Tree						1									2									
Salix sericea	silky willow	Shrub																								
Sambucus	elderberry	Shrub																								
Taxodium distichum	bald cypress	Tree	3	3	3	3	3	3	5	5	5	4	4	4	5	5	5	6	6	6	1	1	1	4	4	4
Ulmus	elm	Tree																								
Ulmus alata	winged elm	Tree			1																					
Ulmus americana	American elm	Tree																								
		Stem count	17	17	19	12	12	13	9	9	9	15	15	18	17	17	21	15	15	15	11	11	21	12	12	20
		size (ares)	1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	7	7	9	6	6	8	3	3	4	5	5	8	6	6	9	6	6	7	4	4	9	4	4	6
		Stems per ACRE	688	688	769	486	486	526	364	364	364	607	607	728	688	688	850	607	607	607	445	445	850	486	486	809

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of Planted stems excluding live stakes
P-all: Number of planted stems including live stakes,
T: Total Stems

Table 9. Planted and Total Stem Counts

Devil's Racetrack Mitigation Site (DMS Project Code 95021)

Monitoring Year 6 - 2019

			Current Plot Data (MY6 2019)																								
			VP 44			VP 45			VP 46			VP 47			VP 48			VP 49			VP 50			VP 51		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree																									
Alnus serrulata	hazel alder	Shrub																									
Baccharis halimifolia	eastern baccharis	Shrub												1													1
Betula nigra	river birch	Tree	1	1	1	2	2	2	4	4	4						1	2	2	2	5	5	5	3	3	4
Cephalanthus occidentalis	common buttonbush	Shrub																									
Fraxinus pennsylvanica	green ash	Tree	3	3	3	1	1	1			1	3	3	3	6	6	6				3	3	4	1	1	2
Ligustrum sinense	Chinese privet	Exotic																									
Liquidambar styraciflua	sweetgum	Tree						3						2													
Liriodendron tulipifera	tuliptree	Tree													2	2	2				2	2	2				
Mimosa	sensitive plant	Exotic																									
Morella cerifera	wax myrtle	Shrub																									
Nyssa biflora	swamp tupelo	Tree	7	7	8			2																			
Nyssa sylvatica	blackgum	Tree																									
Pinus	pine	Tree						13			14																
Platanus occidentalis	American sycamore	Tree																			2	2	2	4	4	5
Prunus serotina	black cherry	Tree																									
Pyrus calleryana	Callery pear	Exotic			1																						
Quercus laurifolia	laurel oak	Tree																									
Quercus michauxii	swamp chestnut oak	Tree																									
Quercus pagoda	cherrybark oak	Tree							2	2	2	2	2	2	4	4	5			1	2	2	4	4	4	6
Quercus phellos	willow oak	Tree	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	1	1	1	1	1	1
Quercus rubra	northern red oak	Tree																									
Rhus copallinum	flameleaf sumac	Shrub						3															6			2
Salix nigra	black willow	Tree																									
Salix sericea	silky willow	Shrub																									
Sambucus	elderberry	Shrub																									
Taxodium distichum	bald cypress	Tree				6	6	6	1	1	1							1	1	1							
Ulmus	elm	Tree																									
Ulmus alata	winged elm	Tree																									
Ulmus americana	American elm	Tree																									
		Stem count	12	12	13	11	11	19	9	9	10	7	7	9	13	13	15	4	4	6	15	15	24	13	13	20
		size (ares)	1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	4	4	5	4	4	8	4	4	6	3	3	5	4	4	5	3	3	4	6	6	7	5	5	7
		Stems per ACRE	486	486	526	445	445	769	364	364	405	283	283	364	526	526	607	162	162	243	607	607	971	526	526	809

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Volunteer species included in total

PnoLS: Number of Planted stems excluding live stakes

P-all: Number of planted stems including live stakes,

T: Total Stems

Table 9. Planted and Total Stem Counts
Devil's Racetrack Mitigation Site (DMS Project Code 95021)
Monitoring Year 6 - 2019

			Annual Means																				
			MY6 (2019)			MY5 (2018)			MY4 (2017)			MY3 (2016)			MY2 (2015)			MY1 (2014)			MY0 (2014)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree			27			25			8			3			2						
Alnus serrulata	hazel alder	Shrub			1						3			4									
Baccharis halimifolia	eastern baccharis	Shrub			34			28						32									
Betula nigra	river birch	Tree	97	97	101	91	91	91	98	98	98	102	102	102	104	104	104	106	106	106	106	106	106
Cephalanthus occidentalis	common buttonbush	Shrub															2						
Fraxinus pennsylvanica	green ash	Tree	113	113	117	114	114	115	117	117	118	119	119	119	123	123	125	124	124	124	126	126	126
Ligustrum sinense	Chinese privet	Exotic			9			2															
Liquidambar styraciflua	sweetgum	Tree			160			132			135			184			86						
Liriodendron tulipifera	tuliptree	Tree	7	7	7	8	8	10	13	13	13	13	13	13	14	14	14	25	25	25	20	20	20
Mimosa	sensitive plant	Exotic			1			4															
Morella cerifera	wax myrtle	Shrub						3															
Nyssa biflora	swamp tupelo	Tree	48	48	54	48	48	49	53	53	54	54	54	54	59	59	59	64	64	64	60	60	60
Nyssa sylvatica	blackgum	Tree	6	6	12	6	6	11	7	7	9	8	8	8	8	8	8	9	9	9	10	10	10
Pinus	pine	Tree			159			73			232												
Platanus occidentalis	American sycamore	Tree	111	111	116	111	111	115	117	117	118	123	123	126	128	128	128	124	124	124	124	124	124
Prunus serotina	black cherry	Tree						1															
Pyrus calleryana	Callery pear	Exotic			3																		
Quercus laurifolia	laurel oak	Tree			1																		
Quercus michauxii	swamp chestnut oak	Tree	23	23	24	25	25	28	57	57	57	60	60	60	77	77	77	91	91	91	108	108	108
Quercus pagoda	cherrybark oak	Tree	40	40	49	44	44	45	12	12	13	12	12	12	12	12	12	14	14	14			
Quercus phellos	willow oak	Tree	70	70	79	66	66	68	71	71	79	77	77	79	97	97	97	104	104	104	125	125	125
Quercus rubra	northern red oak	Tree	1	1	1	1	1	2	1	1	4	1	1	7	1	1	3						
Rhus copallinum	flameleaf sumac	Shrub			21						2												
Salix nigra	black willow	Tree			26			21			38			13									
Salix sericea	silky willow	Shrub															3						
Sambucus	elderberry	Shrub			1																		
Taxodium distichum	bald cypress	Tree	186	186	186	185	185	185	186	186	186	189	189	189	190	190	190	189	189	189	206	206	206
Ulmus	elm	Tree						8															
Ulmus alata	winged elm	Tree			1																		
Ulmus americana	American elm	Tree						1															
		Stem count	702	702	984	699	699	910	732	732	935	758	758	973	813	813	910	850	850	850	885	885	885
		size (ares)	51			51			51			51			51			51			51		
		size (ACRES)	1.26			1.26			1.26			1.26			1.26			1.26			1.26		
		Species count	11	11	24	11	11	22	11	11	17	11	11	16	11	11	15	10	10	10	9	9	9
		Stems per ACRE	557	557	781	555	555	722	581	581	742	601	601	772	645	645	722	674	674	674	702	702	702

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of Planted stems excluding live stakes
P-all: Number of planted stems including live stakes,
T: Total Stems

APPENDIX 4. Morphological Summary Data and Plots

Table 10a. Baseline Stream Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Devils Racetrack- West

		Pre-Restoration Condition		Reference Reach Data										Design				As-Built/Baseline			
Parameter	**Gage**	**Devil's Racetrack - West**		**Scout West 1**		**Scout East 2**		**Scout West 2**		**Johanna Creek**		**Jarman Oak**		**Devil's Racetrack - West (Reach 1)**		**Devil's Racetrack - West (Reach 2)**		**Devil's Racetrack - West (Reach 1)**		**Devil's Racetrack - West (Reach 2)**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Shallow																					
Bankfull Width (ft)		4.8	8.0	2.6	6.3	4.7	6.1	5.6	7.6	9.7		9.3		9.0		11.5		4.7	9.6	7.7	
Floodprone Width (ft)		7.8	18.0	>20		>50		>50		>75		>150		100	300	100	300	>200		>200	
Bankfull Mean Depth		0.8	1.2	0.3	0.5	1.1	1.3	0.7	1.0	0.8		1.2		0.6		0.8		0.4	0.9	0.5	
Bankfull Max Depth		1.3	1.6	0.5	0.7	1.7	1.8	1.2	1.3	1.1		2.3		0.9	1.1	1.1	1.5	1.1	1.4	0.7	
Bankfull Cross Sectional Area (ft^2)	N/A	5.7	6.3	1.3	2.0	6.0	6.9	5.3	5.4	7.2	7.8	11.6		5.8		9.5		2.1	8.5	4.0	
Width/Depth Ratio		4.0	10.5	5.4	19.4	3.6	5.4	5.7	11.0	10.1	19.7	7.4		14.0	14.5	14.0		10.6	14.8	14.5	
Entrenchment Ratio		1.6	2.2	>2.2		>2.2		>2.2		8.0	9.6	16.1	26.9	11.1	33.3	8.7	26.1	>20.9	>42.5	>26.1	
Bank Height Ratio		1.9	4.5	1.1	1.3	1.0		1.1	1.2	1.0		1.0		1.0	1.1	1.0	1.1	1.0		1.0	
D50 (mm)		0.464																N/A		N/A	
Profile																					
Shallow Length (ft)				---		---		---		---		---		---		---		3.7	86.8	7.4	54.2
Shallow Slope (ft/ft)		---		0.026	0.047	N/A		0.033	0.051	N/A		0.0129		0.0036	0.0277	0.0023	0.0072	0.0013	0.0593	0.0008	0.0195
Pool Length (ft)	N/A			---		---		---		---		---		---		---		5.5	63.1	18.7	72.9
Pool Max Depth (ft)		1.2		0.6		N/A		1.7	1.9	1.5		3.1		0.9	2.1	1.1	2.5	1.1	2.9	1.4	1.9
Pool Spacing (ft)		---		27	67	N/A		21	27	16	59	32	55	14	63	18	81	9	132	38	104
Pool Volume (ft^3)																					
Pattern																					
Channel Beltwidth (ft)		---		8.7	14.3	7.2	16.2	9.1	9.8	14.0	20.0	21.0	36.0	12.0	72.0	15.0	92.0	13.0	53.0	16.0	73.0
Radius of Curvature (ft)		---		3.1	9.0	5.5	16.0	5.4	6.8	15.0	27.0	13.7	18.6	14.0	43.0	17.0	55.0	12.0	40.0	17.0	35.0
Rc:Bankfull Width (ft/ft)	N/A	---		0.6	1.6	1.0	3.0	0.8	1.0	1.5	2.8	1.5	2.0	1.5	4.8	1.5	4.8	2.6	4.2	2.2	4.5
Meander Length (ft)		---		39.8	84.8	36.5	63.2	32.5	36.9	50.0		N/A		27	153	35	196	52	133	70	137
Meander Width Ratio		---		1.6	2.6	1.3	3.0	1.4	1.5	1.4	2.1	2.3	2.9	1.3	8.0	1.3	8.0	2.8	5.5	2.1	9.5
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%																					
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100	N/A	0.168/0.33/0.464/1.23/2.0/9.6		---		---		---		---		---						N/A		N/A	
Reach Shear Stress (Competency) lb/ft^2		0.18	0.23											---		---		N/A		N/A	
Max part size (mm) mobilized at bankfull																					
Stream Power (Capacity) W/m^2																					
Additional Reach Parameters																					
Drainage Area (SM)		0.77		0.06		0.67		0.34		0.90		1.27		0.60		0.70		0.60		0.70	
Watershed Impervious Cover Estimate (%)		<1%		---		---		---		---		---		<1%		<1%		<1%		<1%	
Rosgen Classification		Gc5		E/C5b		E5		E5		E5/C5		E6		E/C5		E/C5		E/C5		C	
Bankfull Velocity (fps)		1.5	1.8	1.3	2.0	2.5	2.9	1.2	1.2	1.8	1.9	0.95		1.7		1.2		1.2	4.8	3.3	
Bankfull Discharge (cfs)		9.2	10.6	2.6		17.5		6.4		14.0		11.0		10.0		13.0		10.0		13.0	
Q-NFF regression		---																			
Q-USGS extrapolation	N/A	---																			
Q-Mannings		---																			
Valley Length (ft)		---		---		---		---		---		---		---		---					
Channel Thalweg Length (ft)		4,976		---		---		---		---		---		4,245		966		4,239		962	
Sinuosity		1.0		1.1		1.2		1.2		1.2		1.4		1.2	1.6	1.2	1.6	1.2		1.4	
Water Surface Slope $(ft/ft)^2$		---		---		---		---		---		---		---		---		0.0054		0.0015	
Bankfull Slope (ft/ft)		0.0041		0.0260		0.0170		0.0040		0.0022		0.0040		0.0025	0.0087	0.0016	0.0022	0.0053	0.0054	0.0017	0.0023

(---): Data was not provided
N/A: Not Applicable

Table 10b. Baseline Stream Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Devils Racetrack- East

		Pre-Restoration Condition		Reference Reach Data										Design						As-Built/Baseline					
Parameter	**Gage**	**Devil's Racetrack - East**		**Scout West 1**		**Scout East 2**		**Scout West 2**		**Johanna Creek**		**Jarman Oak**		**Devil's Racetrack - East (Reach 1)**		**Devil's Racetrack - East (Reach 2)**		**Devil's Racetrack - East (Reach 3)**		**Devil's Racetrack - East (Reach 1)**		**Devil's Racetrack - East (Reach 2)**		**Devil's Racetrack - East (Reach 3)**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Shallow																									
Bankfull Width (ft)		8.1	10.4	2.6	6.3	4.7	6.1	5.6	7.6	9.7		9.3		13.0		8.0		8.0		12.2	13.7	8.2		---	
Floodprone Width (ft)		14.2	18.6	>20		>50		>50		>75		>150		100	500	100	500	100	500	>300		>300		---	
Bankfull Mean Depth		1.0	1.8	0.3	0.5	1.1	1.3	0.7	1.0	0.8		1.2		1.0		0.6		---		0.8	1.1	0.7		---	
Bankfull Max Depth		2.1	2.8	0.5	0.7	1.7	1.8	1.2	1.3	1.1		2.3		1.4	1.8	0.8	1.0	0.9		1.3	1.7	1.1		---	
Bankfull Cross Sectional Area (ft^2)	N/A	14.2	19.1	1.3	2.0	6.0	6.9	5.3	5.4	7.2	7.8	11.6		12.8		4.8		---		10.3	13.9	5.7		---	
Width/Depth Ratio		5.0	7.8	5.4	19.4	3.6	5.4	5.7	11.0	10.1	19.7	7.4		13.0	13.5	14.0	14.5	---		12.1	14.6	11.9		---	
Entrenchment Ratio		1.6	1.8	>2.2		>2.2		>2.2		8.0	9.6	16.1	26.9	7.7	38.5	12.5	62.6	---		>21.9	>24.5	>36.5		---	
Bank Height Ratio		2.6	4.3	1.1	1.3	1.0		1.1	1.2	1.0		1.0		1.0	1.1	1.0	1.1	---		1.0		1.0		---	
D50 (mm)		0.179																		N/A		N/A		---	
Profile																									
Shallow Length (ft)				---		---		---		---		---		---		---		---		13.0	80.1	20.8	42.4	11.3	25.9
Shallow Slope (ft/ft)		---		0.026	0.047	N/A		0.033	0.051	N/A		0.0129		0.0007	0.0025	0.0377	0.0671	---		0.0004	0.0099	0.0192	0.0318	0.0072	0.0675
Pool Length (ft)	N/A			---		---		---		---		---		---		---		---		16.0	77.3	16.5	66.1	13.0	34.2
Pool Max Depth (ft)		---		0.6		N/A		1.7	1.9	1.5		3.1		1.4	3.2	0.8	2.0	1.2		1.9	3.4	1.7	2.7	1.4	2.5
Pool Spacing (ft)		---		27	67	N/A		21	27	16	59	32	55	21	91	39	64	---		26	131	43	73	25	70
Pool Volume (ft^3)																									
Pattern																									
Channel Beltwidth (ft)		---		8.7	14.3	7.2	16.2	9.1	9.8	14.0	20.0	21.0	36.0	17.0	65.0	10.0	40.0	---		15.0	55.0	21	41	12	32
Radius of Curvature (ft)		---		3.1	9.0	5.5	16.0	5.4	6.8	15.0	27.0	13.7	18.6	20.0	62.0	12.0	36.0	---		18.0	65.0	12	26	10	35
Rc:Bankfull Width (ft/ft)	N/A	---		0.6	1.6	1.0	3.0	0.8	1.0	1.5	2.8	1.5	2.0	1.5	4.8	1.5	4.5	---		1.5	4.7	1.5	3.2	---	
Meander Length (ft)		---		39.8	84.8	36.5	63.2	32.5	36.9	50.0		N/A		39	221	64	136	---		62	203	101	140	52	112
Meander Width Ratio		---		1.6	2.6	1.3	3.0	1.4	1.5	1.4	2.1	2.3	2.9	1.3	5.0	1.3	5.0	---		1.2	4.0	2.6	5.0	---	
Substrate, Bed and Transport Parameters																									
Ri%/Ru%/P%/G%/S%																									
SC%/Sa%/G%/C%/B%/Be%																									
d16/d35/d50/d84/d95/d100	N/A	-/-/0.179/0.642/1.0/9.6		---		---		---		---		---								N/A		N/A		N/A	
Reach Shear Stress (Competency) lb/ft^2		0.01												---		---		---		N/A		N/A		N/A	
Max part size (mm) mobilized at bankfull																									
Stream Power (Capacity) W/m^2																									
Additional Reach Parameters																									
Drainage Area (SM)		1.30		0.06		0.67		0.34		0.90		1.27		1.14		1.30		---		1.14		1.30		---	
Watershed Impervious Cover Estimate (%)		<1%		---		---		---		---		---		<1%		<1%		<1%		<1%		<1%		<1%	
Rosgen Classification		Gc5		E/C5b		E5		E5		E5/C5		E6		E/C5		E/C5		E/C5		C		C		---	
Bankfull Velocity (fps)		0.3	0.4	1.3	2.0	2.5	2.9	1.2	1.2	1.8	1.9	0.95		1.2		3.5		---		1.2	1.6	3.0		---	
Bankfull Discharge (cfs)		8.5		2.6		17.5		6.4		14.0		11.0		16.0		17.0		---		16.0		17.0		---	
Q-NFF regression		---																							
Q-USGS extrapolation	N/A	---																							
Q-Mannings		---																							
Valley Length (ft)		---		---		---		---		---		---		---		---		---							
Channel Thalweg Length (ft)		4,844		---		---		---		---		---		4,840		313		385		4,833		310		372	
Sinuosity		1.0		1.1		1.2		1.2		1.2		1.4		1.1	1.3	1.1	1.2	---		1.1		1.1		1.1	
Water Surface Slope $(ft/ft)^2$		---		---		---		---		---		---		---		---		---		---		---		---	
Bankfull Slope (ft/ft)		0.0003		0.0260		0.0170		0.0040		0.0022		0.0040		0.0004	0.0008	0.0224	0.0251	---		0.0007	0.0008	0.0153	0.0166	0.0219	0.0231

(---): Data was not provided
N/A: Not Applicable

Table 10c. Baseline Stream Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Southeast Branch

		Pre-Restoration Condition		Reference Reach Data										Design						As-Built/Baseline					
Parameter	**Gage**	**Southeast Branch**		**Scout West 1**		**Scout East 2**		**Scout West 2**		**Johanna Creek**		**Jarman Oak**		**Southeast Branch (Reach 1)**		**Southeast Branch (Reach 2)**		**Southeast Branch (Reach 3)**		**Southeast Branch (Reach 1)**		**Southeast Branch (Reach 2)**		**Southeast Branch (Reach 3)**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Shallow																									
Bankfull Width (ft)		2.7	5.7	2.6	6.3	4.7	6.1	5.6	7.6	9.7		9.3		3.0		4.0		5.4		3.0		3.8		5.3	
Floodprone Width (ft)		8.6	11.4	>20		>50		>50		>75		>150		25	35	50	70	100	300	>30		>60		>200	
Bankfull Mean Depth		0.2	0.4	0.3	0.5	1.1	1.3	0.7	1.0	0.8		1.2		0.5		0.6		1.0		0.3		0.4		0.4	
Bankfull Max Depth		0.4	1.4	0.5	0.7	1.7	1.8	1.2	1.3	1.1		2.3		0.4	0.6	0.5	0.7	0.8	1.2	0.5		0.5		0.6	
Bankfull Cross Sectional Area (ft^2)	N/A	1.1	1.4	1.3	2.0	6.0	6.9	5.3	5.4	7.2	7.8	11.6		1.0		1.5		2.5		0.8		1.3		2.1	
Width/Depth Ratio		6.8	24.3	5.4	19.4	3.6	5.4	5.7	11.0	10.1	19.7	7.4		9.0	10.0	10.0	12.0	11.0	12.0	11.4		10.8		13.8	
Entrenchment Ratio		1.5	4.2	>2.2		>2.2		>2.2		8.0	9.6	16.1	26.9	8.3	11.7	12.5	17.5	18.5	55.6	>9.9		>15.8		>37.5	
Bank Height Ratio		2.2	6.0	1.1	1.3	1.0		1.1	1.2	1.0		1.0		1.0	1.1	1.0	1.1	1.0	1.2	1.0		1.0		1.0	
D50 (mm)		0.409																		N/A		N/A		N/A	
Profile																									
Shallow Length (ft)				---		---		---		---		---		---		---		---		2.1	64.4	3.4	144.4	6.0	47.3
Shallow Slope (ft/ft)		---		0.026	0.047	N/A		0.033	0.051	N/A		0.0129		0.0162	0.0681	0.0144	0.0384	0.0035	0.0285	0.0010	0.0803	0.0021	0.0272	0.0005	0.0168
Pool Length (ft)				---		---		---		---		---		---		---		---		2.1	36.7	3.1	33.6	3.2	61.3
Pool Max Depth (ft)	N/A	0.4		0.6		N/A		1.7	1.9	1.5		3.1		0.5	1.1	0.4	1.2	0.5	1.5	0.7	1.5	0.5	1.0	0.5	1.1
Pool Spacing (ft)		---		27	67	N/A		21	27	16	59	32	55	15	24	20	32	9	38	4	76	8	90	14	52
Pool Volume (ft^3)																									
Pattern																									
Channel Beltwidth (ft)		---		8.7	14.3	7.2	16.2	9.1	9.8	14.0	20.0	21.0	36.0	4.0	9.0	5.0	12.0	7.0	43.0	5.3	11.2	6.8	14.3	12.7	32.8
Radius of Curvature (ft)		---		3.1	9.0	5.5	16.0	5.4	6.8	15.0	27.0	13.7	18.6	5.0	14.0	6.0	18.0	8.0	26.0	5.0	23.5	10.0	25.6	10.4	29.5
Rc:Bankfull Width (ft/ft)	N/A	---		0.6	1.6	1.0	3.0	0.8	1.0	1.5	2.8	1.5	2.0	1.5	4.5	1.5	4.5	1.5	4.8	1.7	7.8	2.6	6.7	2.0	5.6
Meander Length (ft)		---		39.8	84.8	36.5	63.2	32.5	36.9	50.0		N/A		24	51	32	68	16	92	22	63	33	70	32	74
Meander Width Ratio		---		1.6	2.6	1.3	3.0	1.4	1.5	1.4	2.1	2.3	2.9	1.3	3.0	1.3	3.0	1.3	8.0	1.8	3.7	1.8	3.8	2.4	6.2
Substrate, Bed and Transport Parameters																									
Ri%/Ru%/P%/G%/S%																									
SC%/Sa%/G%/C%/B%/Be%																									
d16/d35/d50/d84/d95/d100	N/A	0.08/0.28/0.41/0.94/1.6/9.6		---		---		---		---		---										N/A		N/A	
Reach Shear Stress (Competency) lb/ft^2		0.51												---		---		---		N/A		N/A		N/A	
Max part size (mm) mobilized at bankfull																									
Stream Power (Capacity) W/m^2																									
Additional Reach Parameters																									
Drainage Area (SM)		0.19		0.06		0.67		0.34		0.90		1.27		0.03		0.07		0.10		0.03		0.07		0.10	
Watershed Impervious Cover Estimate (%)		<1%		---		---		---		---		---		<1%		<1%		<1%		<1%		<1%		<1%	
Rosgen Classification		G/F5		E/C5b		E5		E5		E5/C5		E6		---		---		E/C5		E/C5		E/C5		E/C5	
Bankfull Velocity (fps)		2.2		1.3	2.0	2.5	2.9	1.2	1.2	1.8	1.9	0.95		1.7		1.4		1.4		1.9		1.5		1.4	
Bankfull Discharge (cfs)		2.4		2.6		17.5		6.4		14.0		11.0		1.5		2.0		3.0		1.5		2.0		3.0	
Q-NFF regression		---																							
Q-USGS extrapolation	N/A	---																							
Q-Mannings		---																							
Valley Length (ft)		---		---		---		---		---		---		---		---		---							
Channel Thalweg Length (ft)		2,976		---		---		---		---		---		1,559		716		617		1,559		713		616	
Sinuosity		1.0		1.1		1.2		1.2		1.2		1.4		1.1	1.2	1.1	1.2	1.2	1.6	1.6		1.1		1.3	
Water Surface Slope ($ft/ft)^2$		---		---		---		---		---		---		---		---		---		0.0221		0.0174		0.0030	
Bankfull Slope (ft/ft)		0.0230		0.0260		0.0170		0.0040		0.0022		0.0040		0.0108	0.0227	0.0096	0.0128	0.0025	0.0089	0.0222		0.0015	0.0119	0.0028	0.0030

(---): Data was not provided
N/A: Not Applicable

Table 10d. Baseline Stream Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Middle Branch

		Pre-Restoration Condition		Reference Reach Data										Design				As-Built/Baseline			
Parameter	**Gage**	**Middle Branch**		**Scout West 1**		**Scout East 2**		**Scout West 2**		**Johanna Creek**		**Jarman Oak**		**Middle Branch (Reach 1)**		**Middle Branch (Reach 2)**		**Middle Branch (Reach 1)**		**Middle Branch (Reach 2)**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Shallow																					
Bankfull Width (ft)		1.8	2.3	2.6	6.3	4.7	6.1	5.6	7.6	9.7		9.3		3.0		4.0		2.2		3.4	
Floodprone Width (ft)		4.6	6.8	>20		>50		>50		>75		>150		40	60	100	300	>50		>200	
Bankfull Mean Depth		0.2	0.3	0.3	0.5	1.1	1.3	0.7	1.0	0.8		1.2		0.3		0.3		0.3		0.3	
Bankfull Max Depth		0.3	0.6	0.5	0.7	1.7	1.8	1.2	1.3	1.1		2.3		0.4	0.5	0.5	0.6	0.5		0.5	
Bankfull Cross Sectional Area (ft^2)	N/A	0.4	0.5	1.3	2.0	6.0	6.9	5.3	5.4	7.2	7.8	11.6		0.9		1.5		0.7		1.1	
Width/Depth Ratio		6.9	12.0	5.4	19.4	3.6	5.4	5.7	11.0	10.1	19.7	7.4		10.0	10.5	10.0	12.0	6.7		10.1	
Entrenchment Ratio		2.0	3.8	>2.2		>2.2		>2.2		8.0	9.6	16.1	26.9	33.3	100.0	22.2	66.7	>22.9		>58.8	
Bank Height Ratio		5.3	6.5	1.1	1.3	1.0		1.1	1.2	1.0		1.0		1.0	1.1	1.0	1.1	1.0		1.0	
D50 (mm)		0.083																N/A		N/A	
Profile																					
Shallow Length (ft)				---		---		---		---		---		---		---		2.5	46.6	7.9	16.1
Shallow Slope (ft/ft)		---		0.026	0.047	N/A		0.033	0.051	N/A		0.0129		0.0144	0.0489	0.0002	0.0074	0.0008	0.0492	0.0059	0.0236
Pool Length (ft)	N/A			---		---		---		---		---		---		---		2.9	17.3	11.2	19.8
Pool Max Depth (ft)		---		0.6		N/A		1.7	1.9	1.5		3.1		0.4	1.0	0.5	1.0	0.5	1.2	0.6	0.9
Pool Spacing (ft)		---		27	67	N/A		21	27	16	59	32	55	15	24	5	22	8	56	18	24
Pool Volume (ft^3)																					
Pattern																					
Channel Beltwidth (ft)		---		8.7	14.3	7.2	16.2	9.1	9.8	14.0	20.0	21.0	36.0	4.0	9.0	6.0	36.0	4.1	9.4	6.7	20.9
Radius of Curvature (ft)		---		3.1	9.0	5.5	16.0	5.4	6.8	15.0	27.0	13.7	18.6	5.0	14.0	7.0	22.0	7.0	23.9	9.2	23.5
Rc:Bankfull Width (ft/ft)	N/A	---		0.6	1.6	1.0	3.0	0.8	1.0	1.5	2.8	1.5	2.0	1.7	4.5	1.5	4.8	3.2	10.9	2.7	6.9
Meander Length (ft)		---		39.8	84.8	36.5	63.2	32.5	36.9	50.0		N/A		24	51	14	77	23	44	32	57
Meander Width Ratio		---		1.6	2.6	1.3	3.0	1.4	1.5	1.4	2.1	2.3	2.9	1.3	3.0	1.3	8.0	2.2	4.3	2.0	6.1
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%																					
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100	N/A	-/-/0.083/0.498/0.9/9.6		---		---		---		---		---						N/A		N/A	
Reach Shear Stress (Competency) lb/ft^2		0.24	0.27											---		---		N/A		N/A	
Max part size (mm) mobilized at bankfull																					
Stream Power (Capacity) W/m^2																					
Additional Reach Parameters																					
Drainage Area (SM)		0.02		0.06		0.67		0.34		0.90		1.27		0.01		0.01		0.01		0.01	
Watershed Impervious Cover Estimate (%)		<1%		---		---		---		---		---		<1%		<1%		<1%		<1%	
Rosgen Classification		G5		E/C5b		E5		E5		E5/C5		E6		N/A		E/C5		E/C5		E/C5	
Bankfull Velocity (fps)		1.4	1.5	1.3	2.0	2.5	2.9	1.2	1.2	1.8	1.9	0.95		1.3		0.8		1.4		0.9	
Bankfull Discharge (cfs)		0.6	0.7	2.6		17.5		6.4		14.0		11.0		1.0		1.0		1.0		1.0	
Q-NFF regression		---																			
Q-USGS extrapolation	N/A	---																			
Q-Mannings		---																			
Valley Length (ft)		---		---		---		---		---		---		---		---		985			
Channel Thalweg Length (ft)		1,736		---		---		---		---		---		1,060		436		1,058		432	
Sinuosity		1.0		1.1		1.2		1.2		1.2		1.4		1.1	1.2	1.2	1.5	1.1		1.2	
Water Surface Slope $(ft/ft)^2$		---		---		---		---		---		---		---		---		0.0145		0.0064	
Bankfull Slope (ft/ft)		0.0240		0.0260		0.0170		0.0040		0.0022		0.0040		0.0096	0.0163	0.0024	0.0077	0.0148		0.0024	0.0066

(---): Data was not provided
N/A: Not Applicable

Table 10e. Baseline Stream Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Southwest Branch

		Pre-Restoration Condition		Reference Reach Data										Design				As-Built/Baseline			
Parameter	**Gage**	**Southwest Branch**		**Scout West 1**		**Scout East 2**		**Scout West 2**		**Johanna Creek**		**Jarman Oak**		**Southwest Branch (Reaches 1 - 3)**		**Southwest Branch (Reach 4)**		**Southwest Branch (Reaches 1 - 3)**		**Southwest Branch (Reach 4)**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Shallow																					
Bankfull Width (ft)		2.8	3.4	2.6	6.3	4.7	6.1	5.6	7.6	9.7		9.3		3.0		3.3		---		2.4	
Floodprone Width (ft)		4.9	6.2	>20		>50		>50		>75		>150		40	60	100	300	---		>200	
Bankfull Mean Depth		0.2	0.3	0.3	0.5	1.1	1.3	0.7	1.0	0.8		1.2		0.3		0.3		---		0.3	
Bankfull Max Depth		0.3	0.9	0.5	0.7	1.7	1.8	1.2	1.3	1.1		2.3		0.5	0.6	0.4	0.5	---		0.4	
Bankfull Cross Sectional Area (ft^2)	N/A	0.8	0.9	1.3	2.0	6.0	6.9	5.3	5.4	7.2	7.8	11.6		1.0		1.0		---		0.6	
Width/Depth Ratio		10.0	14.0	5.4	19.4	3.6	5.4	5.7	11.0	10.1	19.7	7.4		9.0	10.0	10.0	12.0	---		9.7	
Entrenchment Ratio		1.5	1.9	>2.2		>2.2		>2.2		8.0	9.6	16.1	26.9	13.3	20.0	30.3	90.9	---		82.3	
Bank Height Ratio		10.0	10.7	1.1	1.3	1.0		1.1	1.2	1.0		1.0		1.0	1.1	1.0	1.1	---		1.0	
D50 (mm)		0.105																---		N/A	
Profile																					
Shallow Length (ft)				---		---		---		---		---		---		---		3.8	51.6	8.3	44.1
Shallow Slope (ft/ft)		---		0.026	0.047	N/A		0.033	0.051	N/A		0.0129		0.0257	0.0648	0.0109	0.0308	0.0015	0.0339	0.0032	0.0228
Pool Length (ft)	N/A			---		---		---		---		---		---		---		1.7	19.9	4.3	23.4
Pool Max Depth (ft)		---		0.6		N/A		1.7	1.9	1.5		3.1		0.5	1.1	0.4	1.0	0.3	1.2	0.6	1.4
Pool Spacing (ft)		---		27	67	N/A		21	27	16	59	32	55	15	24	5	23	8	53	12	51
Pool Volume (ft^3)																					
Pattern																					
Channel Beltwidth (ft)		---		8.7	14.3	7.2	16.2	9.1	9.8	14.0	20.0	21.0	36.0	4.0	9.0	4.0	26.0	3.9	10.2	5.2	18.9
Radius of Curvature (ft)		---		3.1	9.0	5.5	16.0	5.4	6.8	15.0	27.0	13.7	18.6	5.0	14.0	5.0	16.0	10.0	19.0	7.4	20.3
Rc:Bankfull Width (ft/ft)	N/A	---		0.6	1.6	1.0	3.0	0.8	1.0	1.5	2.8	1.5	2.0	1.7	4.5	1.5	4.8	---		3.1	8.5
Meander Length (ft)		---		39.8	84.8	36.5	63.2	32.5	36.9	50.0		N/A		24	51	10	56	27	50	28	54
Meander Width Ratio		---		1.6	2.6	1.3	3.0	1.4	1.5	1.4	2.1	2.3	2.9	1.3	3.0	1.3	8.0	---		2.2	7.9
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%																					
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100	N/A	-/0.065/0.105/0.336/0.4/9.6		---		---		---		---		---						N/A		N/A	
Reach Shear Stress (Competency) lb/ft^2		0.37	0.42											---		---		N/A		N/A	
Max part size (mm) mobilized at bankfull																					
Stream Power (Capacity) W/m^2																					
Additional Reach Parameters																					
Drainage Area (SM)		0.03		0.06		0.67		0.34		0.90		1.27		0.02		0.02		0.02		0.02	
Watershed Impervious Cover Estimate (%)		<1%		---		---		---		---		---		<1%		<1%		<1%		<1%	
Rosgen Classification		G5		E/C5b		E5		E5		E5/C5		E6		NA		E/C5		N/A		E/C5	
Bankfull Velocity (fps)		1.8	1.9	1.3	2.0	2.5	2.9	1.2	1.2	1.8	1.9	0.95		1.7		1.3		N/A		2.5	
Bankfull Discharge (cfs)		1.6	1.7	2.6		17.5		6.4		14.0		11.0		1.5		1.5		1.5		1.5	
Q-NFF regression		---																			
Q-USGS extrapolation	N/A	---																			
Q-Mannings		---																			
Valley Length (ft)		---		---		---		---		---		---		---		---					
Channel Thalweg Length (ft)		1,080		---		---		---		---		---		650		482		646		479	
Sinuosity		1.0		1.1		1.2		1.2		1.2		1.4		1.1	1.2	1.1	1.5	1.0		1.3	
Water Surface Slope (ft/ft^2)		---		---		---		---		---		---		---		---		0.0191		0.0090	
Bankfull Slope (ft/ft)		0.0320		0.0260		0.0170		0.0040		0.0022		0.0040		0.0171	0.0216	0.0078	0.0096	0.0186	0.0191	0.0085	0.0088

(---): Data was not provided
N/A: Not Applicable

Table 10f. Baseline Stream Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

North Branch

		Pre-Restoration Condition	Reference Reach Data										Design		As-Built/Baseline	
Parameter	**Gage**	**North Branch**	**Scout West 1**		**Scout East 2**		**Scout West 2**		**Johanna Creek**		**Jarman Oak**		**North Branch**		**North Branch**	
		Min	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Shallow																
Bankfull Width (ft)	N/A	---	2.6	6.3	4.7	6.1	5.6	7.6	9.7		9.3		9.2		8.6	9.3
Floodprone Width (ft)		---	>20		>50		>50		>75		>150		100	300	>200	
Bankfull Mean Depth		---	0.3	0.5	1.1	1.3	0.7	1.0	0.8		1.2		0.6		0.7	0.7
Bankfull Max Depth		---	0.5	0.7	1.7	1.8	1.2	1.3	1.1		2.3		0.9	1.1	1.0	1.2
Bankfull Cross Sectional Area (ft^2)		---	1.3	2.0	6.0	6.9	5.3	5.4	7.2	7.8	11.6		5.9		5.7	6.5
Width/Depth Ratio		---	5.4	19.4	3.6	5.4	5.7	11.0	10.1	19.7	7.4		14.0	14.5	13.1	13.2
Entrenchment Ratio		---	>2.2		>2.2		>2.2		8.0	9.6	16.1	26.9	10.9	32.6	>21.6	>23.2
Bank Height Ratio		---	1.1	1.3	1.0		1.1	1.2	1.0		1.0		1.0	1.1	1.0	
D50 (mm)		---													N/A	
Profile																
Shallow Length (ft)	N/A		---		---		---		---		---		---		5.3	35.8
Shallow Slope (ft/ft)		---	0.026	0.047	N/A		0.033	0.051	N/A		0.0129		0.0010	0.0065	0.0013	0.0163
Pool Length (ft)			---		---		---		---		---		---		8.5	80.8
Pool Max Depth (ft)		---	0.6		N/A		1.7	1.9	1.5		3.1		0.9	2.1	1.0	3.8
Pool Spacing (ft)		---	27	67	N/A		21	27	16	59	32	55	15	64	17	101
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A	---	8.7	14.3	7.2	16.2	9.1	9.8	14.0	20.0	21.0	36.0	12.0	74.0	16	72
Radius of Curvature (ft)		---	3.1	9.0	5.5	16.0	5.4	6.8	15.0	27.0	13.7	18.6	14.0	44.0	15	40
Rc:Bankfull Width (ft/ft)		---	0.6	1.6	1.0	3.0	0.8	1.0	1.5	2.8	1.5	2.0	1.5	4.8	1.7	4.3
Meander Length (ft)		---	39.8	84.8	36.5	63.2	32.5	36.9	50.0		N/A		28	156	79	129
Meander Width Ratio		---	1.6	2.6	1.3	3.0	1.4	1.5	1.4	2.1	2.3	2.9	1.3	8.0	1.9	7.7
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%	N/A															
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100		---	---		---		---		---		---				N/A	
Reach Shear Stress (Competency) lb/ft^2		---											---		N/A	
Max part size (mm) mobilized at bankfull																
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	N/A	0.08	0.06		0.67		0.34		0.90		1.27		0.19		0.19	
Watershed Impervious Cover Estimate (%)		<1%	---		---		---		---		---		<1%		<1%	
Rosgen Classification		N/A	E/C5b		E5		E5		E5/C5		E6		E/C5		C5	
Bankfull Velocity (fps)		---	1.3	2.0	2.5	2.9	1.2	1.2	1.8	1.9	0.95		0.9		0.8	0.9
Bankfull Discharge (cfs)		---	2.6		17.5		6.4		14.0		11.0		5.0		5.0	
Q-NFF regression		---														
Q-USGS extrapolation		---														
Q-Mannings		---														
Valley Length (ft)		---	---		---		---		---		---		---			
Channel Thalweg Length (ft)		---	---		---		---		---		---		2,418		2,410	
Sinuosity		---	1.1		1.2		1.2		1.2		1.4		1.2	1.6	1.31	
Water Surface Slope ($ft/ft)^2$		---	---		---		---		---		---		---		0.0016	
Bankfull Slope (ft/ft)		---	0.0260		0.0170		0.0040		0.0022		0.0040		0.0007	0.0020	0.0004	0.0020

(---): Data was not provided
N/A: Not Applicable

Table 11a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross Section)

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Devil's Racetrack (West)

	Cross Section 1 (Shallow)								Cross Section 2 (Pool)								Cross Section 3 (Shallow)								Cross Section 4 (Pool)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	135.4	135.4	135.4	135.4	135.4	135.5	135.5		135.1	135.1	135.1	135.1	135.1	135.2	135.0		131.0	131.0	131.0	131.0	131.0	131.2	131.0		130.6	130.6	130.6	130.6	130.6	130.8	130.7	
Low Bank Elevation (ft)	135.4	135.4	135.4	135.4	135.4	135.4	135.5		135.1	135.1	135.1	135.1	135.1	135.1	135.0		131.0	131.0	131.0	131.0	131.0	131.0	131.0		130.6	130.6	130.6	130.6	130.6	130.6	130.7	
Bankfull Width (ft)	9.6	7.6	7.7	7.6	7.8	9.0	9.0		10.7	10.1	10.2	9.8	9.2	8.1	7.2		9.5	10.0	10.0	10.0	9.3	10.0	8.8		11.1	11.4	11.4	11.4	11.2	11.8	11.4	
Floodprone Width (ft)	>200	>200	>200	>200	>200	>200	>200		N/A	N/A	N/A	N/A	N/A	N/A	N/A		>200	>200	>200	>200	>200	>200	>200		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.6	0.7	0.8	0.8	0.7	0.7	0.7		0.7	0.8	0.8	0.8	0.9	1.0	0.9		0.9	0.8	0.8	0.7	0.8	0.8	0.7		1.0	0.8	0.9	0.8	0.7	0.9	0.8	
Bankfull Max Depth (ft)	1.1	1.5	1.5	1.4	1.4	1.3	1.4		1.7	1.9	2.0	1.9	2.0	1.8	1.6		1.4	1.4	1.4	1.4	1.4	1.5	1.3		1.7	1.7	1.7	1.7	1.6	1.7	1.6	
Bankfull Cross Sectional Area (ft^2)	6.2	5.6	5.8	5.8	5.3	6.2	6.0		7.8	7.6	8.6	8.1	8.1	7.8	6.7		8.5	8.1	8.2	7.4	7.1	8.5	6.2		10.7	9.4	9.9	8.6	8.0	10.7	9.0	
Bankfull Width/Depth Ratio	14.8	10.4	10.1	10.0	11.5	13.2	13.6		14.6	13.4	12.2	12.0	10.6	8.4	7.7		10.6	12.3	12.2	13.5	12.1	11.8	12.4		11.4	13.9	13.1	15.1	15.6	13.0	14.4	
Entrenchment Ratio[1]	>20.9	>26.2	>26.1	>26.3	>25.7	>22.2	>22.1		N/A	N/A	N/A	N/A	N/A	N/A	N/A		>21.1	>20.0	>20.1	>20.0	>21.5	>20.0	>22.7		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0	<1.0	<1.0		N/A	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.0	1.0	1.0	<1.0	<1.0		N/A	N/A	N/A	N/A	N/A	N/A	N/A	

	Cross Section 5 (Pool)								Cross Section 6 (Shallow)								Cross Section 7 (Pool)								Cross Section 8 (Shallow)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	125.3	125.3	125.3	125.3	125.3	125.4	125.3		124.7	124.7	124.7	124.7	124.7	124.9	124.8		120.8	120.8	120.8	120.8	120.8	120.9	120.8		119.9	119.9	119.9	119.9	119.9	119.4	120.1	
Low Bank Elevation (ft)	125.3	125.3	125.3	125.3	125.3	125.3	125.3		124.7	124.7	124.7	124.7	124.7	124.9	124.8		120.8	120.8	120.8	120.8	120.8	120.8	120.8		119.9	119.9	119.9	119.9	119.9	119.9	120.1	
Bankfull Width (ft)	8.9	8.6	8.6	8.6	9.3	10.1	10.3		8.7	8.2	8.6	8.5	8.0	9.1	8.2		9.5	8.0	8.0	8.7	8.7	10.3	8.4		4.7	4.8	4.8	4.2	4.2	2.8	4.7	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>200	>200	>200	>200	>200	>200	>200		N/A	N/A	N/A	N/A	N/A	N/A	N/A		>200	>200	>200	>200	>200	>200	>200	
Bankfull Mean Depth (ft)	0.8	0.8	0.8	0.7	0.7	0.7	0.7		0.7	0.7	0.6	0.6	0.5	0.7	0.6		0.8	0.9	0.9	0.8	0.8	0.7	0.7		0.4	0.7	1.2	0.8	1.0	0.8	0.9	
Bankfull Max Depth (ft)	1.5	1.5	1.5	1.5	1.4	1.4	1.4		1.1	1.2	1.2	1.1	1.0	1.2	1.0		1.6	1.7	1.7	1.7	1.8	1.8	1.5		1.3	1.3	1.7	1.2	1.7	1.0	1.5	
Bankfull Cross Sectional Area (ft^2)	7.5	7.0	6.8	6.2	6.5	7.5	7.0		6.0	5.3	5.6	5.2	4.3	6.0	4.6		7.6	7.4	7.3	7.0	7.0	7.6	5.9		2.1	3.3	5.7	3.3	4.4	2.1	4.0	
Bankfull Width/Depth Ratio	10.7	10.6	10.9	11.9	13.4	13.5	15.2		12.6	12.6	13.4	14.0	14.7	13.7	14.7		11.7	8.7	8.8	10.8	10.8	13.8	11.9		10.6	6.9	4.0	5.4	4.0	3.7	5.5	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>23.0	>24.4	>23.2	>23.5	>25.1	>22.1	>24.3		N/A	N/A	N/A	N/A	N/A	N/A	N/A		>42.5	>42.1	>41.9	>47.4	>47.4	>71.9	>42.3	
Bankfull Bank Height Ratio[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.0	1.0	1.0	<1.0	<1.0		N/A	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.0	1.0	1.0	2.0	1.5	

	Cross Section 9 (Shallow)								Cross Section 10 (Pool)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	116.4	116.4	116.4	116.4	116.4	116.3	116.4		116.1	116.1	116.1	116.1	116.1	116.1	116.1	
Low Bank Elevation (ft)	116.4	116.4	116.4	116.4	116.4	116.4	116.4		116.1	116.1	116.1	116.1	116.1	116.1	116.1	
Bankfull Width (ft)	7.7	7.5	7.5	7.5	7.5	7.9	8.8		6.8	5.9	5.9	6.2	6.0	7.9	7.0	
Floodprone Width (ft)	>200	>200	>200	>200	>200	>200	>200		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.5	0.7	0.7	0.6	0.6	0.5	0.5		0.6	0.8	0.8	0.7	0.7	0.6	0.5	
Bankfull Max Depth (ft)	0.7	1.0	1.0	1.1	1.0	0.9	1.0		0.9	1.0	1.0	1.0	0.9	0.9	0.8	
Bankfull Cross Sectional Area (ft^2)	4.0	5.4	4.9	4.7	4.6	4.0	4.1		4.4	4.7	4.6	4.5	4.0	4.4	3.7	
Bankfull Width/Depth Ratio	14.5	10.4	11.4	12.1	12.4	15.5	18.7		10.6	7.5	7.6	8.5	9.0	14.0	13.5	
Entrenchment Ratio[1]	>26.1	>26.7	>26.7	>26.7	>26.7	>25.4	>22.8		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0	1.1	1.0		N/A	N/A	N/A	N/A	N/A	N/A	N/A	

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 11b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross Section)
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Devil's Racetrack (East)

	Cross Section 11 (Pool)								Cross Section 12 (Shallow)								Cross Section 13 (Pool)								Cross Section 14 (Shallow)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	115.4	115.4	115.4	115.4	115.4	115.5	115.2		115.1	115.1	115.1	115.1	115.1	115.3	115.2		115.0	115.0	115.0	115.0	115.0	115.3	114.9		114.6	114.6	114.6	114.6	114.6	114.9	114.6	
Low Bank Elevation (ft)	115.4	115.4	115.4	115.4	115.4	115.3	115.2		115.1	115.1	115.1	115.1	115.1	115.0	115.2		115.0	115.0	115.0	115.0	115.0	115.0	114.9		114.6	114.6	114.6	114.6	114.6	114.6	114.6	
Bankfull Width (ft)	15.0	15.1	15.1	15.1	15.1	14.0	14.6		12.2	12.5	12.3	12.2	12.2	12.7	12.7		19.8	20.5	20.8	21.1	21.8	22.2	20.8		12.7	11.8	12.4	12.2	12.0	12.6	11.9	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>300	>300	>300	>300	>300	>300	>300		N/A	N/A	N/A	N/A	N/A	N/A	N/A		>300	>300	>300	>300	>300	>300	>300	
Bankfull Mean Depth (ft)	1.2	1.1	1.1	1.1	1.1	1.3	0.9		0.8	0.7	0.8	0.7	0.7	0.8	0.7		1.5	1.2	1.3	1.1	1.1	1.4	1.0		1.1	0.9	0.9	0.9	0.9	1.1	0.8	
Bankfull Max Depth (ft)	2.1	2.0	2.0	2.5	2.0	2.2	1.8		1.3	1.3	1.3	1.2	1.3	1.4	1.3		2.7	2.5	2.5	2.3	2.5	2.7	2.2		1.6	1.6	1.6	1.5	1.6	1.8	1.6	
Bankfull Cross Sectional Area (ft^2)	18.8	16.5	17.3	16.1	15.9	18.8	12.8		10.3	8.9	9.3	8.0	8.4	10.3	8.6		30.2	24.6	26.2	23.2	23.2	30.2	20.2		13.3	10.4	10.9	10.5	10.6	13.3	10.1	
Bankfull Width/Depth Ratio	12.0	13.8	13.1	14.2	14.3	10.4	16.7		14.6	17.6	16.1	18.6	17.6	15.7	18.8		13.0	17.1	16.6	19.2	20.5	16.3	21.4		12.1	13.4	14.0	14.1	13.7	11.9	14.0	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>24.5	>23.9	>24.5	>24.5	>24.6	>23.6	>23.6		N/A	N/A	N/A	N/A	N/A	N/A	N/A		>23.7	>25.4	>24.3	>24.6	>24.9	>23.8	>25.2	
Bankfull Bank Height Ratio[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.0	1.0	1.0	<1.0	<1.0		N/A	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.0	1.0	1.0	<1.0	<1.0	

	Cross Section 15 (Pool)								Cross Section 16 (Shallow)								Cross Section 17 (Shallow)								Cross Section 18 (Pool)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	114.2	114.2	114.2	114.2	114.2	114.5	114.2		114.1	114.1	114.1	114.1	114.1	114.3	114.3		113.3	113.3	113.3	113.3	113.3	113.4	113.4		112.6	112.6	112.6	112.6	112.6	113.0	112.6	
Low Bank Elevation (ft)	114.2	114.2	114.2	114.2	114.2	114.1	114.2		114.1	114.1	114.1	114.1	114.1	114.4	114.3		113.3	113.3	113.3	113.3	113.3	113.3	113.4		112.6	112.6	112.6	112.6	112.6	112.5	112.6	
Bankfull Width (ft)	15.6	12.4	12.4	12.4	12.3	13.2	15.3		13.4	12.6	12.7	12.4	12.4	13.8	14.6		13.7	12.5	12.7	12.7	13.6	13.5	14.2		15.5	15.3	15.3	15.3	15.3	17.1	15.3	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>300	>300	>300	>300	>300	>300	>300		>300	>300	>300	>300	>300	>300	>300		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	1.1	1.2	1.2	1.1	1.1	1.3	0.9		1.0	1.0	1.0	0.9	0.9	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.6	1.5	1.4	1.2	1.1	1.5	1.1	
Bankfull Max Depth (ft)	2.1	1.9	1.9	1.8	1.8	2.1	1.9		1.7	1.8	1.7	1.7	1.7	1.8	1.8		1.7	1.7	1.7	2.1	2.1	2.1	2.0		2.8	2.7	2.6	2.1	2.0	2.6	2.1	
Bankfull Cross Sectional Area (ft^2)	17.3	14.5	14.3	13.5	13.3	17.3	13.4		13.2	12.0	12.3	11.5	11.3	13.2	14.0		13.9	12.5	12.7	13.2	13.4	13.9	14.1		25.0	22.4	21.0	18.8	16.6	25.0	17.5	
Bankfull Width/Depth Ratio	14.0	10.6	10.7	11.4	11.4	10.1	17.3		13.6	13.2	13.0	13.4	13.5	14.3	15.3		13.4	12.5	12.6	12.2	13.8	13.1	14.3		9.5	10.5	11.2	12.4	14.1	11.8	13.5	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>22.3	>23.9	>23.6	>24.1	>24.3	>21.8	>20.5		>21.9	>24.0	>23.6	>23.7	>22.1	>22.2	>21.1		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.0	1.0	1.0	1.1	1.0		1.0	1.0	1.0	1.0	1.0	<1.0	1.0		N/A	N/A	N/A	N/A	N/A	N/A	N/A	

	Cross-Section 19 (Shallow)								Cross Section 20 (Shallow)								Cross Section 21 (Pool)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	112.7	112.7	112.7	112.7	112.7	112.9	112.8		109.0	109.0	109.0	109.0	109.0	108.9	109.0		108.1	108.1	108.1	108.1	108.1	108.3	108.1	
Low Bank Elevation (ft)	112.7	112.7	112.7	112.7	112.7	112.8	112.8		109.0	109.0	109.0	109.0	109.0	109.2	109.0		108.1	108.1	108.1	108.1	108.1	108.2	108.1	
Bankfull Width (ft)	13.3	14.3	14.2	12.6	14.0	14.1	13.9		8.2	7.9	7.9	8.3	8.2	8.1	7.7		8.8	8.9	9.1	7.8	7.8	9.0	8.2	
Floodprone Width (ft)	>300	>300	>300	>300	>300	>300	>300		>300	>300	>300	>300	>300	>300	>300		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.9	0.8	0.8	0.8	0.7	0.9	0.7		0.7	0.7	0.8	0.8	0.8	0.7	0.8		1.2	1.1	1.3	1.2	1.4	1.2	1.1	
Bankfull Max Depth (ft)	1.6	1.6	1.6	1.6	1.4	1.7	1.5		1.1	1.1	1.2	1.2	1.2	1.2	1.3		2.0	1.9	2.1	2.1	2.0	2.0	1.7	
Bankfull Cross Sectional Area (ft^2)	12.5	11.2	11.9	9.9	9.6	12.5	9.2		5.7	5.9	6.1	6.3	6.3	5.7	6.3		10.8	9.7	11.5	9.4	10.6	10.8	8.8	
Bankfull Width/Depth Ratio	14.1	18.4	17.1	16.1	20.4	15.9	20.8		11.9	10.6	10.3	10.9	10.6	11.4	9.4		7.3	8.1	7.2	6.5	5.7	7.6	7.7	
Entrenchment Ratio[1]	>22.6	>20.9	>21.1	>23.8	>21.5	>21.3	>21.6		>36.5	>37.8	>37.8	>36.3	>36.6	>37.2	>39.1		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0	<1.0	<1.0		1.0	1.0	1.0	1.0	1.0	1.2	1.1		N/A	N/A	N/A	N/A	N/A	N/A	N/A	

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.
[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 11c. Morphology and Hydraulic Summary (Dimensional Parameters - Cross Section)

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Southeast Branch

	Cross Section 28 (Pool)								Cross Section 29 (Shallow)								Cross Section 30 (Pool)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	137.7	137.7	137.7	137.7	137.7	137.7	137.8		137.1	137.1	137.1	137.1	137.1	137.2	137.3		122.8	122.8	122.8	122.8	122.8	123.0	123.0	
Low Bank Elevation (ft)	137.7	137.7	137.7	137.7	137.7	137.8	137.8		137.1	137.1	137.1	137.1	137.1	137.2	137.3		122.8	122.8	122.8	122.8	122.8	123.0	123.0	
Bankfull Width (ft)	3.8	3.3	3.3	3.2	3.3	3.6	3.4		3.0	2.9	2.6	2.8	2.4	2.6	2.9		3.8	4.1	3.5	3.5	3.0	4.1	3.9	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>30	>30	>30	>30	>30	>30	>30		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.4	0.5	0.5	0.5	0.4	0.4	0.5		0.3	0.4	0.3	0.3	0.3	0.3	0.3		0.3	0.4	0.3	0.3	0.2	0.3	0.3	
Bankfull Max Depth (ft)	0.8	1.2	1.2	1.1	1.1	1.1	1.2		0.5	0.7	0.7	0.7	0.7	0.7	0.7		0.4	0.7	0.5	0.4	0.4	0.5	0.5	
Bankfull Cross Sectional Area (ft^2)	1.5	1.7	1.6	1.5	1.5	1.5	1.7		0.8	1.1	0.8	0.9	0.7	0.8	0.9		1.3	1.7	1.1	0.9	0.7	1.3	1.3	
Bankfull Width/Depth Ratio	9.3	6.6	7.1	7.2	7.3	8.8	6.7		11.4	7.7	8.3	8.2	7.9	8.6	9.0		11.2	9.4	11.7	13.5	12.7	12.9	11.5	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>9.9	>10.4	>11.4	>10.9	>12.5	>11.5	>30.0		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.0	1.0	1.0	1.1	1.1		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	Cross Section 31 (Shallow)								**Cross Section 32 (Shallow)**								**Cross Section 33 (Pool)**							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	122.7	122.7	122.7	122.7	122.7	122.9	122.9		116.5	116.5	116.5	116.5	116.5	116.8	116.8		116.4	116.4	116.4	116.4	116.4	116.7	116.6	
Low Bank Elevation (ft)	122.7	122.7	122.7	122.7	122.7	122.8	122.9		116.5	116.5	116.5	116.5	116.5	116.6	116.8		116.4	116.4	116.4	116.4	116.4	116.5	116.6	
Bankfull Width (ft)	3.8	3.9	3.8	2.7	2.4	3.6	3.5		5.3	5.1	3.9	3.5	3.5	8.5	4.6		6.3	5.8	5.0	3.6	3.7	4.9	5.1	
Floodprone Width (ft)	>60	>60	>60	>60	>60	>60	>60		>200	>200	>200	>200	>200	>200	>200		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.4	0.5	0.3	0.3	0.3	0.4	0.4		0.4	0.4	0.3	0.3	0.3	0.2	0.4		0.4	0.3	0.4	0.3	0.3	0.5	0.3	
Bankfull Max Depth (ft)	0.5	0.8	0.5	0.6	0.5	0.7	0.7		0.6	0.5	0.5	0.5	0.4	0.7	0.6		0.8	0.6	0.6	0.5	0.4	0.7	0.6	
Bankfull Cross Sectional Area (ft^2)	1.3	2.0	1.3	0.9	0.7	1.3	1.4		2.1	1.8	1.2	1.0	0.9	2.1	1.6		2.4	1.7	1.8	1.1	0.9	2.4	1.6	
Bankfull Width/Depth Ratio	10.8	7.8	11.2	8.3	7.9	10.0	8.9		13.8	14.6	13.0	12.5	13.7	34.4	12.9		16.8	19.7	13.7	11.6	14.7	10.0	16.2	
Entrenchment Ratio[1]	>15.8	>15.4	>15.8	>22.4	>24.9	>16.7	>17.2		>37.5	>38.9	>51.3	>57.9	>56.4	>23.5	>43.5		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0	<1.0	1.0		1.0	1.0	1.0	1.0	1.0	<1.0	<1.0		N/A	N/A	N/A	N/A	N/A	N/A	N/A	

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 11d. Morphology and Hydraulic Summary (Dimensional Parameters - Cross Section)

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Middle Branch

	Cross Section 24 (Shallow)								Cross Section 25 (Pool)								Cross Section 26 (Pool)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	136.4	136.4	136.4	136.4	136.4	136.6	136.7		136.4	136.4	136.4	136.4	136.4	136.4	136.5		124.7	124.7	124.7	124.7	124.7	124.7	124.9	
Low Bank Elevation (ft)	136.4	136.4	136.4	136.4	136.4	136.5	136.7		136.4	136.4	136.4	136.4	136.4	136.4	136.5		124.7	124.7	124.7	124.7	124.7	124.8	124.9	
Bankfull Width (ft)	2.2	2.3	2.2	1.3	1.2	1.6	2.1		3.1	3.1	3.2	3.0	2.7	2.5	2.3		4.1	4.8	5.0	5.2	4.4	5.0	4.2	
Floodprone Width (ft)	>50	>50	>50	>50	>50	>50	>50		N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.3	0.3	0.3	0.3	0.3	0.4	0.4		0.4	0.5	0.3	0.4	0.5	0.5	0.8		0.3	0.2	0.2	0.3	0.2	0.3	0.3	
Bankfull Max Depth (ft)	0.5	0.6	0.6	0.4	0.5	0.6	0.7		0.7	0.9	0.6	0.8	0.8	0.8	1.1		0.9	0.5	0.5	0.6	0.5	0.6	0.6	
Bankfull Cross Sectional Area (ft^2)	0.7	0.8	0.7	0.4	0.4	0.7	0.8		1.2	1.6	1.1	1.2	1.2	1.2	1.8		1.4	1.0	1.0	1.5	1.0	1.4	1.3	
Bankfull Width/Depth Ratio	6.7	6.8	6.8	4.0	3.5	3.7	5.4		8.1	6.0	9.1	7.6	5.8	5.1	2.9		11.9	21.9	24.3	17.7	19.7	17.6	13.8	
Entrenchment Ratio[1]	>22.9	>21.5	>23.2	>38.4	>42.9	>31.3	>23.8		N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0	<1.0	1.1		N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	

	Cross Section 27 (Shallow)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	124.6	124.6	124.6	124.6	124.6	124.7	124.8	
Low Bank Elevation (ft)	124.6	124.6	124.6	124.6	124.6	124.6	124.8	
Bankfull Width (ft)	3.4	3.2	3.1	3.5	2.9	3.3	3.3	
Floodprone Width (ft)	>200	>200	>200	>200	>200	>200	>200	
Bankfull Mean Depth (ft)	0.3	0.3	0.3	0.4	0.3	0.3	0.4	
Bankfull Max Depth (ft)	0.5	0.6	0.6	0.7	0.6	0.6	0.7	
Bankfull Cross Sectional Area (ft^2)	1.1	1.0	1.0	1.3	0.9	1.1	1.3	
Bankfull Width/Depth Ratio	10.1	10.7	10.2	9.5	8.7	9.9	8.1	
Entrenchment Ratio[1]	>58.8	>62.5	>64.3	>57.5	>69.8	>60.6	>61.3	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0	<1.0	1.1	

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel

Table 11e. Morphology and Hydraulic Summary (Dimensional Parameters - Cross Section)

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Southwest Branch

	Cross Section 22 (Pool)								Cross Section 23 (Shallow)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	136.4	136.4	136.4	136.4	136.4	136.3	136.4		136.4	136.4	136.4	136.4	136.4	136.5	136.7	
Low Bank Elevation (ft)	136.4	136.4	136.4	136.4	136.4	136.4	136.4		136.4	136.4	136.4	136.4	136.4	136.6	136.7	
Bankfull Width (ft)	4.9	4.8	5.0	4.5	4.2	4.2	3.6		2.4	2.9	3.0	2.5	1.8	2.0	3.5	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>200	>200	>200	>200	>200	>200	>200	
Bankfull Mean Depth (ft)	0.4	0.4	0.4	0.3	0.3	0.4	0.5		0.3	0.3	0.3	0.3	0.2	0.3	0.4	
Bankfull Max Depth (ft)	0.8	1.0	0.9	0.7	0.6	0.7	0.7		0.4	0.4	0.5	0.4	0.3	0.4	0.6	
Bankfull Cross Sectional Area (ft^2)	1.8	1.9	2.1	1.5	1.3	1.8	1.7		0.6	0.8	0.9	0.7	0.3	0.6	1.3	
Bankfull Width/Depth Ratio	13.2	11.9	11.7	13.7	13.2	9.6	7.3		9.7	11.2	10.1	8.9	12.0	6.8	9.8	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>82.3	>68.6	>67.5	>79.4	>108.7	>98.8	>57.1	
Bankfull Bank Height Ratio[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.0	1.0	1.0	1.3	1.5	

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 11f. Morphology and Hydraulic Summary (Dimensional Parameters - Cross Section)

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

North Branch

	Cross Section 34 (Pool)								Cross Section 35 (Shallow)								Cross Section 36 (Shallow)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	118.6	118.6	118.6	118.6	118.6	118.7	118.7		118.7	118.7	118.7	118.7	118.7	118.8	118.7		116.8	116.8	116.8	116.8	116.8	116.7	116.7	
Low Bank Elevation (ft)	118.6	118.6	118.6	118.6	118.6	118.7	118.7		118.7	118.7	118.7	118.7	118.7	118.7	188.7		116.8	116.8	116.8	116.8	116.8	116.7	116.7	
Bankfull Width (ft)	9.8	10.0	10.2	9.7	9.5	10.1	10.0		8.6	9.2	9.2	9.2	8.9	9.6	8.7		9.3	9.0	9.0	9.0	9.0	9.0	9.0	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>200	>200	>200	>200	>200	>200	>200		>200	>200	>200	>200	>200	>200	>200	
Bankfull Mean Depth (ft)	0.8	0.7	0.7	0.7	0.7	0.7	0.6		0.7	0.7	0.7	0.6	0.6	0.6	0.6		0.7	0.8	0.8	0.8	0.7	0.7	0.7	
Bankfull Max Depth (ft)	1.3	1.4	1.4	1.3	1.4	1.4	1.3		1.0	1.2	1.2	1.1	1.1	1.2	1.1		1.2	1.4	1.4	1.4	1.3	1.3	1.3	
Bankfull Cross Sectional Area (ft^2)	7.5	7.2	7.5	6.7	6.9	7.5	6.5		5.7	6.0	6.4	5.4	5.1	5.7	5.0		6.5	7.0	6.9	6.9	6.7	6.5	6.6	
Bankfull Width/Depth Ratio	12.8	14.0	13.9	14.0	12.9	13.5	15.3		13.1	14.1	13.2	15.6	15.4	16.3	15.3		13.2	11.5	11.7	11.8	12.0	12.5	12.3	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		>23.2	>21.7	>21.7	>21.7	>22.5	>20.8	>22.9		>21.6	>22.2	>22.2	>22.2	>22.2	>22.2	>22.2	
Bankfull Bank Height Ratio[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.0	1.0	1.0	<1.0	<1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	

	Cross Section 37 (Pool)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation (ft)	116.5	116.5	116.5	116.5	116.5	116.6	116.5	
Low Bank Elevation (ft)	116.5	116.5	116.5	116.5	116.5	116.6	116.5	
Bankfull Width (ft)	10.6	11.1	10.7	11.1	11.7	11.6	11.8	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.9	0.8	0.9	0.8	0.8	0.8	0.7	
Bankfull Max Depth (ft)	1.4	1.4	1.5	1.4	1.4	1.4	1.3	
Bankfull Cross Sectional Area (ft^2)	9.2	9.2	9.2	8.9	8.9	9.2	8.5	
Bankfull Width/Depth Ratio	12.3	13.4	12.5	13.8	15.4	14.7	16.3	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel

Table 12a. Monitoring Data - Stream Reach Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Devil's Racetrack (West)

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Shallow																
Bankfull Width (ft)	4.7	9.6	4.8	10.0	4.8	10.0	4.2	10.0	4.2	9.3	2.8	10.0	4.7	9.0		
Floodprone Width (ft)	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200		
Bankfull Mean Depth	0.4	0.9	0.7	0.8	0.6	1.2	0.6	0.8	0.5	1.0	0.5	0.8	0.5	0.9		
Bankfull Max Depth	0.7	1.4	1.0	1.5	1.0	1.7	1.1	1.4	1.0	1.7	0.9	1.5	1.0	1.5		
Bankfull Cross Sectional Area (ft^2)	2.1	8.5	3.3	8.1	4.9	8.2	3.3	7.4	4.3	7.1	2.1	8.5	4.0	6.2		
Width/Depth Ratio	10.6	14.8	6.9	12.6	4.0	13.4	4.7	14.0	4.0	14.7	3.7	15.5	5.5	18.7		
Entrenchment Ratio	>20.9	>42.5	>20	>42.1	>20.1	>41.9	>20.0	>47.4	>21.5	>47.4	>20.0	>71.9	>22.1	>42.3		
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	<1.0	2.0	<1.0	1.5		
D50 (mm)																
Profile																
Shallow Length (ft)																
Shallow Slope (ft/ft)																
Pool Length (ft)																
Pool Max Depth (ft)																
Pool Spacing (ft)																
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)																
Radius of Curvature (ft)																
Rc:Bankfull Width (ft/ft)																
Meander Wave Length (ft)																
Meander Width Ratio																
Additional Reach Parameters																
Rosgen Classification																
Channel Thalweg Length (ft)																
Sinuosity (ft)																
Water Surface Slope (ft/ft)																
Bankfull Slope (ft/ft)																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		0%		0%		0%			

*Baseline, MY1, and MY2 data was updated during MY3 to include only shallow data.

Table 12b. Monitoring Data - Stream Reach Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Devil's Racetrack (East)

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Shallow																
Bankfull Width (ft)	8.2	13.7	7.9	14.3	7.9	14.2	8.3	12.7	8.2	14.0	8.1	14.1	7.7	14.6		
Floodprone Width (ft)	>300	>300	>300	>300	>300	>300	>300	>300	>300	>300	>300	>300	>300	>300		
Bankfull Mean Depth	0.7	1.1	0.7	1.0	0.8	1.0	0.7	1.0	0.7	1.0	0.7	1.1	0.7	1.1		
Bankfull Max Depth	1.1	1.7	1.1	1.8	1.2	1.7	1.2	2.1	1.2	2.1	1.2	2.1	1.3	2.0		
Bankfull Cross Sectional Area (ft^2)	5.7	14.1	5.9	12.5	6.1	12.7	6.3	13.2	6.3	13.4	5.7	13.9	6.3	14.1		
Width/Depth Ratio	11.9	14.6	10.6	18.4	10.3	17.1	10.9	18.6	10.6	20.4	11.4	15.9	9.4	18.8		
Entrenchment Ratio	>21.9	>36.5	>20.9	>37.8	>21.1	>37.8	>23.7	>36.3	>21.5	>36.6	>21.3	>37.2	>20.5	>39.1		
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	<1.0	1.2	<1.0	1.0		
D50 (mm)																
Profile																
Shallow Length (ft)																
Shallow Slope (ft/ft)																
Pool Length (ft)																
Pool Max Depth (ft)																
Pool Spacing (ft)																
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)																
Radius of Curvature (ft)																
Rc:Bankfull Width (ft/ft)																
Meander Wave Length (ft)																
Meander Width Ratio																
Additional Reach Parameters																
Rosgen Classification																
Channel Thalweg Length (ft)																
Sinuosity (ft)																
Water Surface Slope (ft/ft)																
Bankfull Slope (ft/ft)																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		0%		0%		0%			

*Baseline, MY1, and MY2 data was updated during MY3 to include only shallow data.

Table 12c. Monitoring Data - Stream Reach Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Southeast Branch

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Shallow																
Bankfull Width (ft)	3.0	5.3	2.9	5.1	2.6	3.9	2.7	3.5	2.4	3.5	2.6	8.5	2.9	4.6		
Floodprone Width (ft)	>30	>200	>30	>200	>30	>200	>30	>200	>30	>200	>30	>200	>30	>200		
Bankfull Mean Depth	0.3	0.4	0.4	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.4	0.3	0.4		
Bankfull Max Depth	0.5	0.6	0.5	0.8	0.5	0.7	0.5	0.7	0.4	0.7	0.7	0.7	0.6	0.7		
Bankfull Cross Sectional Area (ft^2)	0.8	2.1	1.1	2.0	0.8	1.3	0.9	1.0	0.7	0.9	0.8	2.1	0.9	1.6		
Width/Depth Ratio	10.8	13.8	7.7	14.6	8.3	13.0	8.2	12.5	7.9	13.7	8.6	34.4	8.9	12.9		
Entrenchment Ratio	>9.9	>37.5	>10.4	>38.9	>11.4	>51.3	>10.9	>57.9	>12.5	>56.4	>11.5	>23.5	>17.2	>43.5		
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	<1.0	1.1	<1.0	1.1		
D50 (mm)																
Profile																
Shallow Length (ft)																
Shallow Slope (ft/ft)																
Pool Length (ft)																
Pool Max Depth (ft)																
Pool Spacing (ft)																
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)																
Radius of Curvature (ft)																
Rc:Bankfull Width (ft/ft)																
Meander Wave Length (ft)																
Meander Width Ratio																
Additional Reach Parameters																
Rosgen Classification																
Channel Thalweg Length (ft)																
Sinuosity (ft)																
Water Surface Slope (ft/ft)																
Bankfull Slope (ft/ft)																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			10%		0%		0%		0%		0%		0%			

*Baseline, MY1, and MY2 data was updated during MY3 to include only shallow data.

Table 12d. Monitoring Data - Stream Reach Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Middle Branch

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Shallow																
Bankfull Width (ft)	2.2	3.4	2.3	3.2	2.2	3.1	1.3	3.5	1.2	2.9	1.6	3.3	2.1	3.1		
Floodprone Width (ft)	>50	>200	>50	>200	>50	>200	>50	>200	>50	>200	>50	>200	>50	>200		
Bankfull Mean Depth	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.4	0.4		
Bankfull Max Depth	0.5	0.5	0.6	0.6	0.6	0.6	0.4	0.7	0.5	0.6	0.6	0.6	0.7	0.7		
Bankfull Cross Sectional Area (ft^2)	0.7	1.1	0.8	1.0	0.7	1.0	0.4	1.3	0.4	0.9	0.7	1.1	0.8	1.3		
Width/Depth Ratio	6.7	10.1	6.8	10.7	6.8	10.2	4.0	9.5	3.5	8.7	3.7	9.9	5.4	8.1		
Entrenchment Ratio	>22.9	>58.8	>21.5	>62.5	>23.2	>64.3	>38.4	>57.5	>42.9	>69.8	>31.3	>60.6	>23.8	>61.3		
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	<1.0	<1.0	1.1	1.1		
D50 (mm)																
Profile																
Shallow Length (ft)																
Shallow Slope (ft/ft)																
Pool Length (ft)																
Pool Max Depth (ft)																
Pool Spacing (ft)																
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)																
Radius of Curvature (ft)																
Rc:Bankfull Width (ft/ft)																
Meander Wave Length (ft)																
Meander Width Ratio																
Additional Reach Parameters																
Rosgen Classification																
Channel Thalweg Length (ft)																
Sinuosity (ft)																
Water Surface Slope (ft/ft)																
Bankfull Slope (ft/ft)																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		0%		0%		0%			

*Baseline, MY1, and MY2 data was updated during MY3 to include only shallow data.

Table 12e. Monitoring Data - Stream Reach Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Southwest Branch

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Shallow																
Bankfull Width (ft)	2.4		2.9		3.0		2.5		1.8		2.0		3.5			
Floodprone Width (ft)	>200		>200		>200		>200		>200		>200		>200			
Bankfull Mean Depth	0.3		0.3		0.3		0.3		0.2		0.3		0.4			
Bankfull Max Depth	0.4		0.4		0.5		0.4		0.3		0.4		0.6			
Bankfull Cross Sectional Area (ft^2)	0.6		0.8		0.9		0.7		0.3		0.6		1.3			
Width/Depth Ratio	9.7		11.2		10.1		8.9		12.0		6.8		9.8			
Entrenchment Ratio	>82.3		>68.6		>67.5		>79.4		>108.7		>98.8		>57.1			
Bank Height Ratio	1.0		1.0		1.0		1.0		1.0		1.3		1.5			
D50 (mm)																
Profile																
Shallow Length (ft)																
Shallow Slope (ft/ft)																
Pool Length (ft)																
Pool Max Depth (ft)																
Pool Spacing (ft)																
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)																
Radius of Curvature (ft)																
Rc:Bankfull Width (ft/ft)																
Meander Wave Length (ft)																
Meander Width Ratio																
Additional Reach Parameters																
Rosgen Classification																
Channel Thalweg Length (ft)																
Sinuosity (ft)																
Water Surface Slope (ft/ft)																
Bankfull Slope (ft/ft)																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		0%		0%		0%			

*Baseline, MY1, and MY2 data was updated during MY3 to include only shallow data.

Table 12f. Monitoring Data - Stream Reach Data Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

North Branch

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Shallow																
Bankfull Width (ft)	8.6	9.3	9.0	9.2	9.0	9.2	9.0	9.2	8.9	9.0	9.0	9.6	8.7	9.0		
Floodprone Width (ft)	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200	>200		
Bankfull Mean Depth	0.7	0.7	0.7	0.8	0.7	0.8	0.6	0.8	0.6	0.7	0.6	0.7	0.6	0.7		
Bankfull Max Depth	1.0	1.2	1.2	1.4	1.2	1.4	1.1	1.4	1.1	1.3	1.2	1.3	1.1	1.3		
Bankfull Cross Sectional Area (ft^2)	5.7	6.5	6.0	7.0	6.4	6.9	5.4	6.9	5.1	6.7	5.7	6.5	5.0	6.6		
Width/Depth Ratio	13.1	13.2	11.5	14.1	11.7	13.2	11.8	15.6	12.0	15.4	12.5	16.3	12.3	15.3		
Entrenchment Ratio	>21.6	>23.2	>21.7	>22.2	>21.7	>22.2	>21.7	>22.2	>22.2	>22.5	>20.8	>22.2	>22.2	>22.9		
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	<1.0	1.0		
D50 (mm)																
Profile																
Shallow Length (ft)																
Shallow Slope (ft/ft)																
Pool Length (ft)																
Pool Max Depth (ft)																
Pool Spacing (ft)																
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)																
Radius of Curvature (ft)																
Rc:Bankfull Width (ft/ft)																
Meander Wave Length (ft)																
Meander Width Ratio																
Additional Reach Parameters																
Rosgen Classification																
Channel Thalweg Length (ft)																
Sinuosity (ft)																
Water Surface Slope (ft/ft)																
Bankfull Slope (ft/ft)																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		0%		0%		0%			

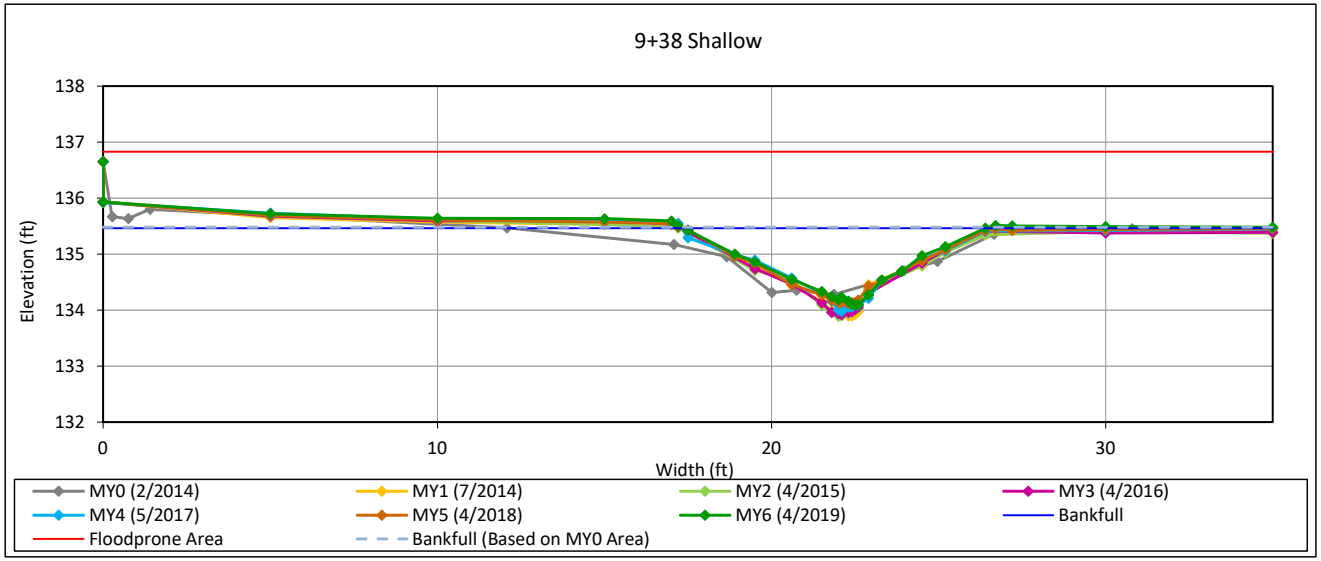
*Baseline, MY1, and MY2 data was updated during MY3 to include only shallow data.

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 1-DRC West



Bankfull Dimensions	
6.0	x-section area (ft.sq.)
9.0	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
9.5	wetted parimeter (ft)
0.6	hyd radi (ft)
13.6	width-depth ratio
200.0	W flood prone area (ft)
22.1	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

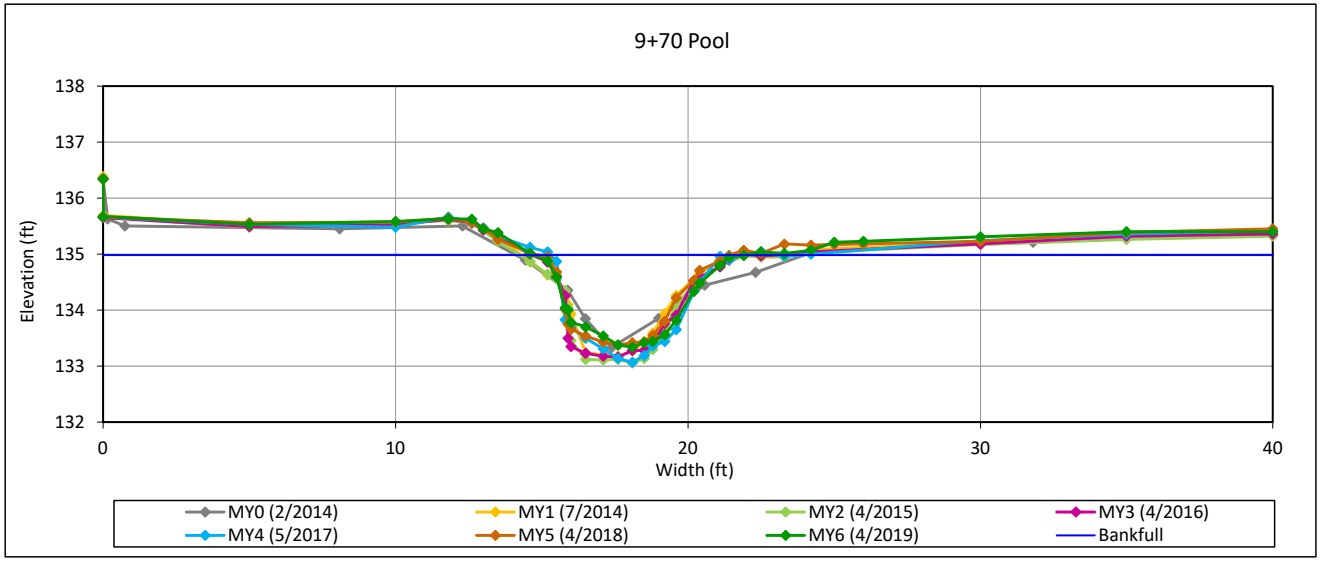
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 2-DRC West



Bankfull Dimensions	
6.7	x-section area (ft.sq.)
7.2	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
8.3	wetted parimeter (ft)
0.8	hyd radi (ft)
7.7	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

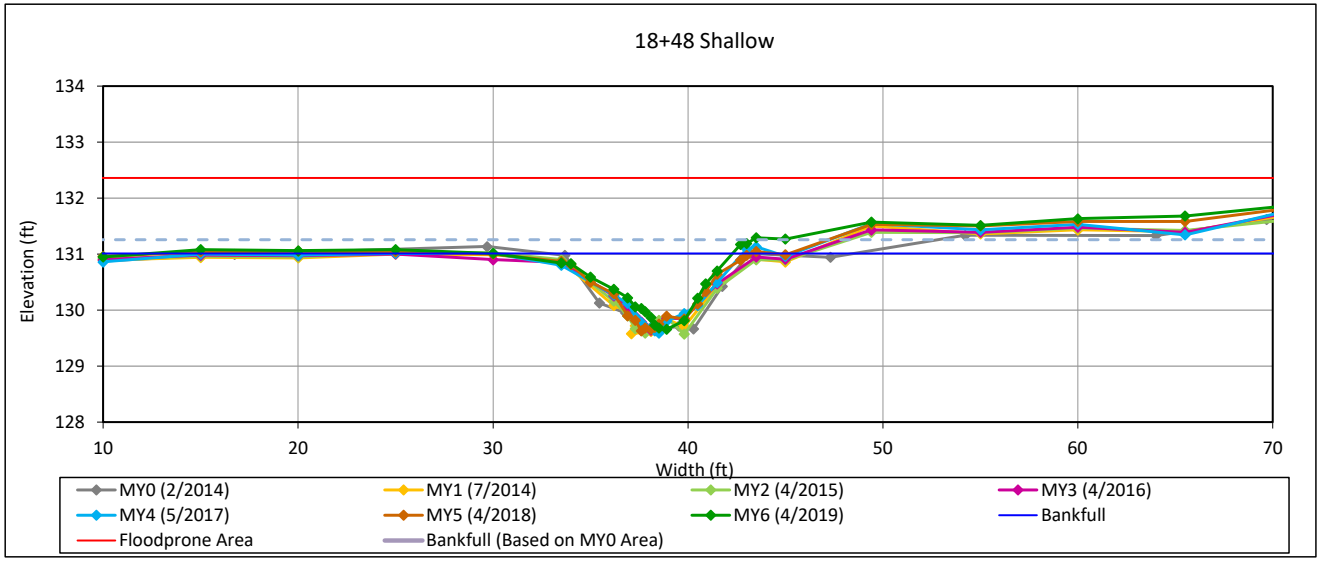
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 3-DRC West



Bankfull Dimensions	
6.2	x-section area (ft.sq.)
8.8	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
9.3	wetted parimeter (ft)
0.7	hyd radi (ft)
12.4	width-depth ratio
200.0	W flood prone area (ft)
22.7	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

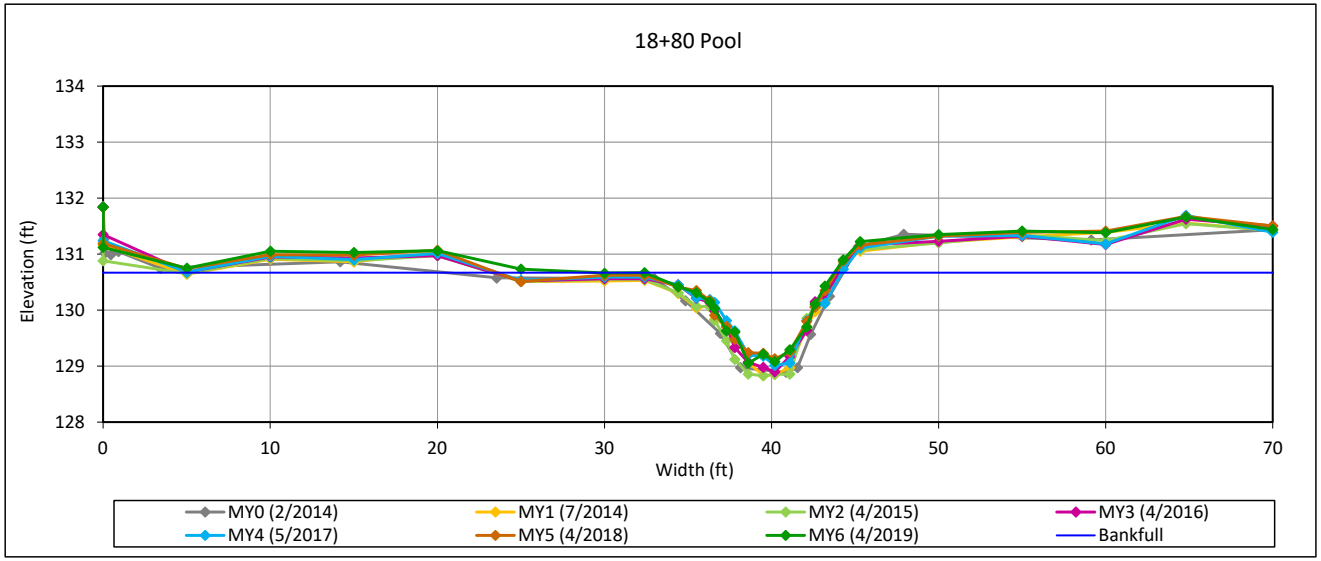
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 4-DRC West



Bankfull Dimensions	
9.0	x-section area (ft.sq.)
11.4	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
12.1	wetted parimeter (ft)
0.7	hyd radi (ft)
14.4	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

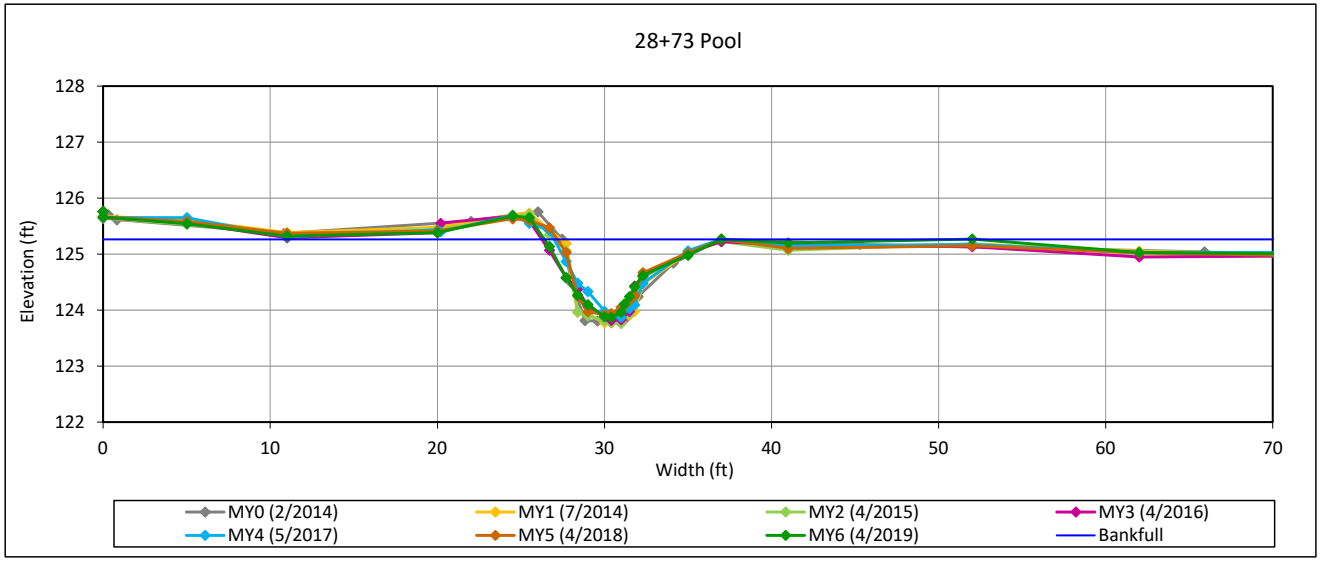
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 5-DRC West



Bankfull Dimensions	
7.0	x-section area (ft.sq.)
10.3	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
10.8	wetted parimeter (ft)
0.6	hyd radi (ft)
15.2	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

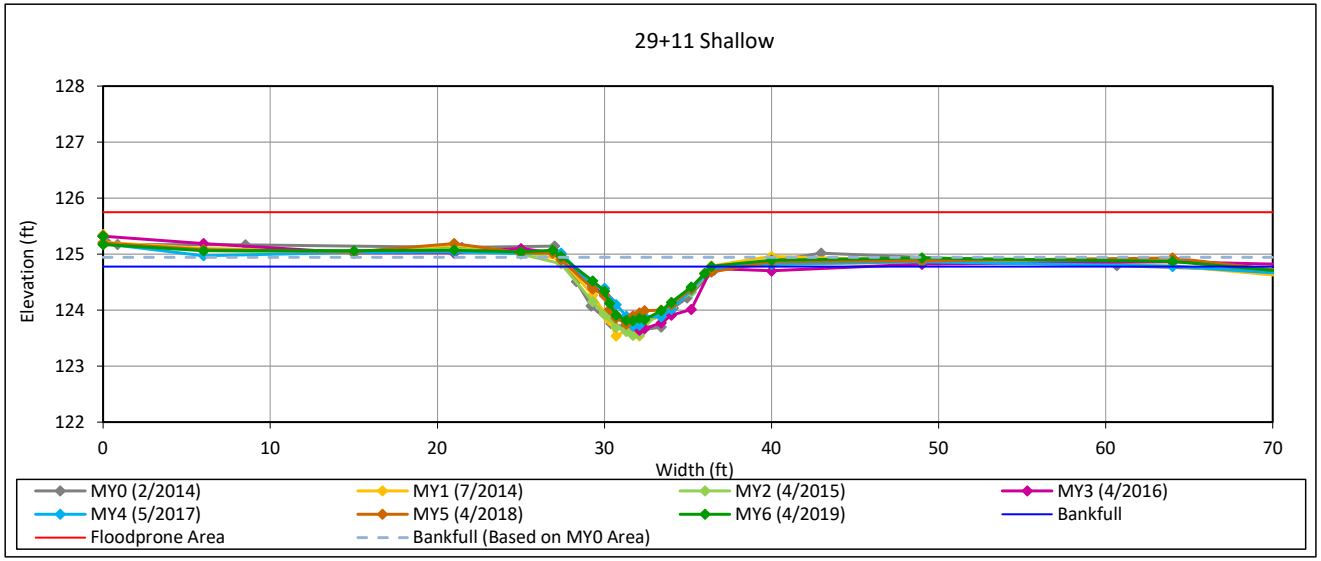
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 6-DRC West



Bankfull Dimensions	
4.6	x-section area (ft.sq.)
8.2	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
8.5	wetted parimeter (ft)
0.5	hyd radi (ft)
14.7	width-depth ratio
200.0	W flood prone area (ft)
24.3	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

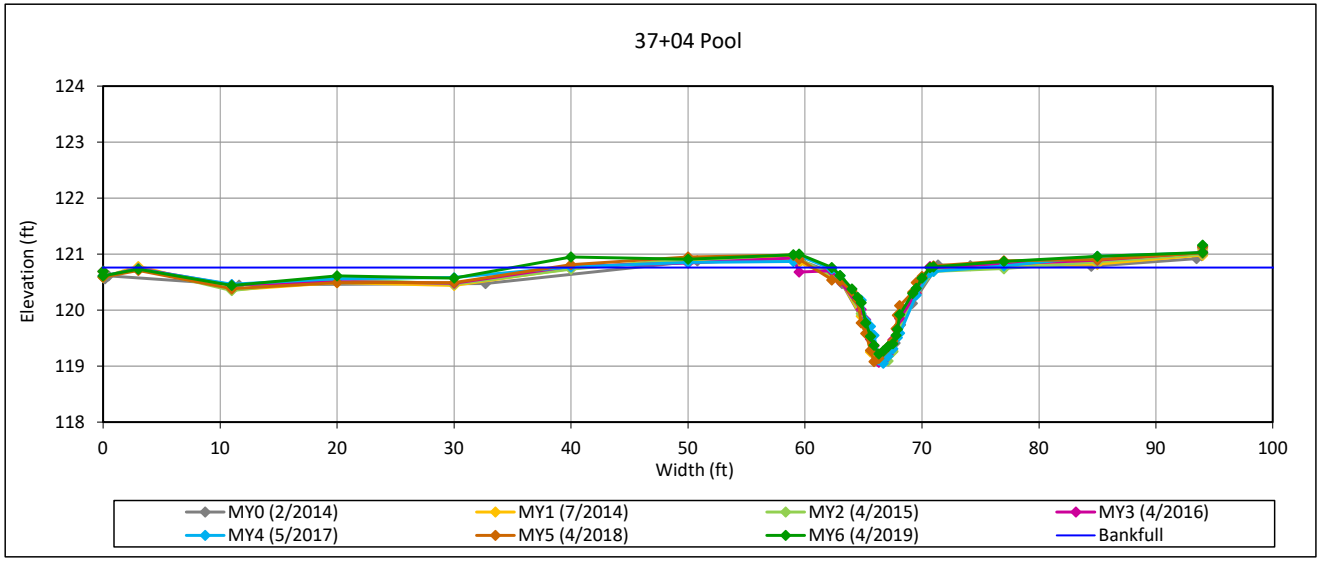
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 7-DRC West



Bankfull Dimensions	
5.9	x-section area (ft.sq.)
8.4	width (ft)
0.7	mean depth (ft)
1.5	max depth (ft)
9.1	wetted parimeter (ft)
0.7	hyd radi (ft)
11.9	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

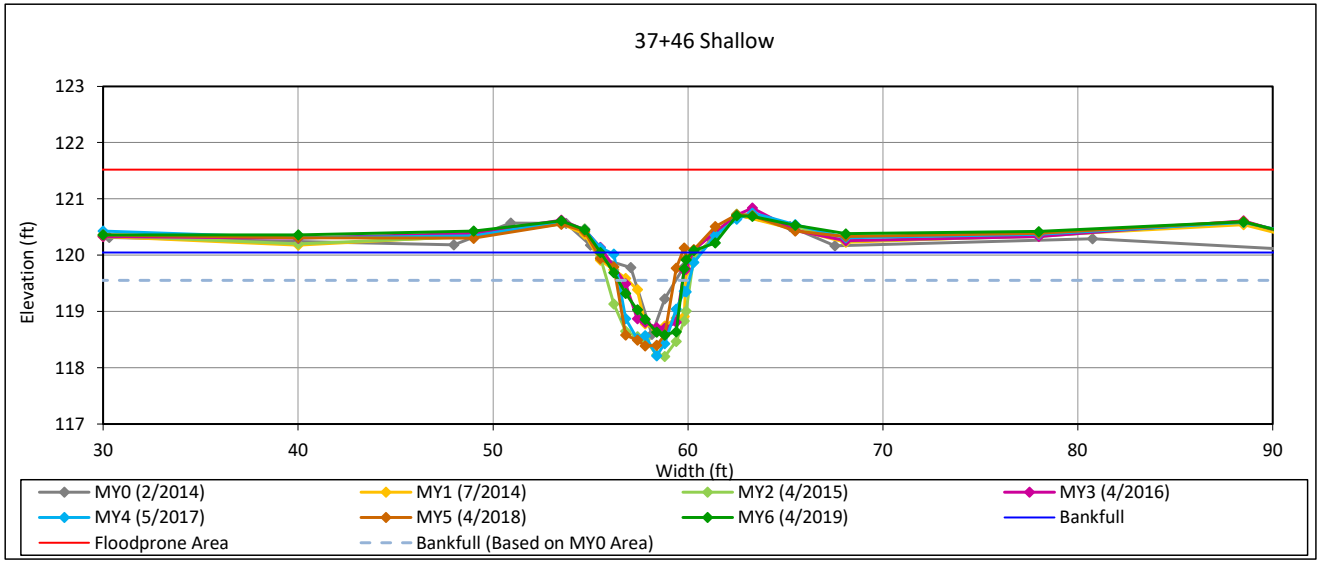
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 8-DRC West



Bankfull Dimensions	
4.0	x-section area (ft.sq.)
4.7	width (ft)
0.9	mean depth (ft)
1.5	max depth (ft)
6.0	wetted parimeter (ft)
0.7	hyd radi (ft)
5.5	width-depth ratio
200.0	W flood prone area (ft)
42.3	entrenchment ratio
1.5	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

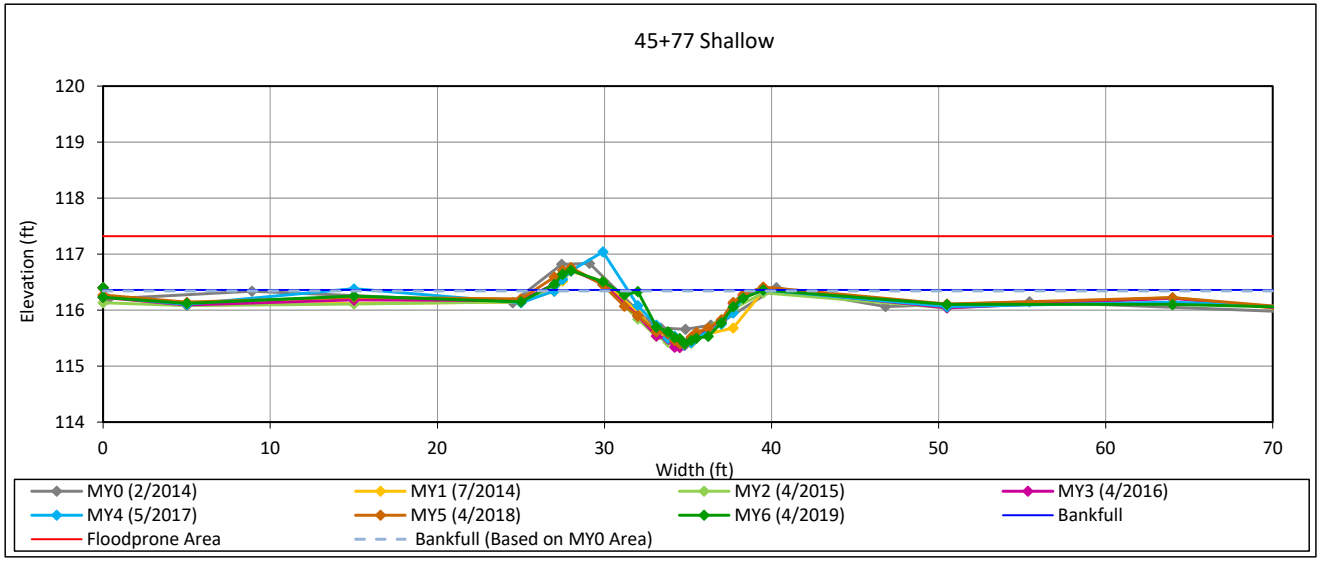
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 9-DRC West



Bankfull Dimensions	
4.1	x-section area (ft.sq.)
8.8	width (ft)
0.5	mean depth (ft)
1.0	max depth (ft)
9.1	wetted parimeter (ft)
0.5	hyd radi (ft)
18.7	width-depth ratio
200.0	W flood prone area (ft)
22.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

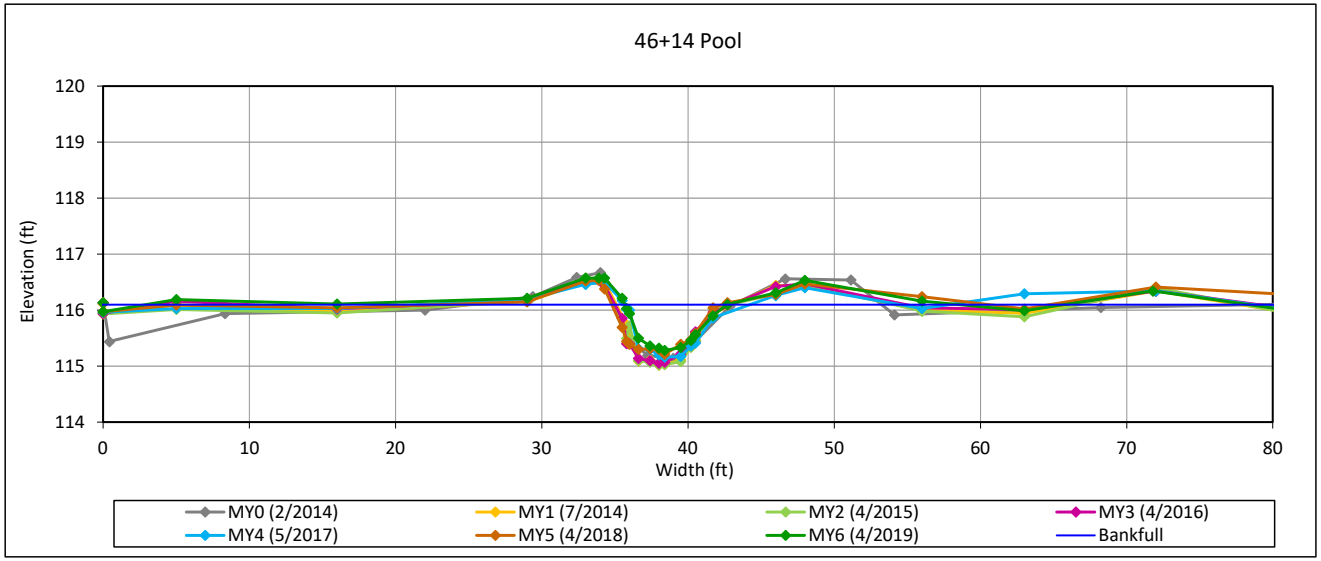
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 10-DRC West



Bankfull Dimensions	
3.7	x-section area (ft.sq.)
7.0	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
7.3	wetted parimeter (ft)
0.5	hyd radi (ft)
13.5	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

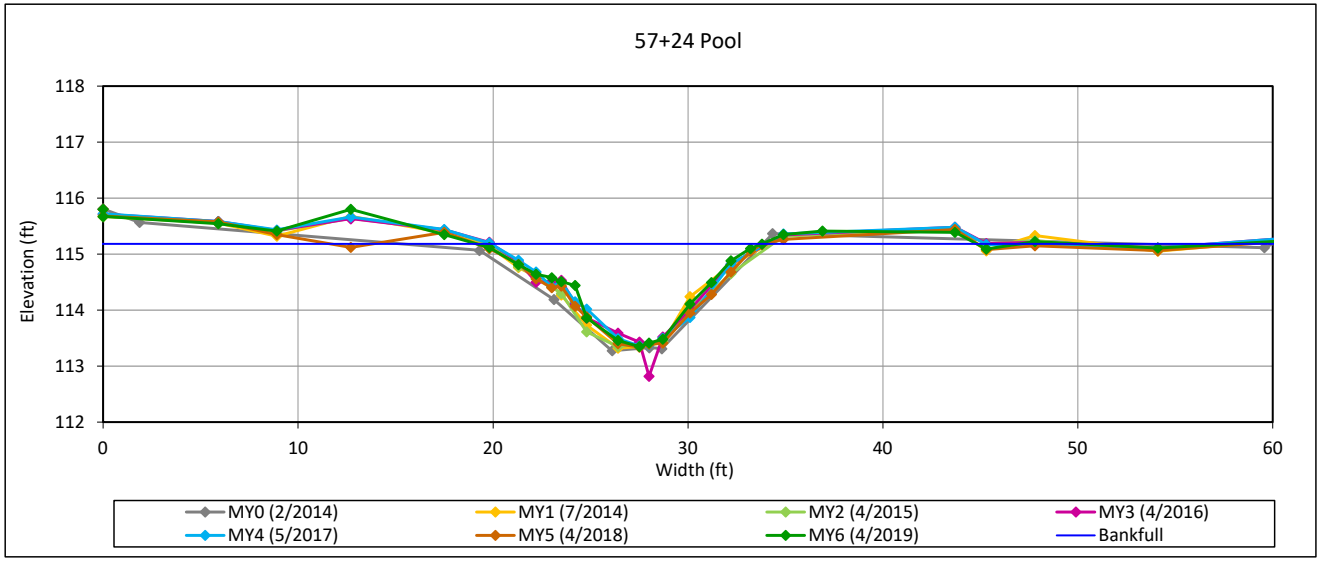
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 11-DRC East



Bankfull Dimensions	
12.8	x-section area (ft.sq.)
14.6	width (ft)
0.9	mean depth (ft)
1.8	max depth (ft)
15.3	wetted parimeter (ft)
0.8	hyd radi (ft)
16.7	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

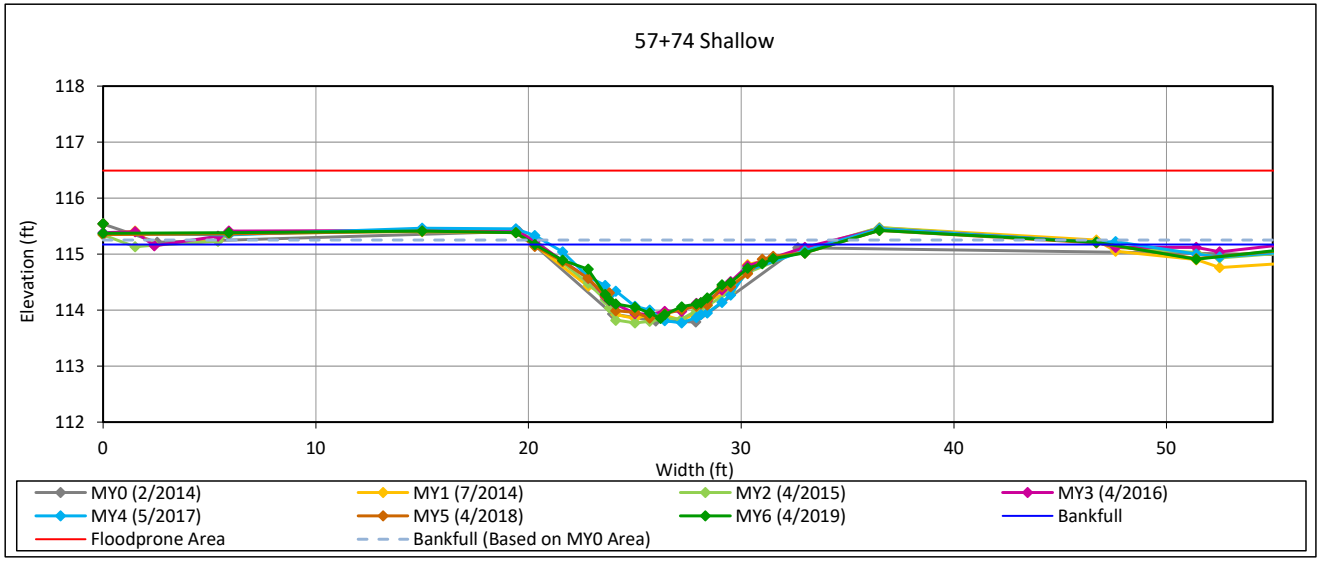
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 12-DRC East



Bankfull Dimensions	
8.6	x-section area (ft.sq.)
12.7	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
13.0	wetted parimeter (ft)
0.7	hyd radi (ft)
18.8	width-depth ratio
300.0	W flood prone area (ft)
23.6	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

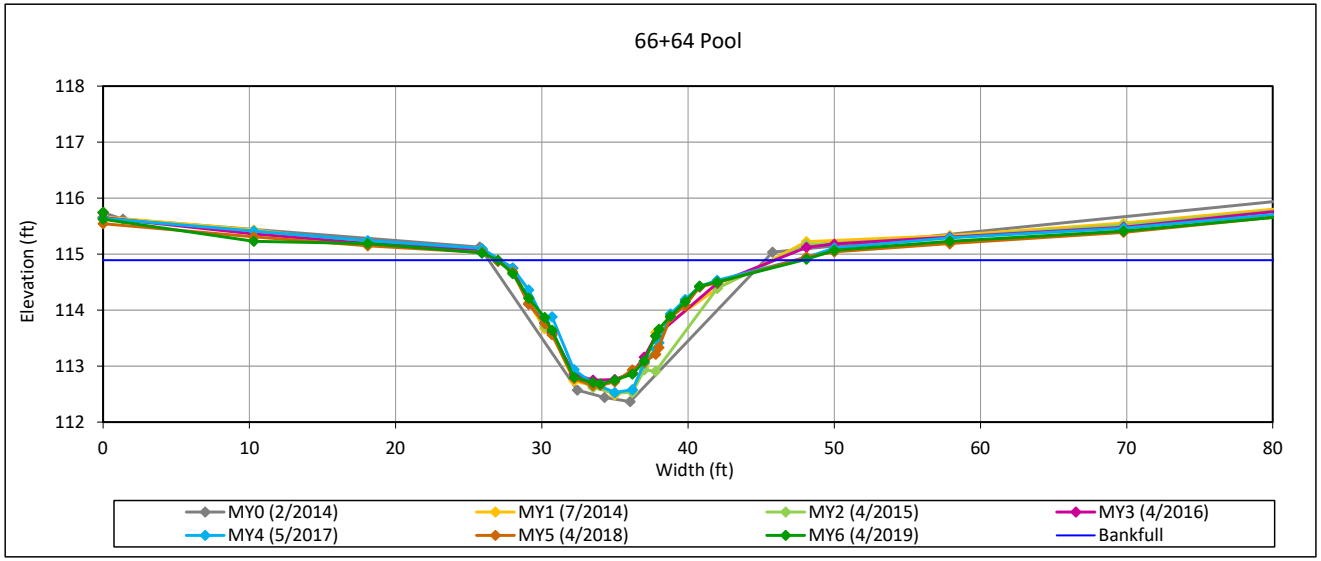
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 13-DRC East



Bankfull Dimensions	
20.2	x-section area (ft.sq.)
20.8	width (ft)
1.0	mean depth (ft)
2.2	max depth (ft)
21.6	wetted parimeter (ft)
0.9	hyd radi (ft)
21.4	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

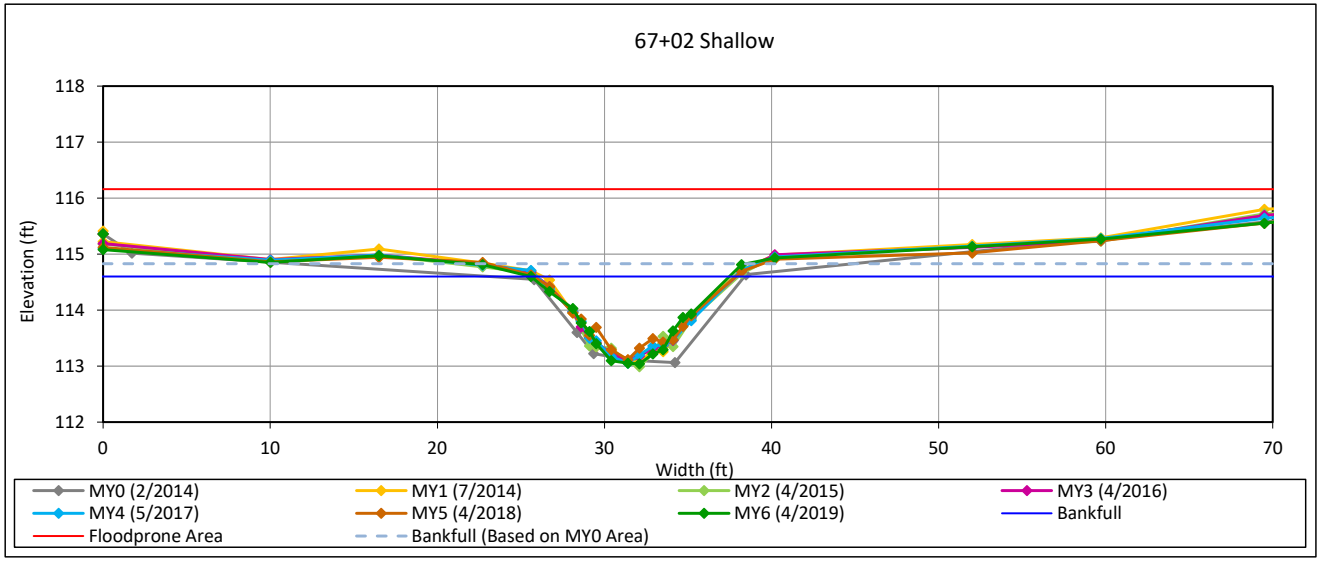
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 14-DRC East



Bankfull Dimensions	
10.1	x-section area (ft.sq.)
11.9	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
12.4	wetted parimeter (ft)
0.8	hyd radi (ft)
14.0	width-depth ratio
300.0	W flood prone area (ft)
25.2	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

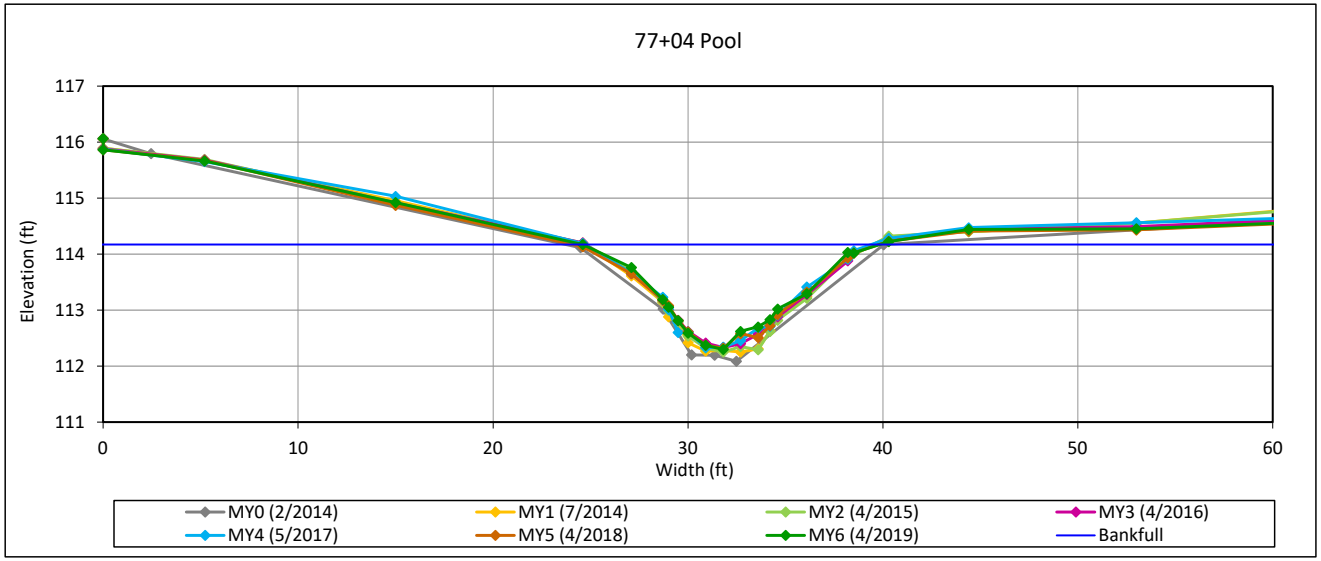
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 15-DRC East



Bankfull Dimensions	
13.4	x-section area (ft.sq.)
15.3	width (ft)
0.9	mean depth (ft)
1.9	max depth (ft)
15.8	wetted parimeter (ft)
0.8	hyd radi (ft)
17.3	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

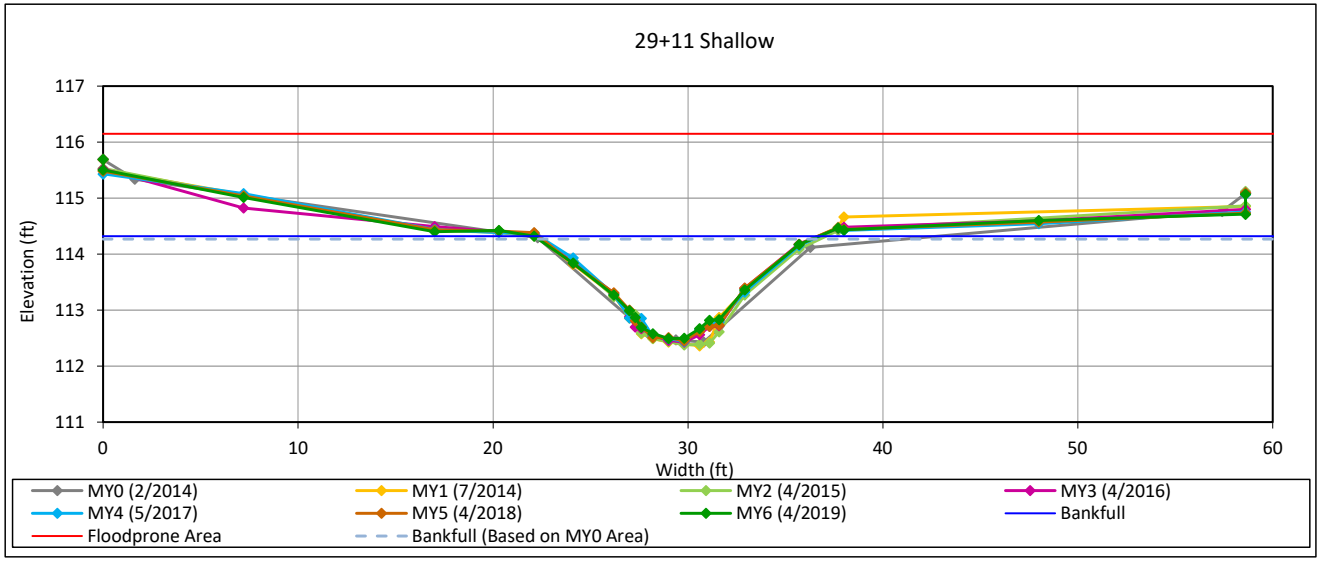
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 16-DRC East



Bankfull Dimensions	
14.0	x-section area (ft.sq.)
14.6	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
15.2	wetted parimeter (ft)
0.9	hyd radi (ft)
15.3	width-depth ratio
300.0	W flood prone area (ft)
20.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

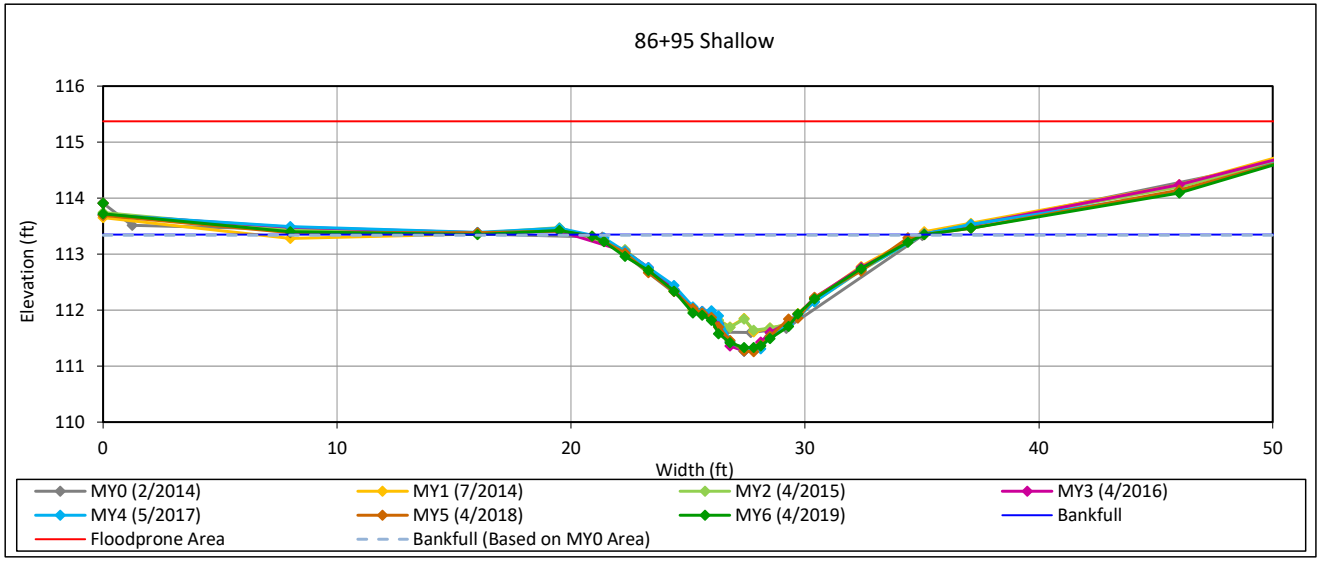
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 17-DRC East



Bankfull Dimensions	
14.1	x-section area (ft.sq.)
14.2	width (ft)
1.0	mean depth (ft)
2.0	max depth (ft)
14.9	wetted parimeter (ft)
0.9	hyd radi (ft)
14.3	width-depth ratio
300.0	W flood prone area (ft)
21.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

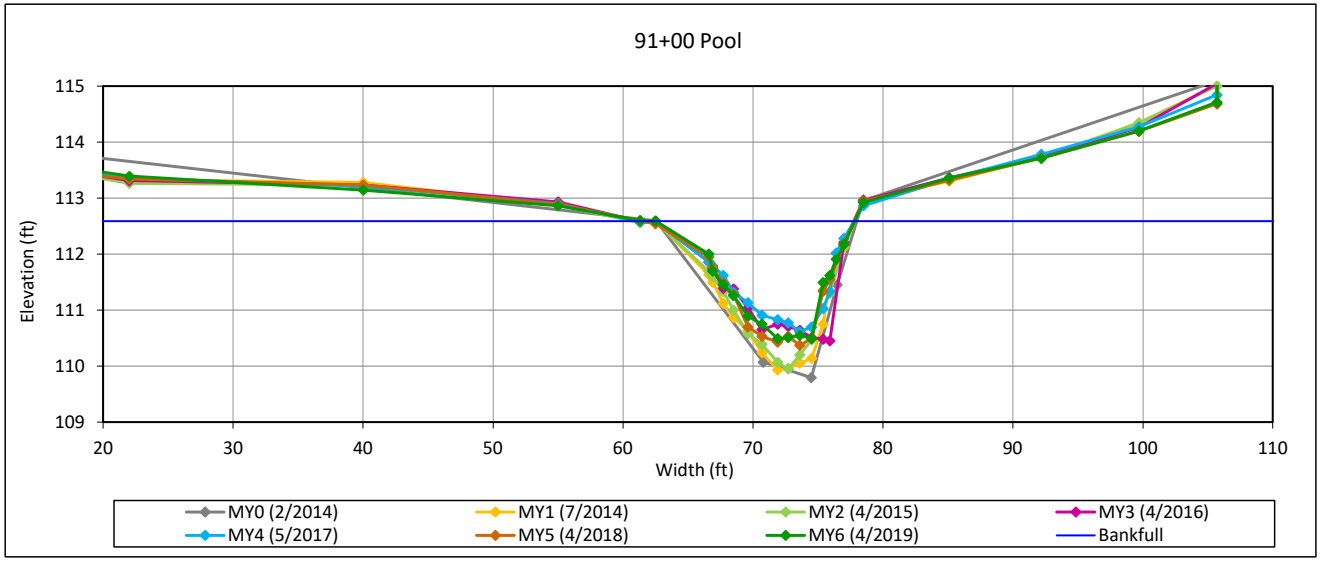
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 18-DRC East



Bankfull Dimensions	
17.5	x-section area (ft.sq.)
15.3	width (ft)
1.1	mean depth (ft)
2.1	max depth (ft)
16.4	wetted parimeter (ft)
1.1	hyd radi (ft)
13.5	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

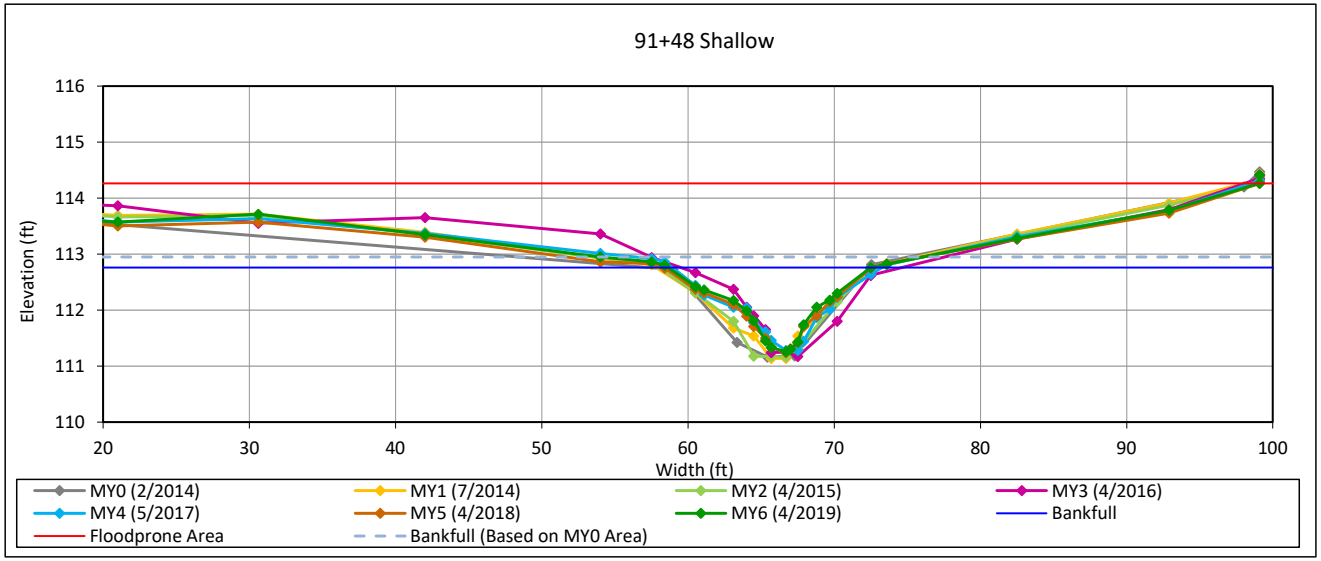
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 19-DRC East



Bankfull Dimensions	
9.2	x-section area (ft.sq.)
13.9	width (ft)
0.7	mean depth (ft)
1.5	max depth (ft)
14.3	wetted parimeter (ft)
0.6	hyd radi (ft)
20.8	width-depth ratio
300.0	W flood prone area (ft)
21.6	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

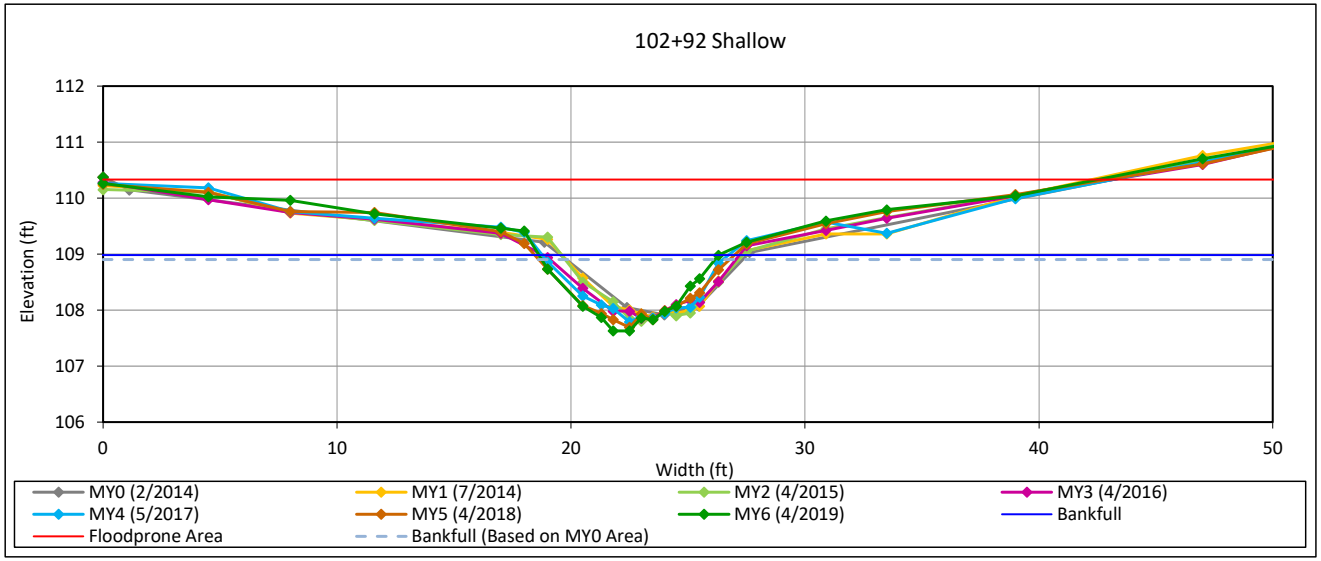
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 20-DRC East



Bankfull Dimensions	
6.3	x-section area (ft.sq.)
7.7	width (ft)
0.8	mean depth (ft)
1.3	max depth (ft)
8.3	wetted parimeter (ft)
0.8	hyd radi (ft)
9.4	width-depth ratio
300.0	W flood prone area (ft)
39.1	entrenchment ratio
1.1	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

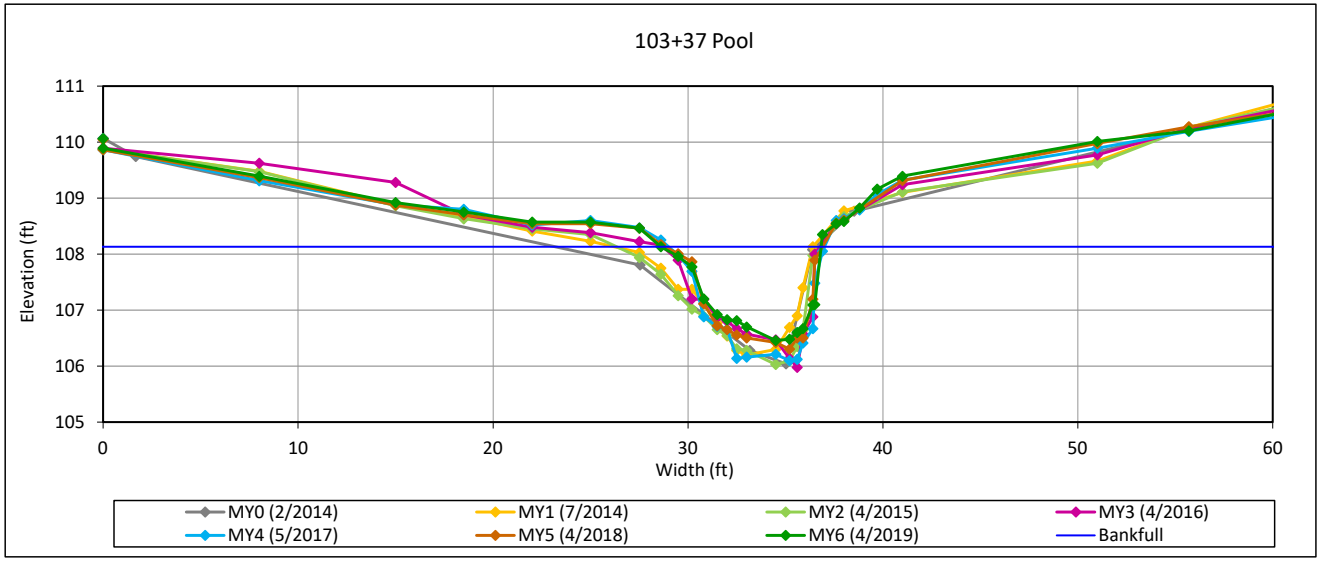
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 21-DRC East



Bankfull Dimensions	
8.8	x-section area (ft.sq.)
8.2	width (ft)
1.1	mean depth (ft)
1.7	max depth (ft)
9.5	wetted parimeter (ft)
0.9	hyd radi (ft)
7.7	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

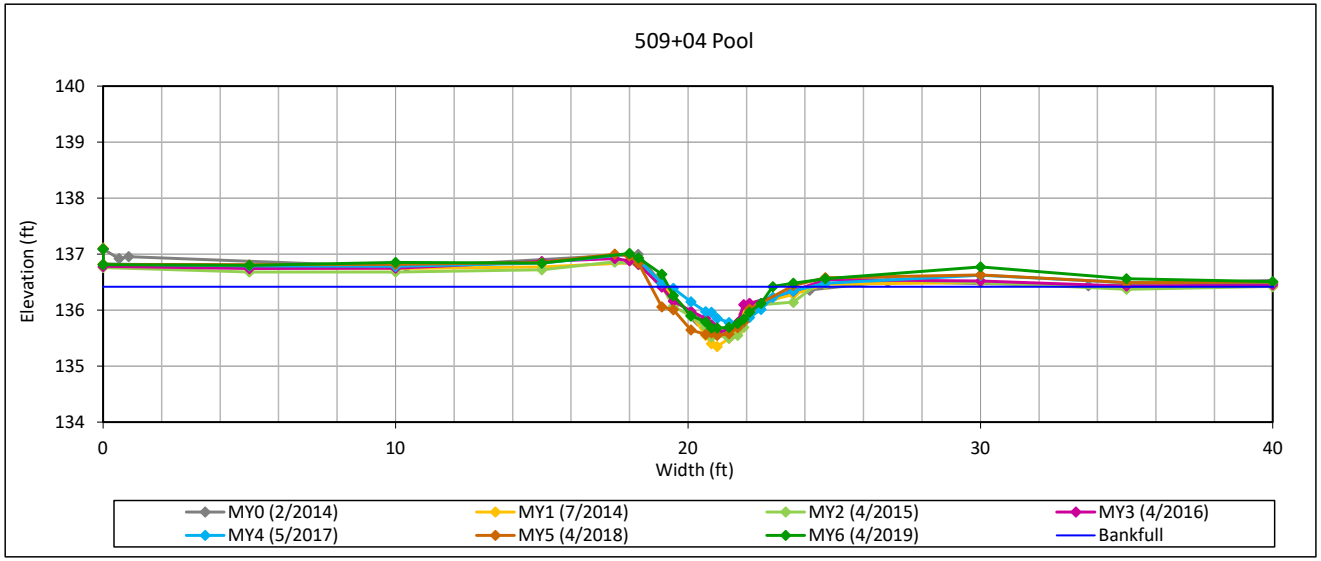
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 22-Southwest Branch



Bankfull Dimensions	
1.7	x-section area (ft.sq.)
3.6	width (ft)
0.5	mean depth (ft)
0.7	max depth (ft)
4.0	wetted parimeter (ft)
0.4	hyd radi (ft)
7.3	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

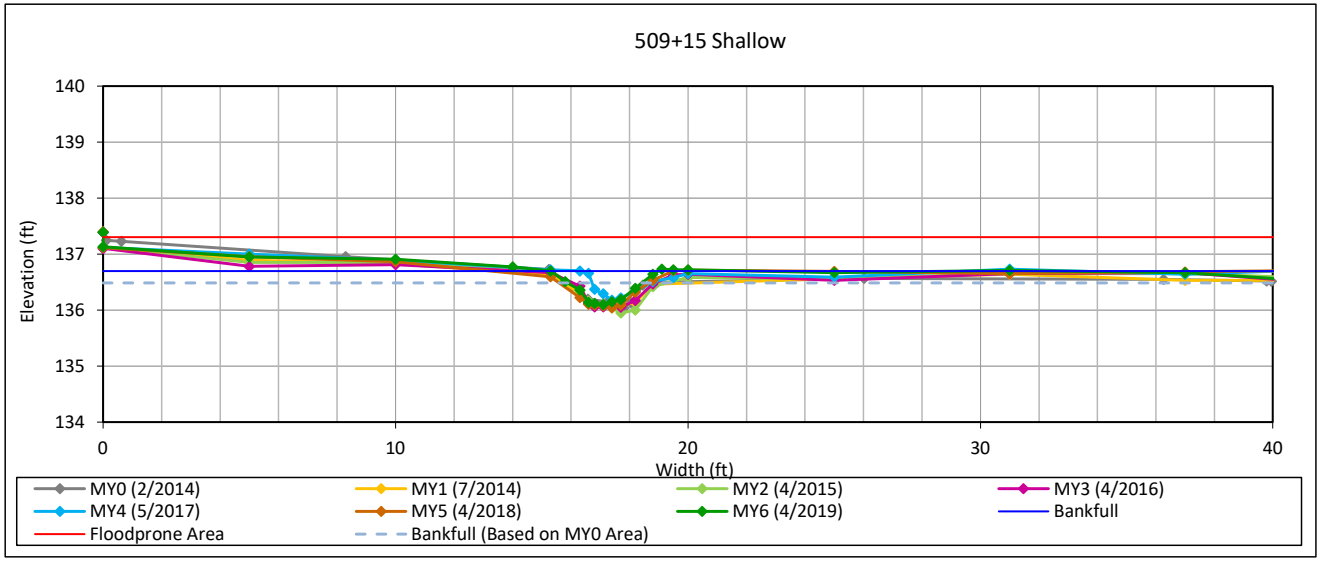
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 23-Southwest Branch



Bankfull Dimensions	
1.3	x-section area (ft.sq.)
3.5	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
3.7	wetted parimeter (ft)
0.3	hyd radi (ft)
9.8	width-depth ratio
200.0	W flood prone area (ft)
57.1	entrenchment ratio
1.5	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

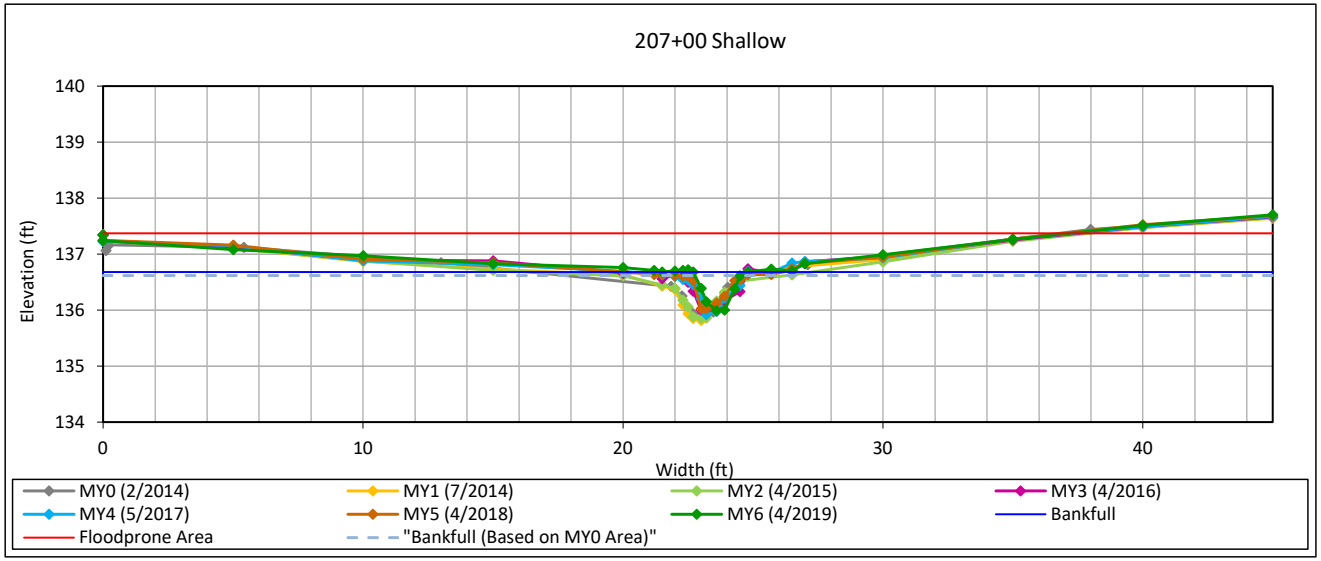
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 24-Middle Branch



Bankfull Dimensions	
0.8	x-section area (ft.sq.)
2.1	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
2.6	wetted parimeter (ft)
0.3	hyd radi (ft)
5.4	width-depth ratio
50.0	W flood prone area (ft)
23.8	entrenchment ratio
1.1	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

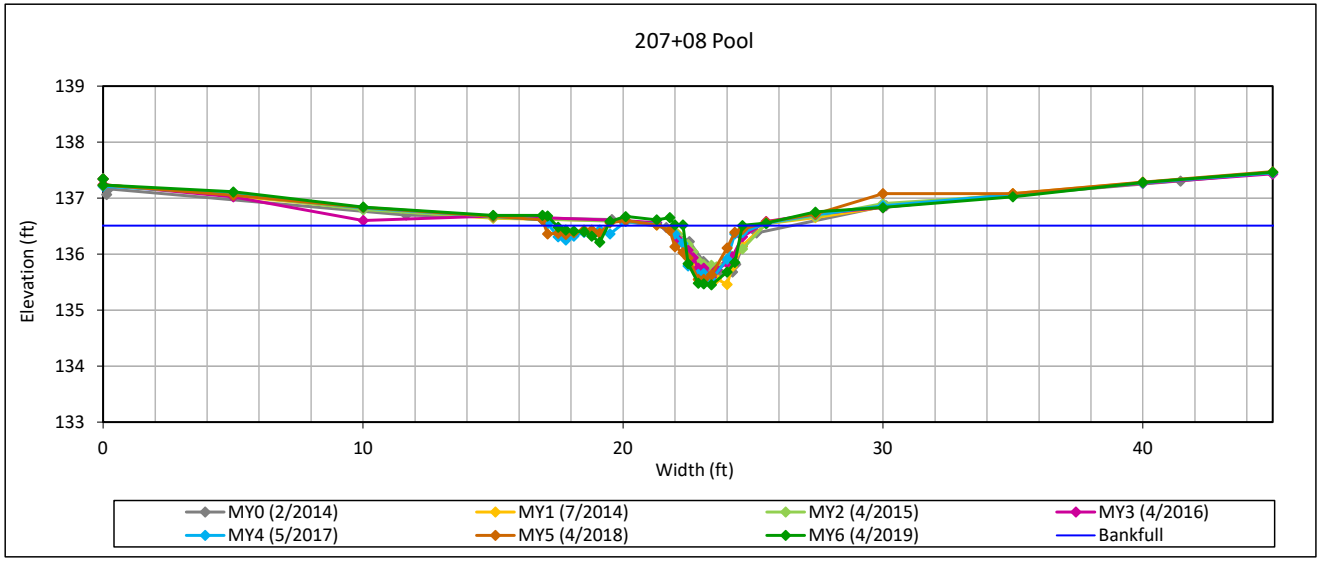
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 25-Middle Branch



Bankfull Dimensions	
1.8	x-section area (ft.sq.)
2.3	width (ft)
0.8	mean depth (ft)
1.1	max depth (ft)
3.5	wetted parimeter (ft)
0.5	hyd radi (ft)
2.9	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

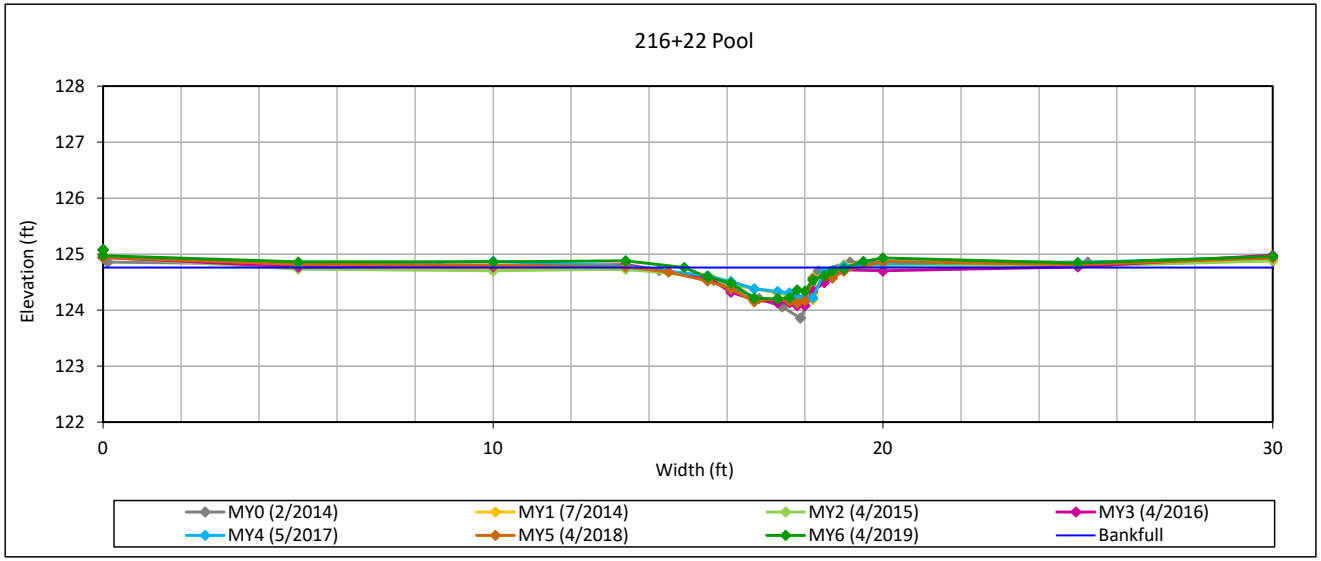
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 26-Middle Branch



Bankfull Dimensions	
1.3	x-section area (ft.sq.)
4.2	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
4.4	wetted parimeter (ft)
0.3	hyd radi (ft)
13.8	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

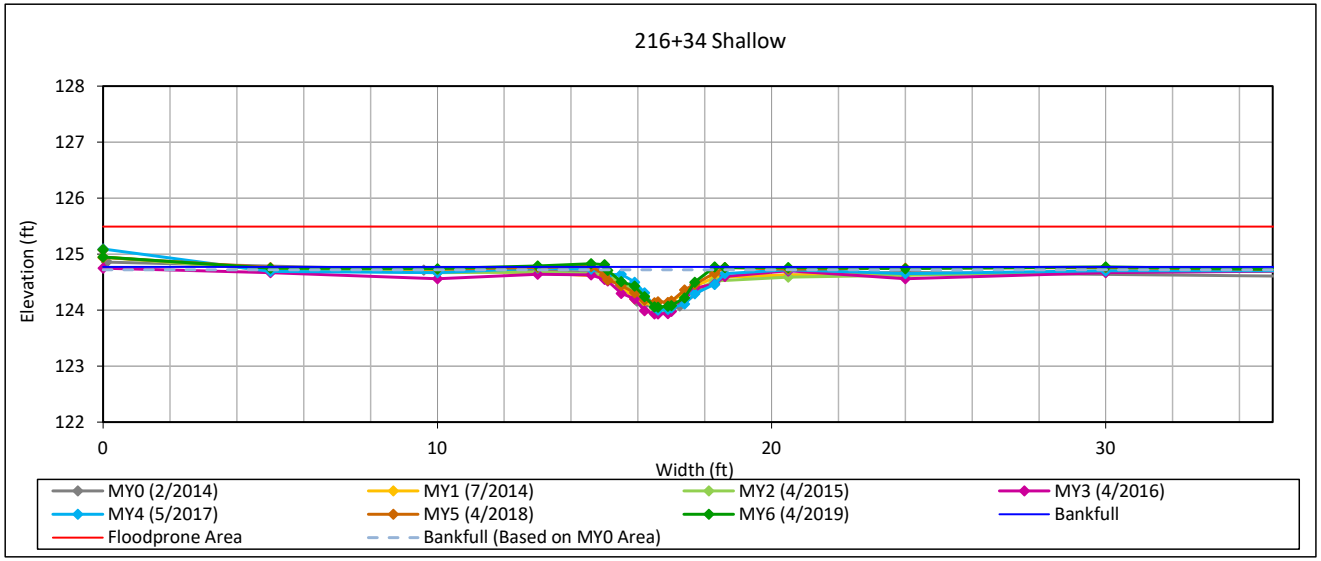
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 27-Middle Branch



Bankfull Dimensions	
1.3	x-section area (ft.sq.)
3.3	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
3.6	wetted parimeter (ft)
0.4	hyd radi (ft)
8.1	width-depth ratio
200.0	W flood prone area (ft)
61.3	entrenchment ratio
1.1	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

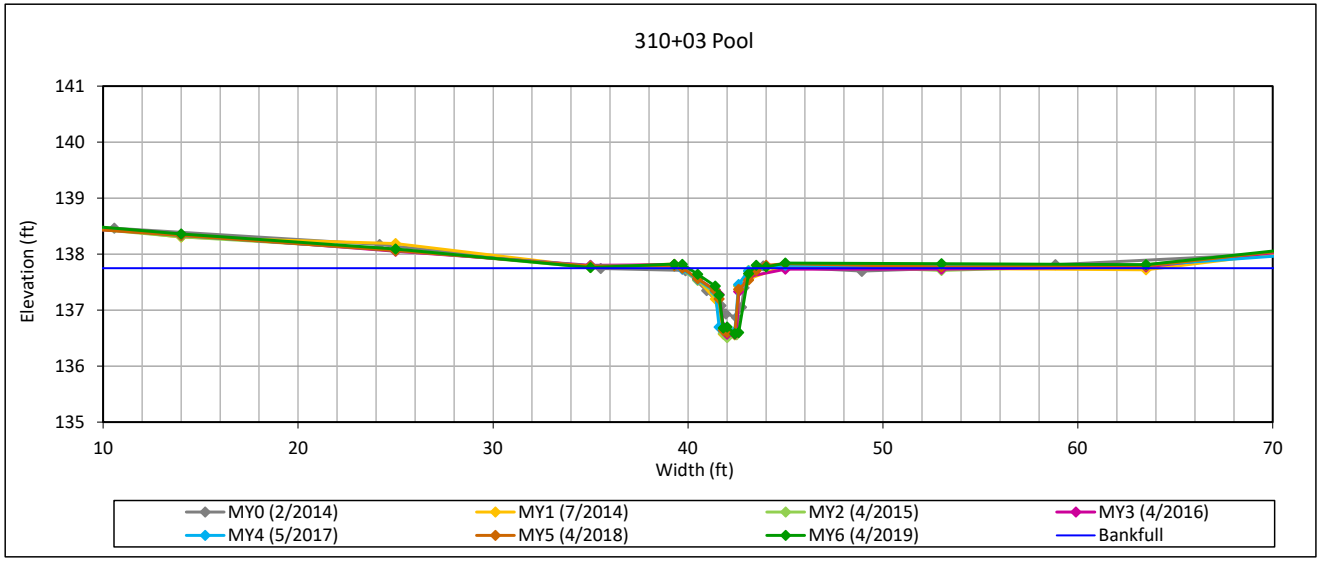
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 28-Southeast Branch



Bankfull Dimensions	
1.7	x-section area (ft.sq.)
3.4	width (ft)
0.5	mean depth (ft)
1.2	max depth (ft)
4.6	wetted parimeter (ft)
0.4	hyd radi (ft)
6.7	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

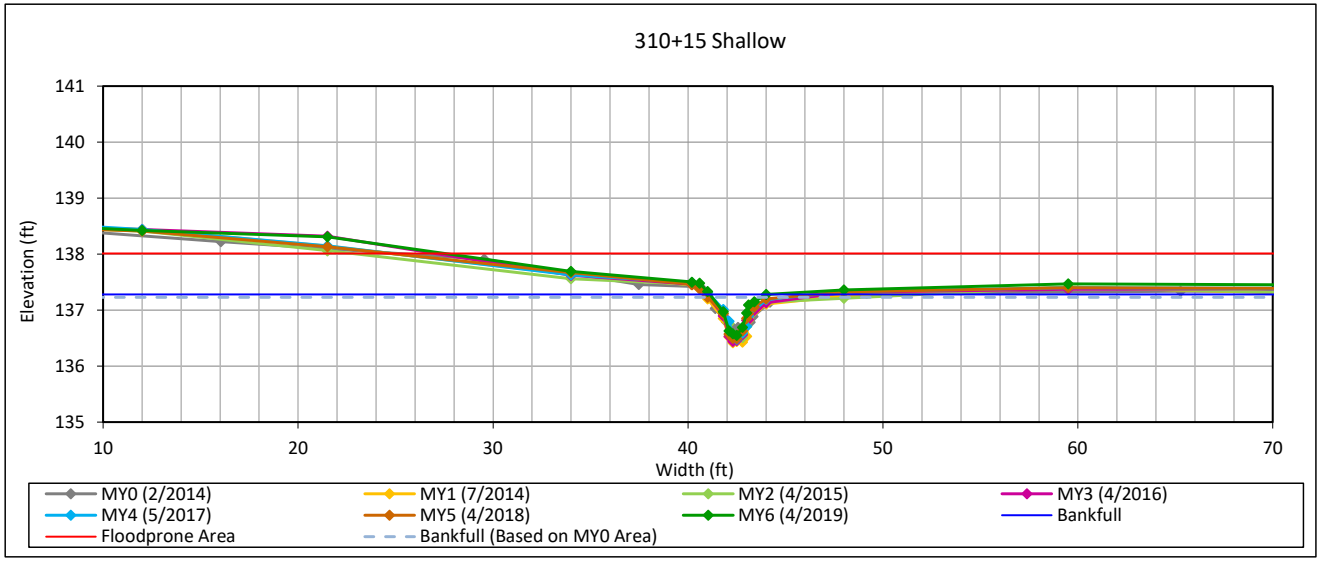
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 29-Southeast Branch



Bankfull Dimensions	
0.9	x-section area (ft.sq.)
2.9	width (ft)
0.3	mean depth (ft)
0.7	max depth (ft)
3.4	wetted parimeter (ft)
0.3	hyd radi (ft)
9.0	width-depth ratio
30.0	W flood prone area (ft)
10.4	entrenchment ratio
1.1	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

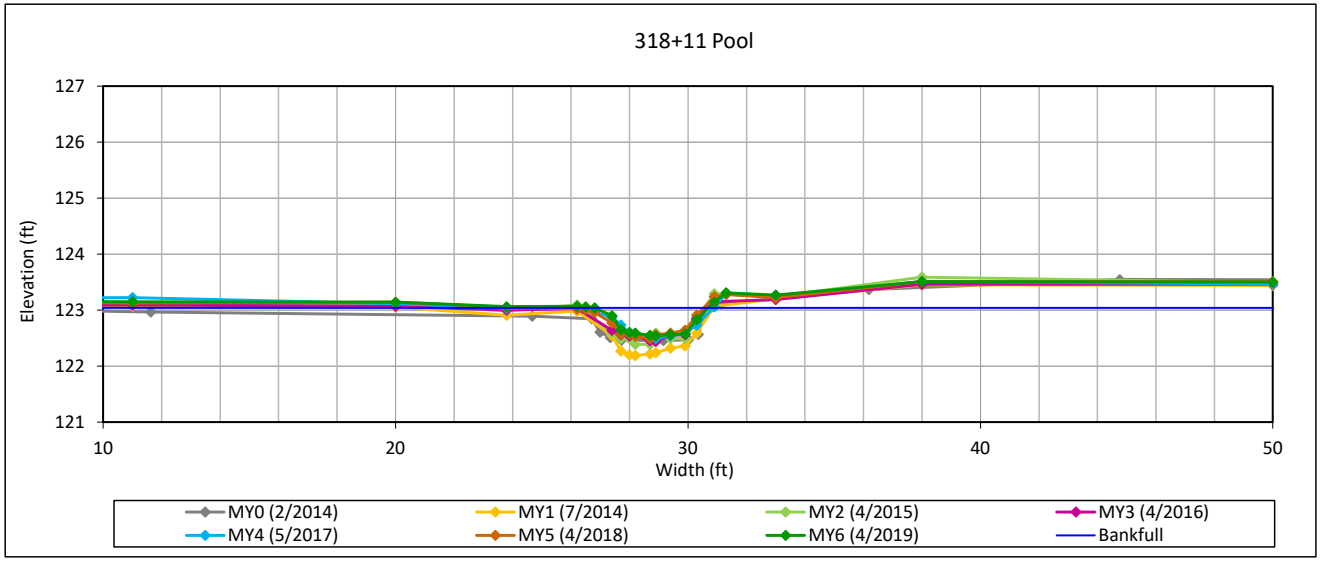
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 30-Southeast Branch



Bankfull Dimensions	
1.3	x-section area (ft.sq.)
3.9	width (ft)
0.3	mean depth (ft)
0.5	max depth (ft)
4.1	wetted parimeter (ft)
0.3	hyd radi (ft)
11.5	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

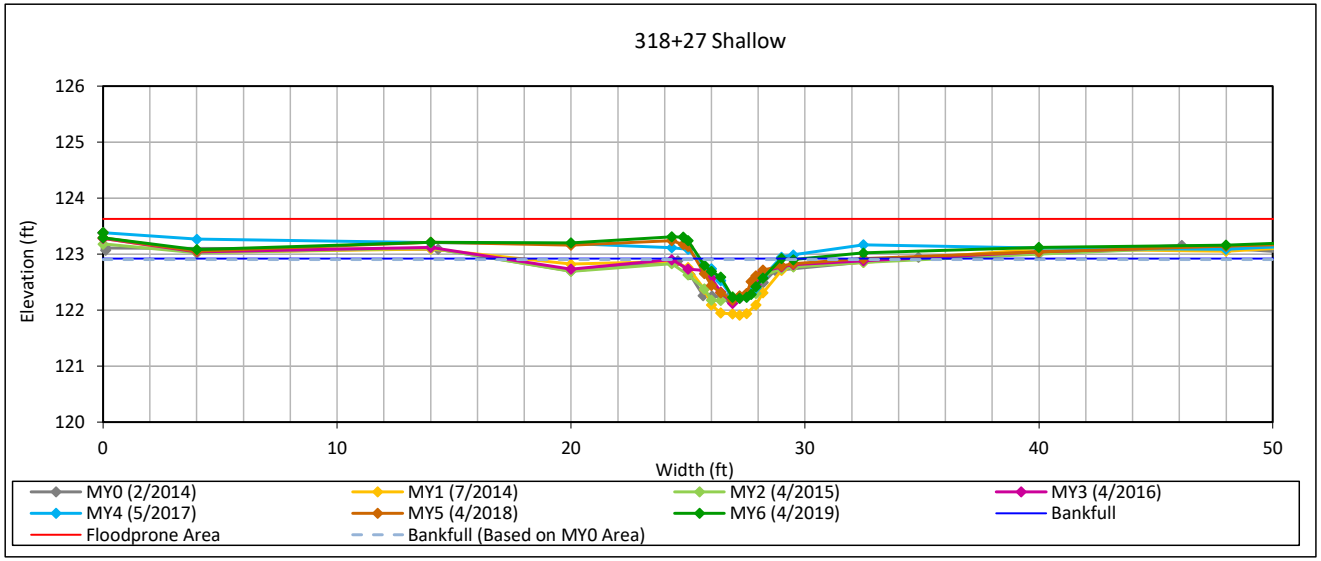
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 31-Southeast Branch



Bankfull Dimensions	
1.4	x-section area (ft.sq.)
3.5	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
3.8	wetted parimeter (ft)
0.4	hyd radi (ft)
8.9	width-depth ratio
60.0	W flood prone area (ft)
17.2	entrenchment ratio
1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

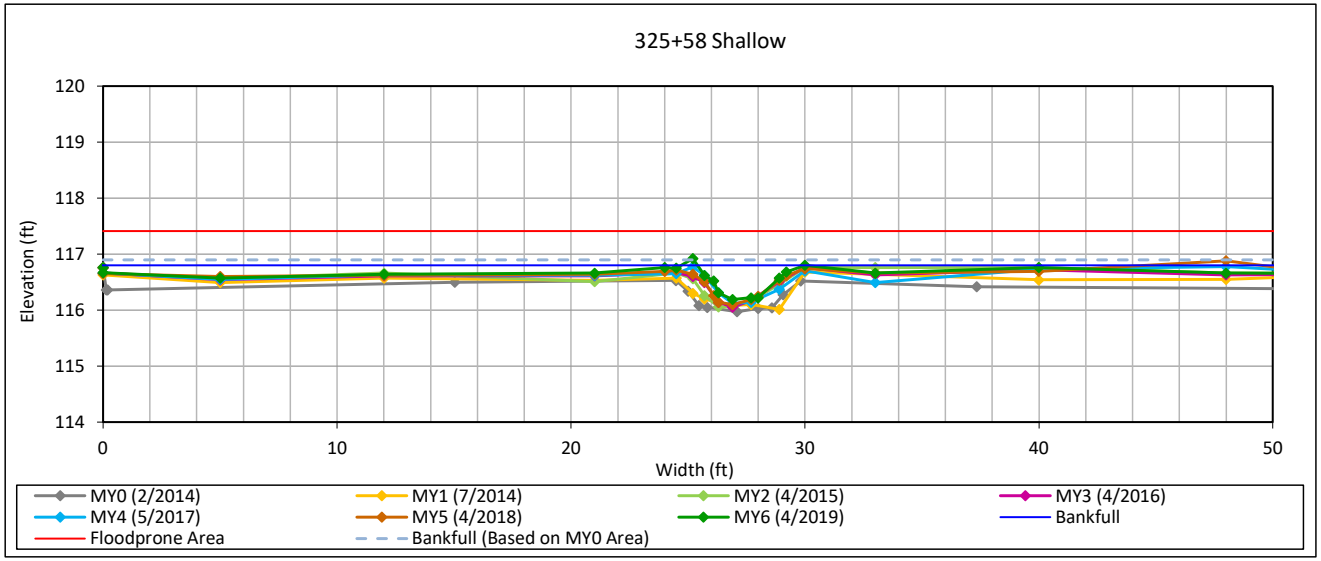
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 32-Southeast Branch



Bankfull Dimensions	
1.6	x-section area (ft.sq.)
4.6	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
4.9	wetted parimeter (ft)
0.3	hyd radi (ft)
12.9	width-depth ratio
200.0	W flood prone area (ft)
43.5	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

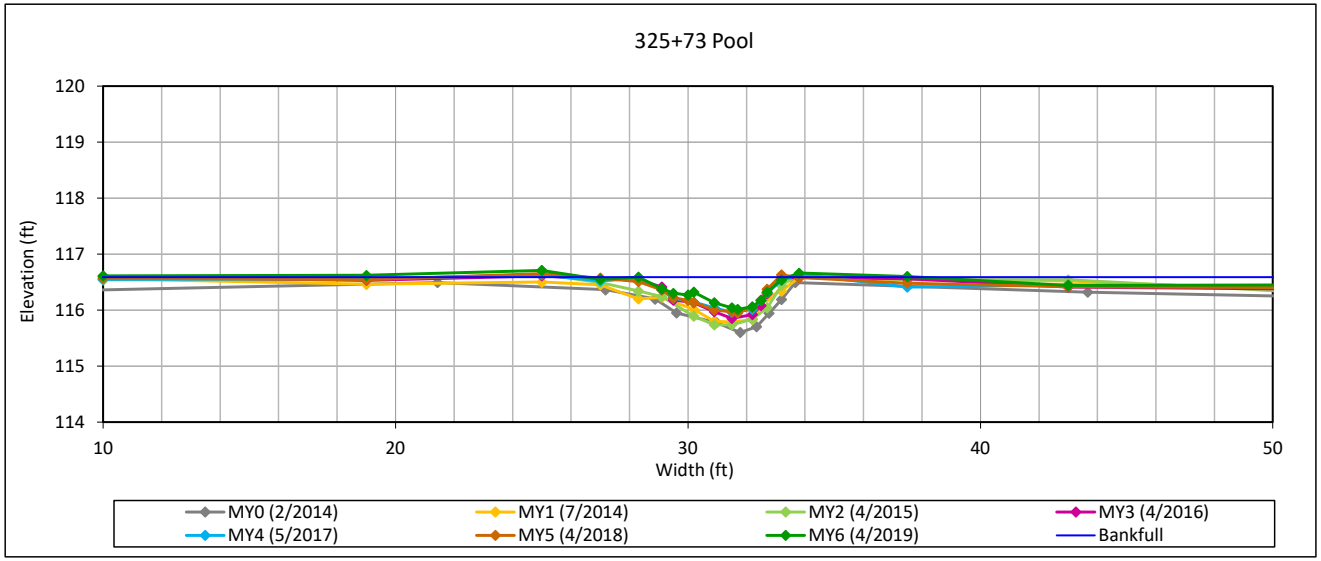
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 33-Southeast Branch



Bankfull Dimensions	
1.6	x-section area (ft.sq.)
5.1	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
5.3	wetted parimeter (ft)
0.3	hyd radi (ft)
16.2	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

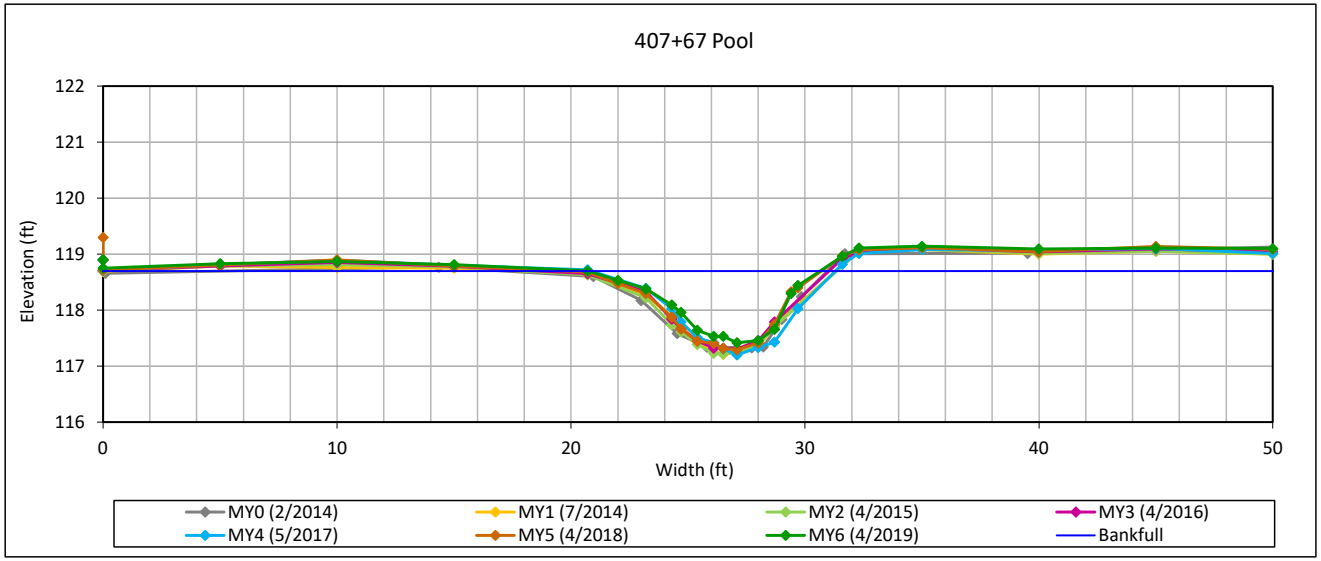
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 34-North Branch



Bankfull Dimensions	
6.5	x-section area (ft.sq.)
10.0	width (ft)
0.6	mean depth (ft)
1.3	max depth (ft)
10.5	wetted parimeter (ft)
0.6	hyd radi (ft)
15.3	width-depth ratio

Survey Date: 4/2019
Field Crew: Wildlands Engineering

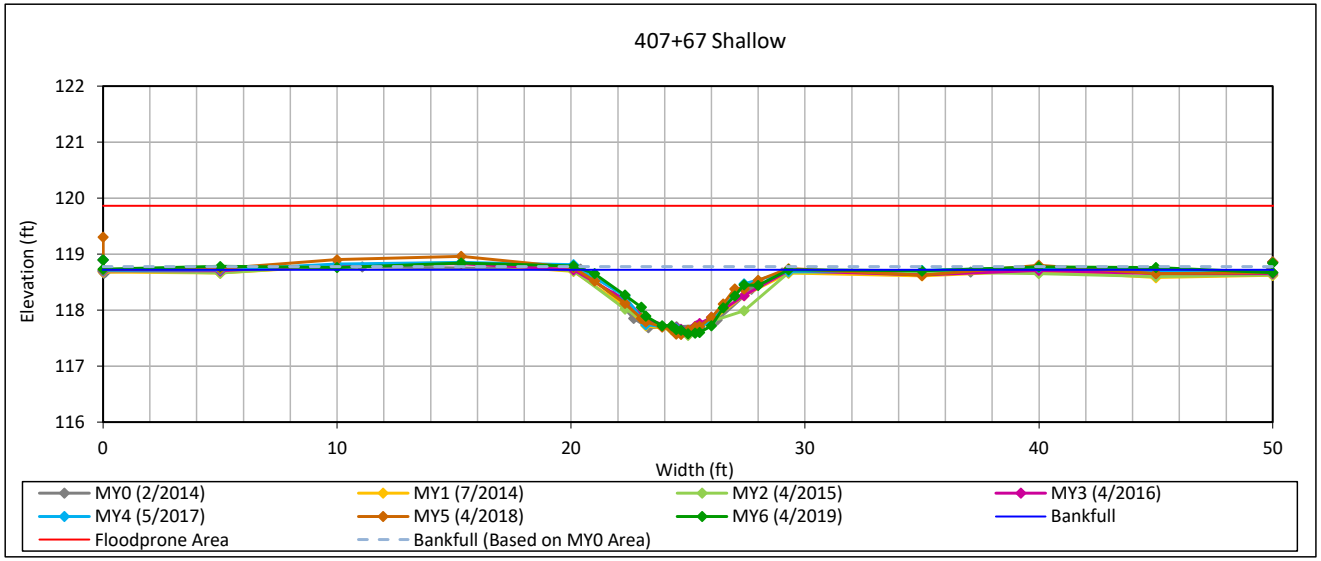
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 35-North Branch



Bankfull Dimensions	
5.0	x-section area (ft.sq.)
8.7	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
9.2	wetted parimeter (ft)
0.5	hyd radi (ft)
15.3	width-depth ratio
200.0	W flood prone area (ft)
22.9	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

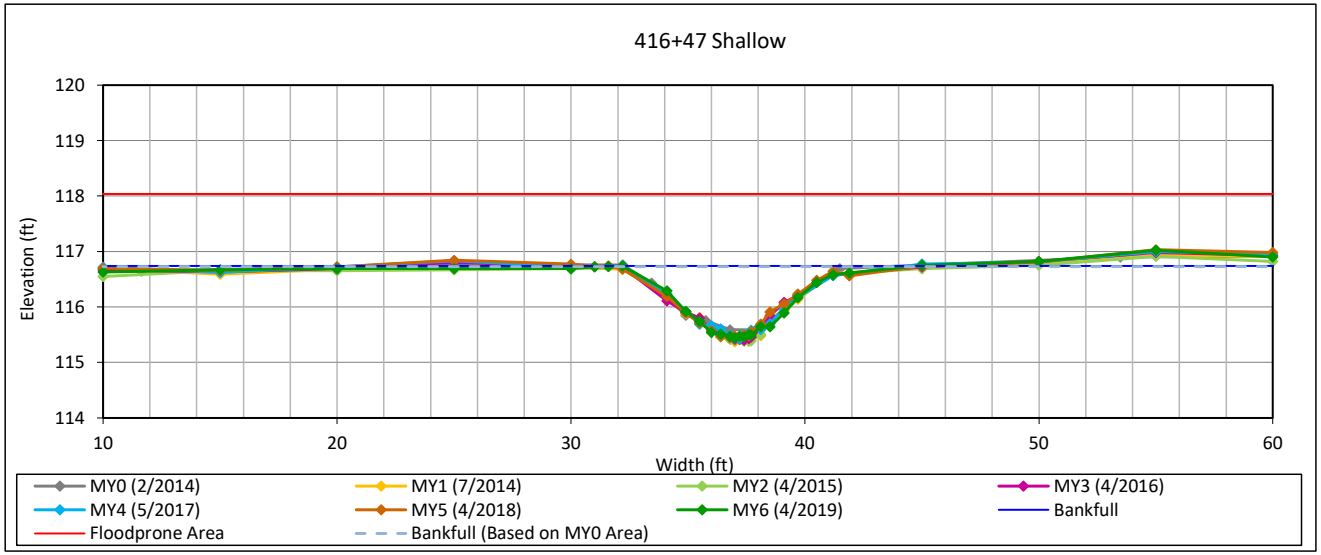
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 36-North Branch



Bankfull Dimensions	
6.6	x-section area (ft.sq.)
9.0	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
9.4	wetted parimeter (ft)
0.7	hyd radi (ft)
12.3	width-depth ratio
200.0	W flood prone area (ft)
22.2	entrenchment ratio
1.0	low bank height ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

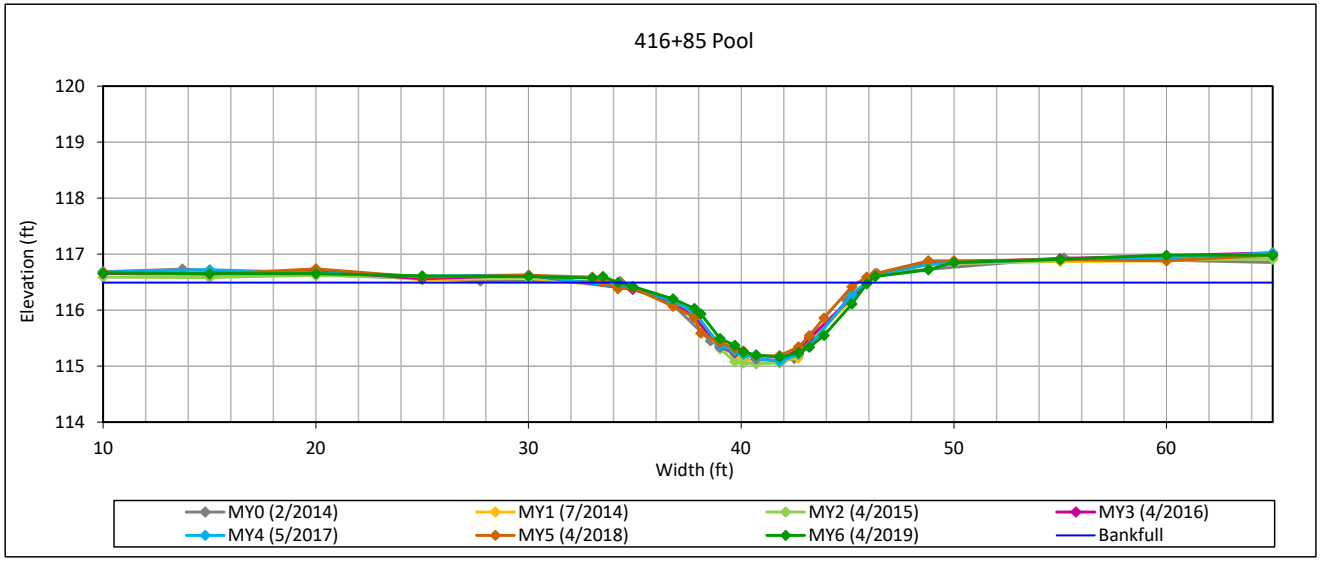
View Downstream

Cross Section Plots

Devil's Racetrack Mitigtion Site (DMS Project No. 95021)

Monitoring Year 6 - 2019

Cross Section 37-North Branch



Bankfull Dimensions	
8.5	x-section area (ft.sq.)
11.8	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
12.2	wetted parimeter (ft)
0.7	hyd radi (ft)
16.3	width-depth ratio

Survey Date: 4/2019

Field Crew: Wildlands Engineering

View Downstream

APPENDIX 5. Hydrology Summary Data and Plots

Table 13. Verification of Bankfull Events
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Reach	MY1	MY2	MY3	MY4	MY5	MY6		Method
	Date of Occurrence	Date of Occurrence	Date of Occurrence	Date of Occurrence	Date of Occurrence	Date of Data Collection	Date of Occurrence	
Devil's Racetrach (West)	3/28/2014 - 4/1/2014	3/5/2015	2/4/2016	3/14/2017	1/3/2018	3/6/2019	1/4/2019	Crest Gage/ Pressure Transducer
	4/29/2014 - 5/1/2014	6/3/2015	4/13/2016	4/25/2017	1/29/2018	3/6/2019	2/13/2019	
	6/9/2014 - 6/20/2014	10/2/2015	4/23/2016	5/24/2017	3/20/2018	3/6/2019	3/3/2019	
	9/7/2014 - 9/9/2014		10/8/2016	6/15/2017	4/24/2018	9/25/2019	4/13/2019	
					5/29/2018	9/25/2019	5/4/2019	
					8/21/2018	9/25/2019	6/10/2019	
					9/15/2018	9/25/2019	7/12/2019	
					10/11/2018	9/25/2019	9/6/2019	
					11/13/2018	11/27/2019	10/23/2019	
					11/24/2018	11/27/2019	11/24/2019	
Devil's Racetrach (East)	Unknown	2/26/2015	2/4/2016	3/14/2017	1/3/2018	3/6/2019	1/4/2019	
	3/28/2014 - 4/1/2014	6/3/2015	6/3/2016	4/25/2017	1/29/2018	3/6/2019	2/18/2019	
	6/9/2014 - 6/20/2014	10/2/2015	10/8/2016	5/24/2017	3/20/2018	3/6/2019	2/23/2019	
					4/24/2018	3/6/2019	3/3/2019	
					5/29/2018	9/25/2019	4/14/2019	
					8/21/2018	9/25/2019	4/20/2019	
					9/15/2018	9/25/2019	6/10/2019	
					10/11/2018	9/25/2019	7/12/2019	
					11/13/2018	9/25/2019	9/6/2019	
					11/24/2018	11/27/2019	10/20/2019	
Southwest Branch	4/29/2014 - 5/1/2014	3/5/2015	2/4/2016	4/25/2017	1/13/2018	3/6/2019	1/4/2019	
	6/9/2014 - 6/20/2014	6/3/2015	10/8/2016	5/24/2017	2/12/2018	3/6/2019	3/3/2019	
	9/7/2014 - 9/9/2014	10/2/2015			9/15/2018	9/25/2019	7/12/2019	
					11/13/2018	9/25/2019	9/6/2019	
Middle Branch	3/28/2014 - 4/1/2014	3/5/2015	2/4/2016	4/25/2017	1/29/2018	3/6/2019	1/4/2019	
	4/29/2014 - 5/1/2014	6/3/2015	10/8/2016	5/24/2017	4/24/2018	3/6/2019	2/18/2019	
	6/9/2014 - 6/20/2014	10/2/2015			5/29/2018	9/25/2019	4/13/2019	
	9/7/2014 - 9/9/2014				9/15/2018	9/25/2019	7/12/2019	
					11/13/2018	9/25/2019	7/23/2019	
Southeast Branch	3/28/2014 - 4/1/2014	Unkown	2/4/2016	3/14/2017	1/29/2018	3/6/2019	3/3/2019	
	4/29/2014 - 5/1/2014	10/2/2015	10/8/2016	4/25/2017	4/24/2018	9/25/2019	4/13/2019	
	6/9/2014 - 6/20/2014				5/29/2018	9/25/2019	7/12/2019	
	9/7/2014 - 9/9/2014				9/15/2018	9/25/2019	8/16/2019	
					11/13/2018	9/25/2019	9/6/2019	
North Branch	4/29/2014 - 5/1/2014	3/5/2015	2/4/2016	4/25/2017	1/3/2018	3/6/2019	1/4/2019	
	6/9/2014 - 6/20/2014	6/3/2015	10/8/2016	5/24/2017	1/29/2018	3/6/2019	3/3/2019	
	9/7/2014 - 9/9/2014	10/1/2015			3/20/2018	9/25/2019	4/13/2019	
					5/29/2018	9/25/2019	6/10/2019	
					9/15/2018	9/25/2019	7/12/2019	
					11/13/2018	9/25/2019	9/6/2019	

Table 14. In-Stream Flow Gage Attainment Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Summary of In-Stream Flow Gage Results for Monitoring Years 1 through 7							
Reach	Max Consecutive Days/ Total Days Meeting Success Criteria						
	Year 1 (2014)	Year 2 (2015)	Year 3 (2016)	Year 4 (2017)	Year 5 (2018)	Year 6 (2019)	Year 7 (2020)
Southwest Branch	114 Days/ 143 Days	365 Days/ 365 Days	365 Days/ 365 Days	365 Days/ 365 Days	*132 Days/ 132 Days	329 Days/ 329 Days	
Middle Branch	102 Days/ 243 Days	365 Days/ 365 Days	365 Days/ 365 Days	*345 Days/ 345 Days	365 Days/ 365 Days	*276 Days/ 276 Days	
Southeast Branch	86 Days/ 134 Days	*16 Days/ 24 Days	136 Days/ 229 Days	70 Days/ 128 Days	*123 Days/ 216 Days	117 Days/ 176 Days	

Success criteria is 30 consecutive days of flow.
*A gage malfunction occurred during a portion of the monitoring year.

Table 15. Wetland Gage Attainment Summary
Devil's Racetrack Mitigation Site (DMS Project No. 95021)
Monitoring Year 6 - 2019

Summary of Groundwater Gage Results for Monitoring Years 1 through 7							
Gage	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2014)**	Year 2 (2015)	Year 3 (2016)	Year 4 (2017)	Year 5 (2018)	Year 6 (2019)	Year 7 (2020)
1	No/7.5 Days (3.1%)	No/16 Days (6.0%)	Yes/31 Days (11.9%)	Yes/28 Days (10.8%)	Yes/37 Days (14.2%)	Yes/48 Days (18.4%)	
2	No/14.5 Days (6.0%)	Yes/ 58 Days (22.3%)	No/21 Days (8.1%)	No/15 Days (5.8%)	Yes/35 Days (13.4%)	Yes/57 Days (21.8%)	
3	No/2.5 Days (1.0%)	Yes/33 Days (12.8%)	No/9 Days (3.5%)	No/11 Days (4.2%)	Yes/35 Days (13.4%)	Yes/56 Days (21.5%)	
4	No/13.5 Days (5.6%)	Yes/57 Days (21.9%)	Yes/25 Days (9.6%)	Yes/30 Days (11.5%)	Yes/67 Days (25.7%)	Yes/59 Days (22.6%)	
5	No/12.5 Days (5.2%)	Yes/34 Days (13.0%)	No/18 Days (6.9%)	No/12 Days (4.6%)	Yes/36 Days (13.8%)	Yes/32 Days (12.3%)	
6	No/11.0 Days (4.6%)	Yes/53 Days (20.3%)	Yes/23 Days (8.8%)	No/13 Days (5.0%)	No/14 Days (5.4%)	Yes/30 Days (11.5%)	
7	Yes/21.5 Days (9.0%)	Yes/66 Days (25.6%)	Yes/25 Days (9.6%)	Yes/23 Days (8.8%)	Yes/51 Days (19.5%)	**No/7 Days * (2.7%)**	
8	No/5.0 Days (2.1%)	Yes/31 Days (12.0%)	No/8 Days (3.1%)	No/10 Days (3.8%)	Removed During MY5	Removed During MY5	
9	Yes/ 22.0 Days (9.2%)	Yes/80 Days (31.0%)	Yes/ 39.0 Days (15.0%)	Yes/28 Days (10.8%)	Yes/36 Days (13.8%)	Yes/55 Days (21.1%)	
10	No/ 1.5 Days (0.6%)	No/10 Days (3.9%)	No/ 3 Days (1.2%)	No/3 Days (1.2%)	Removed During MY4	Removed During MY4	
11	No/9.0 Days (3.8%)	Yes/65 Days (25.2%)	Yes/23 Days (8.8%)	Yes/31 Days (11.9%)	Yes/52 Days (19.9%)	Yes/59 Days (22.6%)	
12	No/7.5 Days (3.1%)	Yes/31 Days (12.0%)	No/13 Days (5.0%)	Yes/30 Days (11.5%)	Yes/52 Days (20.3%)	Yes/58 Days (22.2%)	
13	No/8.0 Days (3.3%)	Yes/34 Days (13.0%)	No/11 Days (4.2%)	No/10 Days (3.8%)	No/14 Days (5.4%)	Yes/31 Days (11.9%)	
14	No/ 8.5 Days (3.5%)	Yes/32 Days (12.4%)	No/12 Days (4.6%)	No/12 Days (4.6%)	Yes/35 Days (13.4%)	Yes/56 Days (21.5%)	
15	No/12.5 Days (5.2%)	Yes/33 Days (12.8%)	No/14 Days (5.4%)	Yes/30 Days (11.5%)	Yes/37 Days (14.2%)	Yes/59 Days (22.6%)	
16	No/12.5 Days (5.2%)	Yes/33 Days (12.8%)	Yes/39 Days (15.0%)	Yes/29 Days (11.2%)	Yes/36 Days (13.8%)	Yes/55 Days (21.1%)	
17	No/15.0 Days (6.3%)	Yes/34 Days (13.2%)	Yes/23 Days (8.8%)	No/16 Days (6.2%)	Yes/37 Days (14.2%)	Yes/56 Days (21.5%)	
18	Yes/69.5 Days (29.0%)	Yes/66 Days (25.6%)	Yes/22 Days (8.5%)	No/14 Days (5.4%)	Yes/36 Days (13.8%)	Yes/59 Days (22.6%)	
19	Yes/31.5 Days (13.1%)	Yes/66 Days (25.6%)	Yes/26 Days (10.0%)	Yes/30 Days (11.5%)	Yes/37 Days (14.2%)	Yes/59 Days (22.6%)	
20	No/19.5 Days (8.1%)	Yes/35 Days (13.4%)	No/12 Days (4.6%)	No/5 Days (1.9%)	No/13 Days (5.0%)	No/0 Days (0%)	
21	Yes/69.5 Days (29.0%)	Yes/79 Days (30.4%)	Yes/38 Days (14.6%)	Yes/31 Days (11.9%)	Yes/37 Days (14.2%)	**No/14 Days * (5.4%)**	
22	Yes/ 31.0 Days (12.9%)	Yes/66 Days (25.6%)	Yes/24 Days (9.2%)	No/16 Days (6.2%)	Yes/37 Days (14.2%)	**No/9 Days * (3.4%)**	
23	No/8.0 Days (3.3%)	Yes/31 Days (11.8%)	No/6 Days (2.3%)	No/5 Days (1.9%)	No/5 Days (1.9%)	No/6 Days (2.3%)	
24	No/13.0 Days (5.4%)	Yes/33 Days (12.8%)	No/ 5 Days (1.9%)	No/9 Days (3.5%)	No/12 Days (4.6%)	Yes/23 Days (8.8%)	
25	Yes/25.5 Days (10.6%)	Yes/66 Days (25.6%)	Yes/23 Days (8.8%)	No/16 Days (6.2%)	Yes/52 Days (19.9%)	Yes/60 Days (23.0%)	
26	Yes/39.0 Days (16.3%)	Yes/83 Days (32.2%)	Yes/25 Days (9.6%)	No/14 Days (5.4%)	No/14 Days (5.4%)	No/19 Days (7.3%)	
27	Yes/29.5 Days (12.3%)	Yes/67 Days (26.0%)	Yes/31 Days (11.9%)	Yes/32 Days (12.3%)	Yes/37 Days (14.2%)	Yes/59 Days (22.6%)	
28	No/19.5 Days (8.1%)	Yes/81 Days (31.2%)	Yes/106 Days (40.8%)	Yes/102 Days (39.2%)	Yes/111 Days (42.5%)	Yes/77 Days (29.5%)	
29	Yes/70.0 Days (29.2%)	Yes/81 Days (31.4%)	Yes/56 Days (21.5%)	Yes/78 Days (30.0%)	Yes/76 Days (29.1%)	Yes/63 Days (24.1%)	
30	Yes/52.5 Days (21.9%)	Yes/83 Days (32.0%)	No/11 Days (4.2%)	No/9 Days (3.5%)	No/22 Days (8.4%)	Yes/31 Days (11.9%)	
31	No/9.0 Days (3.8%)	Yes/77 Days (29.7%)	Yes/40 Days (15.4%)	Yes/32 Days (12.3%)	Yes/66 Days (25.3%)	Yes/61 Days (23.4%)	
32	No/ 7.0 Days (2.9%)	Yes/78 Days (30.2%)	No/11 Days (4.2%)	No/3 Days (1.2%)	Removed During MY5	Removed During MY5	
33	Yes/69.5 Days (29.0%)	Yes/84 Days (32.4%)	Yes/51 Days (19.6%)	Yes/46 Days (17.7%)	Yes/64 Days (24.5%)	Yes/63 Days (24.1%)	
34	No/2.0 Days (0.8%)	No/16 Days (6.0%)	No/10 Days (3.8%)	No/4 Days (1.5%)	No/9 Days (3.4%)	Removed During MY6	
35	Added During MY2	Yes/33 Days (12.8%)	Yes/42 Days (16.2%)	Yes/31 Days (11.9%)	Yes/67 Days (25.7%)	Yes/59 Days (22.6%)	
36	Added During MY2	Yes/34 Days (13.0%)	Yes/40 Days (15.4%)	Yes/31 Days (11.9%)	Yes/53 Days (20.3%)	Yes/59 Days (22.6%)	
37	Added During MY2	Yes/33 Days (12.8%)	Yes/22 Days (8.5%)	No/15 Days (5.8%)	Yes/36 Days (13.8%)	Yes/32 Days (12.3%)	
38	Added During MY2	Yes/33 Days (12.8%)	No/6 Days (2.3%)	No/11 Days (4.2%)	Yes/36 Days (13.8%)	Yes/59 Days (22.6%)	
39	Added During MY5	Added During MY5	Added During MY5	Added During MY5	Yes/65 Days (24.9%)	Yes/60 Days (23.0%)	
40	Added During MY5	Added During MY5	Added During MY5	Added During MY5	Yes/40 Days (15.3%)	Yes/56 Days (21.5%)	
41	Added During MY5	Added During MY5	Added During MY5	Added During MY5	Yes/37 Days (14.2%)	Yes/59 Days (22.6%)	

Success criteria is a free groundwater surface within 12 inches of the ground surface for 8.5% of the growing season.

* Groundwater gages 7, 21, & 22 malfunctioned during the spring of 2019 (MY6).

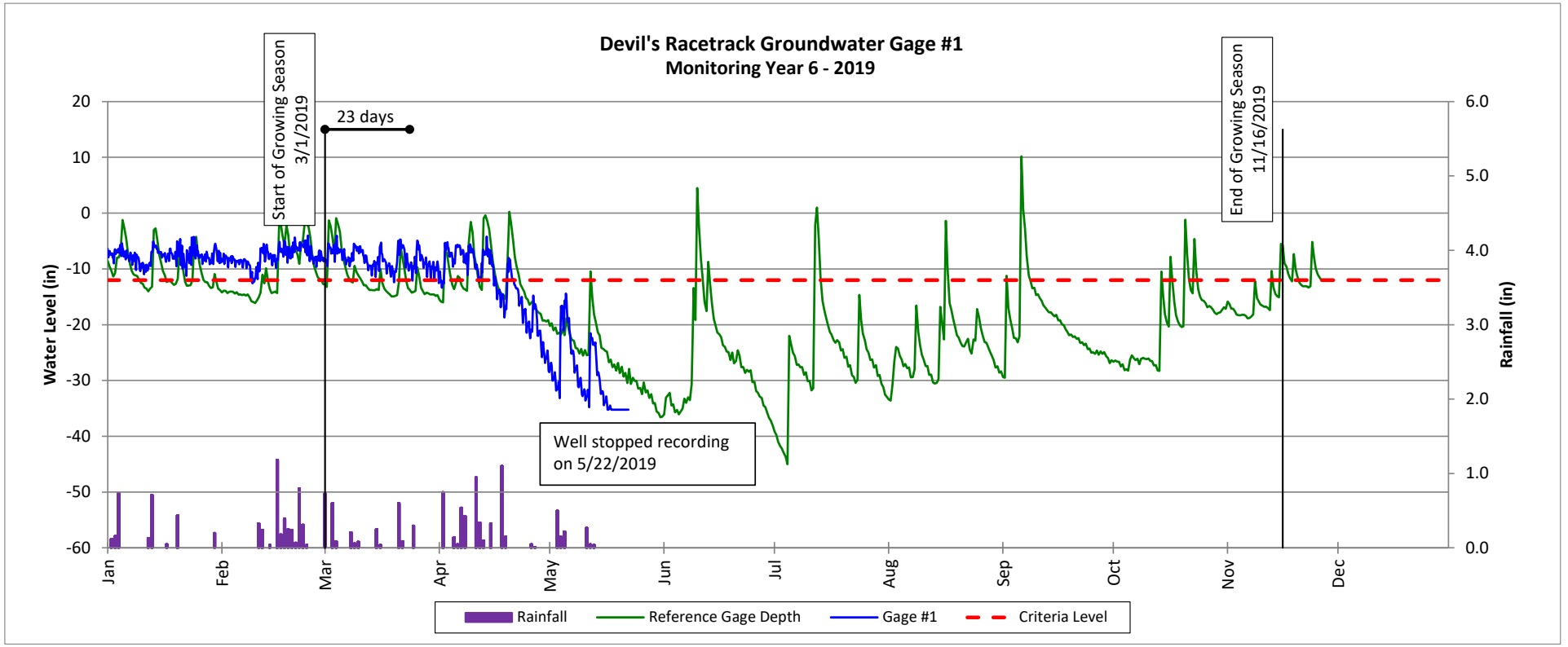
** NRCS WETS data was used to determine the growing season for monitorg year 1. After discussions with the US Army Corps of Engineers, on-site soil temperature probe data is being used to determine the beginning of the growing season.

Groundwater Gage Plots

Devil's Racetrack Mitigation Site

DMS Project No. 95021

Monitoring Year 6 - 2019

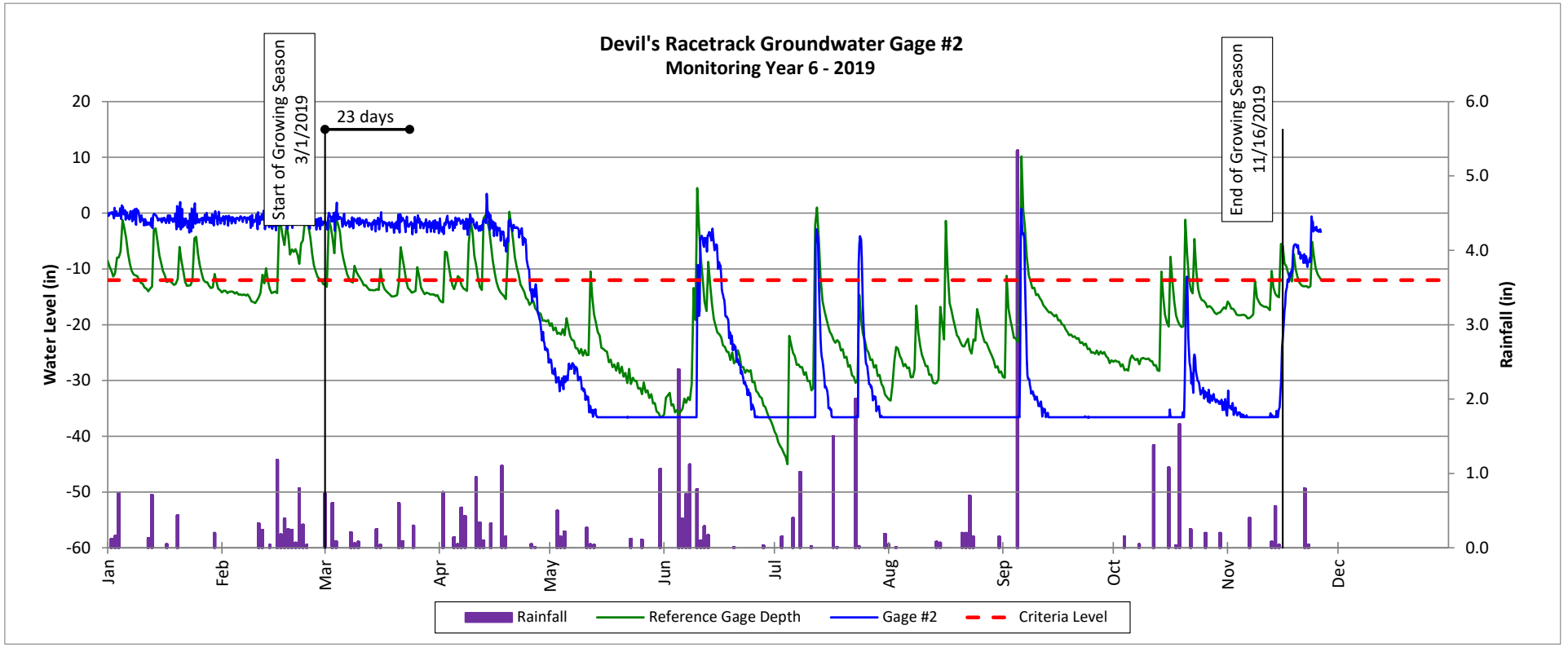


Groundwater Gage Plots

Devil's Racetrack Mitigation Site

DMS Project No. 95021

Monitoring Year 6 - 2019

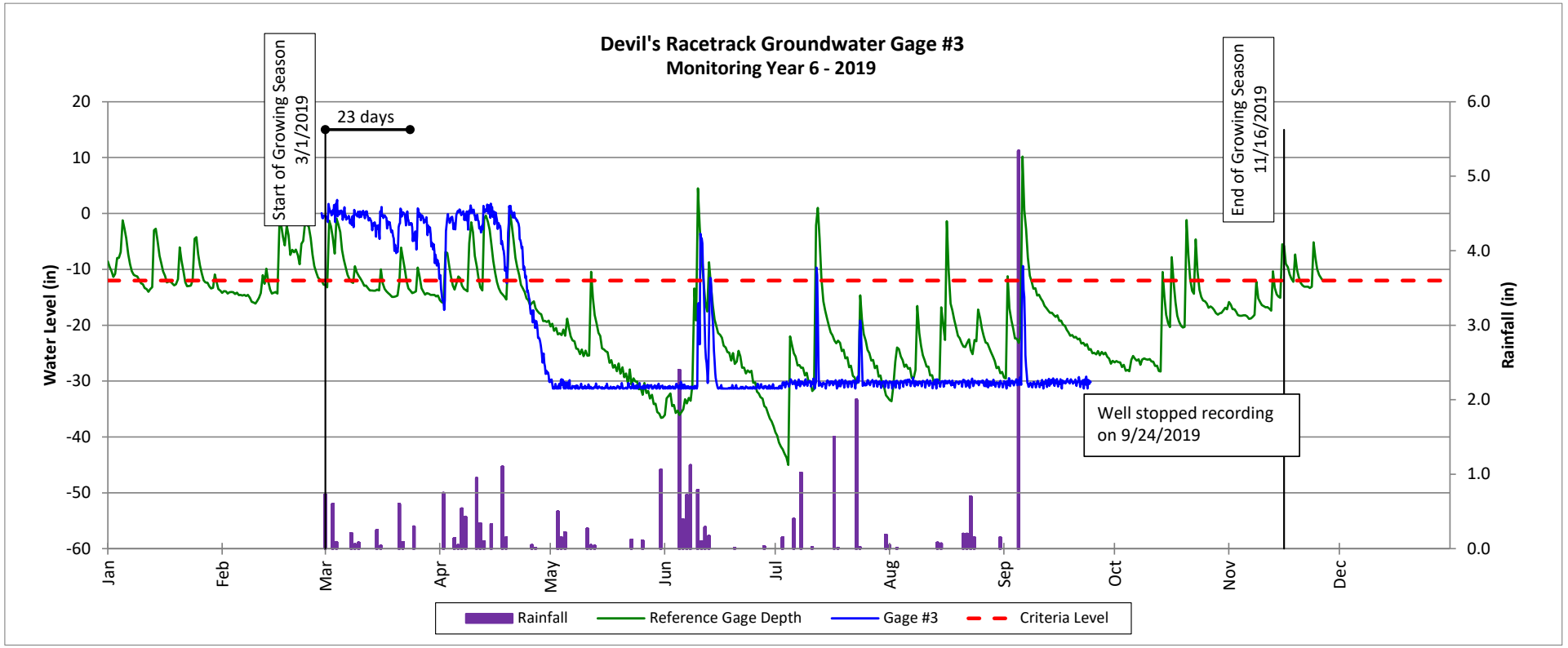


Groundwater Gage Plots

Devil's Racetrack Mitigation Site

DMS Project No. 95021

Monitoring Year 6 - 2019

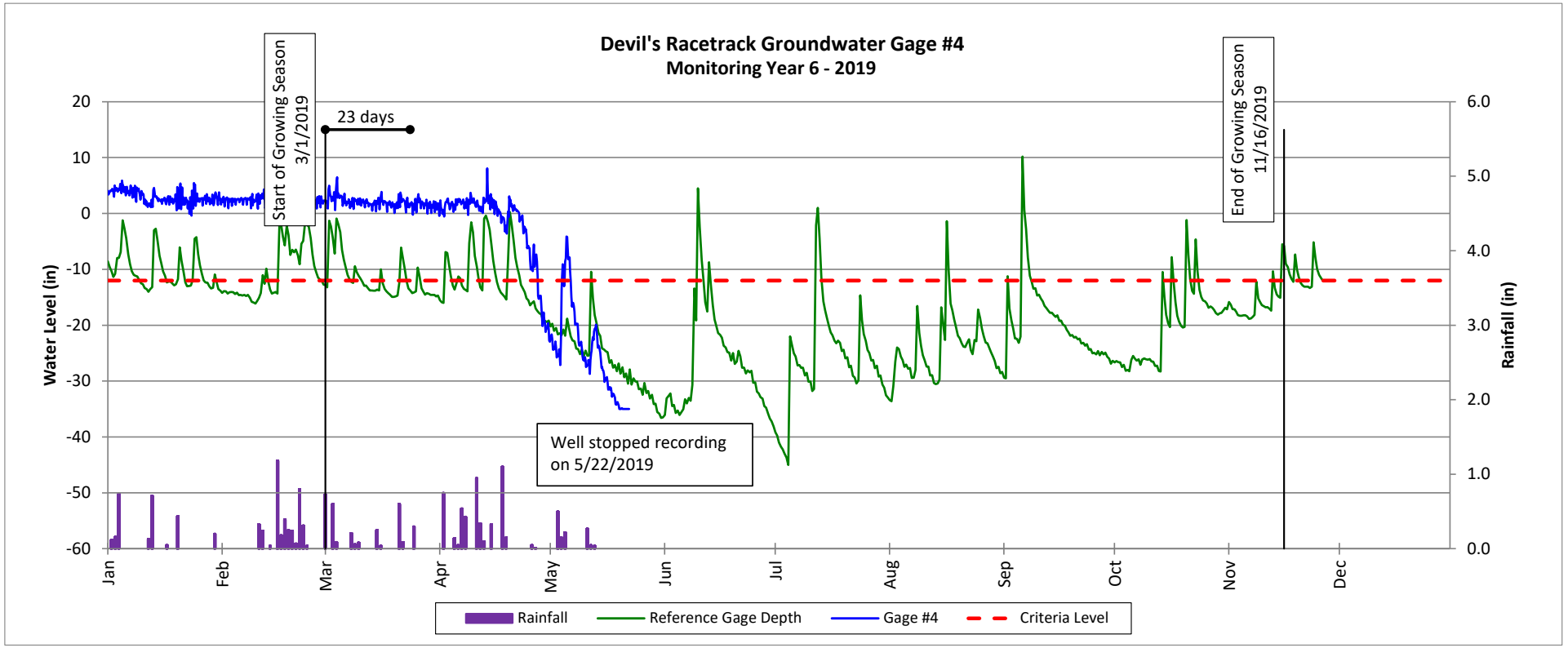


Groundwater Gage Plots

Devil's Racetrack Mitigation Site

DMS Project No. 95021

Monitoring Year 6 - 2019

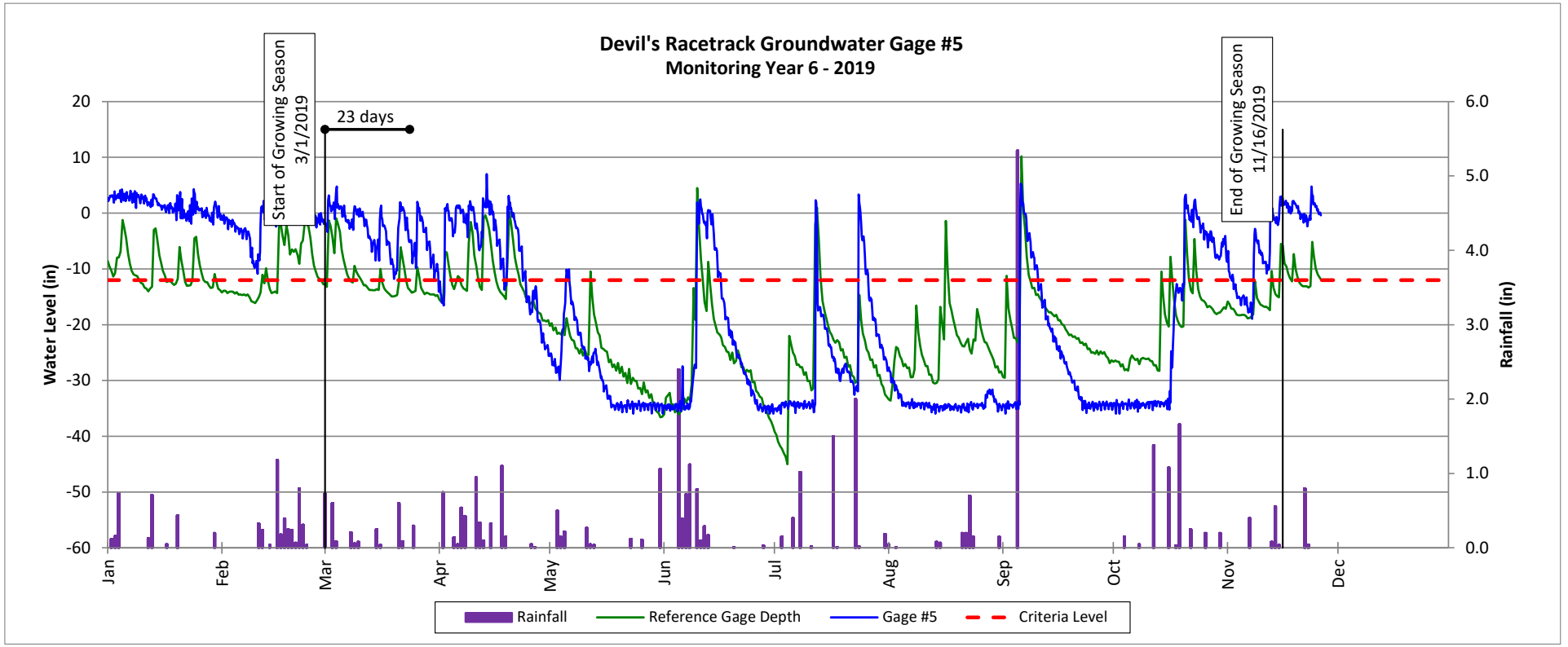


Groundwater Gage Plots

Devil's Racetrack Mitigation Site

DMS Project No. 95021

Monitoring Year 6 - 2019

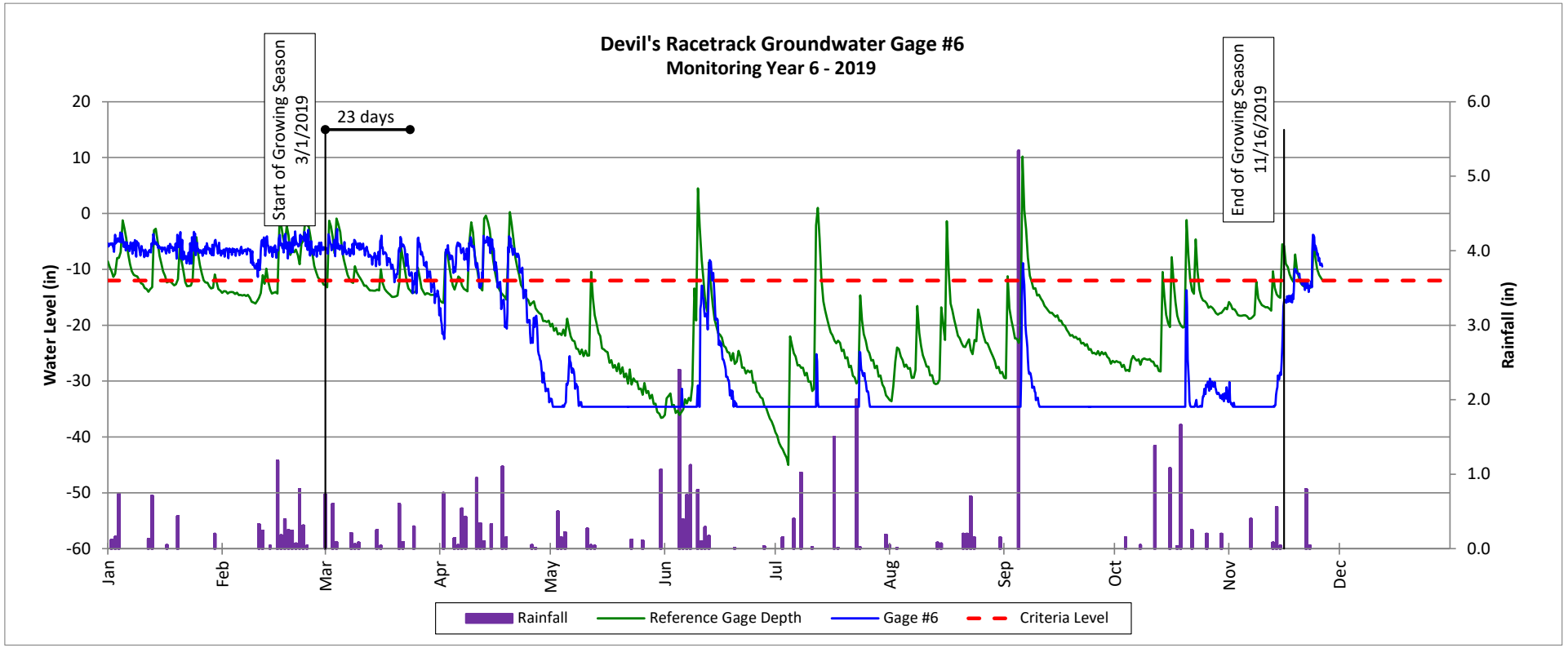


Groundwater Gage Plots

Devil's Racetrack Mitigation Site

DMS Project No. 95021

Monitoring Year 6 - 2019

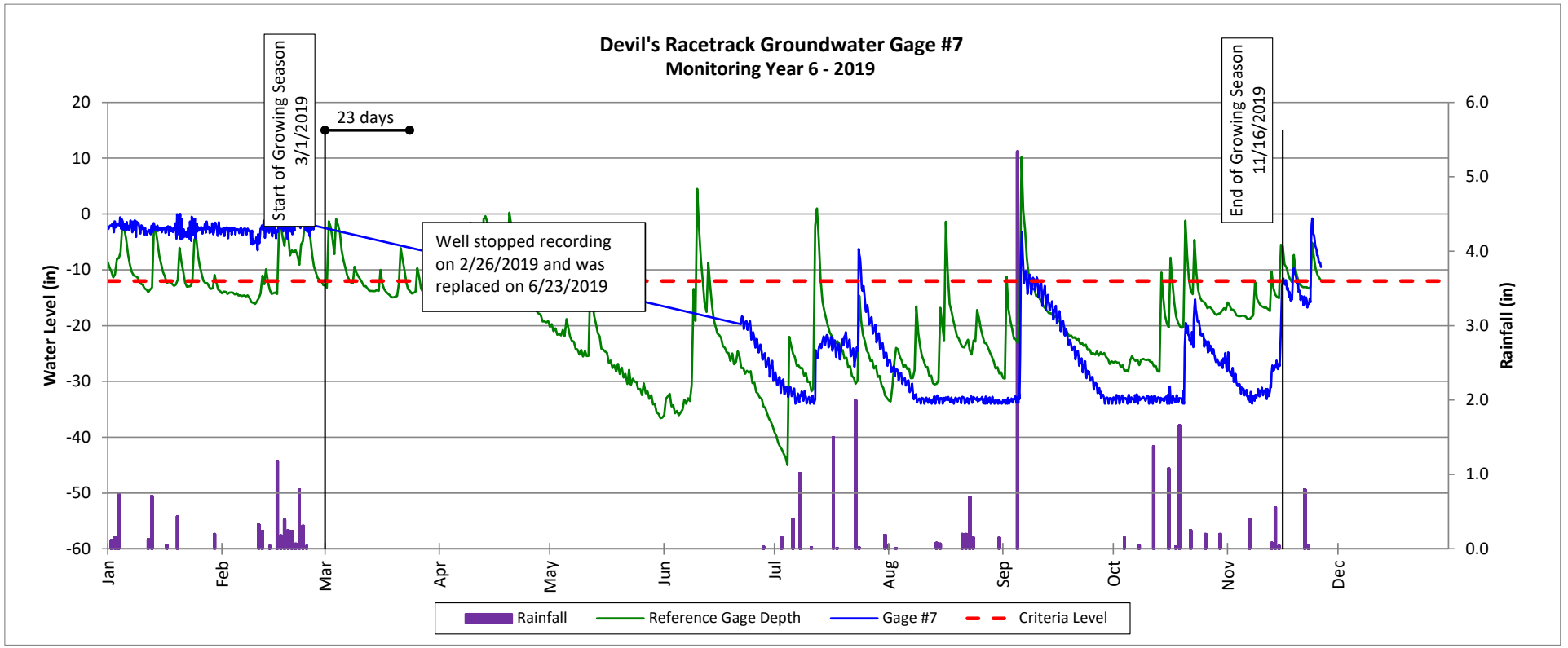


Groundwater Gage Plots

Devil's Racetrack Mitigation Site

DMS Project No. 95021

Monitoring Year 6 - 2019

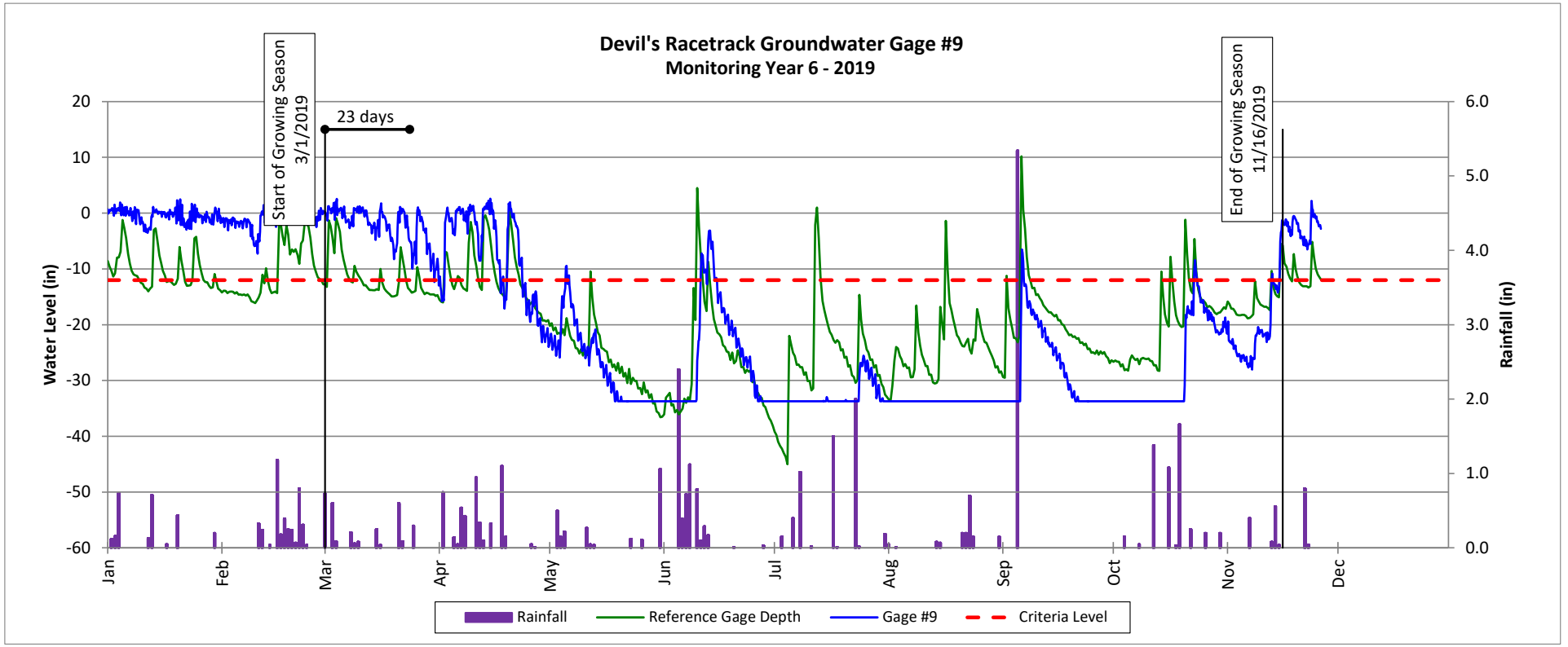


Groundwater Gage Plots

Devil's Racetrack Mitigation Site

DMS Project No. 95021

Monitoring Year 6 - 2019

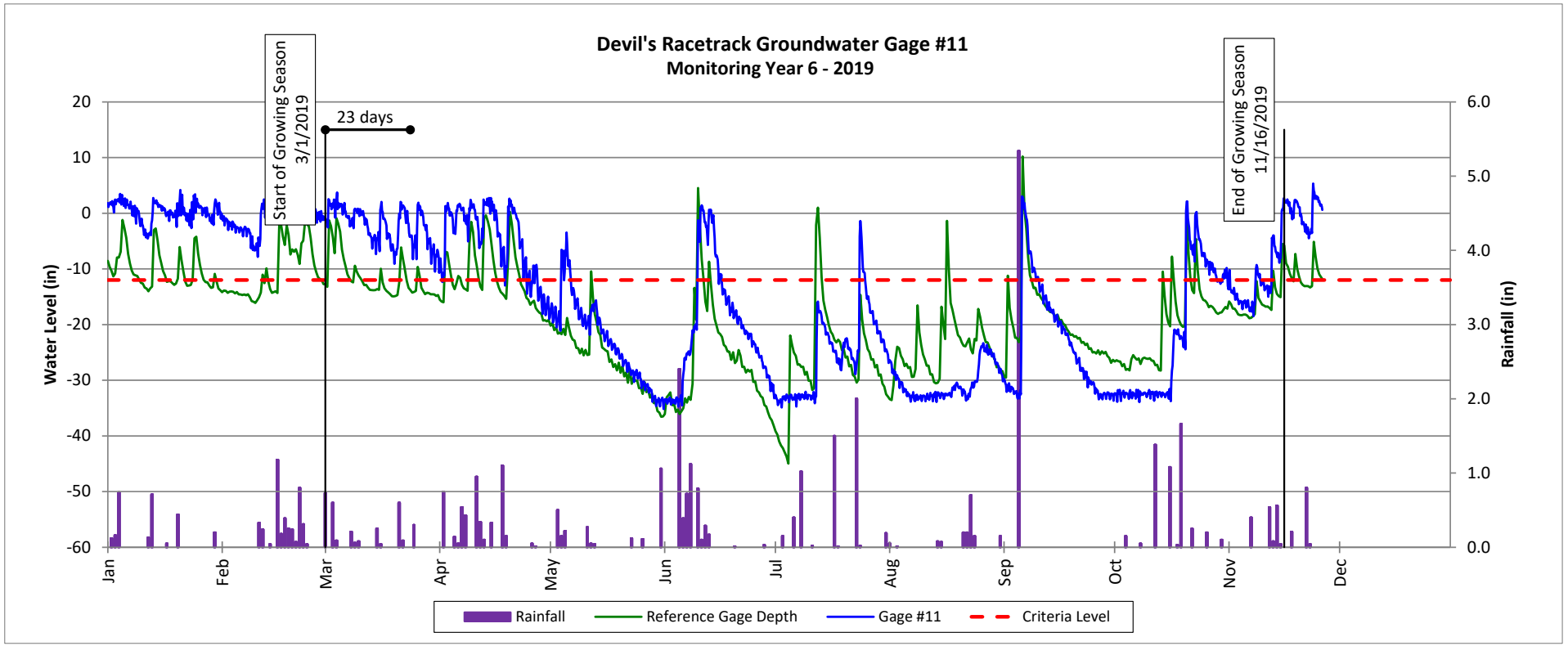


Groundwater Gage Plots

Devil's Racetrack Mitigation Site

DMS Project No. 95021

Monitoring Year 6 - 2019



Groundwater Gage Plots

Devil's Racetrack Mitigation Site

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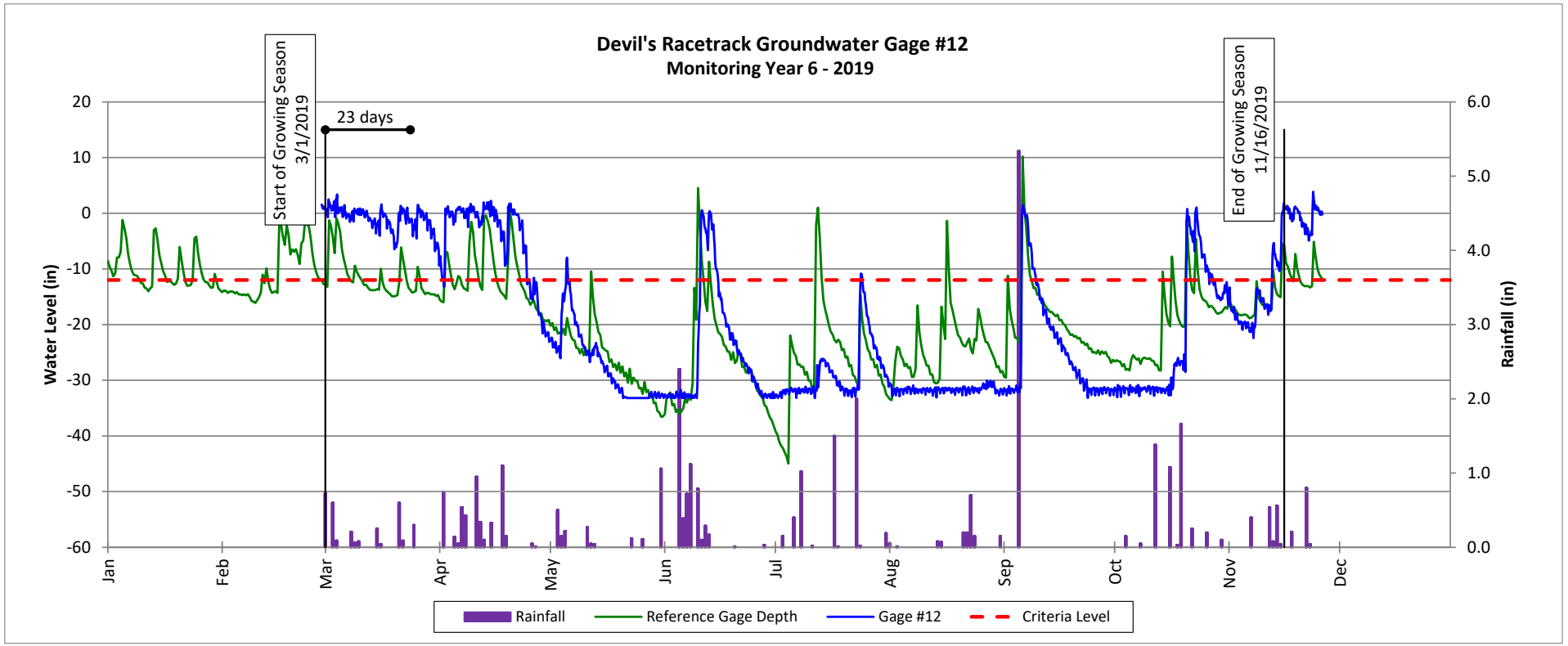
Monitoring Year 6 - 2019



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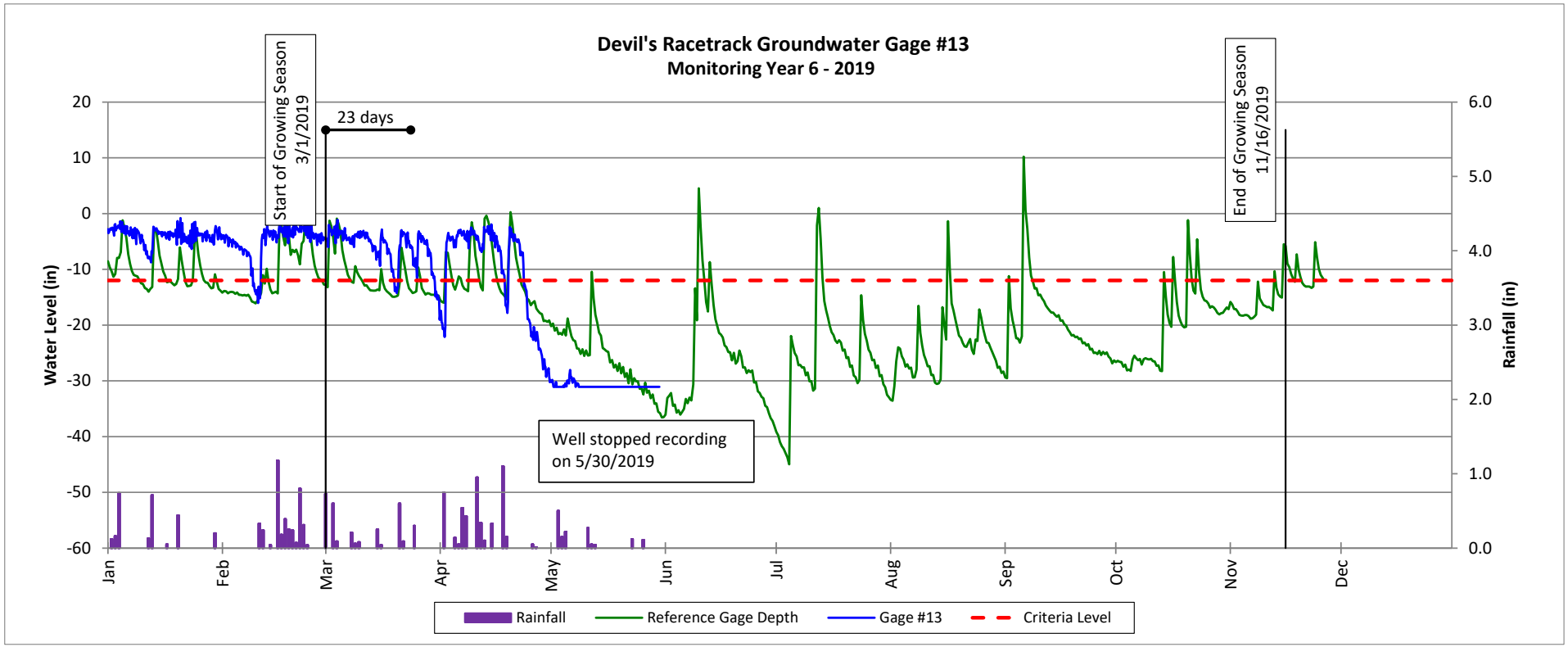

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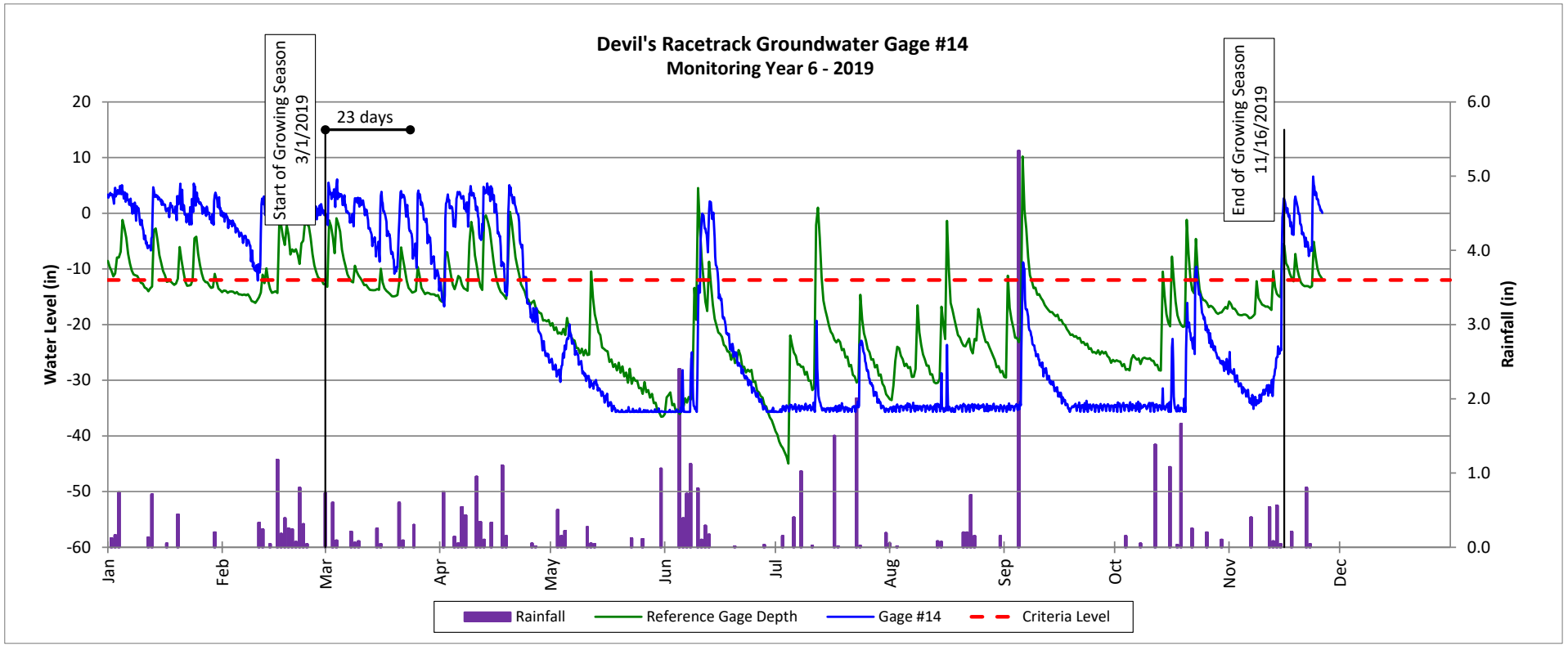

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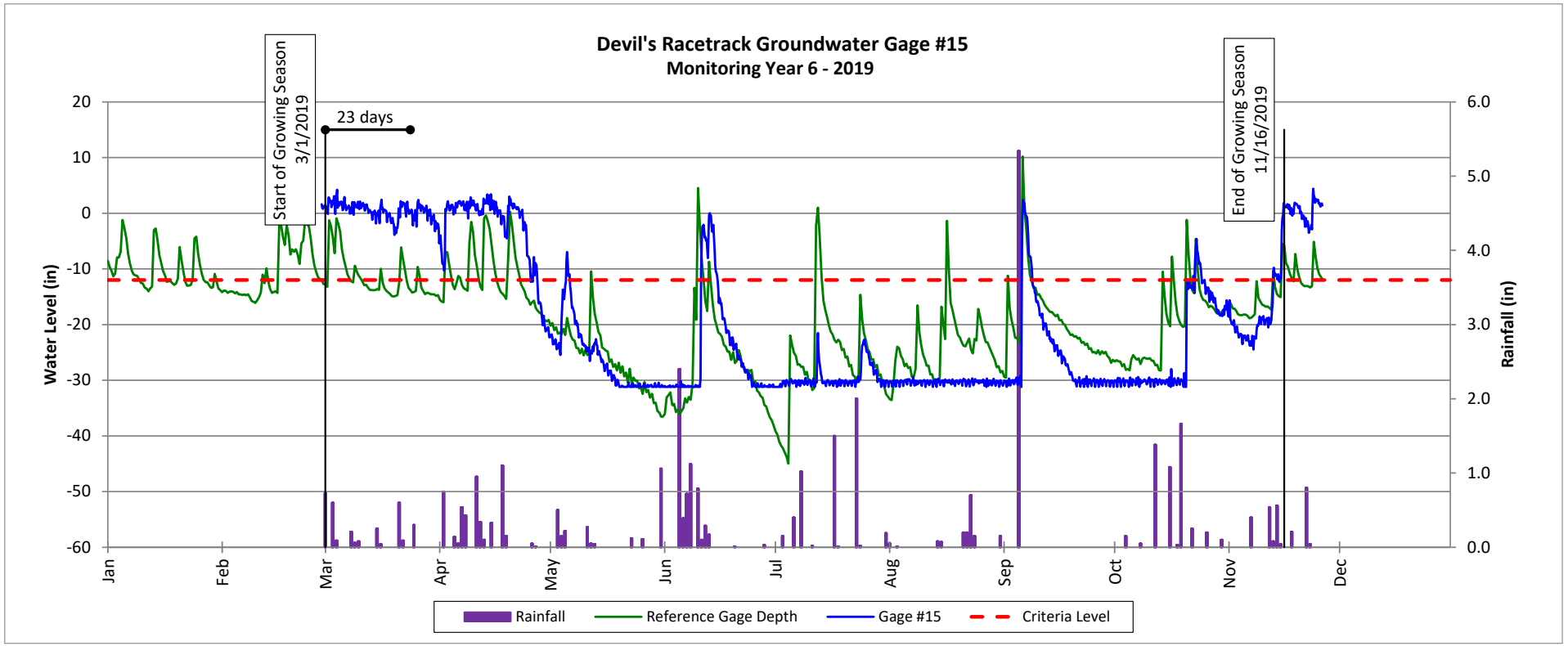

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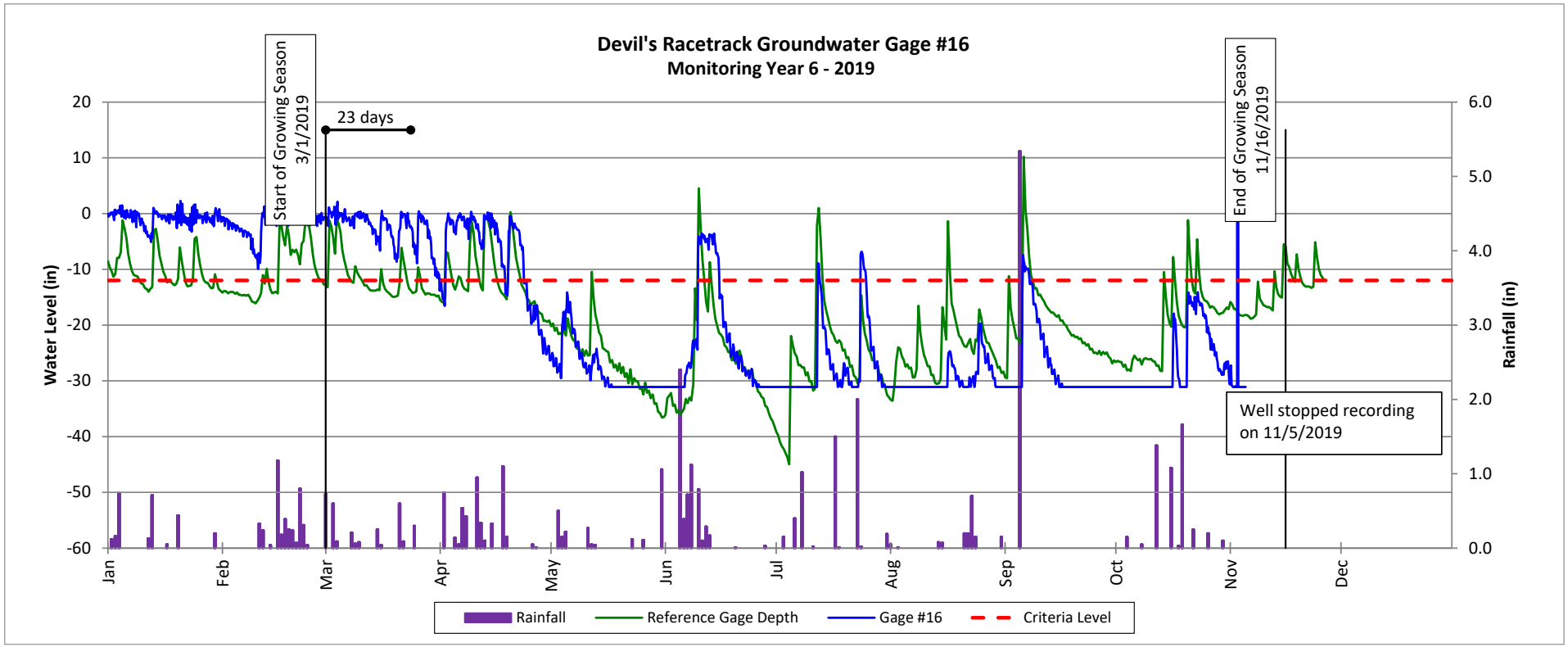

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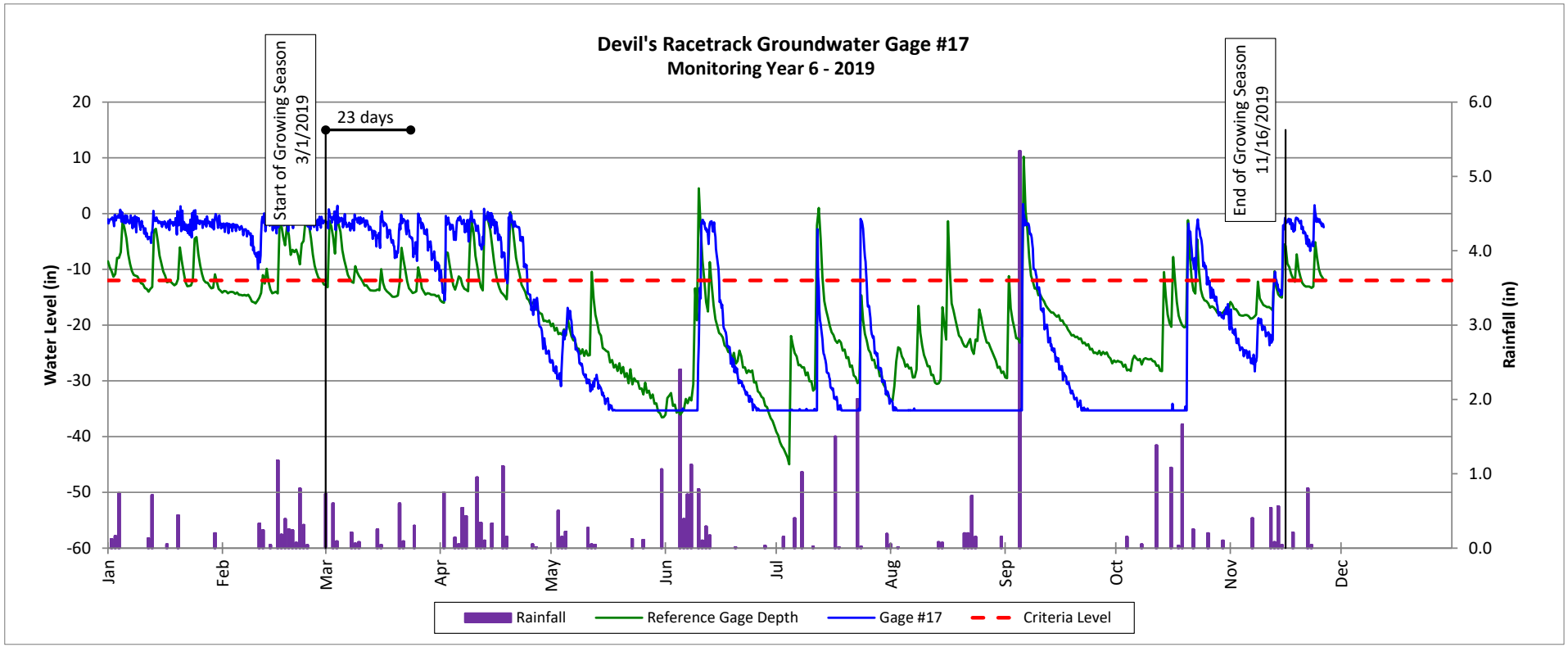

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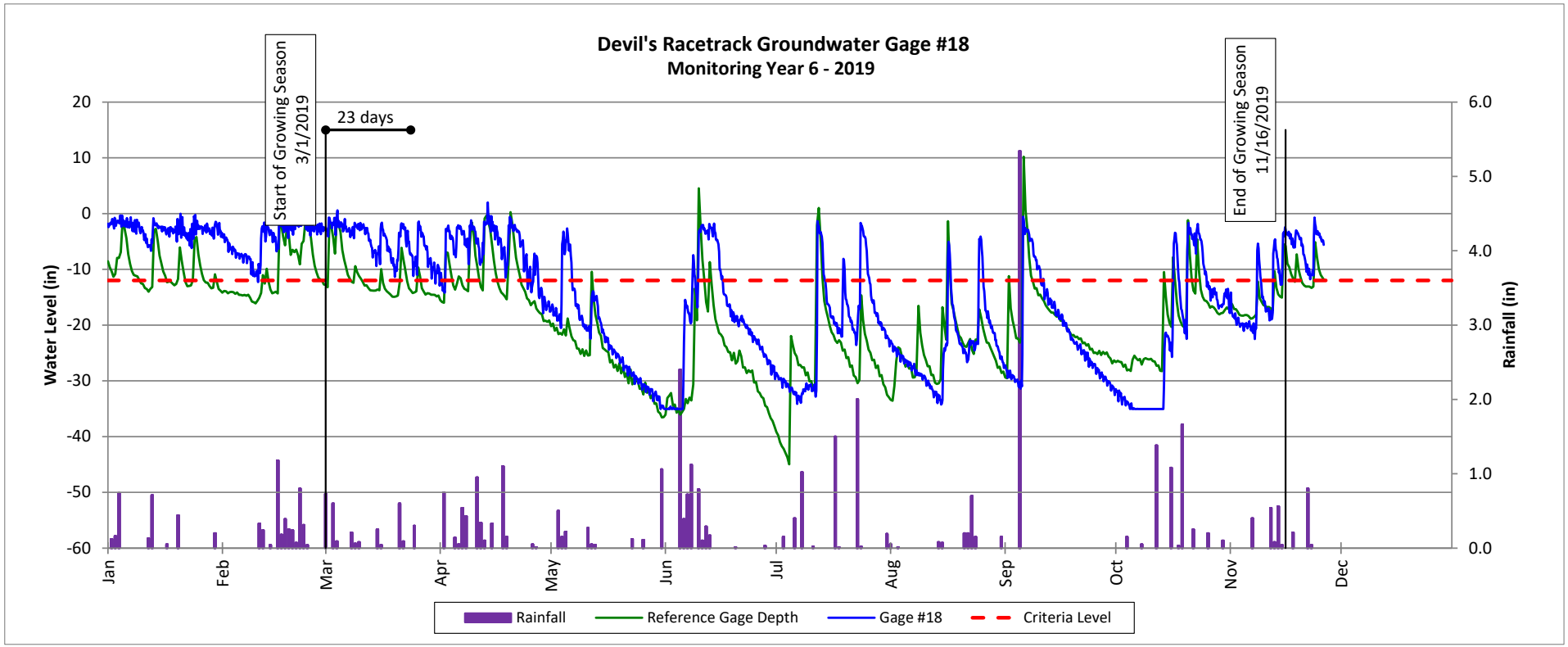

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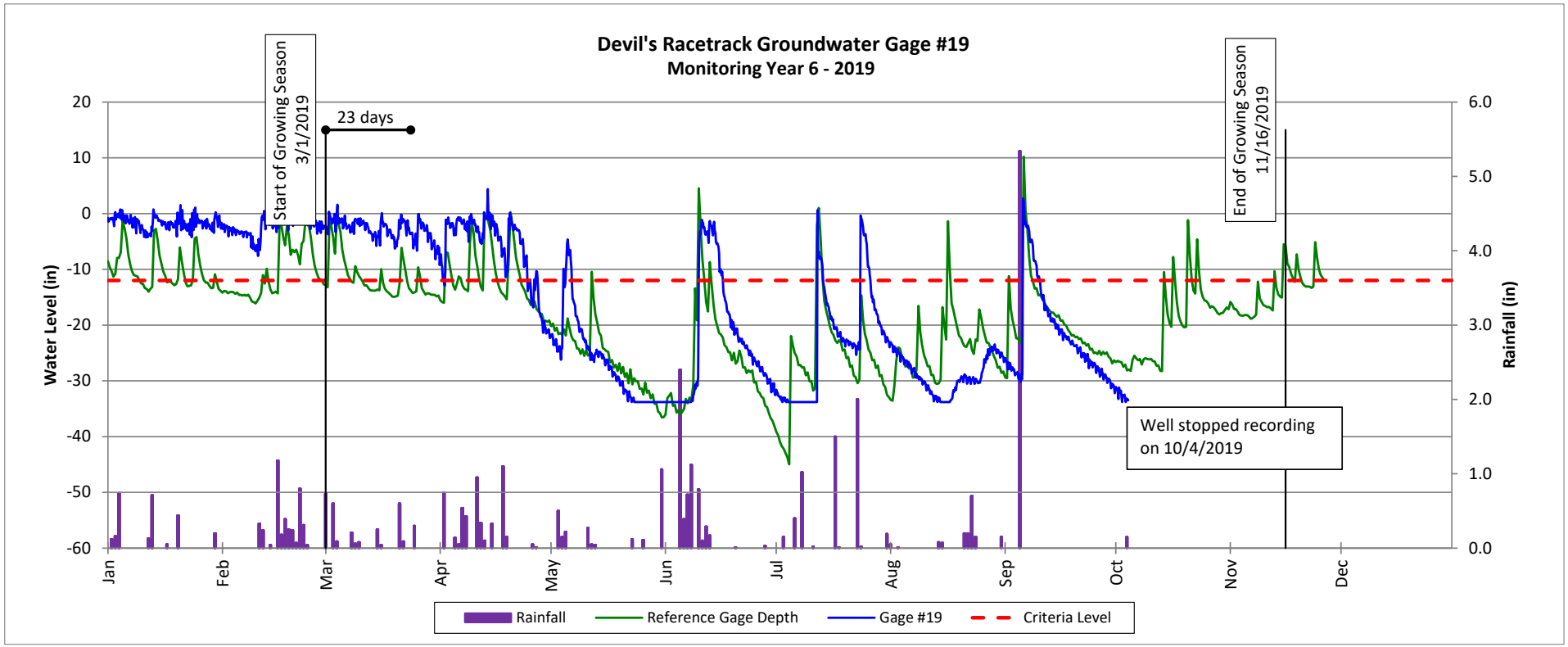

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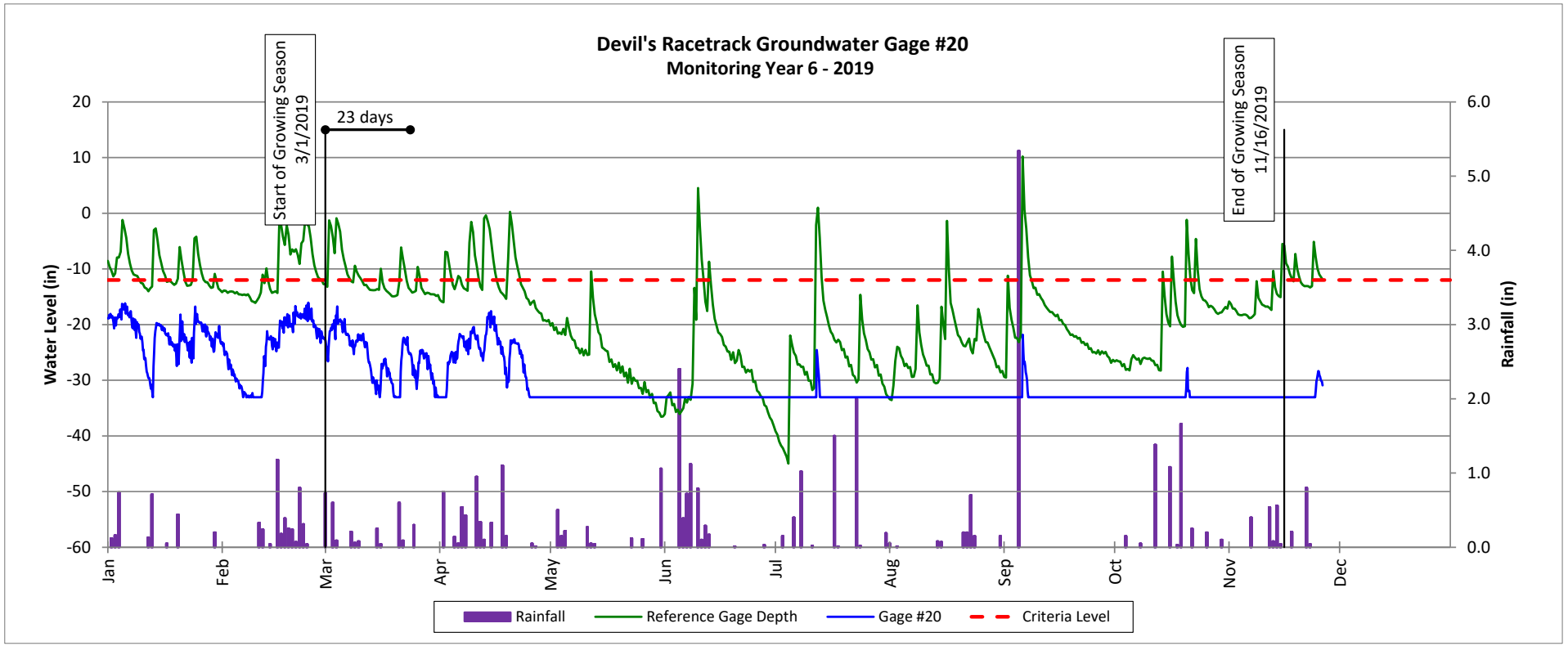

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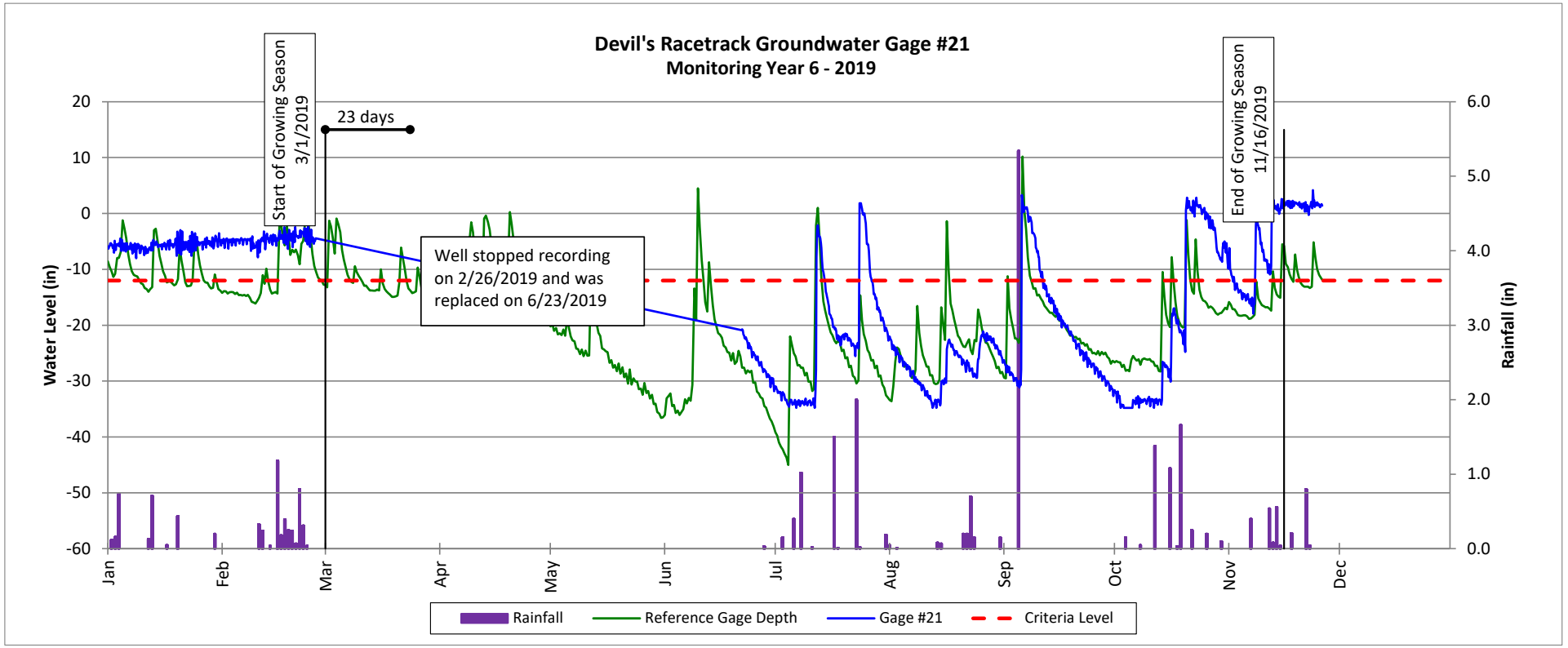

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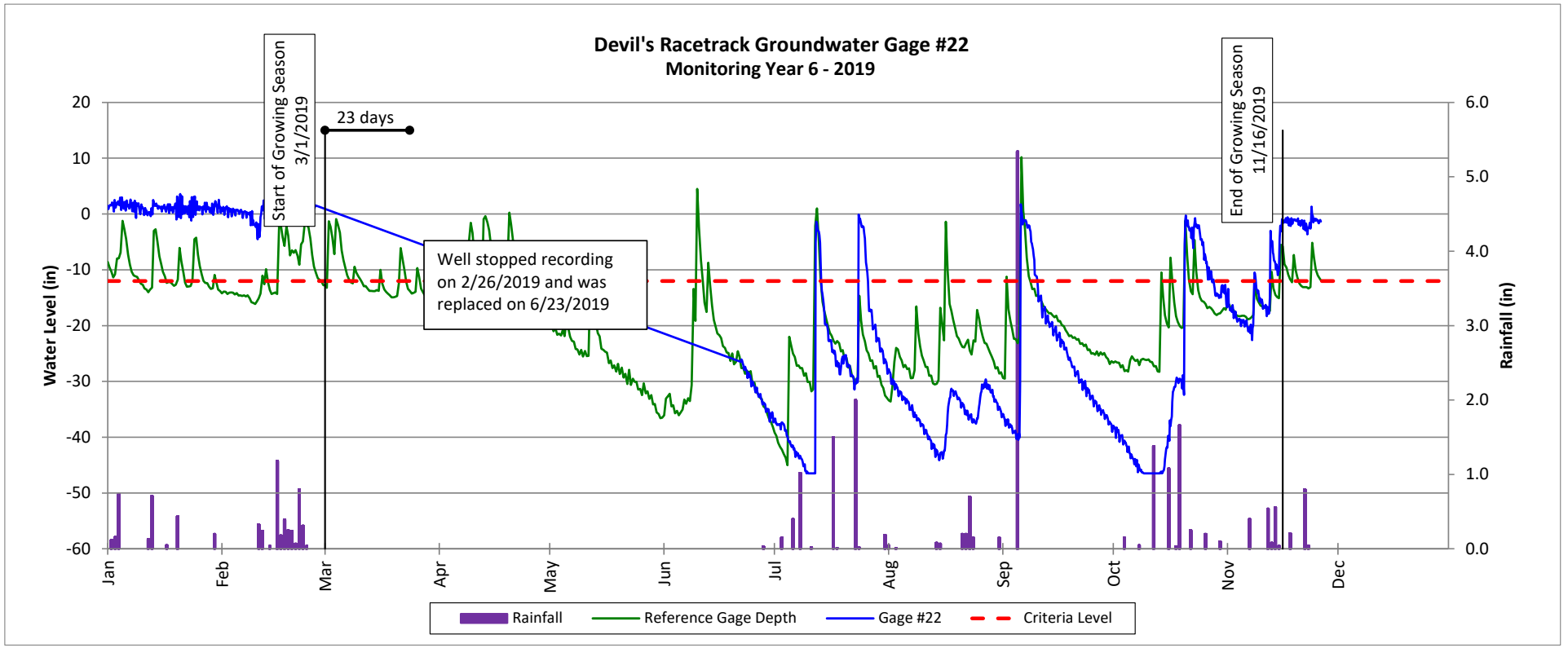

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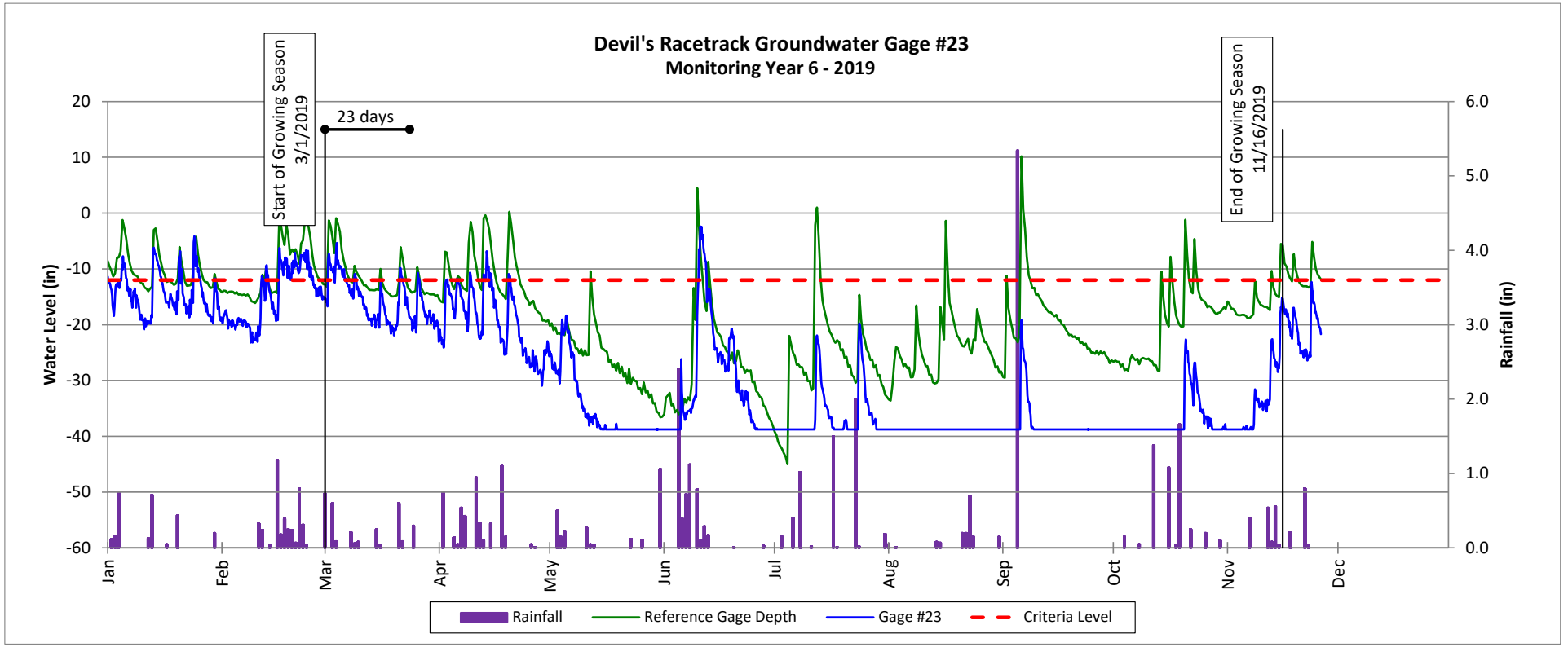

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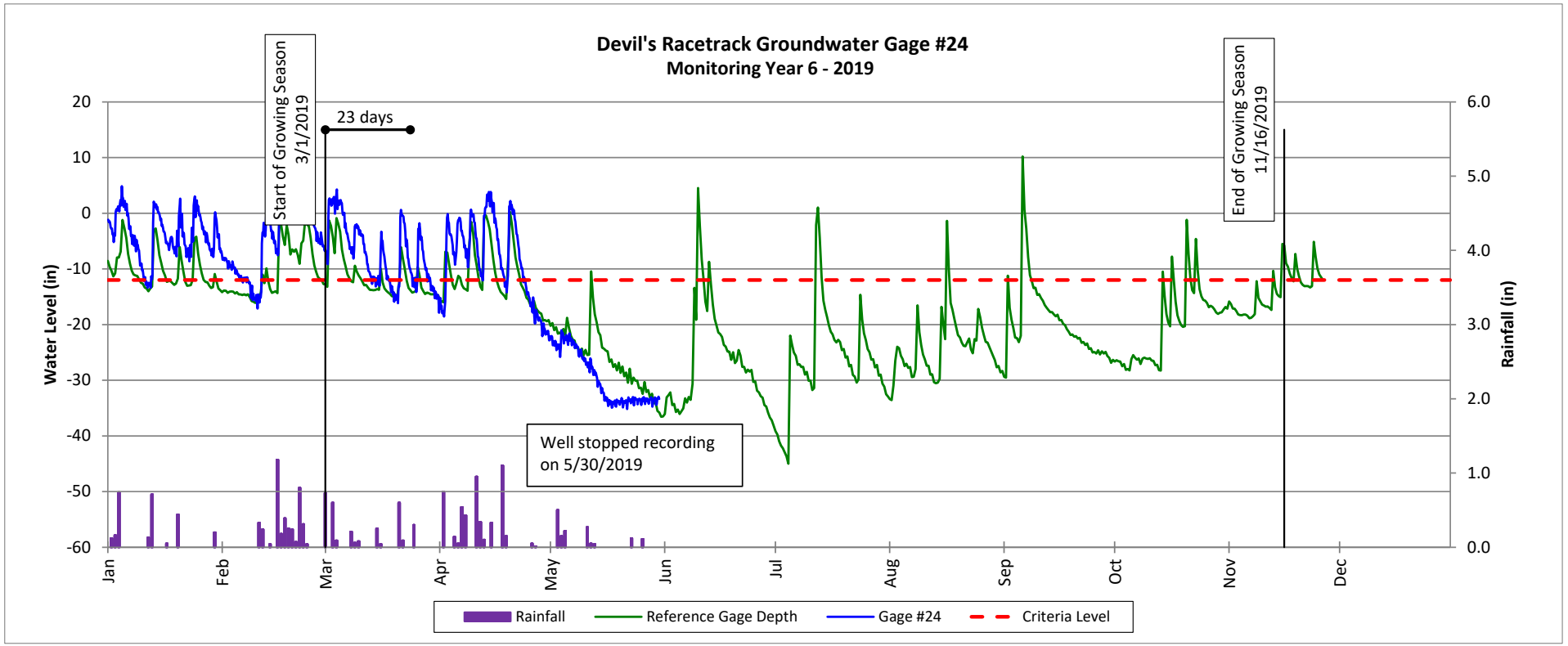

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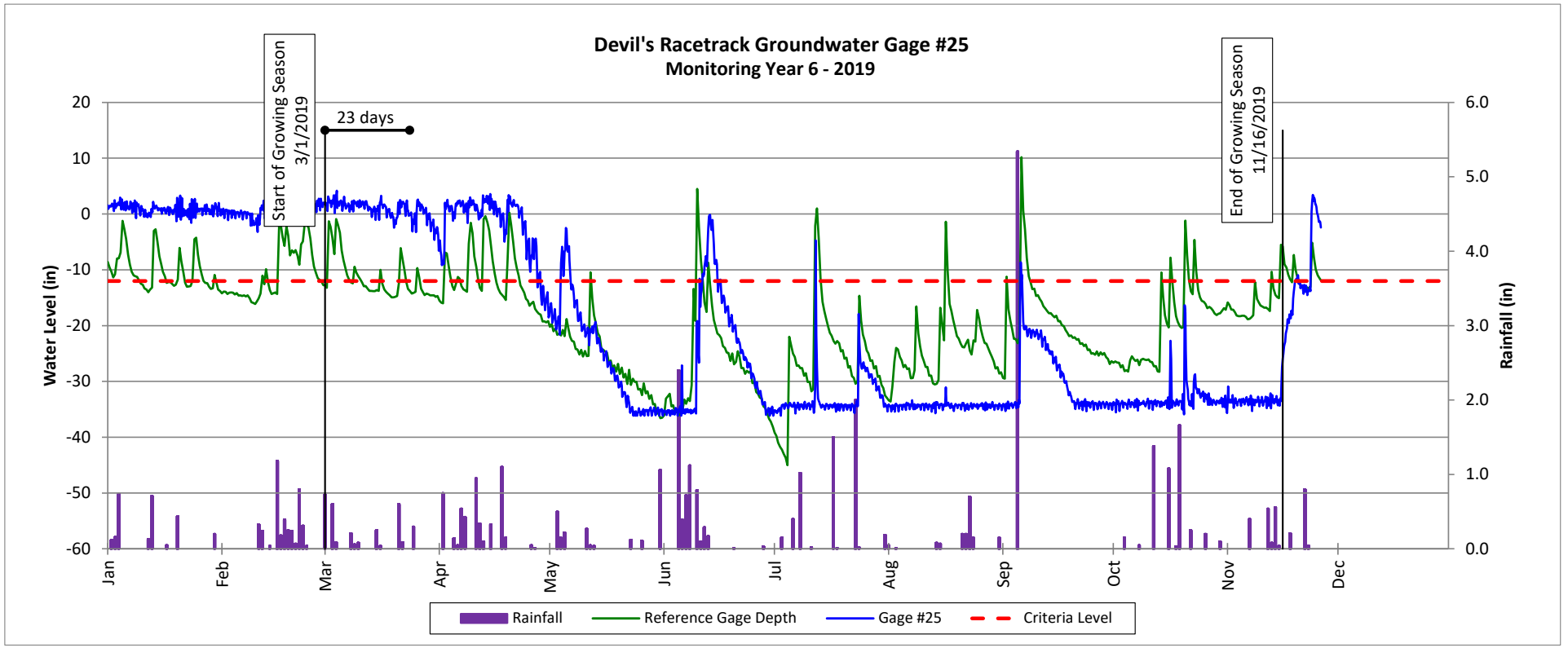

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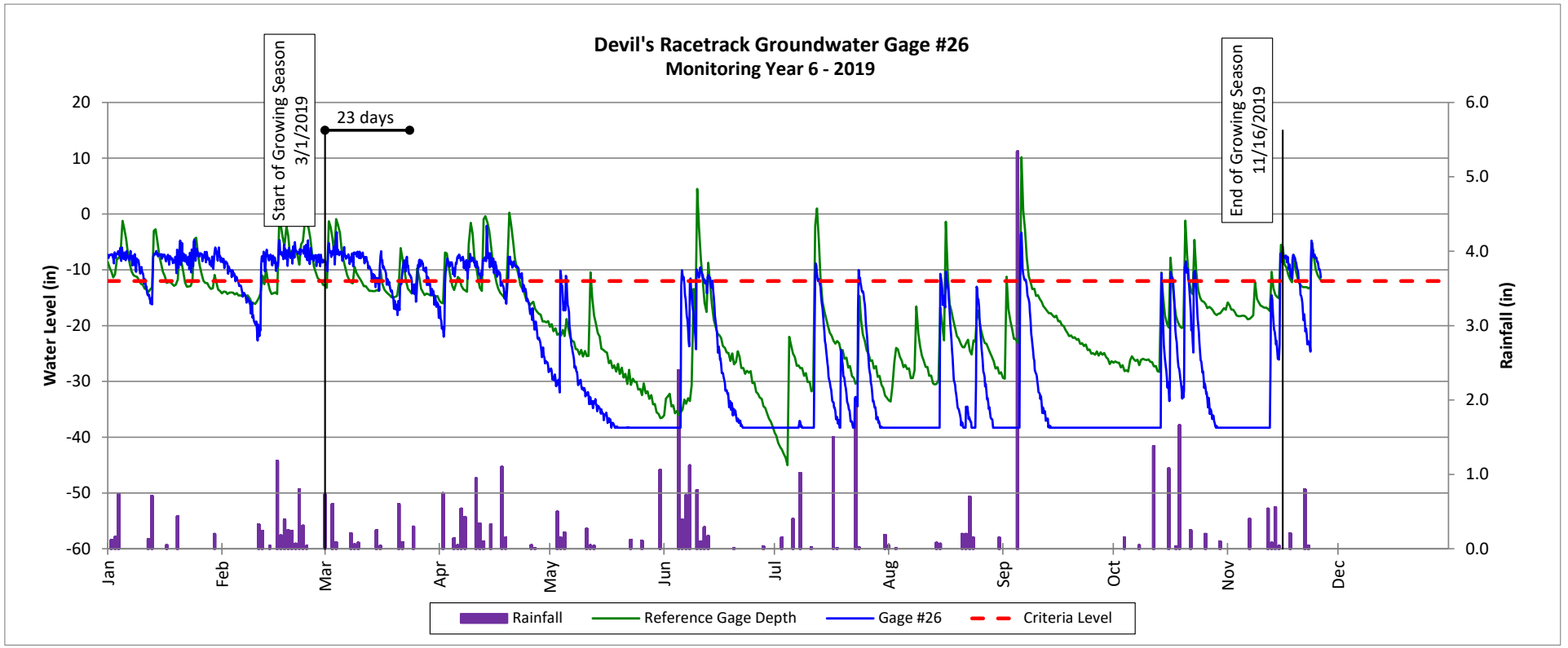

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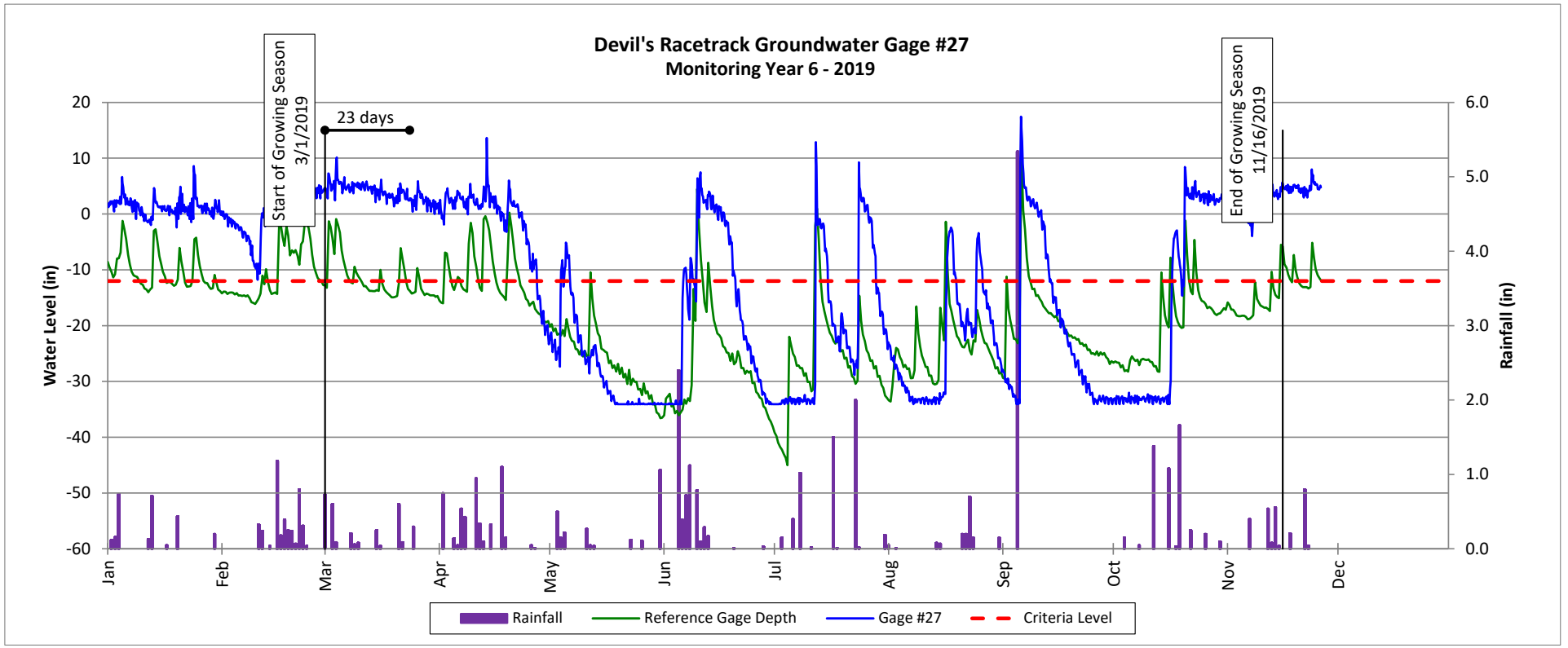

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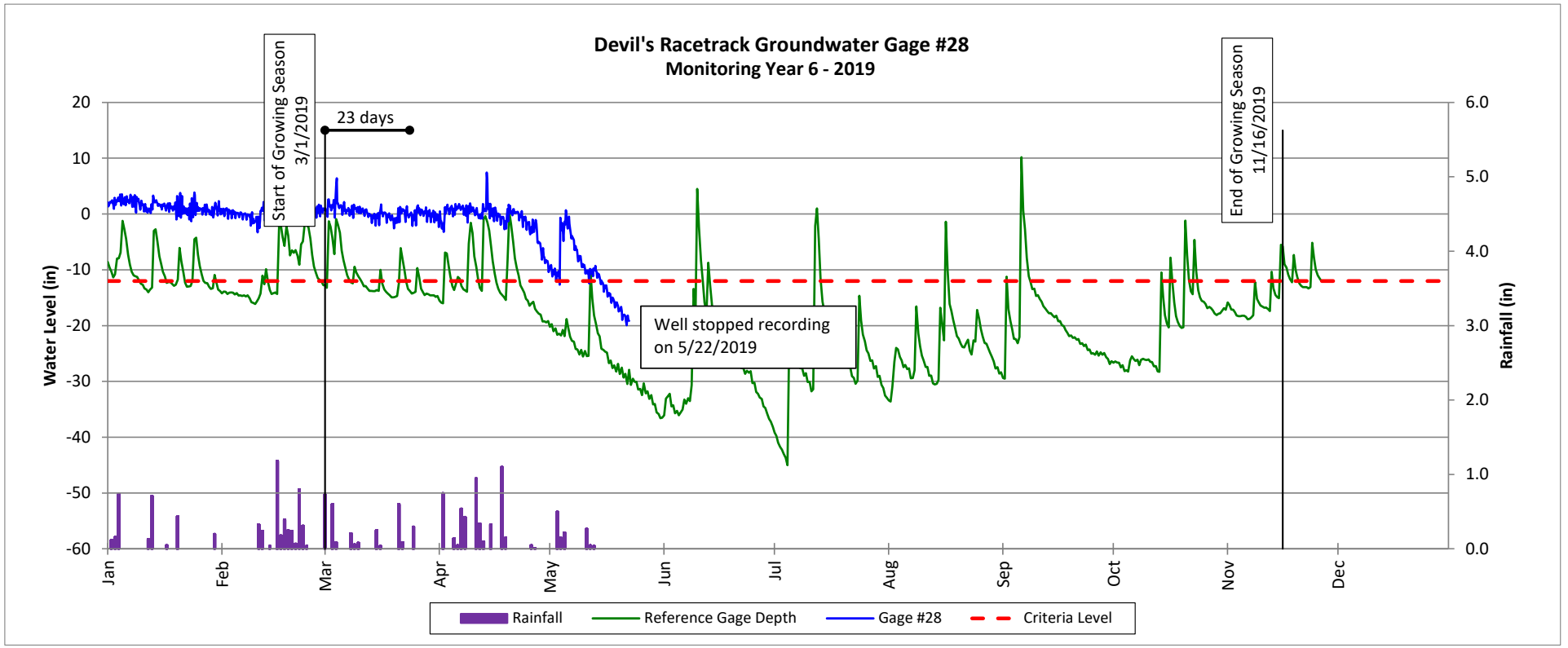

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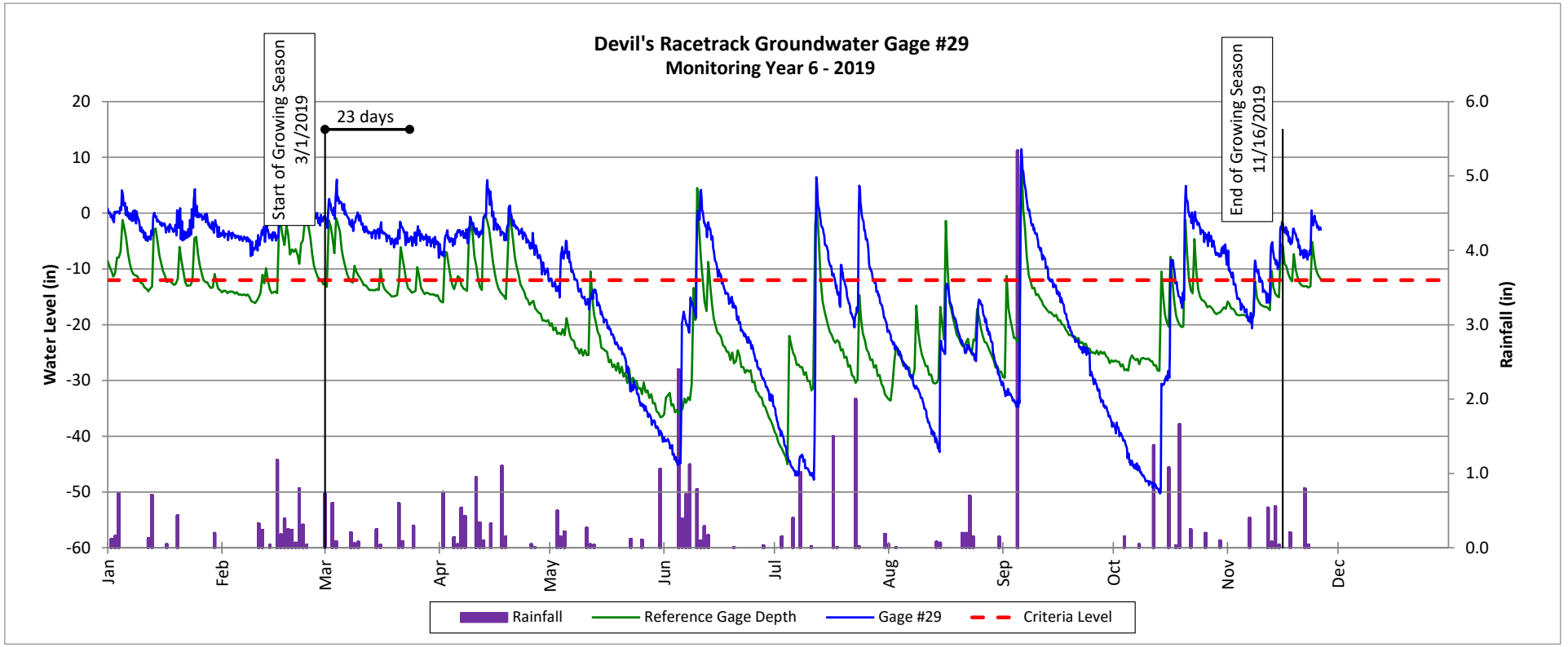

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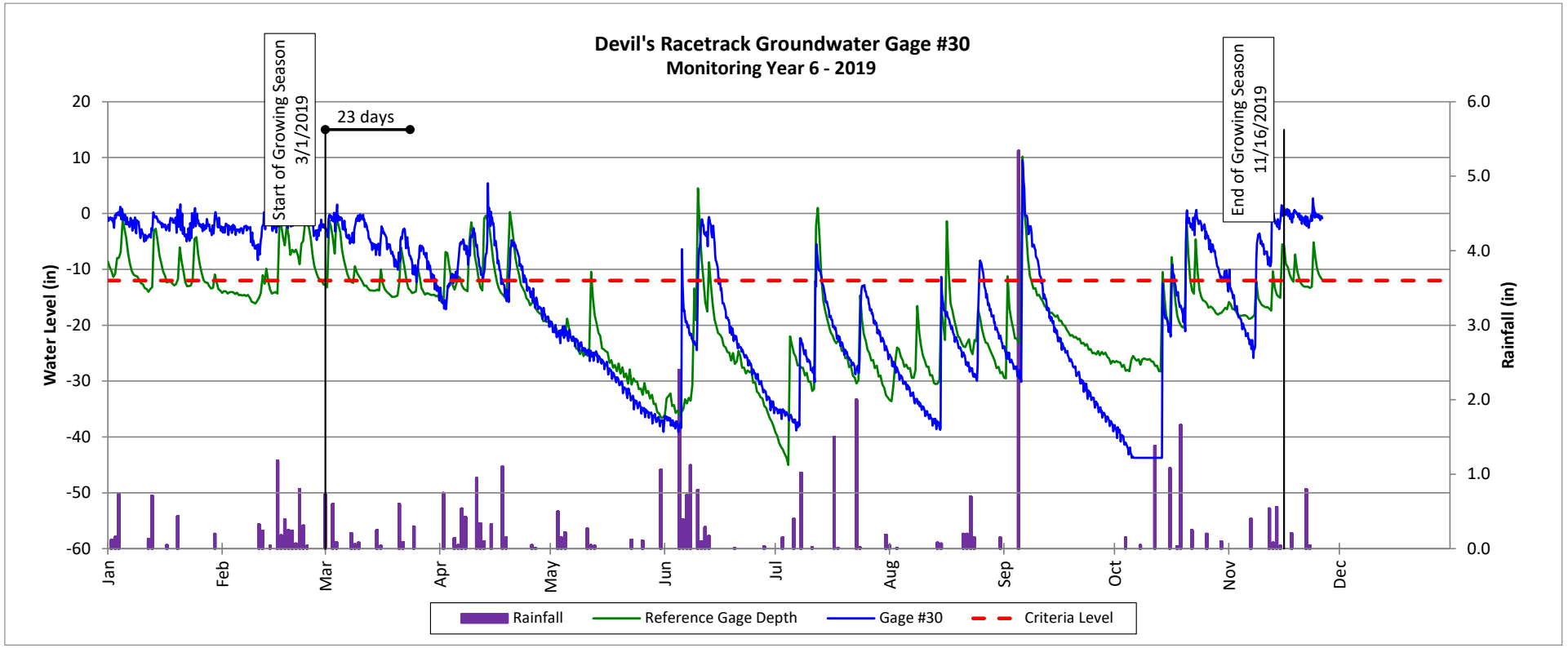

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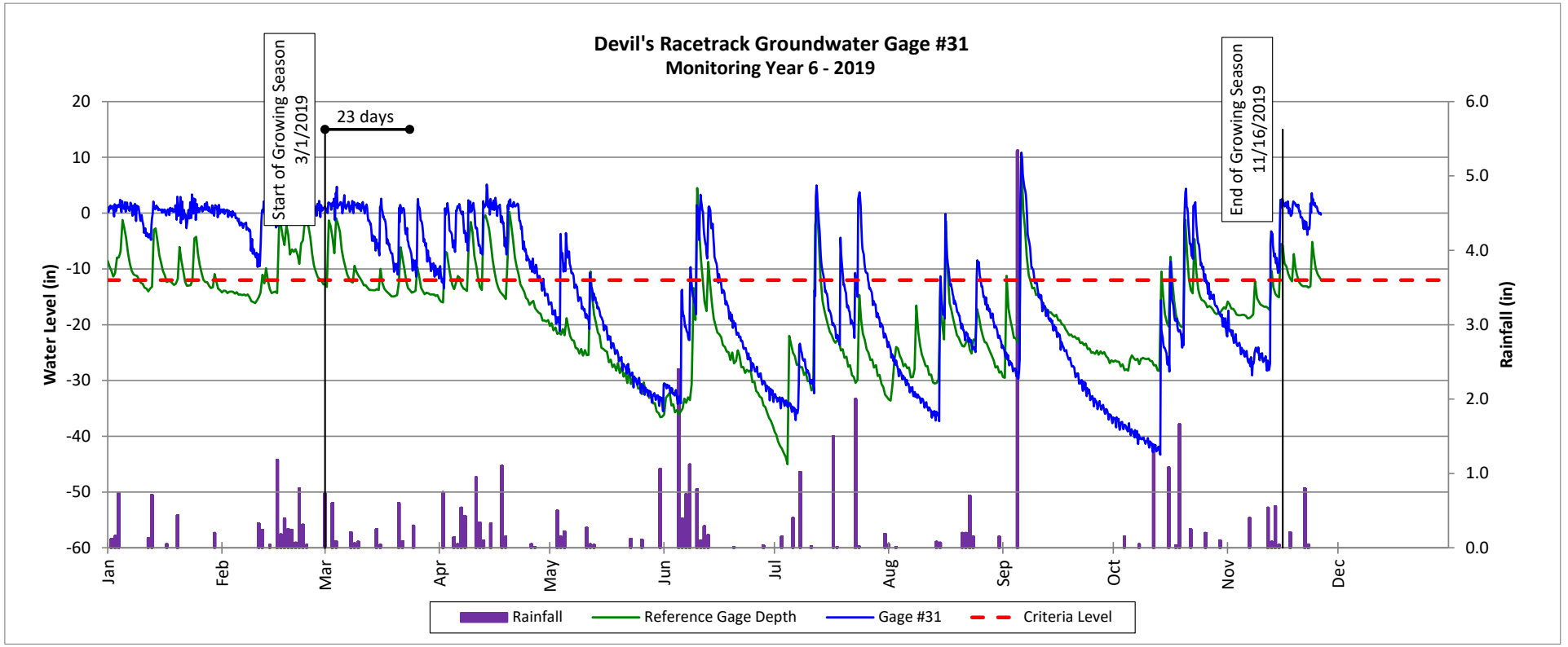

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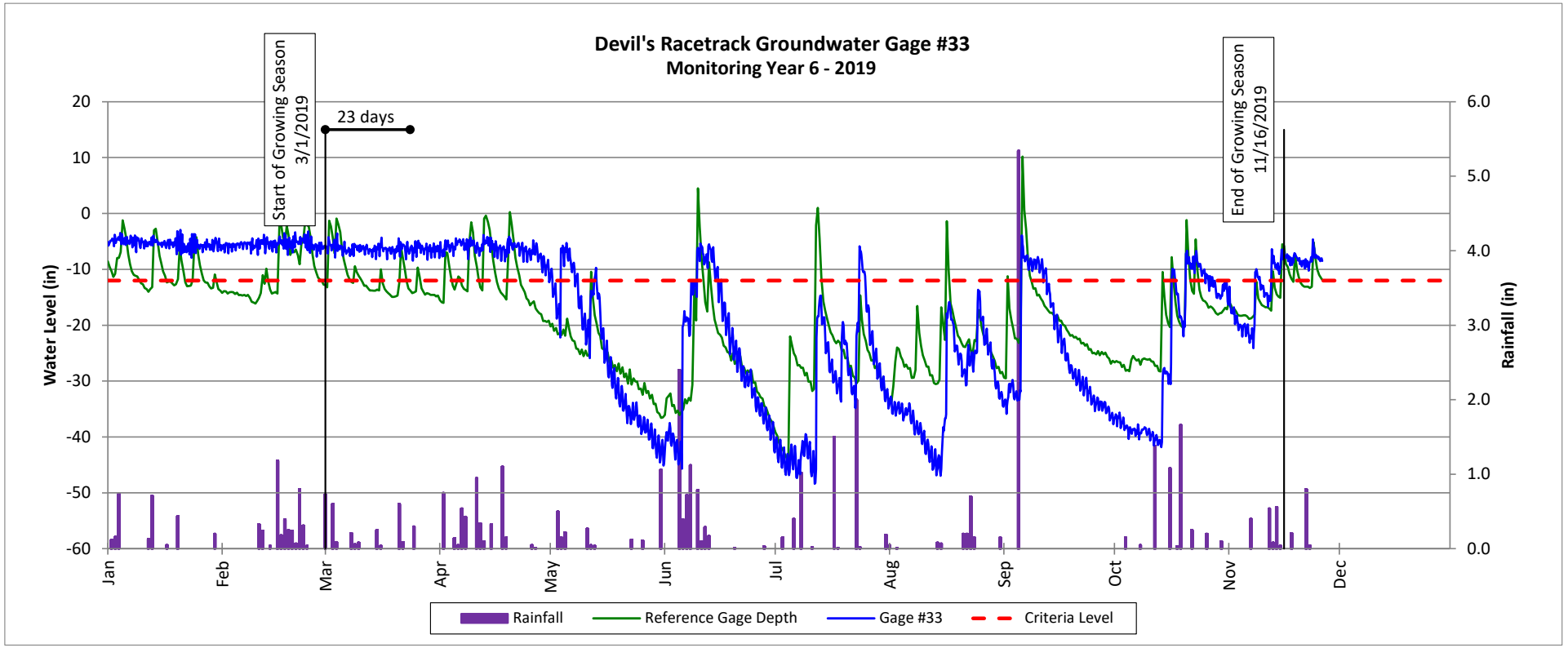

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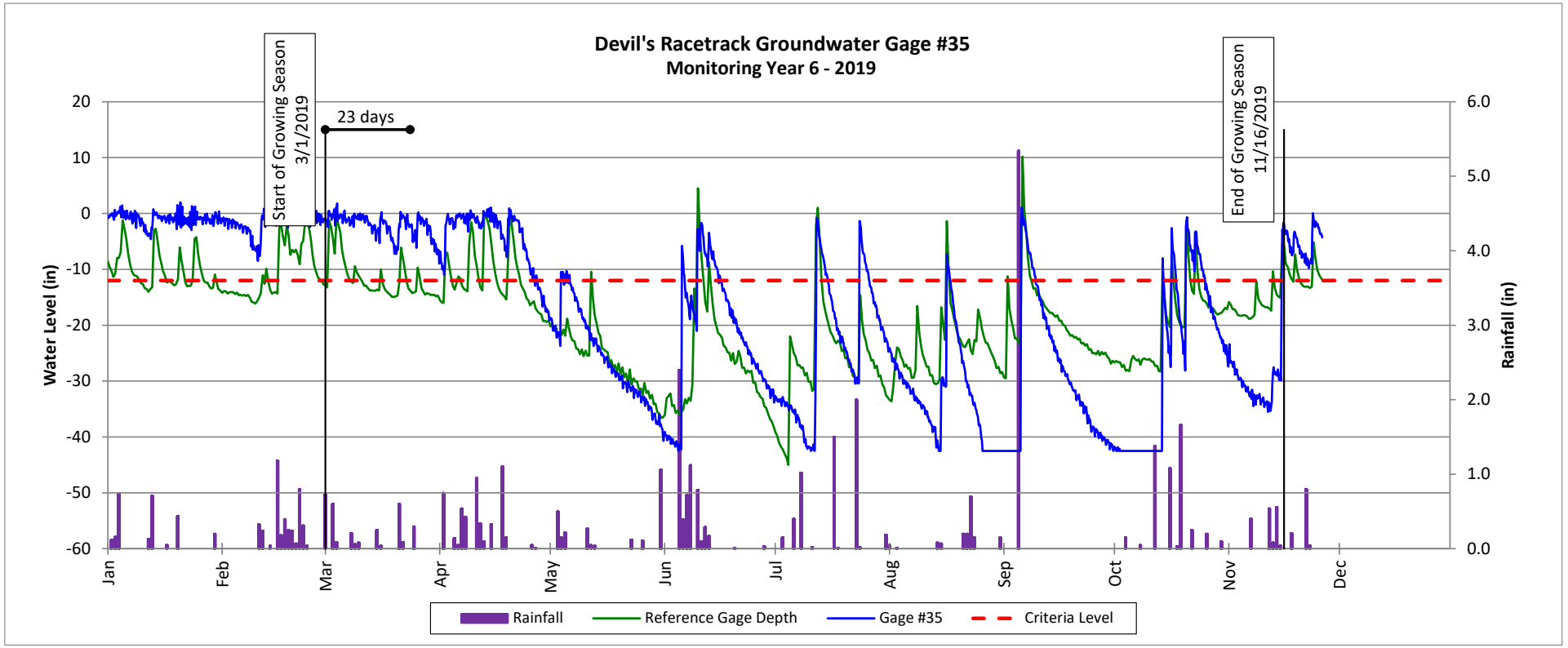

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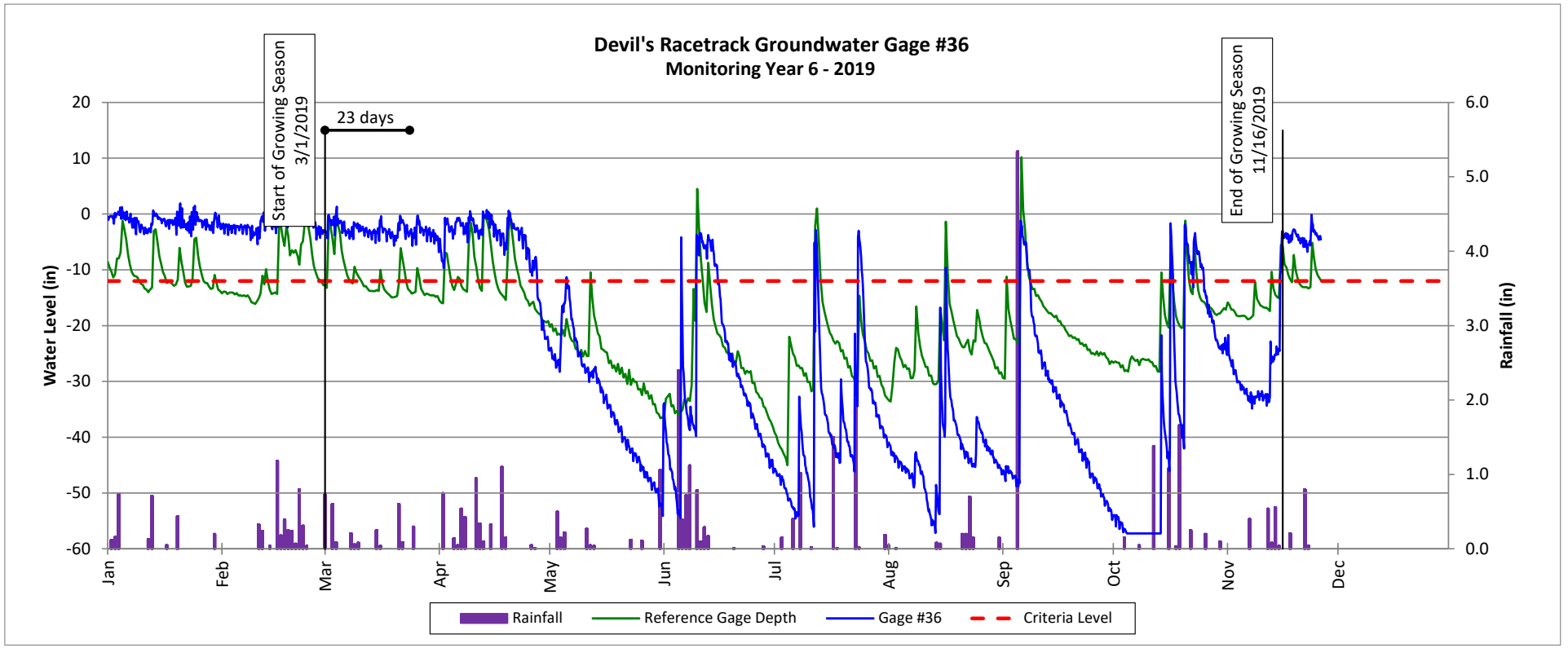

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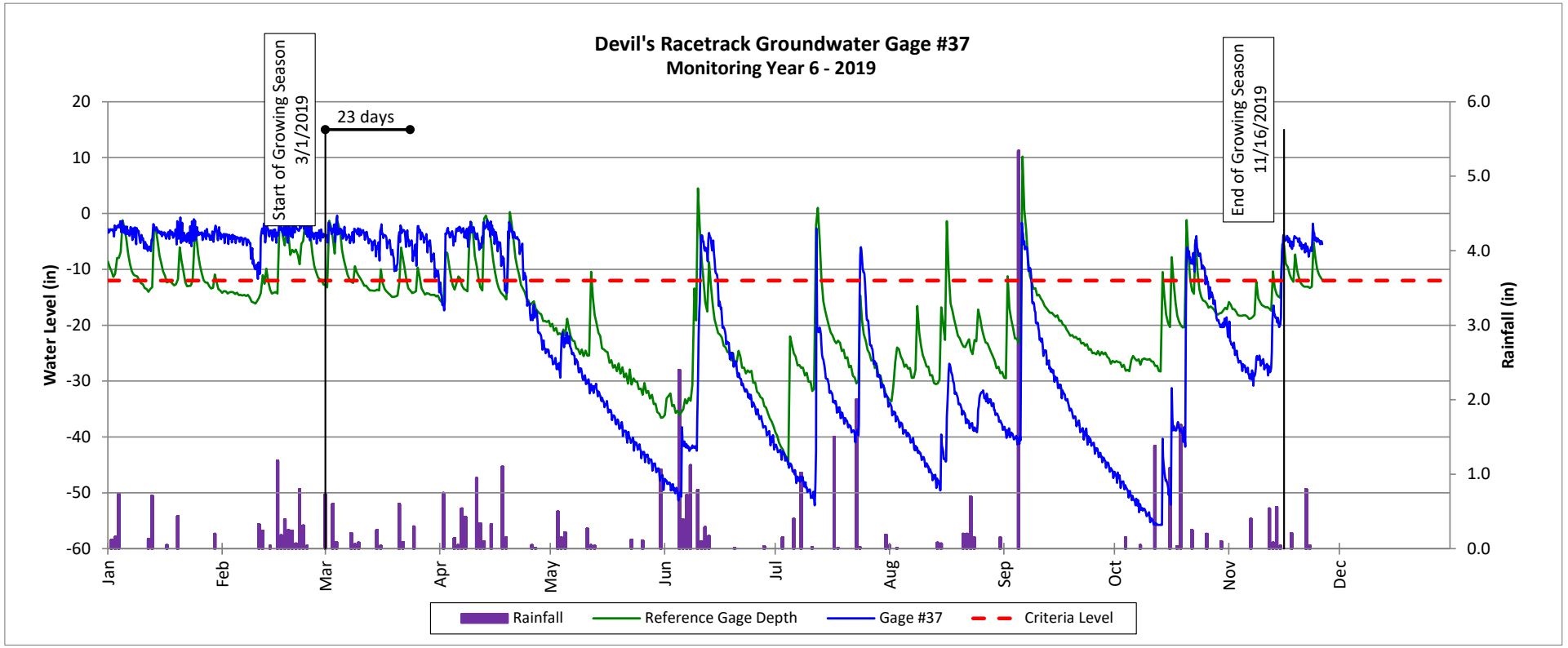

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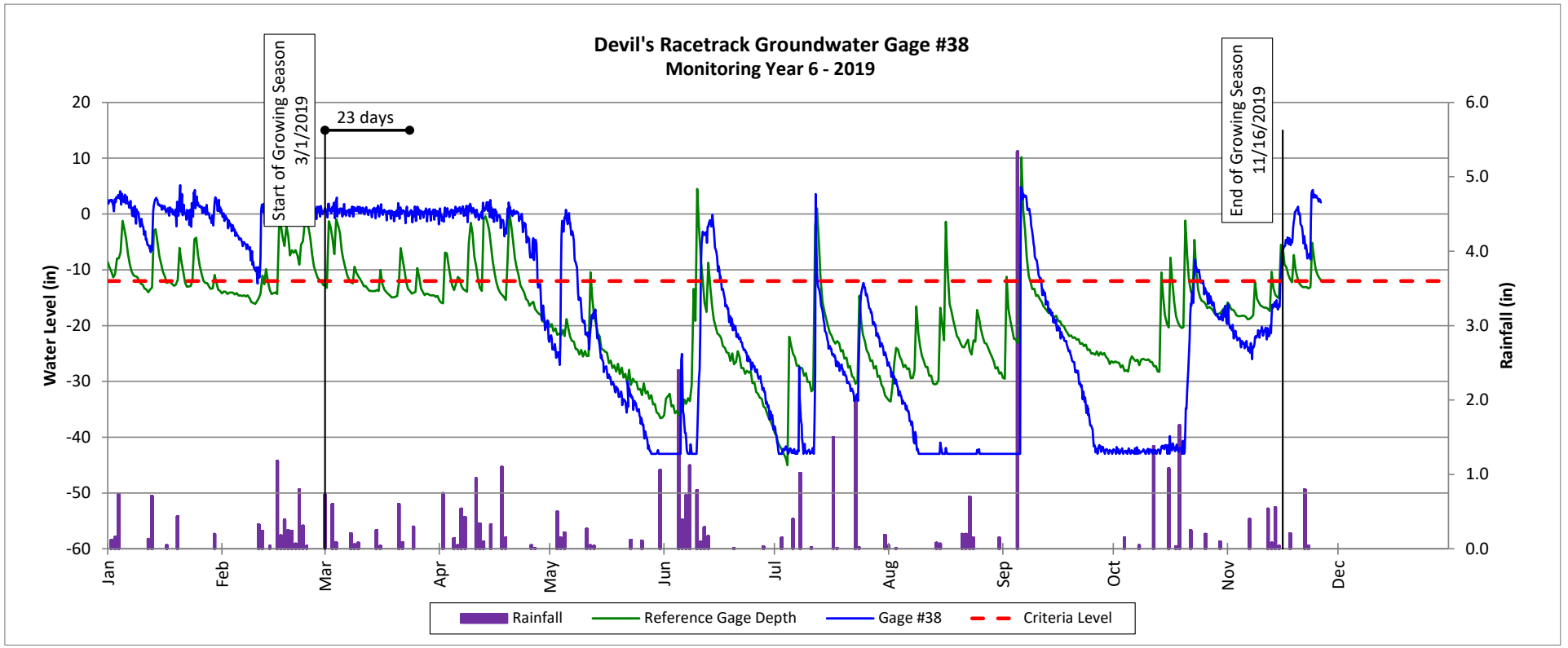

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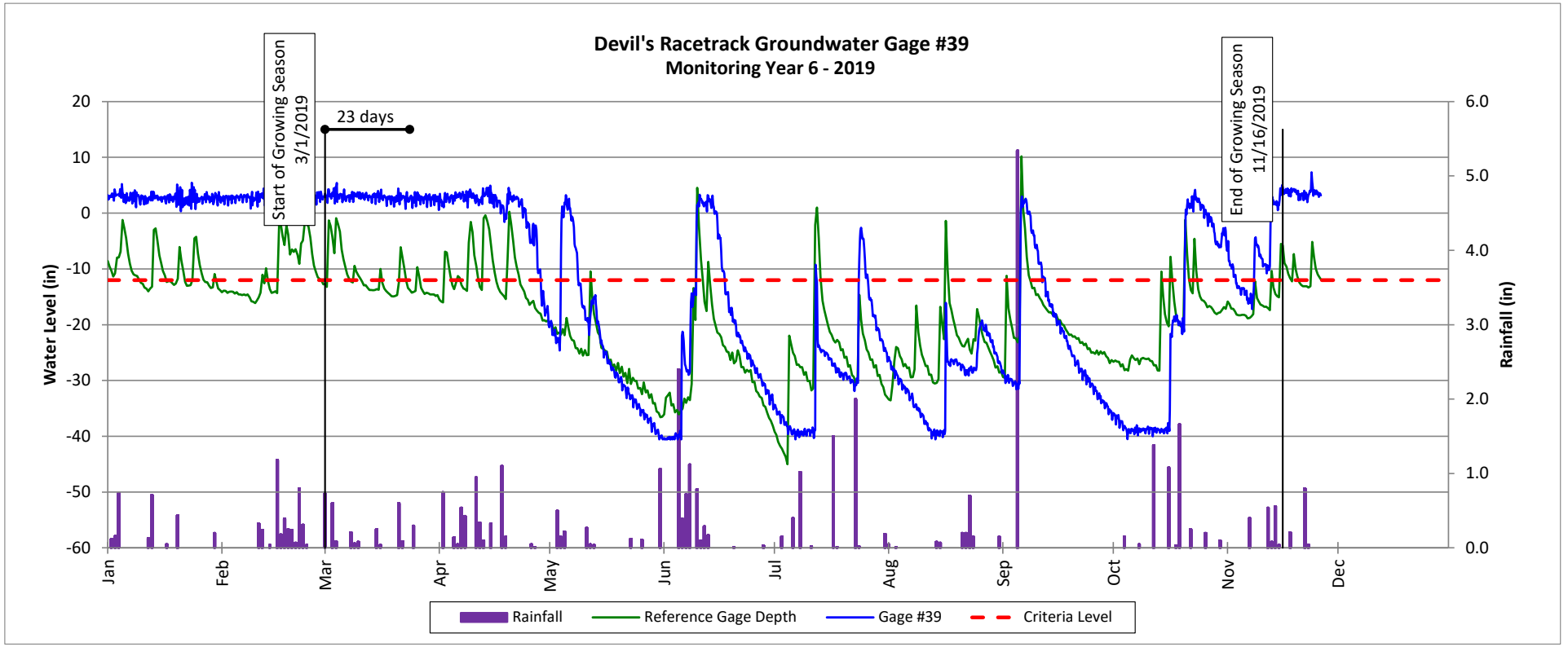

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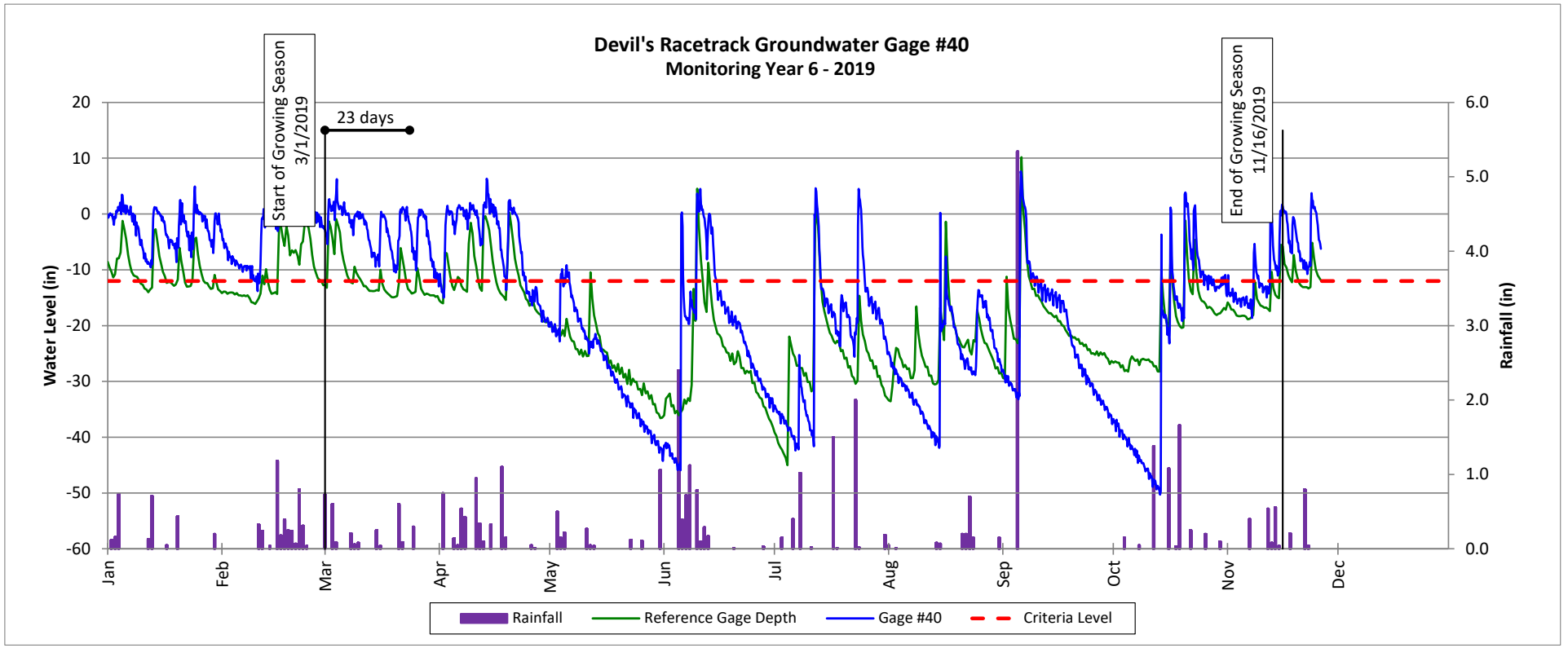

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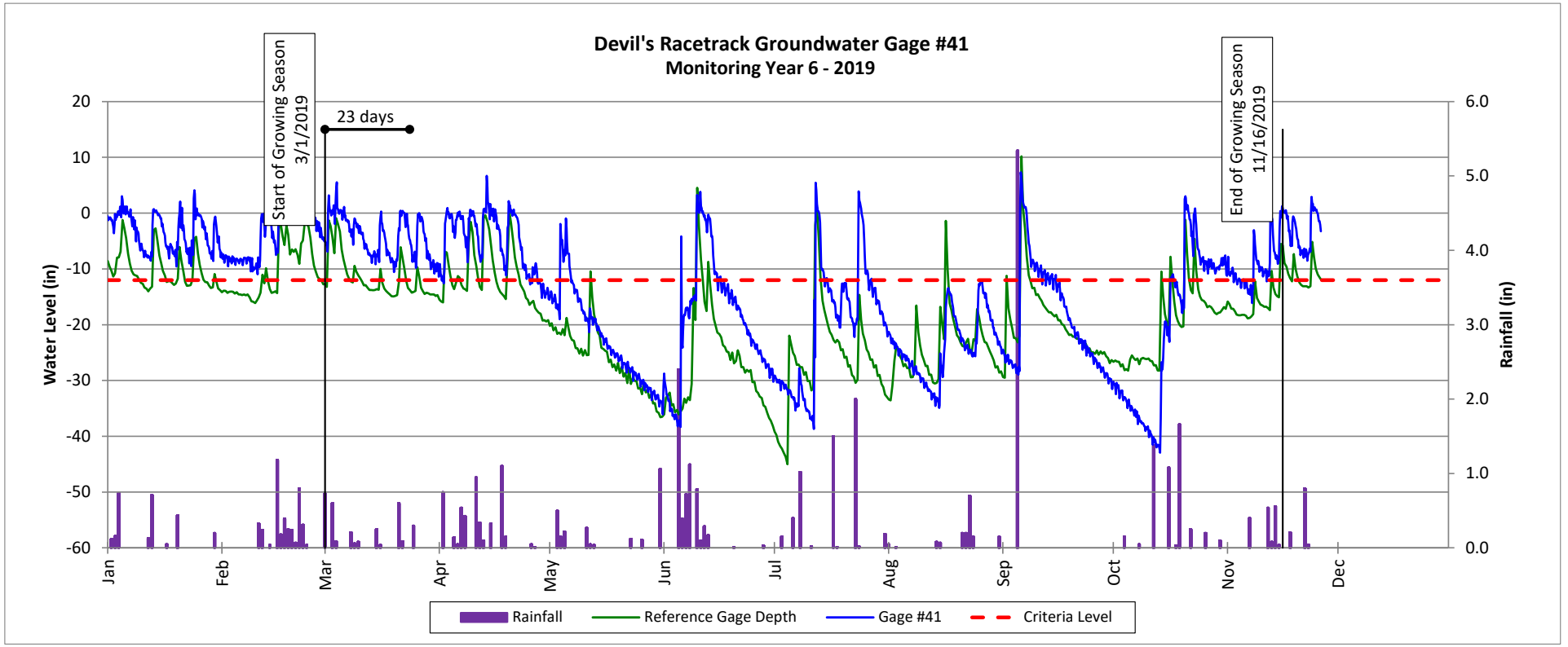
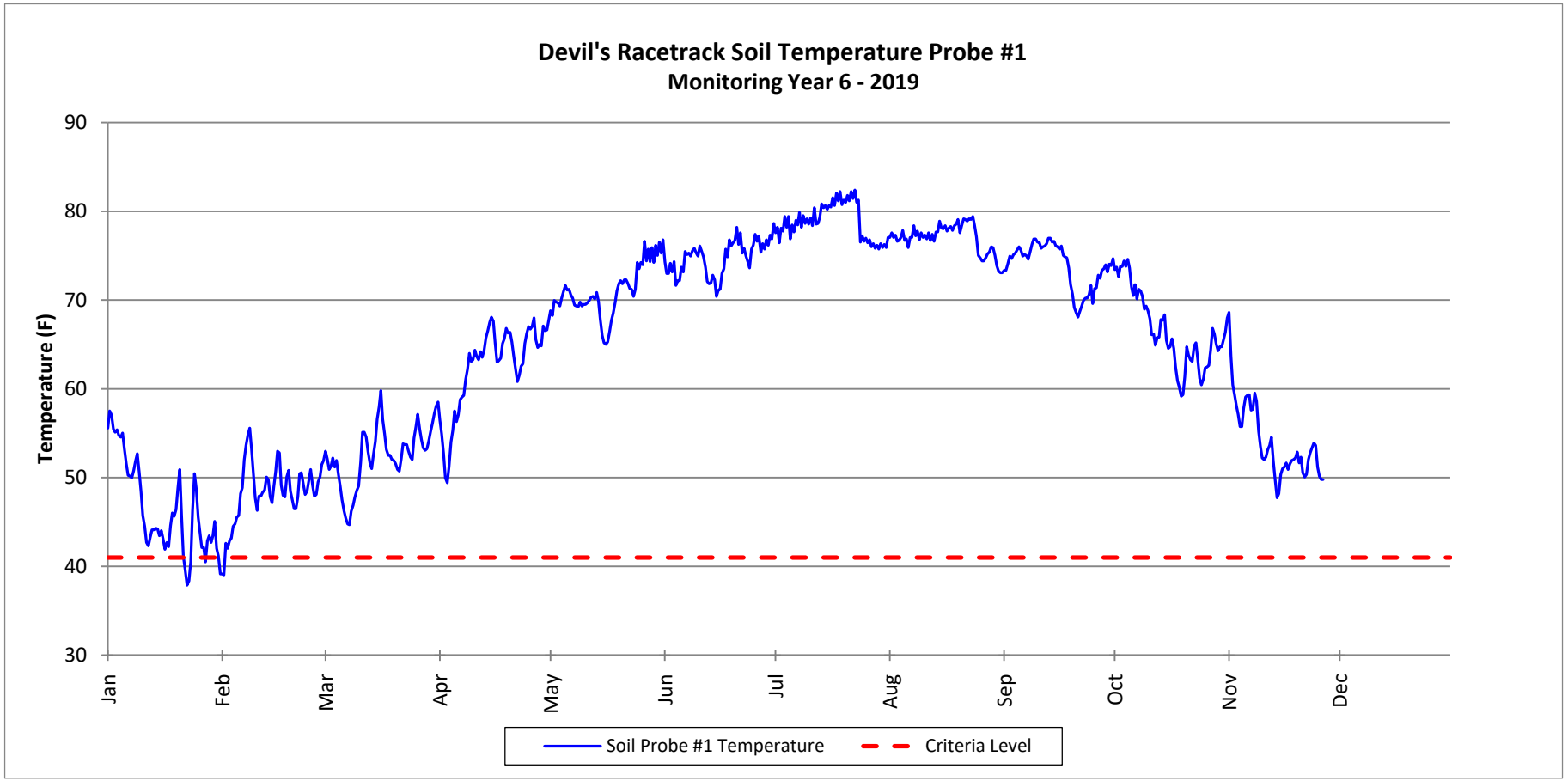


Soil Temperature Probe Plots

Devils Racetrack Mitigation Site(DMS Project No. 95021)

Monitoring Year 6 - 2019



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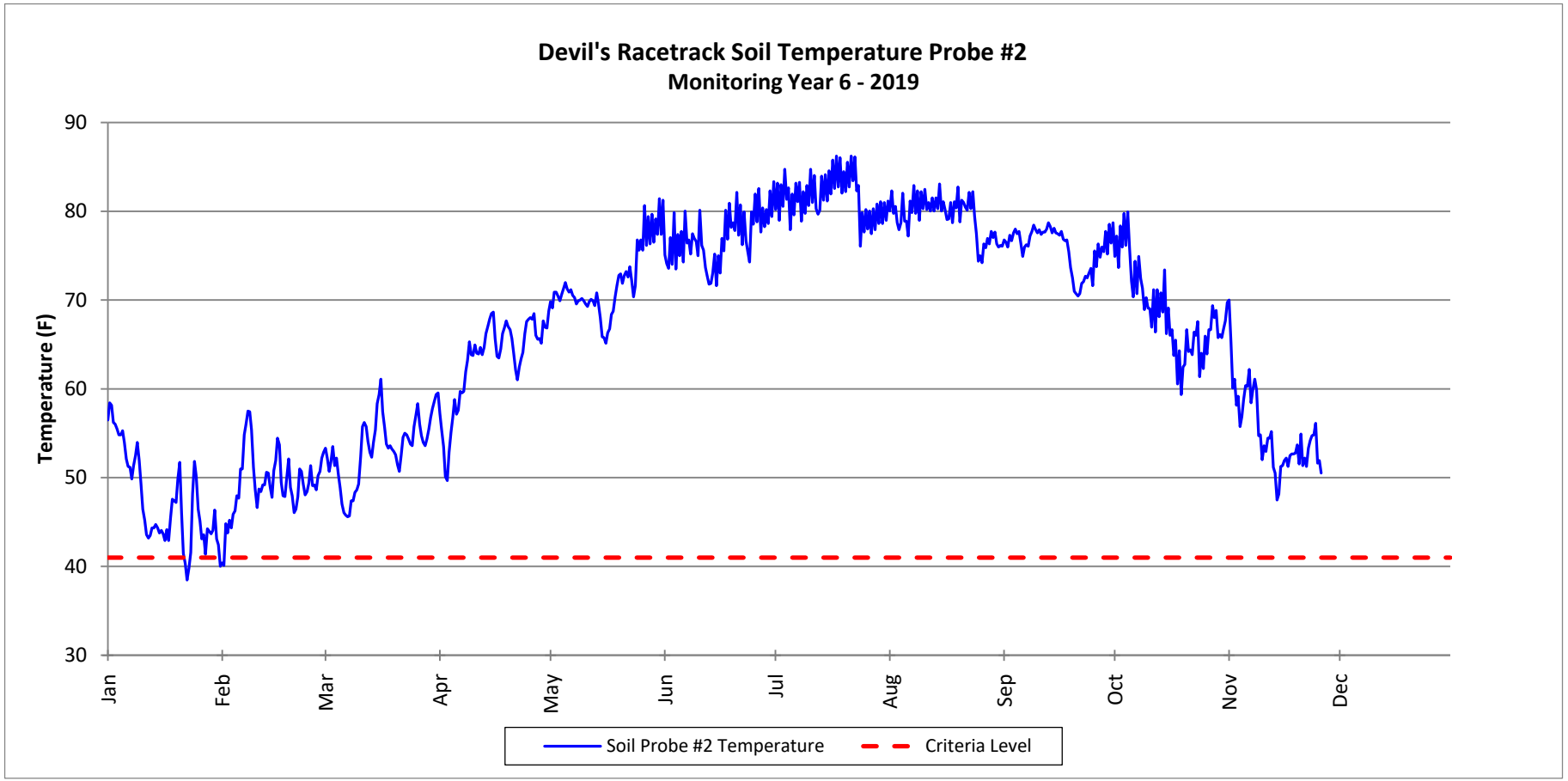

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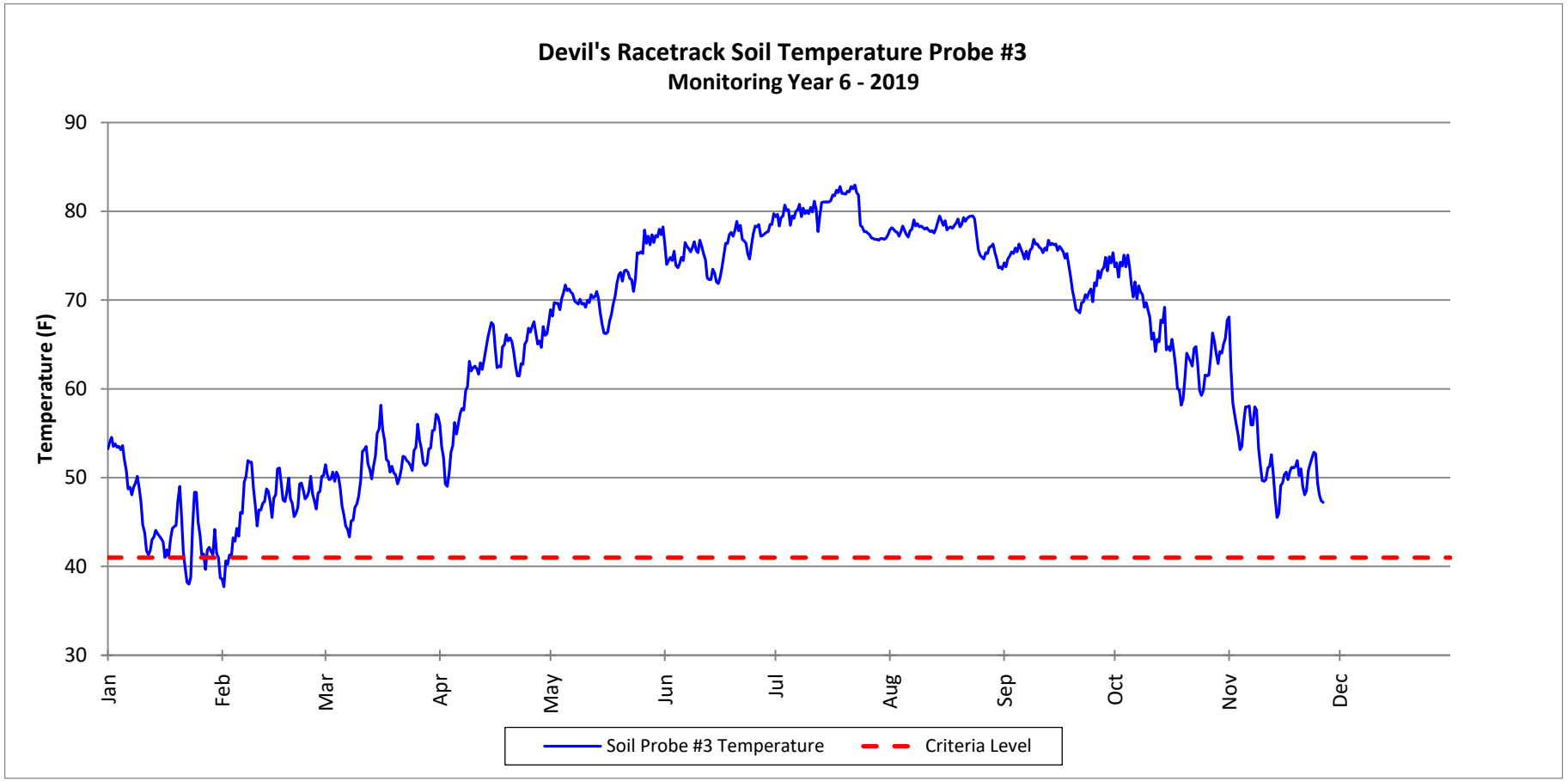
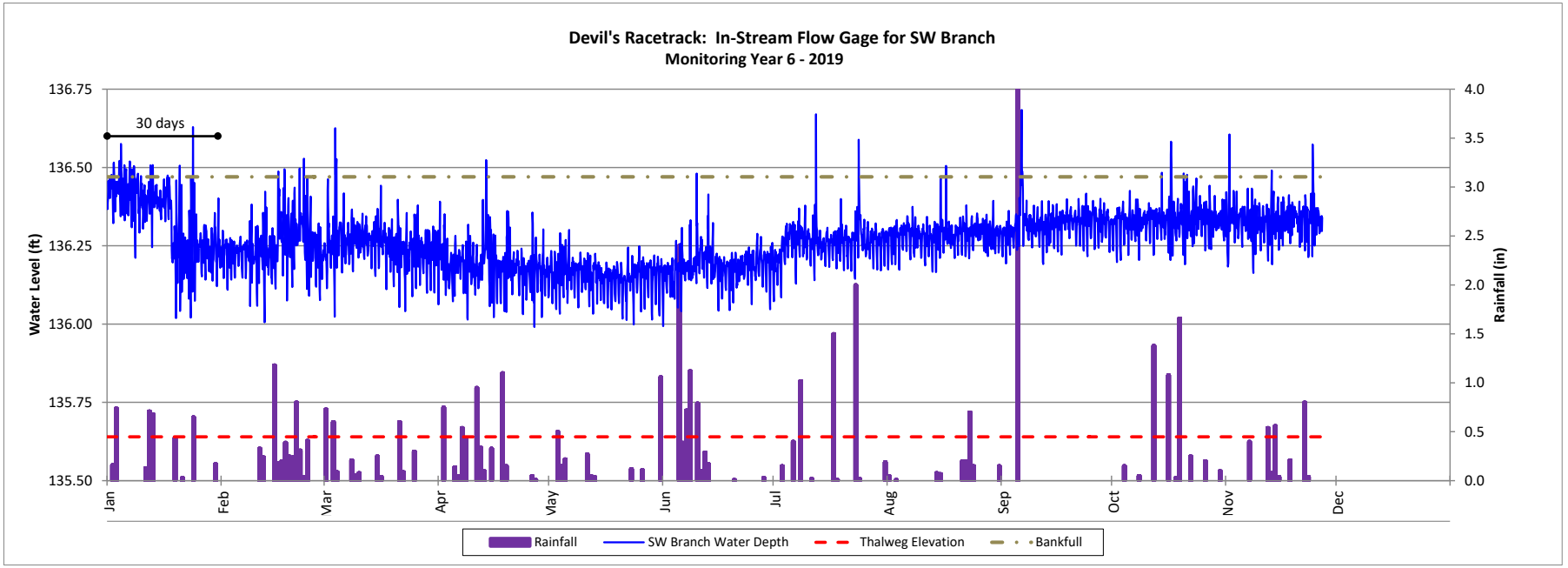


In-Stream Flow Gage Plots

Devil's Racetrack Mitigation Site
DMS Project No. 95021
Monitoring Year 6 - 2019



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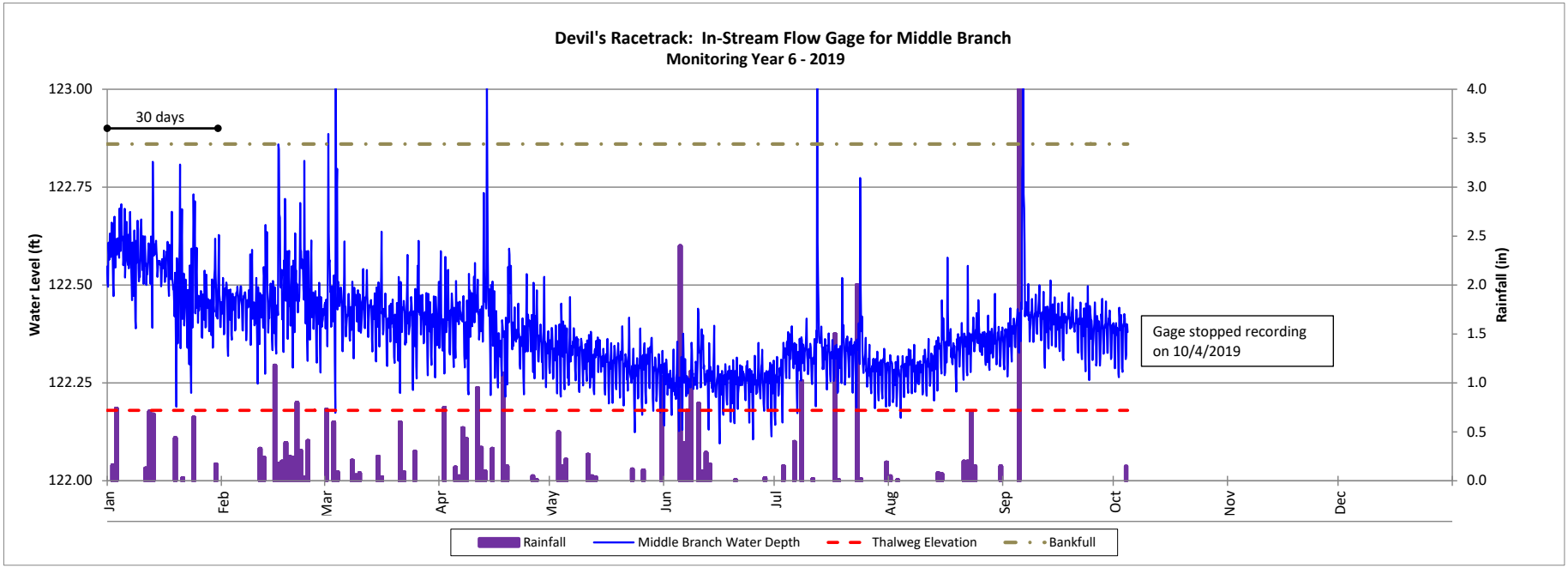

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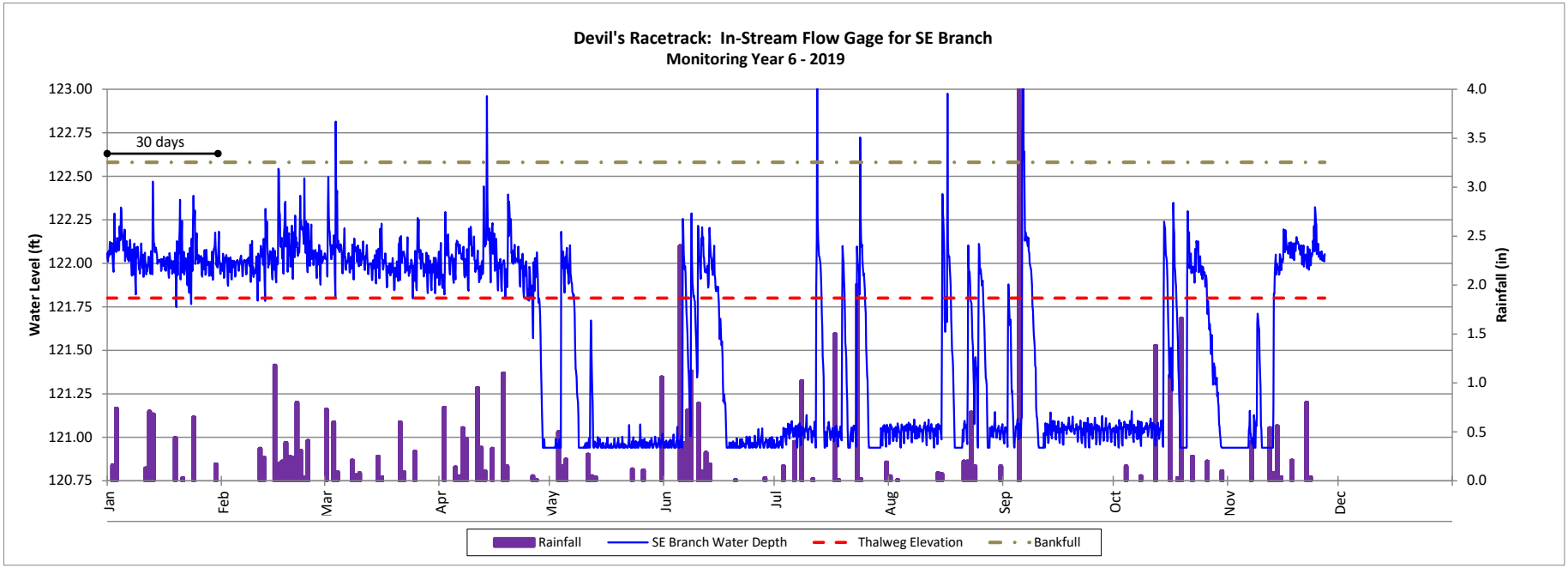
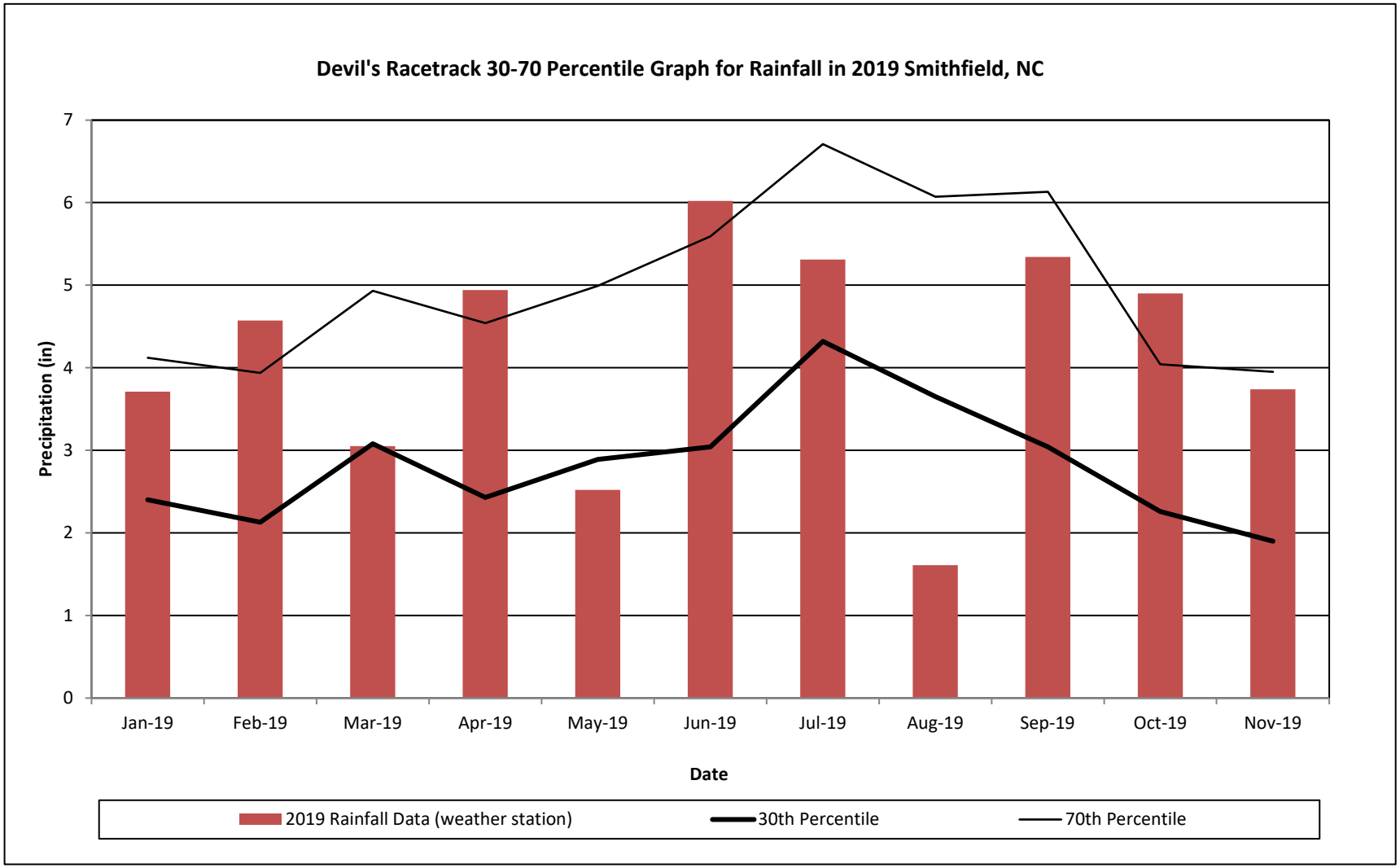


Monthly Rainfall Data

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019



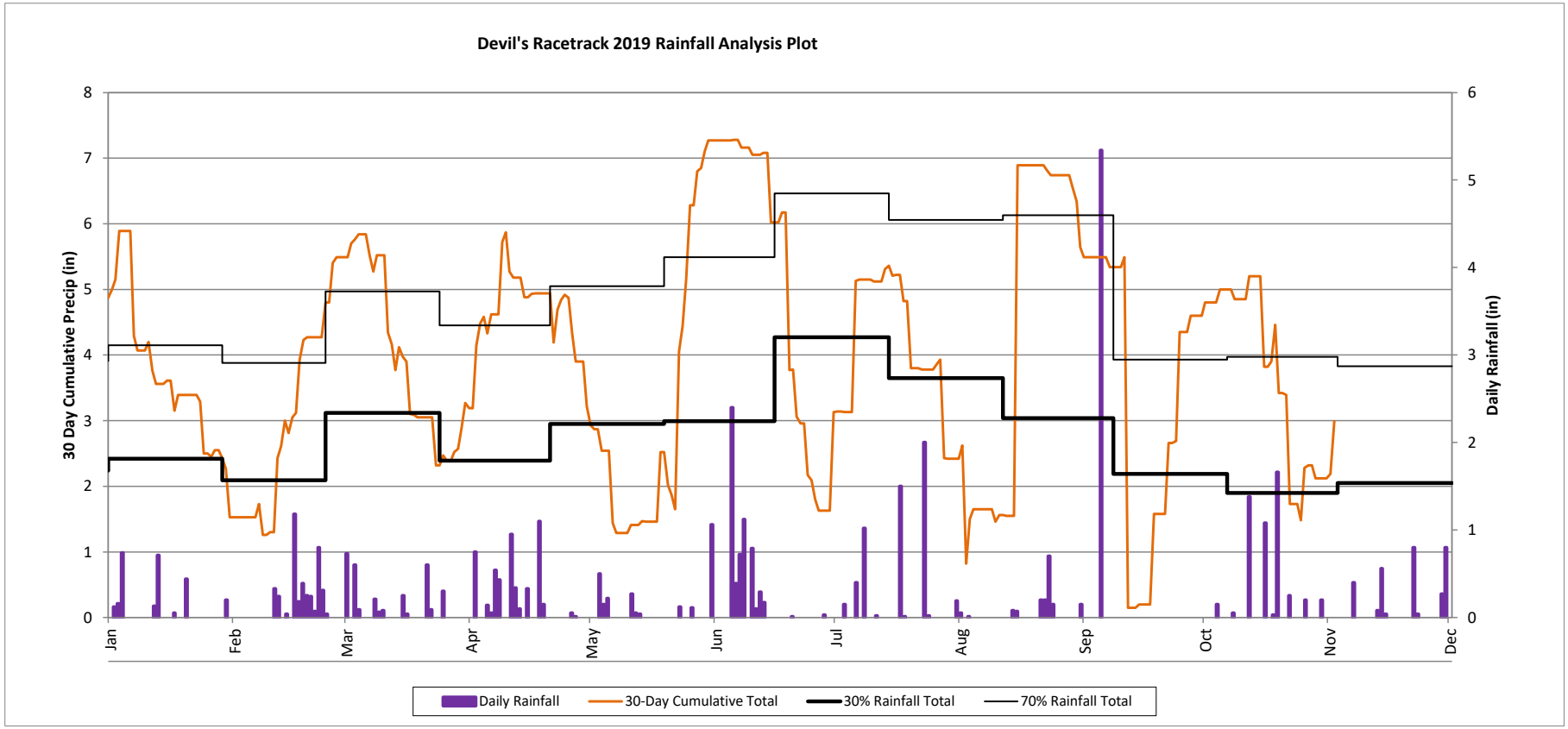
[1] 2019 monthly rainfall collected from USDA weather station 317994 (Smithfield, NC).

[2] 30th and 70th percentile rainfall data collected from weather station 317994, in Smithfield, NC (USDA, 1989 - 2019).

Monthly Rainfall Data

Devil's Racetrack Mitigation Site (DMS Project No. 95021)

Monitoring Year 6 - 2019



[1] 2019 monthly rainfall collected from weather station 317994 Smithfield, NC.

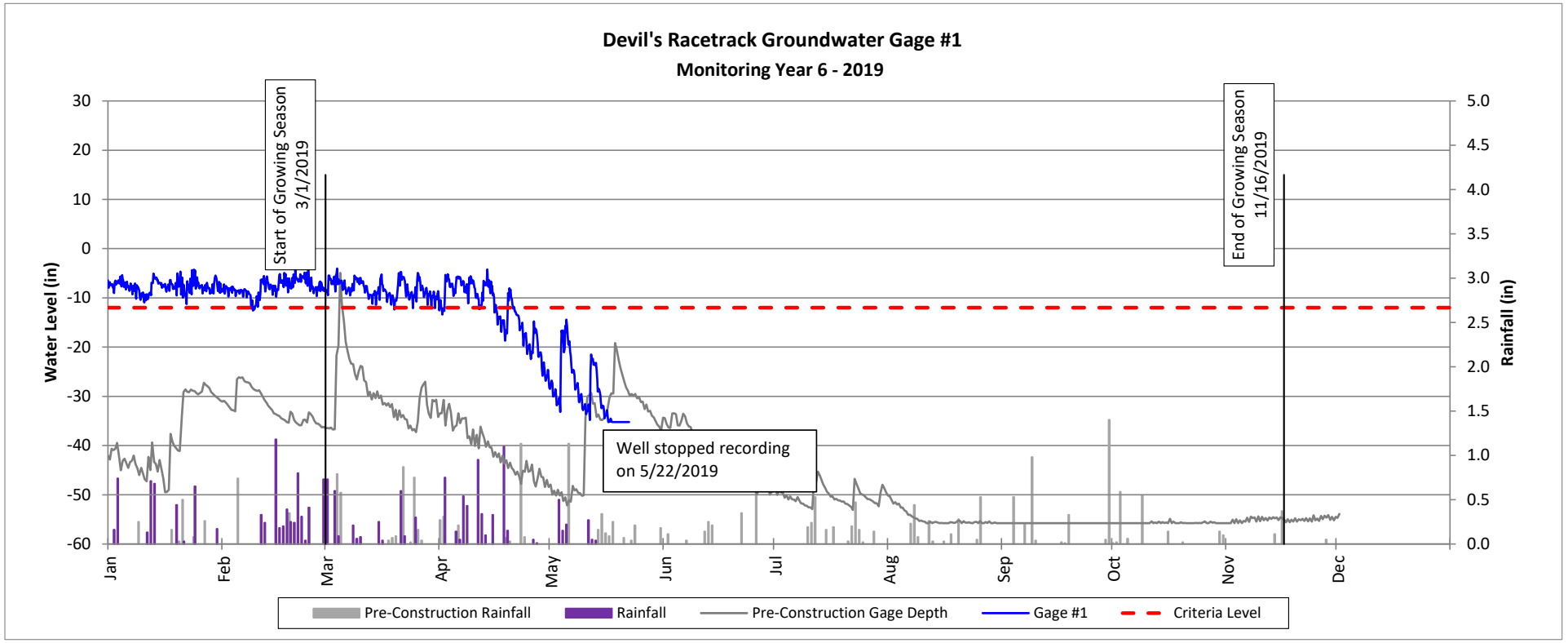
[2] 30th and 70th percentile rainfall data collected from weather station 317994 Smithfield, NC.

Pre and Post Construction Groundwater Gage Comparison Plots

Devil's Racetrack Mitigation Site

(DMS Project No. 95021)

Monitoring Year 6 - 2019



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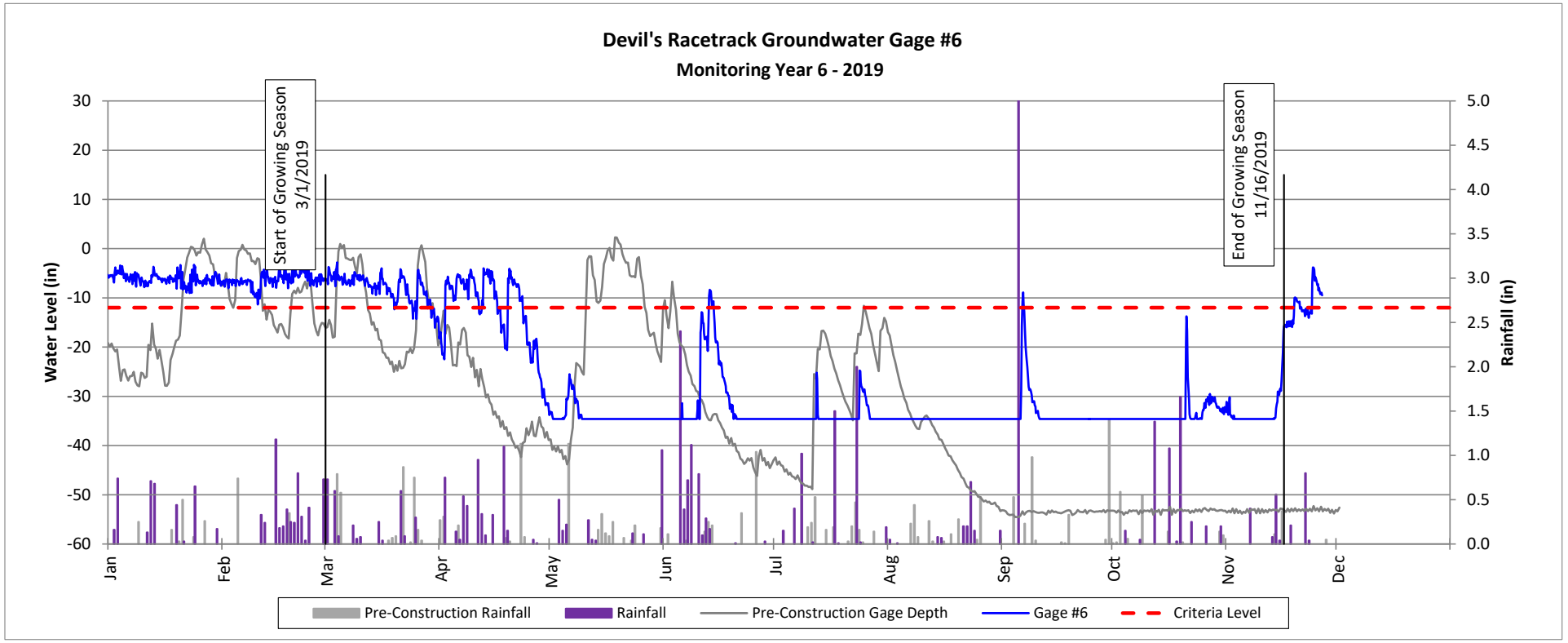

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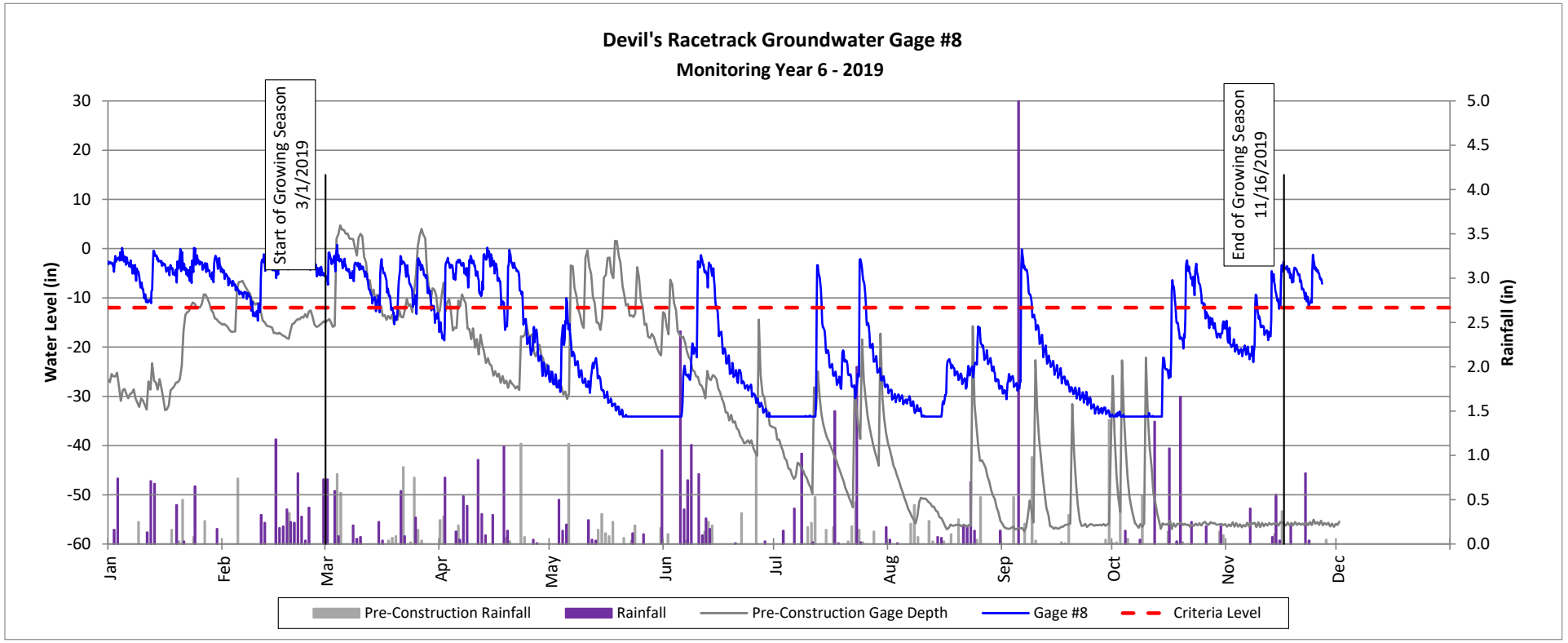

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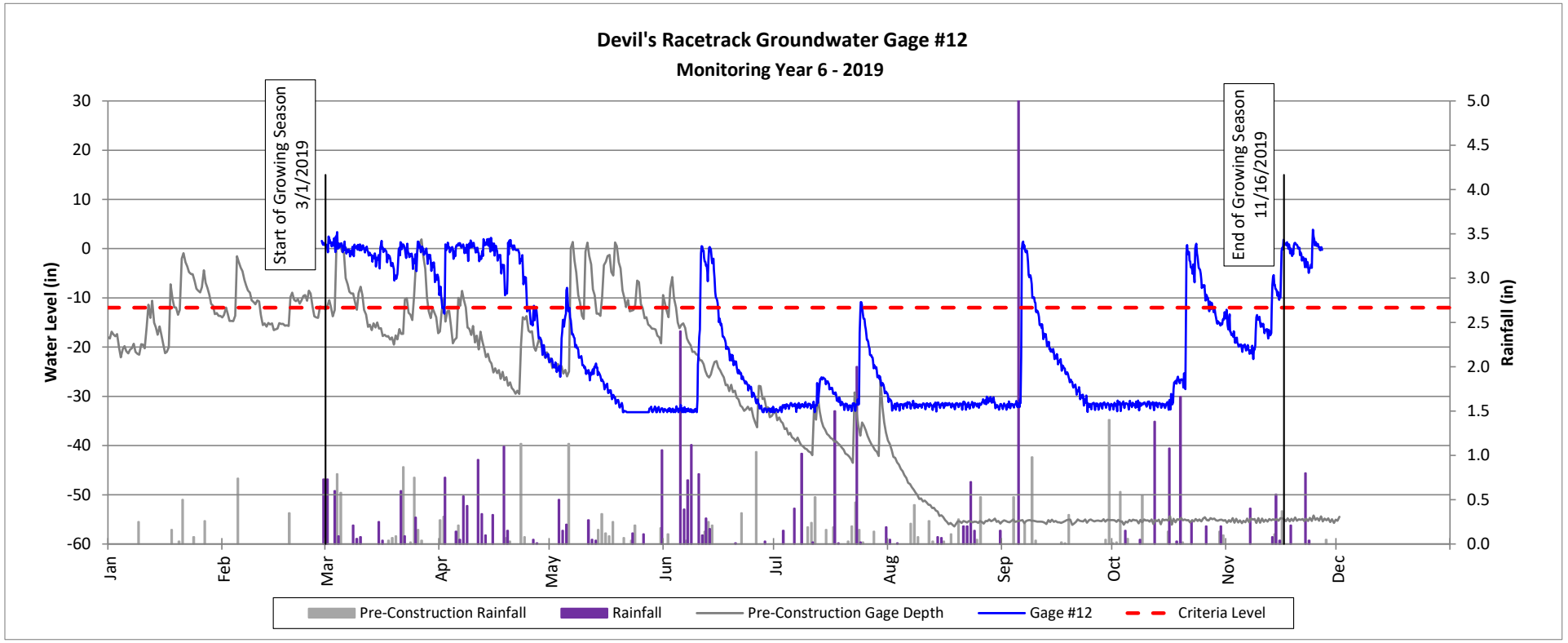

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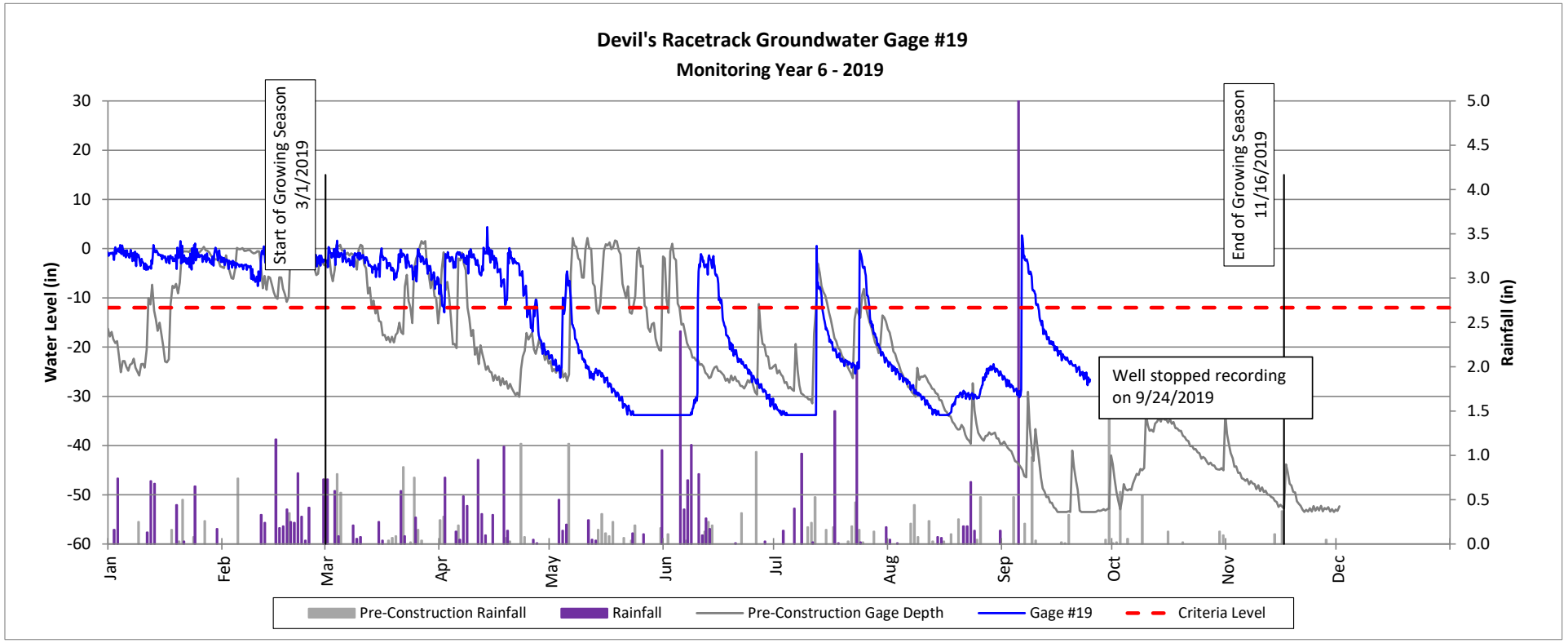

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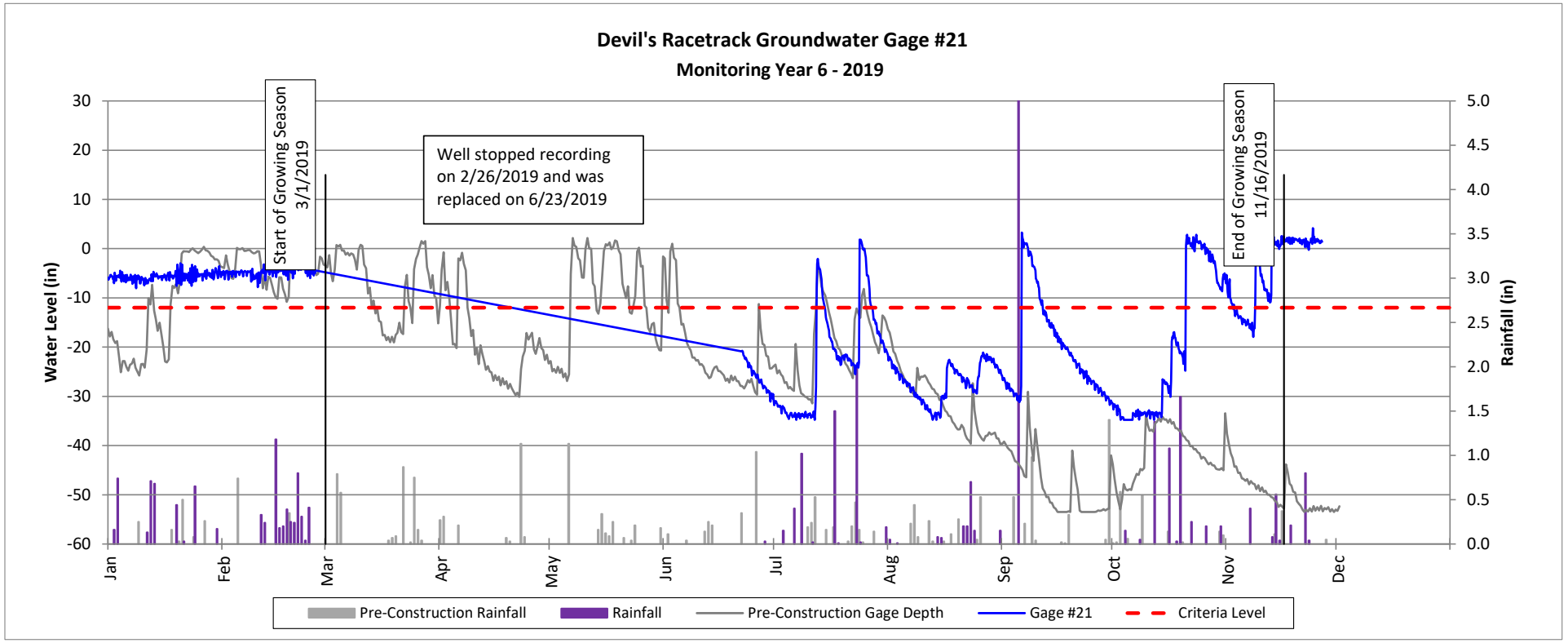

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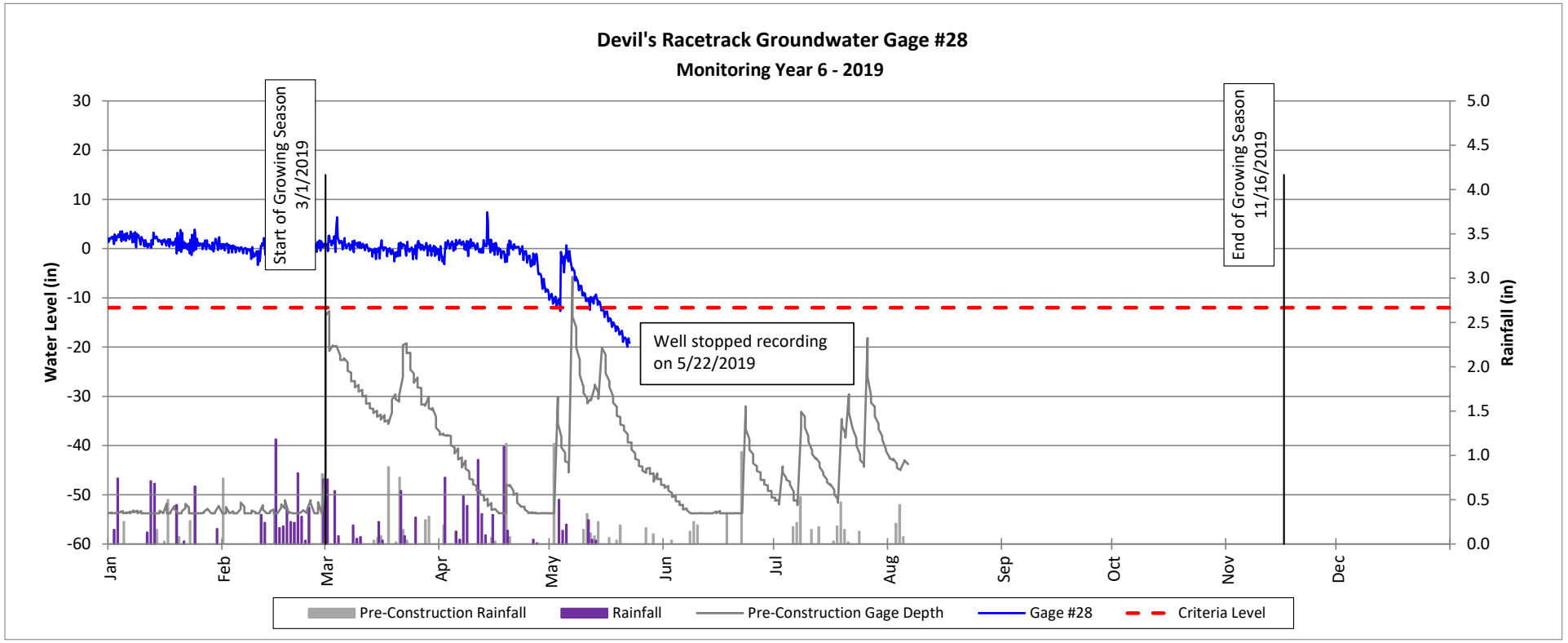

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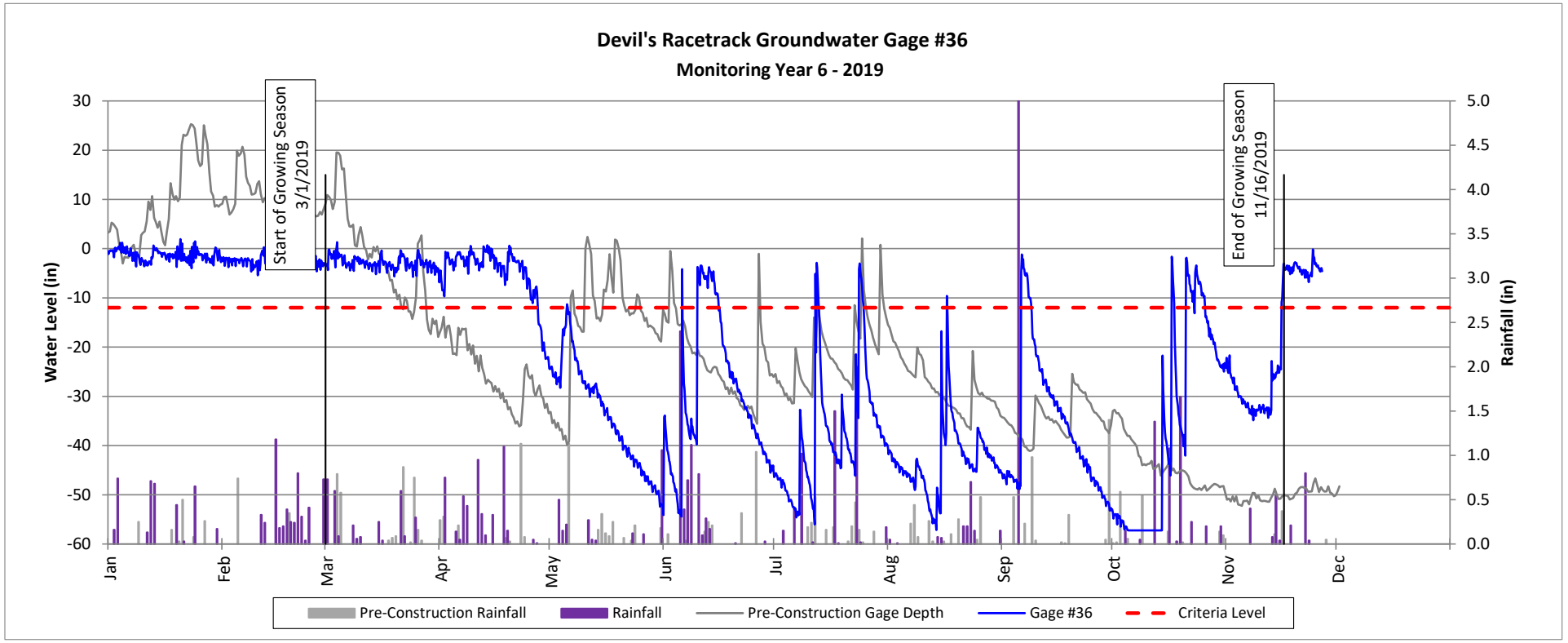

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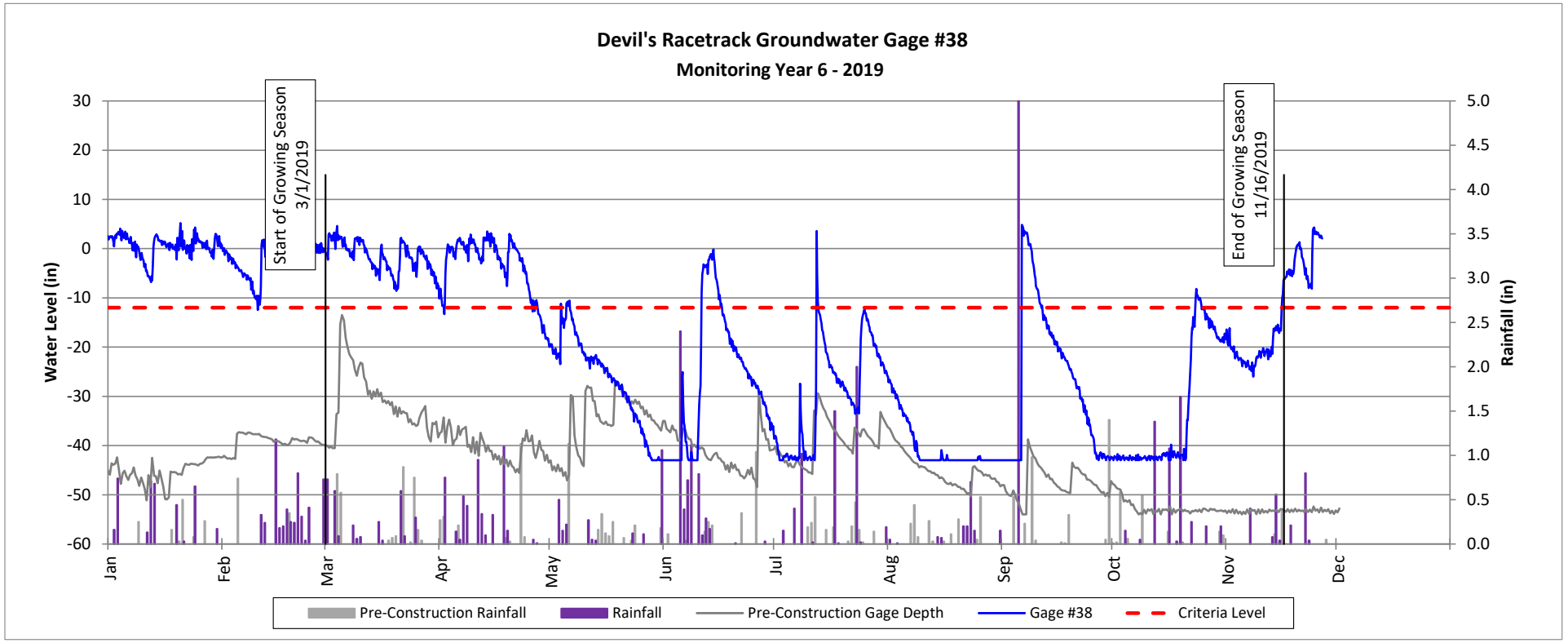

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Soil & Environmental Consultants, PA
11010 Raven Ridge Road • Raleigh, North Carolina 27614 • Phone: (919) 846-5900 • Fax: (919) 846-9467
www.SandEC.com

DETAILED HYDRIC SOIL INVESTIGATION

Devil's Racetrack Mitigation Site

Upper Coastal Plain

Neuse River Basin

Johnston County, North Carolina

Prepared for:
Mr. John Hutton
Wildlands
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

March 22nd, 2019

INTRODUCTION

Soil & Environmental Consultants, PA (S&EC, PA) was retained to perform a detailed evaluation to assess the presence and extent of (current, i.e. not relic) hydric soil indicators within specific areas of the mitigation site (See attached S&EC Hydric Soil Study Area Map). The solid pink areas have been identified by the IRT as being "at Risk" and the areas outlined in orange are additional areas that Wildlands requested that we evaluate. There are a number of restored streams that dissect the site. The areas evaluated are within a completed wetland restoration project.

METHODOLOGY

On February 26th and March 14th, 2019 Kevin Martin (LSS, PWS) of S&EC, PA performed a soil evaluation at the site. Pits were dug with a sharp shooter and hand auger borings were advanced on the property at locations as appropriate to approximately estimate the location and extent of hydric soils that exhibited hydric soil indicators typically associated with current conditions within the parts of the project area. Each pit boring was evaluated to assess the presence or absence of hydric soil indicators. Hydric soil indicators were identified utilizing the *NRCS Field Indicators of Hydric Soils in the Unities States - A Guide for Identifying and Delineating Hydric Soils (Version 8.2, 2018)* and Redoximorphic Features for Identifying Aquic Conditions, North Carolina Agricultural Research Service, NC State University Raleigh, North Carolina, Technical Bulletin 301 August 2015 which states:

(1)Contemporary redox concentrations (masses, pore linings) should have Hues of (Ferrihydrite) 5YR, (Lepidocrocite) 7.5YR, (Goethite) 7.5YR, 10YR and (Jarosite) 2.5Y. They should not have hues of (Hematite) 10R, 5R, 2.5YR. Such features are associated with ped faces or root channels.

(2) An α, α'-dipyridyl dye can be used to test for iron reduction. A pink color will appear in a few minutes if ferrous iron is present. This indicates that the horizon from which the sample came is reduced for soil classification purposes.

Oxidized rhizospheres were also used in this study because they are acknowledged as a wetland hydrology indicator.

BACKGROUND

Prior to development of the mitigation site, an evaluation was performed by a NC Licensed Soil Scientist to identify areas containing hydric soils. Upon review of the past soil profile description it was noted that none referred to the presence of redox concentrations such as Fe masses or pore linings in the surface layer (A horizon). Therefore, the presence of such features today would indicate a change to a wetter condition significant enough to form such features within the last 5 years. The main hydric soil indicators originally present appear to have been Depleted Matrix (F3), Depleted Below Dark Surface (A11) and/or Redox Dark surface (F6). We did not consider these indicators in our evaluation since they were present prior to restoration and could be indicative of relic conditions.

RESULTS

Twenty five pits and numerous soil borings were performed within the study area. Soil characteristics were evaluated and all areas identified as containing current hydric soil indicators indicative of aquic conditions were identified. The location of each pit is shown on the attached S&EC Devils Racetrack Mitigation Site Map. Where pits were dug adjacent to monitoring wells, they have a GW label that corresponds to the existing well number. Where pits were dug that were not adjacent to an existing monitoring well they are only represented by a number (e.g. 06). Areas where current hydric soil indicators were not observed are labeled as Potential

Upland Areas on the map and are outlined in blue with yellow hatching . An abbreviated soil profile description for each pit and a photo of most pits appear on the attached Aquic Conditions Table. The heading of each photograph indicates the current hydric soil indicators indicative of aquic conditions, if present, and the reaction of an α, α'-dipyridyl test strips.

Conclusions

All but four areas evaluated appear to have hydric soil indicators that represent current aquic conditions, they are:

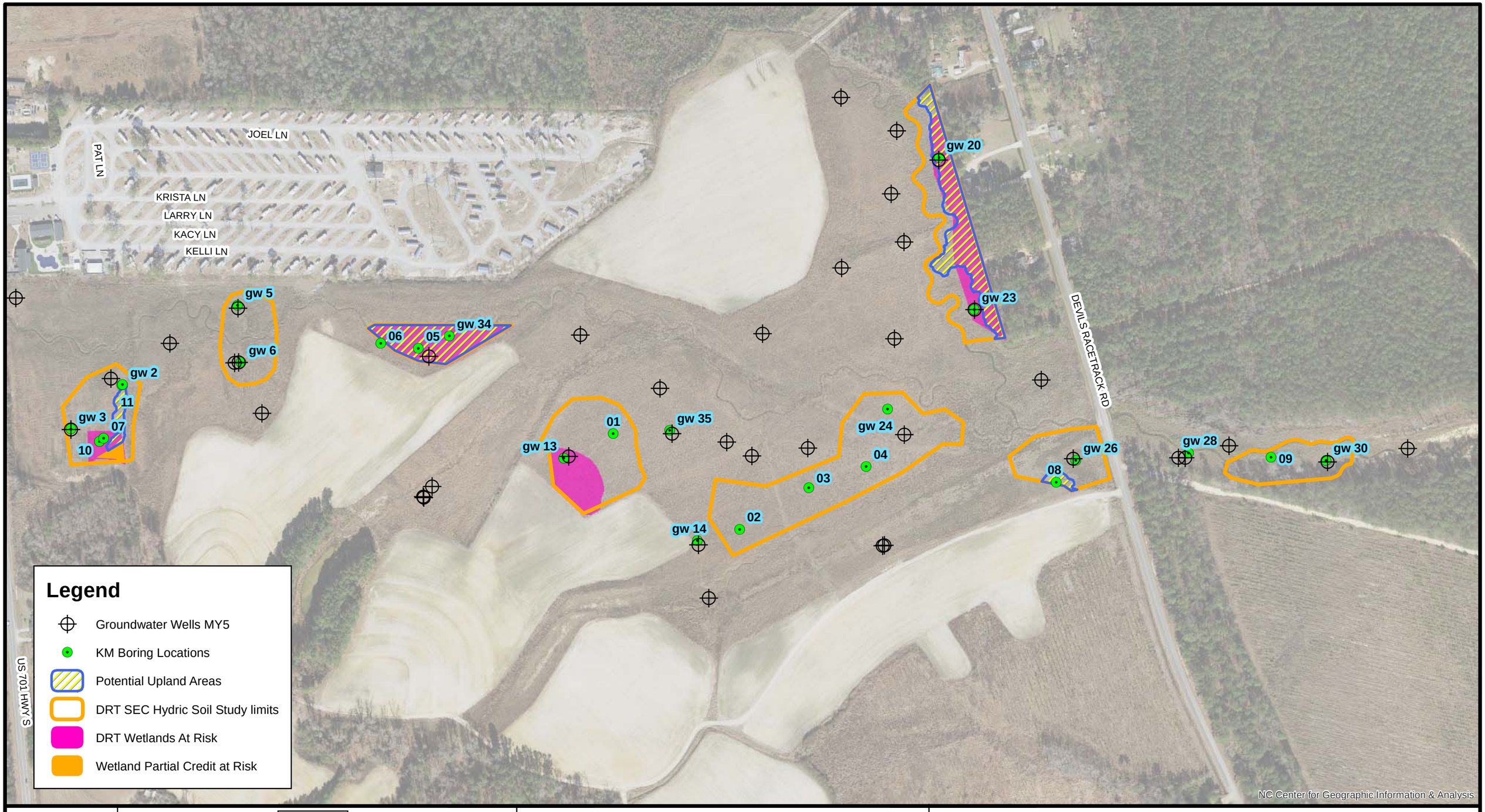
(1) The area around pit 5, 6 and GW34. This area contains hydric soils but did not exhibit pore linings or oxidized rhizospheres near the surface. Also, reaction with α, α'-dipyridyl test strips was weak at best and did not stain the soil ped faces.

(2) The area around pit 8. It does not contain hydric soils.

(3) The elongated area south of pit 11. This area contains hydric soils, but based on a review of aerial photos taken during and after construction, compacted soil observed and slightly higher elevation difference when compared to the surrounding area, it is believed that this areas was used as a construction access road. Since areas observed on each side of this long narrow strip are meeting aquic conditions, we believe by bringing the surface elevation down so it is the same as adjacent wet areas, this area can be made to meet aquic conditions.

(4) The elongated area south of GW20. This area contains hydric soils, but is slightly elevated above adjacent areas that are meeting aquic conditions but the ditch along the eastern property line is likely preventing adequate hydrology that would cause aquic conditions.

These areas are outlined in blue with yellow hatching on the attached S&EC Devils Racetrack Mitigation Site Map.



Project No.	
Project Mgr.: KM	
Scale: 1" = 300'	
3/19/2019	

N W E S

0 300 600 1,200

Feet

Devils Racetrack Mitigation Site

Johnston County, NC

NOTE: Parcel boundary shown is based on a georeferenced image from the Johnston Co. GIS mapping website, aligned based on NCDOT roads GIS layer. As such, all calculated areas shown herein are approximate and subject to change based on new or better information.

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		Matrix		Redox Concentrations						
Sampling Location	Depth (in)	Color	%	Color	Type, Location	%	Text. Class	Reaction to α, α' Dipyridyl	Comment	Date
GW 13	0-6	2.5Y 4/1	95	7.5YR 5/8	On ped faces, Pore Linings, Ox. Rhizospheres	5	SL	Yes		2/26/2019
	6-12+	2.5Y 6/2	60	7.5YR 5/8	Masses, Pore Linings	40	SCL	Yes		
GW 35	0-9	2.5Y 4/1	95	7.5YR 5/8	On ped faces, Pore Linings, Ox. Rhizospheres	5	SL	Yes		2/26/2019
	9-12+	2.5Y 6/2	60	7.5YR 5/8	Masses, Pore Linings	40	Lt. SCL	Yes		
01: No description taken									F3 2" thick, Low Chroma within top6"	2/26/2019

GW13 Bt Positive α, α'-dipyridyl

GW13 Oxidized Rhizospheres

GW13 weak Positive α, α'-dipyridyl Surface and Subsurface

GW13 Weak Positive α, α'-dipyridyl surface

GW35 #2 Positive α, α'-dipyridyl (hard to see due to bright sunlight)

		Matrix		Redox Concentrations						
Sampling Location	Depth (in)	Color	%	Color	Type, Location	%	Text. Class	Reaction to α, α' Dipyridyl	Comment	Date
GW 14	0-7.5	2.5Y 4/1	95	7.5YR 5/8	Pore Linings	5		Weak		2/26/2019
	7.5-12+	2.5Y 6/2	60	7.5YR 5/8	Masses	40		Weak		
02	0-6	2.5Y 4/2	95	7.5YR 4/4	Pore Linings, Ox. Rhizospheres	5	CL	Yes		2/26/2019
	6-12+	10YR 5/1	75	7.5YR 4/6	Pore Linings	25	CL			
03	0-7	10YR 5/2	90	7.5YR 3/4	Masses, Pore Linings, Ox. Rhizospheres	10	SCL	Yes		2/26/2019
	7-12+	2.5Y 4/2	80	5YR 4/6	Masses, Pore Linings	20	CL			
04	0-12+	2.5Y 4/2	80	5YR 4/6	Masses, Pore Linings, Ox. Rhizospheres	20	CL	Yes	Similar to 03 Subsurface	2/26/2019
GW 24	0-7	2.5Y 3/2	98		Masses, Pore Linings, Ox. Rhizospheres, all few to very few	2	SL	Yes	Approx. 100' N of location shown on map	2/26/2019
	7-12+	2.5Y 6/2	60	10YR 8/8	Masses	10	Lt. SCL			
				2.5Y 6/3	Masses	30				

GW14 #2 Pore linings, small Masses but no Oxidized Rhizospheres

GW14 Weak Positive α, α'-dipyridyl surface and subsurface

B2 Positive α, α'-dipyridyl

B2 Oxidized Rhizoshperes

B3 Positive α, α'-dipyridyl

B3 Oxidized Rhizoshperes & Pore Linings

B4 Positive α, α'-dipyridyl

GW24 #2 Positive α, α'-dipyridyl

GW24 Positive α, α'-dipyridyl

		Matrix		Redox Concentrations						
Sampling Location	Depth (in)	Color	%	Color	Type, Location	%	Text. Class	Reaction to α, α' Dipyridyl	Comment	Date
GW 34	0-9.5	10YR 4/1	95	7.5YR 4/6	Masses	5	SCL	Weak		2/26/2019
	9.5-12+	2.5Y 6/1	80	7.5YR 4/6		20	SCL			
05	0-6	2.5Y 5/3	100				SCL	Weak, did not stain soil	Fe conc.'s increasing w/ depth	2/26/2019
	6-12+	2.5 4/1	85	5YR 4/4	Masses	15	SCL	Weak, did not stain soil		
06	0-9.5	10YR 4/1	95	7.5YR 4/6	Masses	5	SCL	Weak	Similar to GW 34	2/26/2019
	9.5-12+	2.5Y 6/1	80	7.5YR 4/6		20	SCL			
GW 6	0-12+	2.5Y 4/1	80	5YR 3/4	Masses, few Ox. Rhizospheres	20	SCL	Yes		2/26/2019
GW5	0-12+	2.5Y 4/1	80	5YR 3/4	Masses, few Ox. Rhizospheres, On ped faces	20	SCL	Yes		2/26/2019

GW34 Positive α, α'-dipyridyl

B5 0-6” Positive α, α'-dipyridyl

B5 6-12+” Positive α, α'-dipyridyl

GW6 Positive α, α'-dipyridyl

GW5 pedface soft masses

		Matrix		Redox Concentrations						
Sampling Location	Depth (in)	Color	%	Color	Type, Location	%	Text. Class	Reaction to α, α' Dipyridyl	Comment	Date
GW 26	0-3	10YR 5/2	65	2.5Y 5/3	Masses, Ox. Rhizospheres	30	SCL	Yes		3/14/2019
				7.5YR 4/6	Pore Linings	5				
	3-12+	10YR 4/1	95	2.5YR 4/4	Masses	5	SCL	Yes		
08	0-3	10YR 4/2	100							3/14/2019
	3-12+	2.5Y 6/4	60	7.5YR 5/8	Masses	10	SL			
				2.5Y 5/2	Pore Linings	30	Lt. SCL			
GW 30	0-3	10YR 5/2	65	2.5Y 5/3	Masses, Ox. Rhizospheres	30	SCL	Yes	Same as GW26	3/14/2019
				7.5YR 4/6	Pore Linings	5				
	3-11	10YR 4/1	75	5YR 3/4	Masses	25	SCL			
09	0-5	2.5Y 4/1	70	7.5YR 4/6	On ped faces, Pore Linings, Ox. Rhizospheres	30	SCL	Yes		3/14/2019
	5-13	10YR 5/1	85	7.5YR 4/6	Masses	15				
GW 28	0-3	10YR 5/2	65	2.5Y 5/3	Masses, Ox. Rhizospheres	30	SCL	Yes	Same as GW30	3/14/2019
				7.5YR 4/6	Pore Linings	5				
	3-11	10YR 4/1	75	5YR 3/4	On ped faces, Masses	25	SCL			

GW26 Positive α, α'-dipyridyl

B8 no redox

GW30 surface #2 Oxidized rhizospheres and Pore Linings

GW30 surface Positive α, α'-dipyridyl

GW30 subsurface Masses on Ped Faces

B9 surface #2 Pore Linings

B9 surface Positive α, α'-dipyridyl

		Matrix		Redox Concentrations						
Sampling Location	Depth (in)	Color	%	Color	Type, Location	%	Text. Class	Reaction to α, α' Dipyridyl	Comment	Date
GW 23	0-8	2.5Y 3/1	97		Few Pore Linings, Few Ox. Rhizospheres	3	Lt. SCL	Yes		3/14/2019
	8-12+	10YR 6/2	90	10YR 5/8	Masses	10	SCL			
GW 20	0-8	2.5Y 5/2 or 2.5Y5/3	95	7.5YR 4/6	Few pore linings	5	SCL	No		3/14/2019
	8-12+	2.5Y 5/1		7.5YR 4/6	Few Pore Linings, Few Ox. Rhizospheres		SCL	Yes		

GW20 Negative α, α'-dipyridyl surface

GW20 surface

GW20 subsurface Positive α, α'-dipyridyl

Sampling Location	Depth (in)	Matrix Color	%	Redox Concentrations Color	Type, Location	%	Text. Class	Reaction to α, α' Dipyridyl	Comment	Date
GW3: No description taken. Extremely compacted to 3 inches.										2/26/2019
07: No description taken. Extremely compacted to 3 inches										2/26/2019
GW2: No description taken. Only non-inundated area was not representative of surrounding conditions										2/26/2019
10	0-3	2.5Y 4/1	90	7.5YR 4/6	Pore Linings, Ox. Rhizospheres	10	SCL	Yes		3/14/2019
	3-12+	2.5Y 4/1	85	5YR 3/4	On ped face, Pore Linings	15	SCL	Yes		
11	0-6	2.5Y 5/2	98		Very few Pore linings	2	SCL	Yes		3/14/2019
	6-12+	2.5Y 4/1	70	10YR 4/6	Masses	30	SCL	Yes	Compacted	

Near GW2 (Compacted area possibly due to old construction access, not meeting aquic conditions)

B10 subsurface Positive α, α'-dipyridyl

B10 surface #2 Pore Linings and Oxidized rhizospheres

B10 surface Positive α, α'-dipyridyl

B11 no rhizospheres or Pore linings surface

B11 subsurface Positive α, α'-dipyridyl

B11 surface Positive α, α'-dipyridyl