MONITORING YEAR 6 ANNUAL REPORT

FINAL

OWL'S DEN MITIGATION SITE
Lincoln County, NC
DEQ Contract 005150
DMS Project Number 95808
DWR No. 14-0153
USACE Action ID No. SAW-2010-00717
Catawba River Basin
HUC 03050102

Data Collection Period: March - November 2021
Submission Date: January 3, 2022

PREPARED FOR:

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January 3, 2022

Mr. Paul Wiesner
NC Department of Environmental Quality
Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

RE: Owl's Den Mitigation Site-Year 6 Monitoring Report
Final Submittal for DMS
Contract Number 005150, DMS# 95808
Catawba River Basin – CU# 03050102; Lincoln County, NC
Providing mitigation for CU#03050103 (Catawba ESA)

Dear Mr. Wiesner:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments and observations from the Owl's Den Mitigation Site Draft Year 6 Monitoring Report received on December 20, 2021. The report text has been revised for the final submittal to reflect the most current condition of the site. Your comments and observations from the report are noted below in **Bold**. Wildlands' response to those comments are noted in *Italics*.

DMS' Comment: General/ Report Text and Table 1: Please continue to maintain Table 1 and do not remove the potential "at risk" wetland credits from the table. DMS has entered the 0.103 potential "at risk" WMUs into our internal accounting system (CRM) for tracking purposes. The potential "at risk" wetland credits can be removed from the project's final credit ledger at proposed project closeout as they do not exceed the final 10% wetland credit release.

Wildlands' Response: We acknowledge DMS' request and the "at risk" acreage and WMUs will not be removed from Table 1.

DMS' Comment: Section 1.2.2 Stream Areas of Concern and Management Activity: This section notes; "During a Site visit on October 18th, beavers were still active on the Site. Dams above and below the crossing had been re-established, and an additional dam was built on HC1 Reach 1 at station 101+00." Please update this section to indicate when these dams were removed and beaver trapped or provide a scheduled removal/ trapping date/s. DMS recommends removing beaver and beaver dams as soon as possible to avoid potential irregular monitoring data, project damage and additional project maintenance. As noted in the report text, beaver and beaver dams should be removed from the site through project closeout.

Wildlands' Response: The report and figures have been updated to reflect that all dams inside the project area were removed in early November of 2021 and not present during the final Site walk on November 10th, 2021. Wildlands is currently monitoring for continued beaver activity and will address re-established and/or newly established dams in MY7.

DMS' Comment: Section 1.2.6 Vegetation Areas of Concern and Management Activity: Please continue to treat marsh dewflower (*Murdannia keisak*) aggressively so it does not become established on the project site.

Wildlands' Response: Wildlands will continue to aggressively treat marsh dewflower (Murdannia keisak) throughout MY7 to keep the species from becoming established on the Site.

DMS' Comment: Table 5 (a-c) & Table 6: Please include the date that the project was visually assessed at the top of each table. This was an IRT request at the 2021 credit release meeting.

Wildlands' Response: Table 5 (a-c) and Table 6 have been updated to include dates the visual assessment was conducted.

DMS' Comment: APPENDIX 6. Wetland Re-Establishment Addendum: DMS recommends titling the Appendix "Supplemental Wetland Boring Data" rather than "Addendum" to avoid confusion.

Wildlands' Response: Appendix 6 is now titled "Supplemental Wetland Boring Data", as requested.

Enclosed please find two (2) hard copies of the Year 6 Final Monitoring Report and one (1) USB with all the final corrected electronic files for DMS distribution. Please contact me at 704-332-7754 x101 if you have any questions.

Sincerely,

Kristi Suggs
ksuggs@wildlandseng.com

EXECUTIVE SUMMARY

Wildlands Engineering Inc. (Wildlands) implemented a full delivery project at the Owl's Den Mitigation Site (Site) for the North Carolina Division of Mitigation Services (DMS) to restore 2,453 linear feet (LF) of perennial streams, rehabilitate 2.82 acres of existing wetlands, and re-establish 6.77 acres of wetlands in Lincoln County, NC. The Site is expected to generate 2,453.000 stream mitigation units (SMUs) and 8.938 riparian wetland mitigation units (WMUs) (Table 1). A wetland area "at risk" was defined in the wetland re-establishment area during Monitoring Year 6 and would result is a loss of 0.103 acres of wetlands and 0.103 WMUs. The "at risk" acreage has not been updated in Table 1.

The Site is located near the City of Lincolnton in Lincoln County, NC within the DMS targeted watershed for the Catawba River Basin Hydrologic Unit Code (HUC) 03050102040040 and NCDWR Subbasin 03-08-35 (Figure 1) and is being submitted for mitigation credit in the Catawba River Basin HUC 03050103 within the expanded service area of this HUC. The project streams consist of two unnamed tributaries to Howards Creek, HC1 and HC2 (Figure 2). Howards Creek eventually flows into the South Fork Catawba River near the City of Lincolnton in Lincoln County. The adjacent land to the streams and wetlands is maintained for agricultural purposes.

The Site is located in the Howards Creek watershed and is within a Targeted Local Watershed (TLW) identified in NCDMS 2007 Catawba River Basin Restoration Priority Plan (RBRP). The Site is also identified in the Indian Creek and Howards Creek Local Watershed Plan (LWP) Project Atlas (DMS, 2010). The Indian and Howards Creek LWP identified stream channelization and dredging, incised channels and unstable stream banks, deforested riparian buffers, drained and cleared wetlands, and nutrient inputs to streams and wetlands as major stressors within this watershed. The LWP Project Atlas identified the Owl's Den Mitigation Site as a restoration opportunity with the potential to improve water quality, habitat, and hydrology within the Howards Creek watershed.

The project goals established in the mitigation plan (Wildlands, 2014) were completed with careful consideration of goals and objectives that were described in the RBRP and to address stressors identified in the LWP. The following project goals established include:

- Correct hydrologic modifications to streams including stream incision and dredging, bank erosion, lowering of the local water table, sedimentation, and loss of riparian buffer and floodplain functions.
- Improve hydrology and function of previously drained and cleared wetlands.
- Re-establish riparian buffer and wetland vegetation communities.
- Reduce excess sediment to downstream waters by stabilizing streams and revegetating site.
- Reduce nutrient loads to downstream waters by improving wetlands and buffers to treat runoff.

Secondary project goals include:

- Improve instream habitat by diversifying the stream bedform and introducing habitat structures and wood debris.
- Reduce agricultural pollution from pesticides and herbicides used on adjacent fields by improving wetland and buffers to treat runoff.

The Site construction and as-built surveys were completed between May 2015 and August 2015. A conservation easement is in place on 12.87 acres of the riparian corridors to protect them in perpetuity.

Monitoring year six (MY6) assessments and Site visits were completed between March and November 2021 to assess the conditions of the project. Per the NC Interagency Review Team (IRT) guidelines, detailed monitoring and analysis of vegetation and channel cross-sectional dimensions were omitted during MY6. Visual observations, hydrology data, and stream and vegetation management practices are

included in this report. To preserve clarity and continuity of reporting structure, this report maintains section and appendix numbering from previous monitoring reports. Omitted sections within the appendix are shown in gray.

Overall, the Site has met the required vegetation and stream hydrology success criteria for MY6. Based on a visual assessment, vegetation performance appears to be on track to attain the success criteria of 210 stems per acre at the end of monitoring year seven. Consistent baseflow and multiple bankfull events were recorded on all streams during MY6, and visual observations confirm that stream channels have remained morphologically stable. Stream areas of concern include localized aggradation at the confluence of HC1 and HC2 in the stream bed and persistent beaver dams that have been identified and removed throughout the monitoring year. All wetland gages, except for GWG1, met the wetland hydrology success criteria during MY6. Per request by the IRT at the previous year's MY5 credit release meeting, a localized high area surrounding GWG1 was mapped to identify the area at risk of not meeting performance standards. An area of 0.103 acres was identified, and Wildlands is no longer seeking wetland re-establishment credit for the area. However, Table 1 has not been adjusted to reflect the acreage or credit "at risk." Overall, the Site wetland and riparian corridors are stable, and the Site is on track to meet the required MY7 success criteria.

OWL'S DEN MITIGATION SITE

Monitoring Year 6 Annual Report

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APPENDICES

*Content not required for Monitoring year 6

Section 1: PROJECT OVERVIEW

The Site is located in central Lincoln County within the Catawba River Basin (USGS Hydrologic Unit 03050102) and is located off of Owl's Den Road northwest of Lincolnton, North Carolina. The Site is located in in the Inner Piedmont Belt of the Piedmont Physiographic Province (USGS, 1998). The project watershed is dominated by agricultural and forested land. The drainage area for the Site is 152 acres. (0.24 square miles).

The project streams include unnamed tributaries to Howards Creek (HC1 and HC2). Stream restoration reaches included HC1 (Reach 1 and 2) and HC2 comprising 2,453 linear feet (LF) of perennial stream channel. The riparian areas were planted with native vegetation to improve habitat and protect water quality. Wetland components included rehabilitating 2.82 acres of existing wetlands and re-establishing 6.77 acres of wetlands. A wetland area "at risk" was defined in the wetland re-establishment area during Monitoring Year 6 and would result is a loss of 0.103 acres of wetlands. The "at risk" acreage has not been updated in Table 1.

Construction activities were completed by Land Mechanic Designs, Inc. in July 2015. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in January 2016. A conservation easement has been recorded and is in place on 12.87 acres (Deed Book 2455, Page Number 864) within a tract owned by Owl's Den Farm, LLC. The project is expected to generate 2,453.000 stream mitigation units (SMU's) and 8.938 wetland mitigation units (WMUs). A credit loss of "0.103" WMUs has not been revised in the Project Components and Mitigation Credits table in Appendix 1. Annual monitoring will be conducted for seven years with the close-out anticipated to commence in 2023 given the success criteria are met. Appendix 1 provides more detailed project activity, history, contact information, and watershed/site background information for this project.

Directions and a map of the Site are provided in Figure 1 and project components are illustrated for the Site in Figure 2.

1.1 Project Goals and Objectives

Prior to construction activities, the streams on the Site had been straightened, widened, and deepened to provide drainage for surrounding cropland. The adjacent floodplain areas had been cleared and maintained to support agricultural activities. Table 10a and b in Appendix 4 present the pre-restoration conditions in detail.

The Site will help address stressors identified in the LWP and provide numerous ecological benefits within the Catawba River Basin. While many of these benefits are limited to the Owl's Den project area, others, such as pollutant removal, reduced sediment loading, and improved aquatic and terrestrial habitat, have farther-reaching effects. Expected improvements to water quality and ecological processes are outlined below as project goals and objectives. These project goals established were completed with careful consideration of goals and objectives that were described in the RBRP and address stressors identified in the LWP while also meeting the DMS mitigation needs.

The primary objectives of the Owl's Den Mitigation Site address stressors identified in the LWP and included the following:

- **Correct hydrologic modifications to streams including stream incision and dredging, bank erosion, lowering of the local water table, sedimentation, and loss of riparian buffer and floodplain functions.** The project re-connected streams with a stable floodplain using Priority 1 restoration techniques. The Priority 1 restoration eliminated vertically incised channels on site.

Stream banks were stabilized with grading, in-stream structures, and planting. By stabilizing stream banks on site, sediment loading should be reduced in the receiving watershed.

- **Improve hydrology and function of previously drained and cleared wetlands.** The project restored hydrologic connections to existing wetlands using Priority 1 stream restoration to raise the local water table and increase overbank flooding. The project extended existing wetland zones into adjacent areas and established wetland vegetation throughout the site.
- **Re-establish wetland hydrology and function in relic wetland areas.** Removal of historic overburden uncovered relic hydric soils and should bring local water table elevations closer to the ground surface. Disking and roughening of wetland re-establishment areas should increase retention times and improve natural infiltrative processes.
- **Re-establish riparian buffer and wetland vegetation communities.** A native vegetation community was planted on the site to revegetate the riparian buffers and wetlands and return the functions associated with these wooded areas.
- **Reduce excess sediment to downstream waters by stabilizing streams and revegetating site.** Stream banks were stabilized on all project reaches. The site was also revegetated with a native forest community to prevent erosion and sedimentation from overland runoff of agricultural lands and filter runoff from adjacent fields.
- **Reduce nutrient and agricultural pollutant inputs to streams and wetlands.** Increased retention times along with reestablished vegetation in restored wetland areas will reduce fertilizers used in blackberry and soybean agricultural production before runoff enters the streams.

Secondary project goal include:

- **Improve instream habitat by diversifying the stream bedform and introducing habitat structures and woody debris.** Large woody debris, brush toe meander bends, other woody structures, and native stream bank vegetation were installed to improve both instream and terrestrial habitat value throughout the riparian corridor.
- **Reduce agricultural pollution from pesticides and herbicides used on adjacent fields by improving wetlands and buffers to treat runoff.** Restored wetland areas will provide treatment for agricultural runoff from blackberry and soybean fields that are sprayed with pesticides and herbicides.

1.2 Monitoring Year 6 Data Assessment

In accordance with the Mitigation Plan (Wildlands, 2014), no vegetative inventory and analysis nor geomorphic surveys were conducted as a part of the Year 6 monitoring assessment. A visual assessment of the site was emphasized this year, with the full vegetation and cross-section survey monitoring to resume in Monitoring Year 7 in 2022. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Owl's Den Mitigation Plan (Wildlands, 2014). The following sections provide detailed visual observations, hydrology data, and management practices observed during MY6.

1.2.1 Stream Assessment

Detailed morphological survey and analysis is not required for this Monitoring Year 6 as mentioned in Section 1.2. Therefore, Wildlands conducted a visual assessment of project reaches, noting geomorphic conditions of the stream bed profile, both stream banks, and engineered in-stream structures. The restoration reaches within the Site appear to be functioning as designed and stable. Stream riffle beds are vertically stable, and the pools appear to be maintaining depth. Stream banks are generally stable and vegetated, and in-stream structures are intact and functioning as designed. No areas of erosion or

scour were observed on restoration reaches. Several beaver dams on Site have resulted in sediment deposition downstream of the dams, but dam removal will allow deposition to move through the system. Refer to Tables 5a-5c for Site assessment data.

Refer to Appendix 2 for the visual stability assessment tables, Integrated Current Condition Plan View (CCPV) maps, and reference photographs.

1.2.2 Stream Areas of Concern and Management Activity

Even with the prolonged floodplain inundation from the downstream beaver dams, over 90% of the Site is functioning as designed. Localized aggradation was observed at the confluence of HC1 R1 and HC2. Some in-stream vegetation was also noted in this area, and it consisted of mostly native vegetation, but marsh dewflower (*Murdannia keisak*) was also observed. Live stakes were installed along the stream banks where additional shading of the stream was needed to limit the growth of in-stream vegetation. Additionally, beaver dams have been removed several times this monitoring year, increasing stream flow and facilitating sediment transport through the system. Backwater deposition from recurring beaver dams and bankfull events on Howards Creek have resulted in floodplain aggradation and increased bank height at the lower section of HC1 R2 near the confluence. However, overall channel form and sediment conveyance have not been affected. Silky willow and black willow live stakes have been added to the banks to help stabilize channel walls.

To help control beaver activity within the Site, Animal and Plant Inspection Service (APHIS) has been actively monitoring the Site throughout the year. On January 10th, 2021, APHIS removed two beaver dams on HC1 Reach 2, above and below the culvert. During the Site assessment survey in the second quarter (Q2) of 2021, another beaver dam was mapped on HC1 directly above the farm road crossing. During a Site visit on October 18th, beavers were still active on the Site. Dams above and below the crossing had been re-established, as well as an additional dam was built on HC1 Reach 1 at station 101+00. These dams were removed during the first week of November 2021. During the final Site visit on November 10th, no on-site beaver dams were noted; however, a large dam directly outside of the project area was observed slightly downstream of the confluence of Howard's Creek and HC1 Reach 2. No monitoring features or data were affected by dams except for the floodplain inundation. The floodplain inundation is visible on the stream gage data plots for HC1 R2 and HC2 in Appendix 5. Wildlands will continue to monitor and remove beaver dams on the Site.

The current beaver dam location and stream areas of concern are depicted on the CCPV Figures in Appendix 2, along with the visual stability assessment tables and reference photographs.

1.2.3 Stream Hydrologic Assessment

The stream hydrology success criteria were met within the first two years of monitoring on HC1 and HC2. In MY6, both streams show prolonged floodplain inundation during multiple times of the year along restoration reaches. As expected, there is a corresponding drop in water level on both stream hydrographs associated with dam removal. Once removed and stream flow returned to normal, there were at least 2 bankfull events on both restoration reaches. The barotroll recorded abnormal atmospheric pressure readings from 7/3/2021 to 7/17/2021 and from 10/10/2021 to 11/10/2021, however the cause of these abnormal readings is unknown. Data for these date ranges were calibrated from the Henry Fork Mitigation Site, which is in Catawba County approximately 15 miles from the Owl's Den Mitigation Site. Data from both barotrolls were plotted over time and confirmed that both Sites recorded nearly identical atmospheric pressure readings throughout the year. The current barotroll will continue to be used but will be replaced if malfunctions or anomalies continue. Refer to Appendix 5 for hydrologic summary data and plots.

1.2.4 Wetland Assessment

Following construction, groundwater gages (GWGs) were distributed so that the data collected would provide a reasonable indication of groundwater levels throughout the wetland components on the Site. A gage was established in an adjacent reference wetland and is being utilized to compare with the hydrologic response within the restored wetland areas at the Site. Rainfall data is collected from an existing NC CRONOS station (Lincolnton 2 NW, NC). All monitoring gages were downloaded on a quarterly basis and maintained on an as-needed basis. In December 2018, an additional gage (GWG15) was added to define the wetland re-establishment area near GWG1. A soil temperature gage was also installed during December 2018. The soil probe was installed at least 12 inches below ground, adjacent to GWG1. Wildlands is using the soil temperature probe data to confirm the dates of the 2021 growing season, March 28th to November 5th (223 days in 2021). The final performance standard established for wetland hydrology are a free groundwater surface within 12 inches of the ground surface for 18 consecutive days (8.1%) of the defined growing season under typical precipitation conditions.

In MY6, 14 of 15 (93%) GWGs met the hydrologic wetland success criteria defined for Lincoln County. The measured cumulative hydroperiod, where the water level was above the criteria threshold for the monitoring gages on the Site, ranged from 7% to 100% of the growing season. In MY6, GWG1 failed to meet wetland success criteria by 2 days. Since construction, GWG1 has failed to meet criteria 5 out of 6 years of annual monitoring, suggesting GWG1 was installed on the edge of a localized high area within the proposed wetland re-establishment boundary; therefore, at the MY5 credit release meeting, the NC IRT requested that Wildlands reassess the wetland re-establishment area near GWG1 (Wildlands, 2020). To determine the extent of the wetland re-establishment area represented by GWG1, Wildlands staff took several soil borings in this area to map the extent of the hydric soils and delineate the wetland boundary. A localized high area “at risk” and totaling 0.103 acres within the Wetland Re-establishment area was identified. Refer to Figure 4.0 in Appendix 6 for soil boring locations and typical soil profile photos.

Core 2, mapped within the “at risk” area, had a high chroma matrix of 5YR4/6 (95%) in the first 11 inches and 10YR5/3 (95%) with prominent redox concentrations of 7.5YR 4/6 (5%) from 11-17 inches. There were no hydrologic or hydric soil indicators that would support wetland re-establishment in this area, and 0.103 acres were determined to be “at risk.” Wildlands is no longer seeking credit for this area. Excluding the mapped area “at risk”, this project will still provide 8.835 riparian wetland mitigation units (WMUs), which exceeds the contract amount of 8 WMUs. Therefore, removing this area from the wetland re-establishment credit request will not affect Wildland’s delivery of the required WMU credits for this project. Neither the wetland acreage nor credit value have been updated in Table 1.

Overall, wetlands on site are well vegetated, and remain well saturated throughout the year. Refer to Appendix 2 for the groundwater gage locations, and Appendix 5 for groundwater hydrology data and plots.

1.2.5 Vegetation Assessment

As per the Mitigation Plan and DMS Monitoring guidance for this project, detailed vegetation inventory and analysis is not required for Monitoring Year 6. Visual assessments during MY6 indicated that vegetation on the Site overall is performing well and the planted vegetation is on track to meet the final density requirement of the survival of 210 planted stems per acre, and the average height requirement of 10 feet of the planted riparian and wetland corridor in MY7.

1.2.6 Vegetation Areas of Concern and Management Activity

The vegetation areas of concern continue to be monitored and treated in MY6. Overall, herbaceous cover has become well-established throughout the site. There are no bare areas on Site; however, an

area of 0.08 acres continued to experience low stem vigor in MY6. A seed mix consisting of various native riparian species was distributed in this area in the spring of 2021.

Several invasive species continue to be monitored and treated throughout the monitoring year. Floodplain species that have undergone targeted treatment include Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), and Chinese and Japanese privet (*Ligustrum sinsense* and *japonicum*). While native to North Carolina, vine strangulation by the climbing hempvine (*Mikania scadens*) is occurring in vegetation plot 1. The plot is still meeting stem density criteria although the trees have reduced height and vigor relative to the rest of the vegetation plots on Site. Treatment of the climbing hempvine on Site is scheduled to occur every few weeks in MY7 to prevent stem strangulation. Cattails (*Typha latifolia*) and marsh dewflower (*Murdannia keisak*) found growing in a few isolated areas on Site were treated during the summer of 2021 and will continue to be treated as needed through MY7 to keep the species from becoming established on the Site. Live stakes were added along the banks of HC1 Reach 1 and HC2 to shade out these species over time. In total, over 98% of the Site is free of invasive and undesirable species. As needed, nuisance species will be treated throughout the post-construction monitoring period.

1.3 Monitoring Year 6 Summary

Visual assessments indicate that all streams are geomorphically stable and functioning as designed, and that vegetation on the Site is on track to meet the MY7 success criteria for density and vigor. The Site met the final (MY7) stream hydrology success criteria during MY2. Fourteen out of the fifteen groundwater monitoring gages met the wetland hydrologic success criteria for MY6. Approximately 0.103 acres of proposed wetland re-establishment area was determined to be “at risk,” and wetland credit will not be sought. Invasive vegetation will continue to be monitored and treated as necessary to support the establishment of native vegetation. Beaver activity will continue to be monitored and managed by Wildlands and APHIS.

Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information can be found in the Mitigation Plan (Wildlands, 2014) document available on DMS website.

Section 2: METHODOLOGY

All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Stream gages to detect bankfull events were installed in surveyed riffle cross-sections and monitored quarterly. Hydrologic monitoring instrument installation are in accordance with the United States Army Corps of Engineers (USACE, 2005) standards, and monitoring with IRT's Stream and Wetland Mitigation Update (2016). Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

Section 3: REFERENCES

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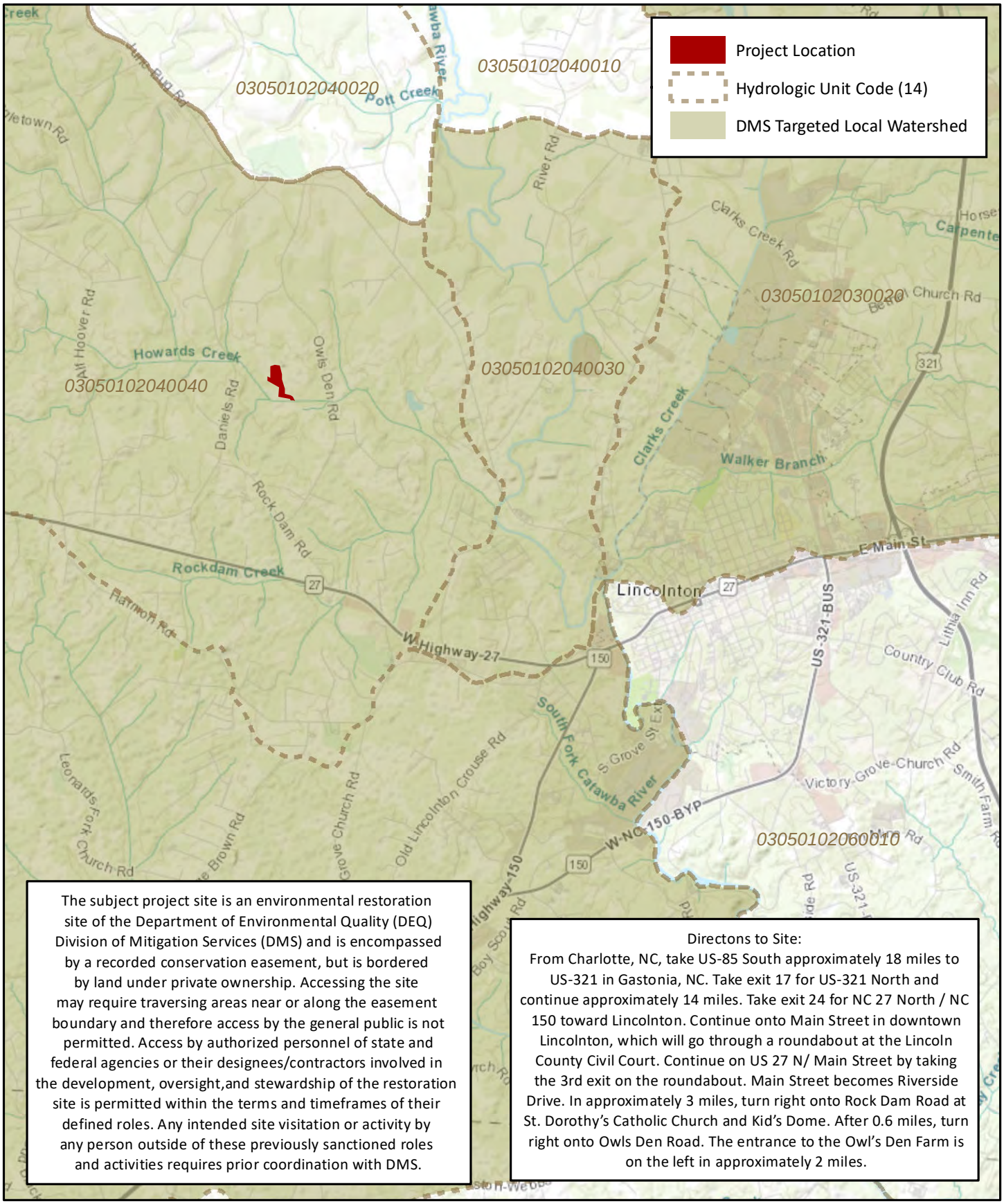
APPENDIX 1. General Figures and Tables



The subject project site is an environmental restoration site of the Department of Environmental Quality (DEQ) 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 activities requires prior coordination with DMS.

Directons to Site:
From Charlotte, NC, take US-85 South approximately 18 miles to US-321 in Gastonia, NC. Take exit 17 for US-321 North and continue approximately 14 miles. Take exit 24 for NC 27 North / NC 150 toward Lincolnton. Continue onto Main Street in downtown Lincolnton, which will go through a roundabout at the Lincoln County Civil Court. Continue on US 27 N/ Main Street by taking the 3rd exit on the roundabout. Main Street becomes Riverside Drive. In approximately 3 miles, turn right onto Rock Dam Road at St. Dorothy's Catholic Church and Kid's Dome. After 0.6 miles, turn right onto Owls Den Road. The entrance to the Owl's Den Farm is on the left in approximately 2 miles.

WILDLANDS ENGINEERING

0 0.5 1 Miles

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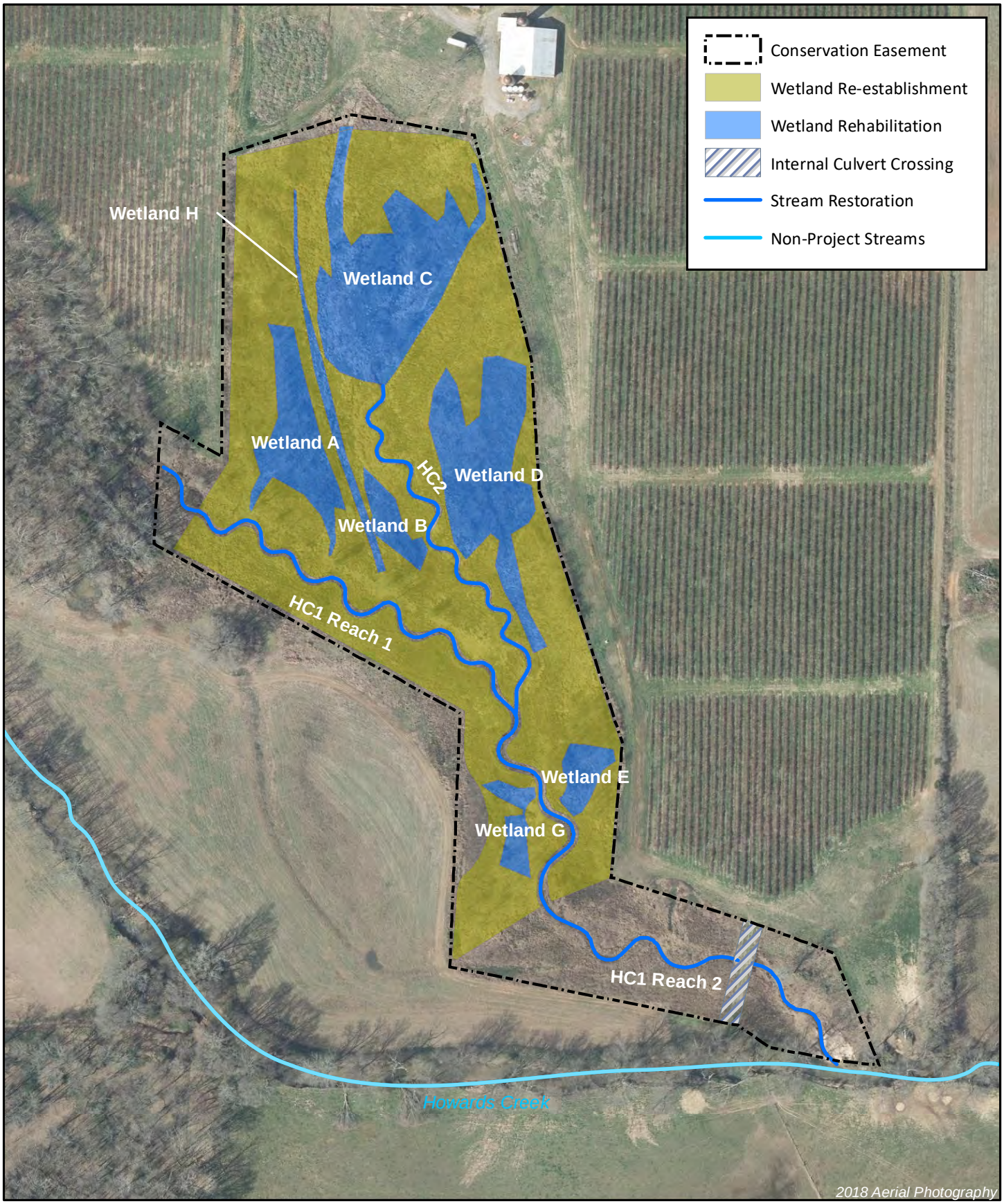
Figure 1 Project Vicinity Map
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Lincoln County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 2 Project Component/Asset Map
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Lincoln County, NC

Table 1. Project Components and Mitigation Credits
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

Mitigation Credits									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	2,453.000	N/A	8.938	N/A	N/A	N/A	N/A	N/A	N/A

Project Components							
Reach ID	As-Built Stationing / Location[1]	Existing Footage / Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage / Acreage[1]	Mitigation Ratio	Credits[1] (SMU / WMU)
STREAMS							
HC1 Reach 1	99+94 - 108+09	609	P1	Restoration	815	1:1	815.000
HC1 Reach 2	108+09 - 115+35	994	P1	Restoration	726	1:1	726.000
	115+65 - 117+79		P1	Restoration	214	1:1	214.000
HC2	200+00 - 206+98	444	P1	Restoration	698	1:1	698.000
WETLANDS							
Wetland A	N/A	0.44	Significant improvement to wetland functions	Rehabilitation	0.44	1.3:1	0.338
Wetland B	N/A	0.13	Significant improvement to wetland functions	Rehabilitation	0.13	1.3:1	0.100
Wetland C	N/A	1.03	Significant improvement to wetland functions	Rehabilitation	1.03	1.3:1	0.792
Wetland D	N/A	0.81	Significant improvement to wetland functions	Rehabilitation	0.81	1.3:1	0.623
Wetland E	N/A	0.13	Significant improvement to wetland functions	Rehabilitation	0.13	1.3:1	0.100
Wetland G	N/A	0.13	Significant improvement to wetland functions	Rehabilitation	0.13	1.3:1	0.100
Wetland H	N/A	0.15	Significant improvement to wetland functions	Rehabilitation	0.15	1.3:1	0.115
Wetland Re-Establishment Area[2,3]	N/A	n/a	Planting, hydrologic improvement	Re-Establishment	6.77	1:1	6.770

Component Summation						
Restoration Level	Stream (LF)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	2,453	-	-	-	-	-
Enhancement		-	-	-	-	-
Enhancement I	-					
Enhancement II	-					
Wetland Re-Establishment		6.77	-	-		
Wetland Rehabilitation	-	2.82	-	-		-

The 30 linear feet associated with the stream crossing on HC1 Reach 2 were excluded from the computations.
[1]Stream Mitigation Credits were adjusted in MY2 to reflect credits proposed in the mitigation plan using centerline alignment.
[2]Wetland Re-Establilishment credits were revised during the as-built as a result of an easement adjustment after mitigation plan was approved.
[3] Wetland Re-Establilishment acreage and credits were not revised to reflect the area determined to be "at risk".

Table 2. Project Activity and Reporting History
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

Activity or Report		Data Collection Complete	Completion or Scheduled Delivery
Mitigation Plan		July 2013	April 2014
Final Design - Construction Plans		March 2015	April 2015
Construction		May 2015 - July 2015	July 2015
Temporary S&E mix applied to entire project area[1]		May 2015 - July 2015	July 2015
Permanent seed mix applied to reach/segments		June 2015	July 2015
Bare root and live stake plantings for reach/segments		January 2016	January 2016
Baseline Monitoring Document (Year 0)	Stream Survey	June 2015	February 2016
	Vegetation Survey	January 2016	
Year 1 Monitoring	Stream Survey	April 2016	November 2016
	Vegetation Survey	September 2016	
Year 2 Monitoring	Stream Survey	March 2017	December 2017
	Vegetation Survey	July 2017	
Year 3 Monitoring	Stream Survey	April 2018	December 2018
	Vegetation Survey	September 2018	
Year 4 Monitoring	Supplemental Planting	March 2019	December 2019
	Stream Survey	N/A	
	Vegetation Survey	N/A	
	Beaver Removal	N/A	December 2019
Year 5 Monitoring	Stream Survey	March 2020	December 2020
	Vegetation Survey	July 2020	
	Invasive Species Treatment	March 2020	
	Beaver Removal	October 2020	
Year 6 Monitoring	Stream Survey	N/A	December 2021
	Vegetation Survey	N/A	
	Live Stake Installation	June 2021	
	Invasive Species Treatment	June 2021 - September 2021	
	Beaver Removal	November 2021	
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

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

Table 3. Project Contact Table
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

Designer Emily Reinicker, PE	**Wildlands Engineering, Inc.** 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractor	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Seed Mix Sources	**Green Resource, LLC**
Nursery Stock Suppliers **Bare Roots** **Live Stakes**	**Bruton Natural Systems, Inc**
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Kristi Suggs 704.332.7754, ext. 110

Table 4. Project Information and Attributes

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

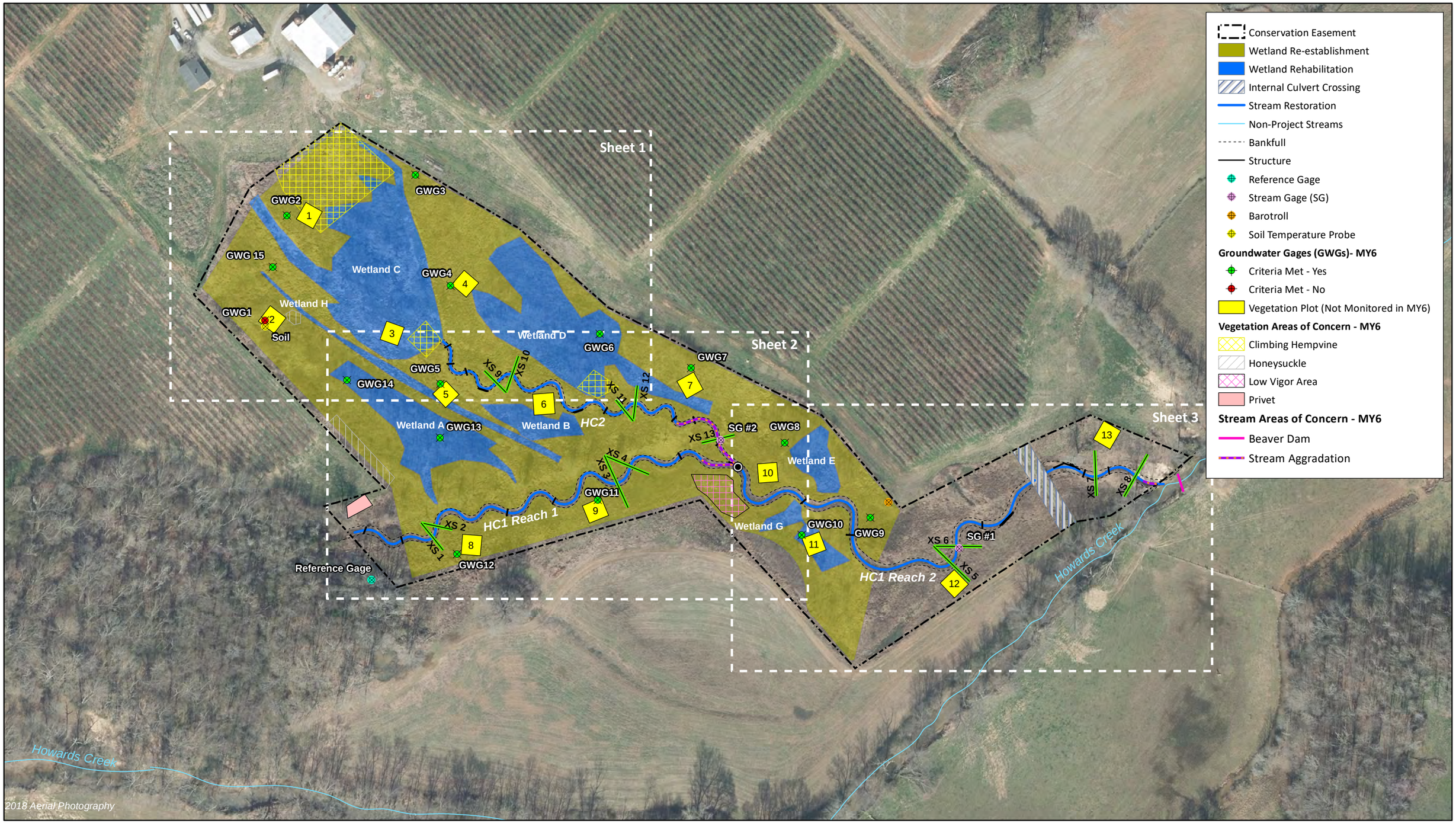
Project Information	
Project Name	Owl's Den Mitigation Site
County	Lincoln County
Project Area (acres)	12.87
Project Coordinates (latitude and longitude)	35°29'33.22" N, 81° 18'45.95" W
Project Watershed Summary Information	
Physiographic Province	Inner Piedmont Belt of the Piedmont Physiographic Province
River Basin	Catawba
USGS Hydrologic Unit 8-digit	03050102
USGS Hydrologic Unit 14-digit	03050102040040
DWR Sub-basin	03-08-35
Project Drainage Area (acres)	152
Project Drainage Area Percentage of Impervious Area	<1%
CGIA Land Use Classification	93% – Agriculture/Managed Herbaceous; 7% – Forested/Scrubland

Reach Summary Information			
Parameters	**HC1 Reach 1**	**HC1 Reach 2**	**HC2**
Length of reach (linear feet) - Post-Restoration	815	940	698
Drainage area (acres)	62	152	27
NCDWR stream identification score	31.5	37.5	31.5
NCDWR Water Quality Classification	C		
Morphological Desription (stream type)	P	P	P
Evolutionary trend (Simon's Model) - Pre- Restoration	IV	IV	IV
Underlying mapped soils	Chewacla Loam, Helena sandy loam, Riverview loam, Worsham fine sandy loam		
Drainage class	---	---	---
Soil hydric status	---	---	---
Slope	0.0061	0.0075	0.0059
FEMA classification	AE*		
Native vegetation community	Piedmont Bottomland 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 (Action ID# SAW-2013-00717) 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	Owl's Den Mitigation Plan; Wildlands determined "no effect" on Lincoln County listed endangered species. May 18, 2015 email correspondence from USFWS indicating no effect on the northern long-eared bat.
Historic Preservation Act	X	X	No historic resources were found to be impacted (letter from SHPO dated 4/30/2013).
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A	N/A	N/A
FEMA Floodplain Compliance	X	X	Floodplain development permit issued by Lincoln County.
Essential Fisheries Habitat	No	N/A	N/A

*The project site reaches do not have regulated floodplain mapping, but are located within the Howards Creek floodplain.

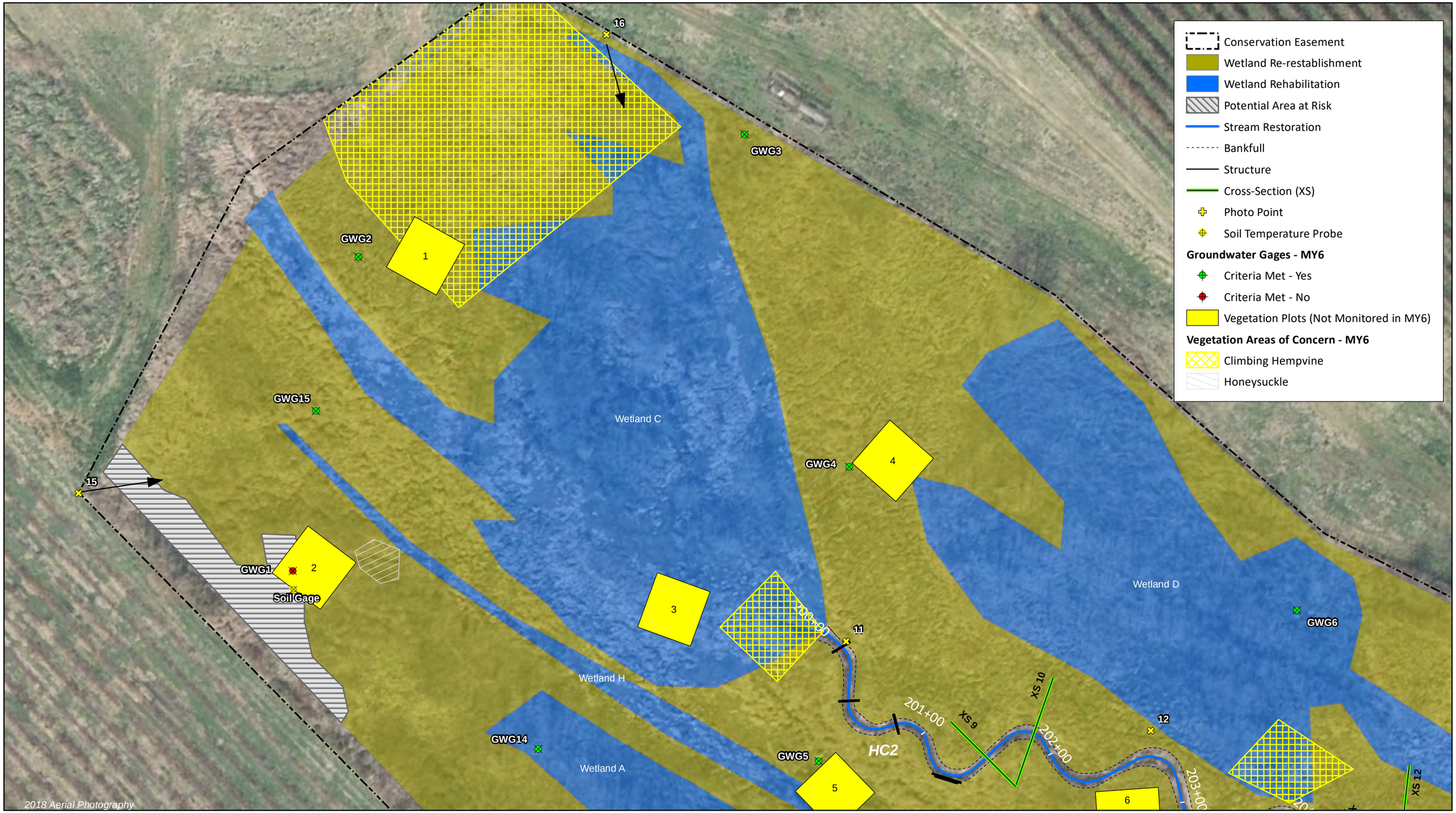
APPENDIX 2. Visual Assessment Data



WILDLANDS ENGINEERING

0 125 250 Feet

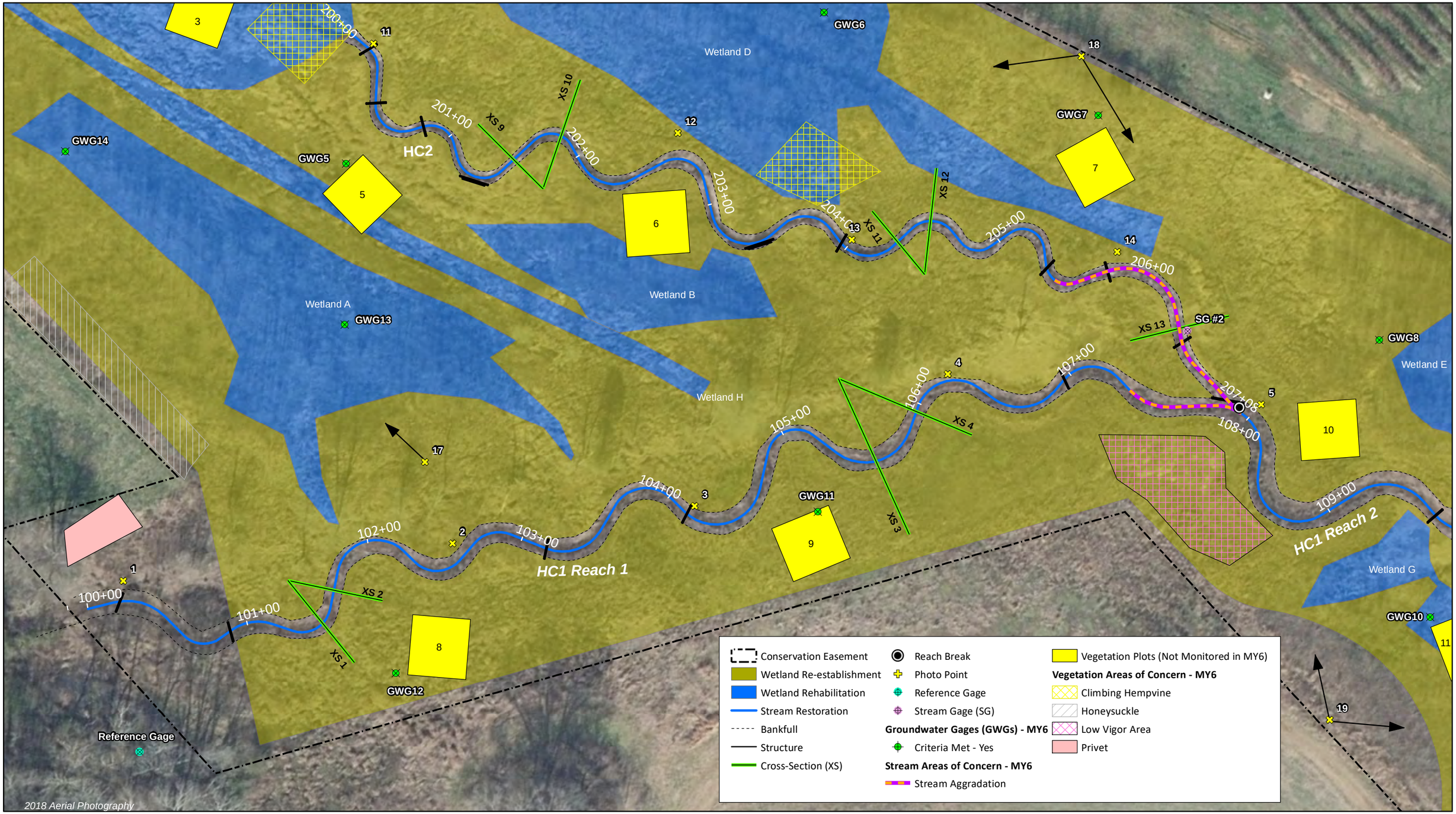
Figure 3.0 Integrated Current Condition Plan View (Key)
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Lincoln County, NC



WILDLANDS ENGINEERING

0 25 50 Feet

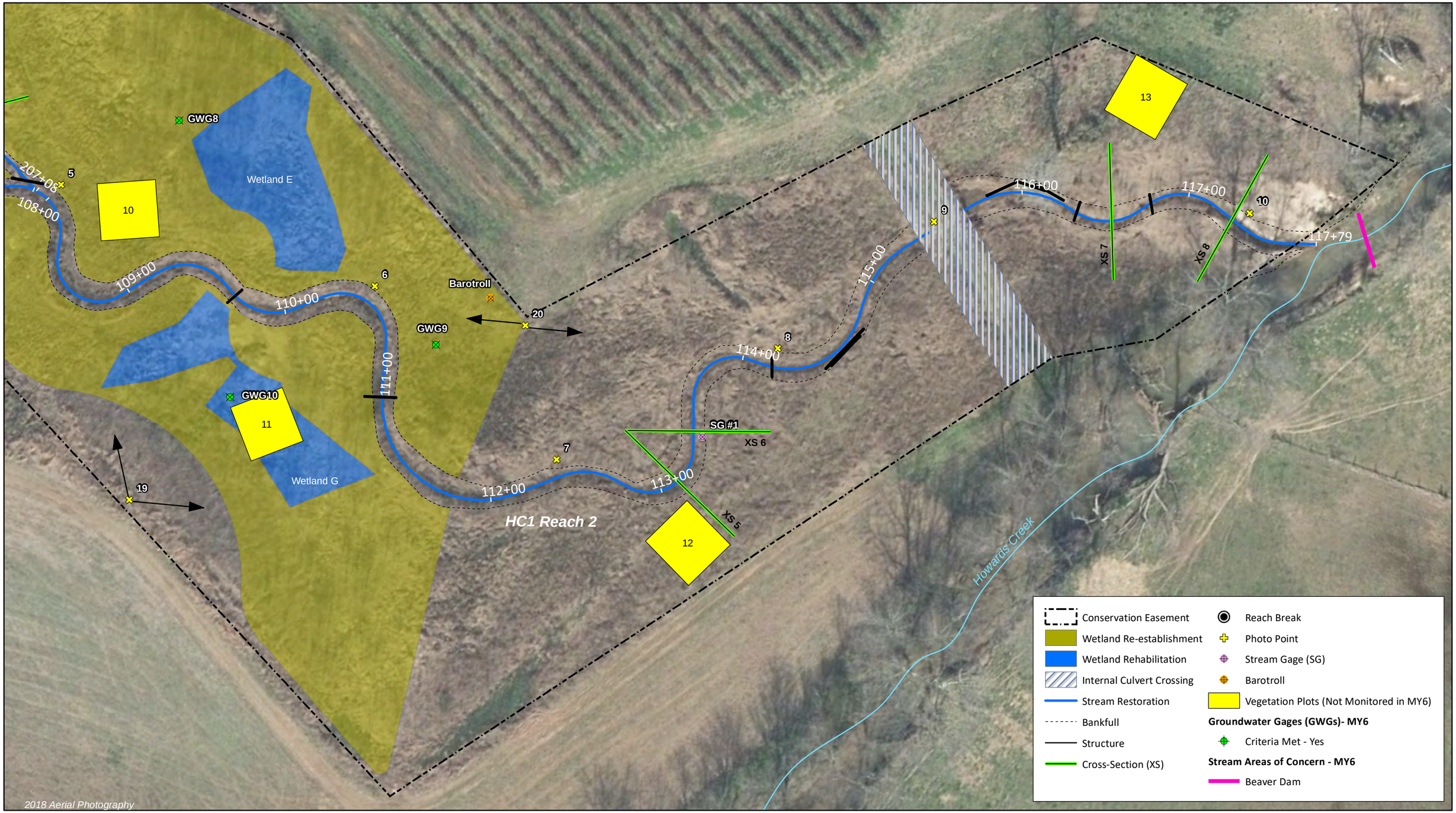
Figure 3.1 Integrated Current Condition Plan View (Sheet 1 of 3)
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Lincoln County, NC



WILDLANDS ENGINEERING

0 25 50 Feet

Figure 3.2 Integrated Current Condition Plan View (Sheet 2 of 3)
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Lincoln County, NC



WILDLANDS ENGINEERING

0 25 50 Feet

Figure 3.3 Integrated Current Condition Plan View (Sheet 3 of 3)
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Lincoln County, NC

Table 5a. Visual Stream Morphology Stability Assessment Table
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

HC1 Reach 1 (820 LF)		Date of Assessment: 10/18/2021								
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 (Shallow and Run units)**	Aggradation			1	65	87%			
		Degradation			0	0	100%			
	2. Shallow Condition	Texture/Substrate	17	17			100%			
	3. Meander Pool Condition	Depth Sufficient	16	16			100%			
		Length Appropriate	16	16			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	16	16			100%			
		Thalweg centering at downstream of meander bend (Glide)	16	16			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, calving, 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.	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	9	9			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	4	4			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	1	1			100%			

[1]Excludes constructed shallows since they are evaluated in channel category.

Table 5b. Visual Stream Morphology Stability Assessment Table
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

HC1 Reach 2 (940 LF)		Date of Assessment: 10/18/2021								
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 (Shallow and Run units)**	Aggradation			1	24	97%			
		Degradation			0	0	100%			
	2. Shallow Condition	Texture/Substrate	14	14			100%			
	3. Meander Pool Condition	Depth Sufficient	15	15			100%			
		Length Appropriate	15	15			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	15	15			100%			
		Thalweg centering at downstream of meander bend (Glide)	15	15			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, calving, 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.	11	11			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			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.	1	1			100%			

[1]Excludes constructed shallows since they are evaluated in channel category.

Table 5c. Visual Stream Morphology Stability Assessment Table
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

HC2 (708 LF)		Date of Assessment: 10/18/2021								
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 (Shallow and Run units)**	Aggradation			1	148	79%			
		Degradation			0	0	100%			
	2. Shallow Condition	Texture/Substrate	17	17			100%			
	3. Meander Pool Condition	Depth Sufficient	16	16			100%			
		Length Appropriate	16	16			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	16	16			100%			
		Thalweg centering at downstream of meander bend (Glide)	16	16			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, calving, 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.	13	13			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

[1]Excludes constructed shallows since they are evaluated in channel category.

Table 6. Vegetation Condition Assessment Table

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

Planted Acreage:	**13**	**Date of Assessment: 10/18/2021, 11/10/2021**			
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 Low Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 Ac	1	0.08	1%
		Cumulative Total	**0**	**0.0**	**0.6%**

Easement Acreage: 35	**35**	**Date of Assessment: 10/18/2021, 11/12/2021**			
Vegetation Category	**Definitions**	**Mapping Threshold (SF)**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1,000	6	0.62	1.8%
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 – HC1 Reach 1 view upstream (04/15/2021)

Photo Point 1 – HC1 Reach 1 view downstream (04/15/2021)

Photo Point 2 – HC1 Reach 1 view upstream (04/15/2021)

Photo Point 2 – HC1 Reach 1 view downstream (04/15/2021)

Photo Point 3 – HC1 Reach 1 view upstream (04/15/2021)

Photo Point 3 – HC1 Reach 1 view downstream (04/15/2021)

Photo Point 4 – HC1 Reach 1 view upstream (04/15/2021)

Photo Point 4 – HC1 Reach 1 view downstream (04/15/2021)

Photo Point 5 – HC1 Reach 1 & HC2 view upstream (04/15/2021)

Photo Point 5 – HC2 view upstream (04/15/2021)

Photo Point 5 – HC1 Reach 1 view downstream (04/15/2021)

	
Photo Point 6 – HC1 Reach 2 view upstream (04/15/2021)	Photo Point 6 – HC1 Reach 2 view downstream (04/15/2021)
	
Photo Point 7 – HC1 Reach 2 view upstream (04/15/2021)	Photo Point 7 – HC1 Reach 2 view downstream (04/15/2021)
	
Photo Point 8 – HC1 Reach 2 view upstream (04/15/2021)	Photo Point 8 – HC1 Reach 2 view downstream (04/15/2021)

Photo Point 9 – HC1 Reach 2 view upstream (04/15/2021)

Photo Point 9 – HC1 Reach 2 view downstream (04/15/2021)

Photo Point 10 – HC1 Reach 2 view upstream (04/15/2021)

Photo Point 10 – HC1 Reach 2 view downstream (04/15/2021)

Photo Point 11 – HC2 view upstream (04/15/2021)

Photo Point 11 – HC2 view downstream (04/15/2021)

	
Photo Point 12 – HC2 view upstream (04/15/2021)	Photo Point 12 – HC2 view downstream (04/15/2021)
	
Photo Point 13 – HC2 view upstream (04/15/2021)	Photo Point 13 – HC2 view downstream (04/15/2021)
	
Photo Point 14 – HC2 view upstream (04/15/2021)	Photo Point 14 – HC2 view downstream (04/15/2021)

Wetland Photographs

Photo Point 15 – looking southeast (04/15/2021)

Photo Point 16 – looking southeast (04/15/2021)

Photo Point 17 – looking north (04/15/2021)

Photo Point 18 – looking northwest (04/15/2021)

Photo Point 18 – looking southwest (04/15/2021)

	
Photo Point 19 – looking northeast (04/15/2021)	Photo Point 19 – looking southeast (04/15/2021)
	
Photo Point 20 – looking northwest (04/15/2021)	Photo Point 20 – looking southeast (04/15/2021)

Area of Concern Photographs

	
Floodplain inundation from beaver dam at station 101+00 (11/10/2021)	Floodplain inundation from removed beaver dam at station 116+00 (10/18/2021)
	
Floodplain inundation from removed beaver dam at station 115+00 (10/18/2021)	Dam outside of project on Howard's Creek; downstream of confluence (11/10/2021)

	
Aggradation on HC2; extends from station 205+50 to station 207+08 (11/10/2020)	Vertical left bank on HC1 Reach 2; extends from station 117+50 to station 117+79 (10/18/2021)
	
Climbing hempvine in Vegetation Plot 1 (6/24/2021)	Area of Low Vigor (10/18/2021)

APPENDIX 3. Vegetation Plot Data

Vegetative surveys and analysis not required in Monitoring Year 6

APPENDIX 4. Morphological Summary Data and Plots

Morphological surveys and analysis not required in Monitoring Year 6

APPENDIX 5. Hydrology Summary Data and Plots

Table 13. Verification of Bankfull Events

Owls Den Mitigation Site

DMS Project No. 95808

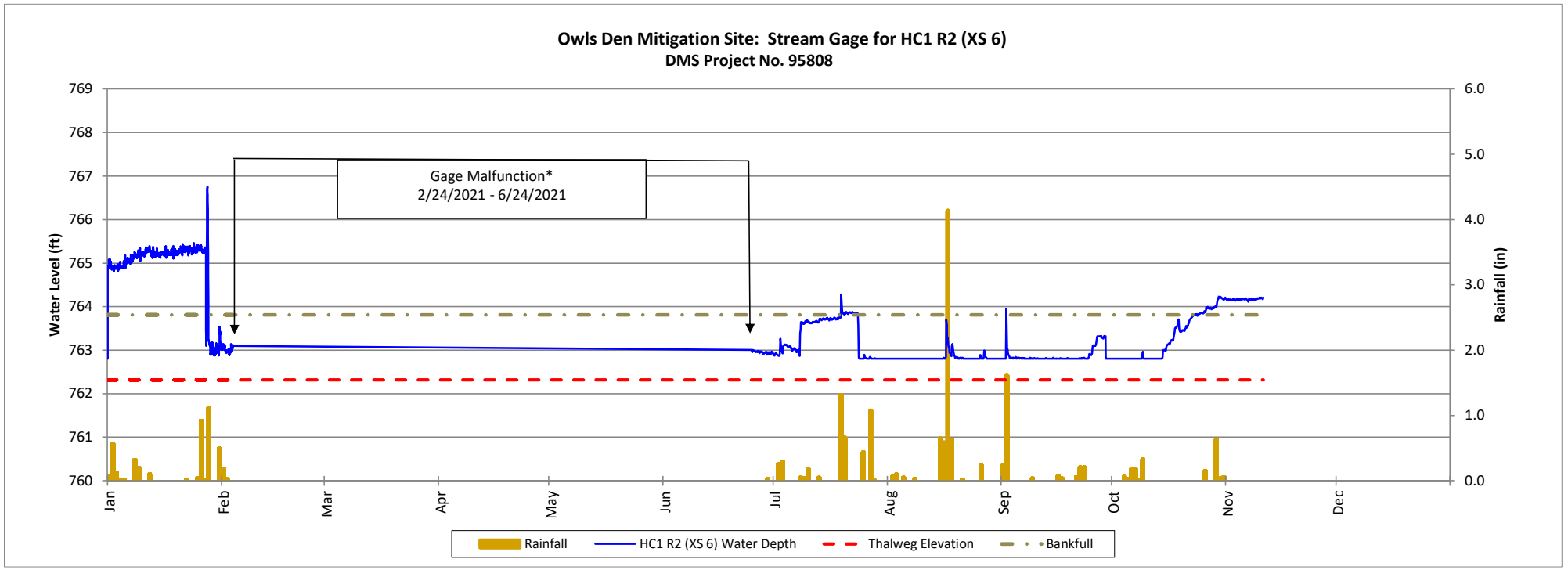
Monitoring Year 6 - 2021

Reach	MY	Date of Occurrence	Method
HC1	MY1	1/16/2016	Stream Gage
		2/3/2016	
		5/1/2016	
		5/3/2016	
		5/20/2016	
		7/4/2016	
HC1	MY2	5/21/2017	
		7/1/2017	
		9/5/2017	
		10/9/2017	
		10/23/2017	
HC1	MY3	2/3/2018	
		2/7/2018	
		4/24/2018	
		5/18/2018	
		5/30/2018	
		10/11/2018	
		10/26/2018	
HC1	MY4	2/18/2019	
		4/14/2019	
		6/8/2019	
		7/9/2019	
HC1	MY5	1/3/2020	
		1/24/2020	
		2/6/2020	
		2/11/2020	
		2/13/2020	
HC1	MY6	9/2/2021	

Reach	MY	Date of Occurrence	Method
HC2	MY1	1/16/2016	Stream Gage
		5/3/2016	
		7/4/2016	
HC2	MY2	1/23/2017	
		2/9/2017	
		2/26/2017	
		4/24/2017	
		5/21/2017	
		7/1/2017	
		9/5/2017	
		10/9/2017	
		10/23/2017	
		10/29/2017	
HC2	MY3	2/7/2018	
		4/24/2018	
		5/18/2018	
		10/11/2018	
		10/26/2018	
HC2	MY4	2/18/2019	
		4/14/2019	
		6/8/2019	
		7/9/2019	
HC2	MY5	4/30/2020	
		5/21/2020	
		6/1/2020	
		7/27/2020	
		8/13/2020	
HC2	MY6	6/12/2021	
		7/7/2021	

Recorded Stream Flow Events

Owls Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

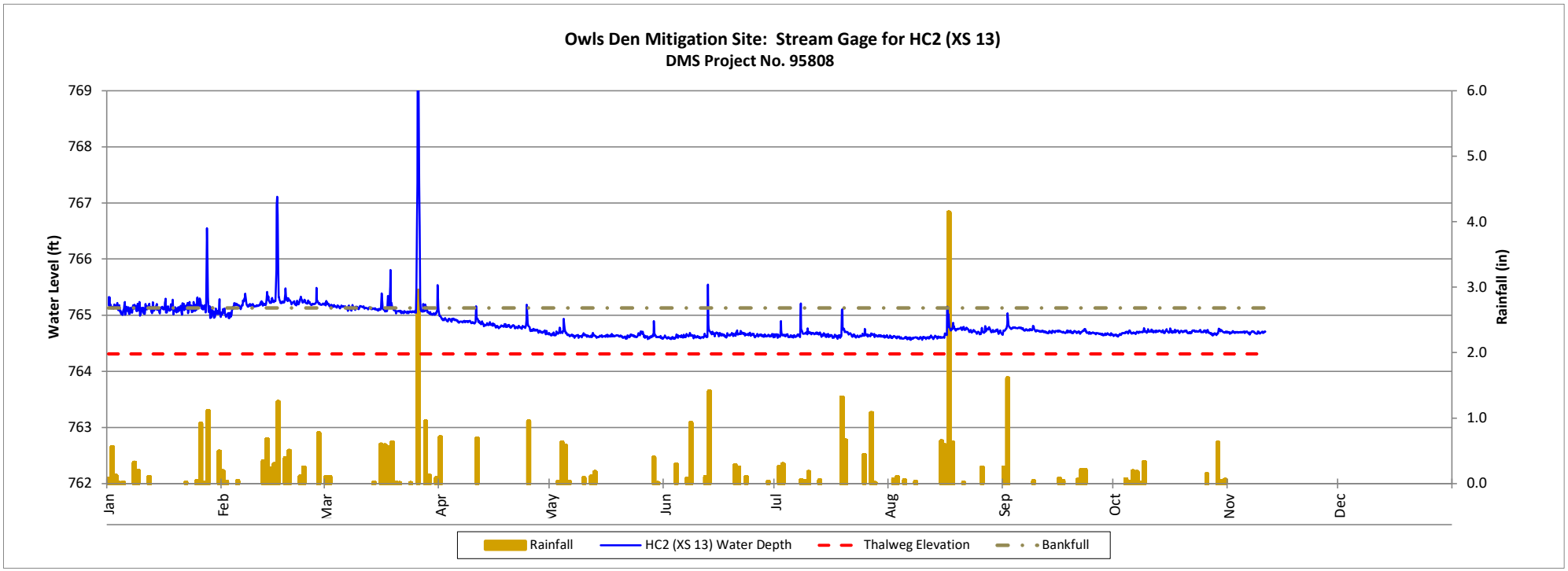


The Barotroll malfunctioned from 7/3/2021 to 7/17/2021 and 10/10/2021 to 11/10/2021; therefore, data for these ranges was calibrated from the Henry Fork Mitigation Site which is located in Lincoln County, approximatley 15 miles from the Owl's Den Mitigation Site.

* Gage replaced on 6/24/2021

Recorded Stream Flow Events

Owls Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021



The Barotroll malfunctioned from 7/3/2021 to 7/17/2021 and 10/10/2021 to 11/10/2021; therefore, data for these ranges was calibrated from the Henry Fork Mitigation Site which is located in Catawba County, approximatley 15 miles from the Owl's Den Mitigation Site.

Table 14. Wetland Gage Attainment Summary

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021

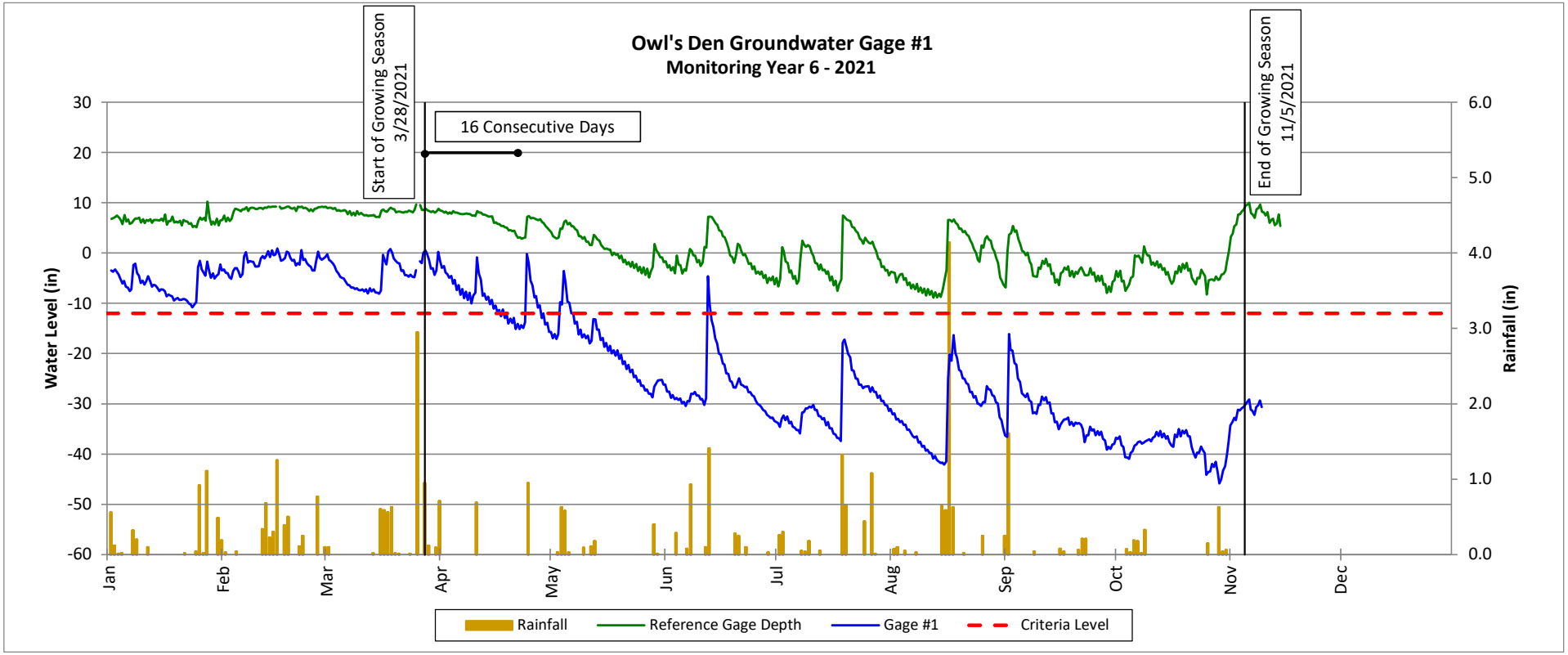
Summary of Groundwater Gage Results for Monitoring Years 1 through 7							
Gage	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage) [1]						
	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)	Year 6 (2021)	Year 7 (2022)
1	No/4 Days (2%)	No/14 Days (6%)	No/16 Days (7%)	Yes/19 Days (9%)*	No/15 Days (6.7%)	No/16 Days (7.2%)	
2	Yes/223 Days (100%)	Yes/223 Days (100%)	Yes/142 Days (64%)	Yes/113 Days (51%)	Yes/223 Days (100%)	Yes/223 Days (100%)	
3	Yes/223 Days (100%)	Yes/223 Days (100%)	Yes/218 Days (98%)	Yes/222 Days (100%)	Yes/223 Days (100%)	Yes/222 Days (99.6%)	
4	Yes/75 Days (34%)	Yes/94 Days (42%)	Yes/143 Days (64%)	Yes/49 Days (22%)**	Yes/109 Days (48.9%)	Yes/60 Days (26.9%)	
5	Yes/223 Days (100%)	Yes/223 Days (100%)	Yes/176 Days (80%)	Yes/222 Days (100%)	Yes/223 Days (100%)	Yes/223 Days (100%)	
6	Yes/20 Days (9%)	Yes/53 Days (24%)	Yes/87 Days (39%)	Yes/61 Days (27%)	Yes/97 Days (43.5%)	Yes/57 Days (25.6%)	
7	Yes/39 Days (18%)	Yes/68 Days (31%)	Yes/96 Days (43%)	Yes/63 Days (28%)	Yes/97 Days (43.5%)	Yes/61 Days (27.4%)	
8	No/10 Days (5%)	Yes/49 Days (22%)	Yes/47 Days (21%)	Yes/34 Days (15%)	Yes/55 Days (24.7%)	Yes/34 Days (15.2%)	
9	Yes/30 Days (14%)	Yes/51 Days (23%)	Yes/83 Days (37%)	Yes/36 Days (16%)*	Yes/106 Days (47.4%)	Yes/50 Days (22.4%)	
10	Yes/223 Days (100%)	Yes/223 Days (100%)	Yes/217 Days (98%)	Yes/223 Days (100%)	Yes/223 Days (100%)	Yes/113 Days (50.7%)	
11	Yes/89 Days (40%)	Yes/52 Days (23%)	Yes/96 Days (43%)	Yes/113 Days (51%)	Yes/100 Days (44.8%)	Yes/54 Days (24.2%)	
12	Yes/39 Days (40%)	Yes/53 Days (24%)	Yes/82 Days (37%)	Yes/58 Days (26%)	Yes/ 111 Days (49.8%)	Yes/53 Days (23.8%)	
13	Yes/223 Days (100%)	Yes/223 Days (100%)	Yes/217 Days (98%)	Yes/223 Days (100%)	Yes/97 Days (43.5%)	Yes/223 Days (100%)	
14	---	Yes/192 Days (87%)	Yes/218 Days (98%)	Yes/222 Days (100%)	Yes/223 Days (100%)	Yes/223 Days (100%)	
15	---	---	---	Yes/54Days (24%)[2]	Yes/76 Days (34.1%)	Yes/54 Days (24.2%)	
Reference Gage	Yes/83 Days (37%)	Yes/124 Days (56%)	Yes/157 Days (71%)	Yes/223 Days (100%)	Yes/223 Days (100%)	Yes/100 Days (44.8%)	

[1]Success Criteria: Water table within 12 inches of ground surface for 8.1% of growing season (3/28 - 11/5)

[2] GWG 15 installed December 2018

Groundwater Gage Plots

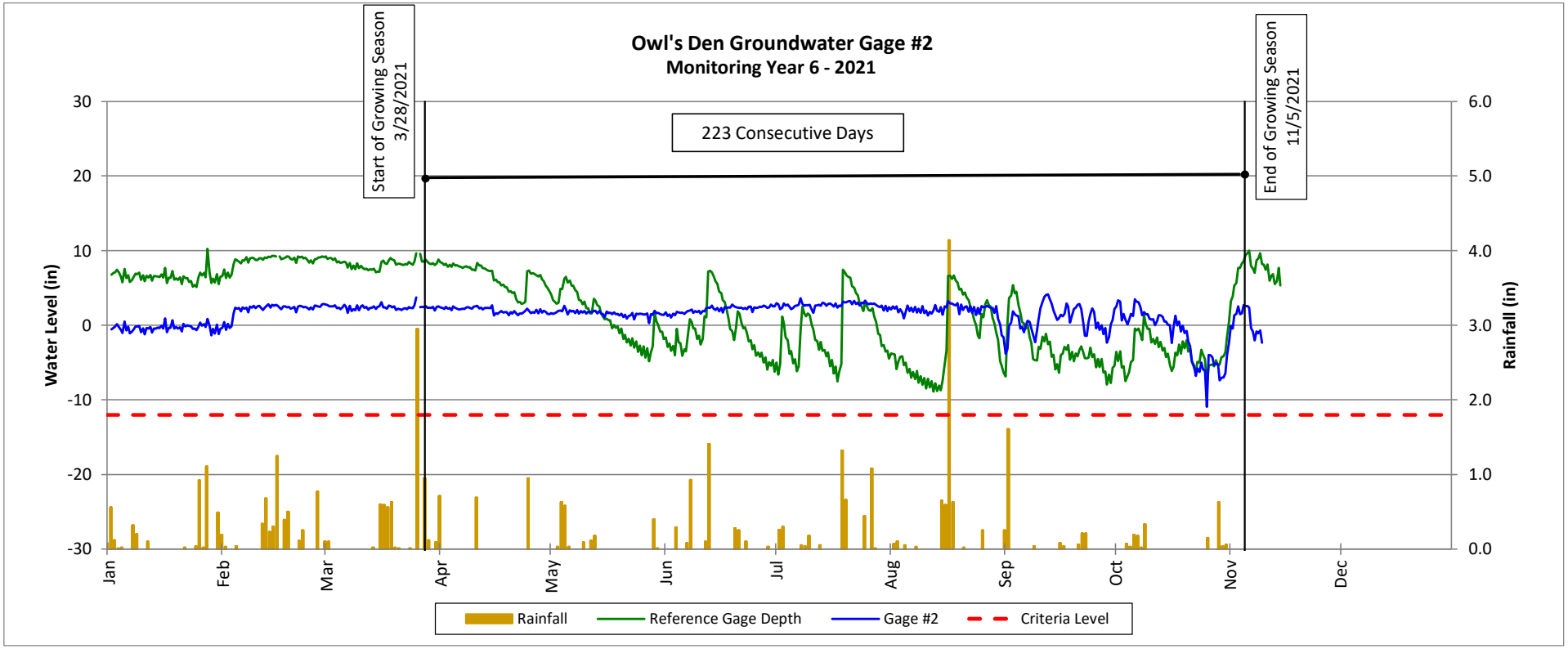
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



The Barotroll malfunctioned from 7/3/2021 to 7/17/2021 and 10/10/2021 to 11/10/2021; therefore, data for these ranges was calibrated from the Henry Fork Mitigation Site which is located in Catawba County, approximately 15 miles from the Owl's Den Mitigation Site.

Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



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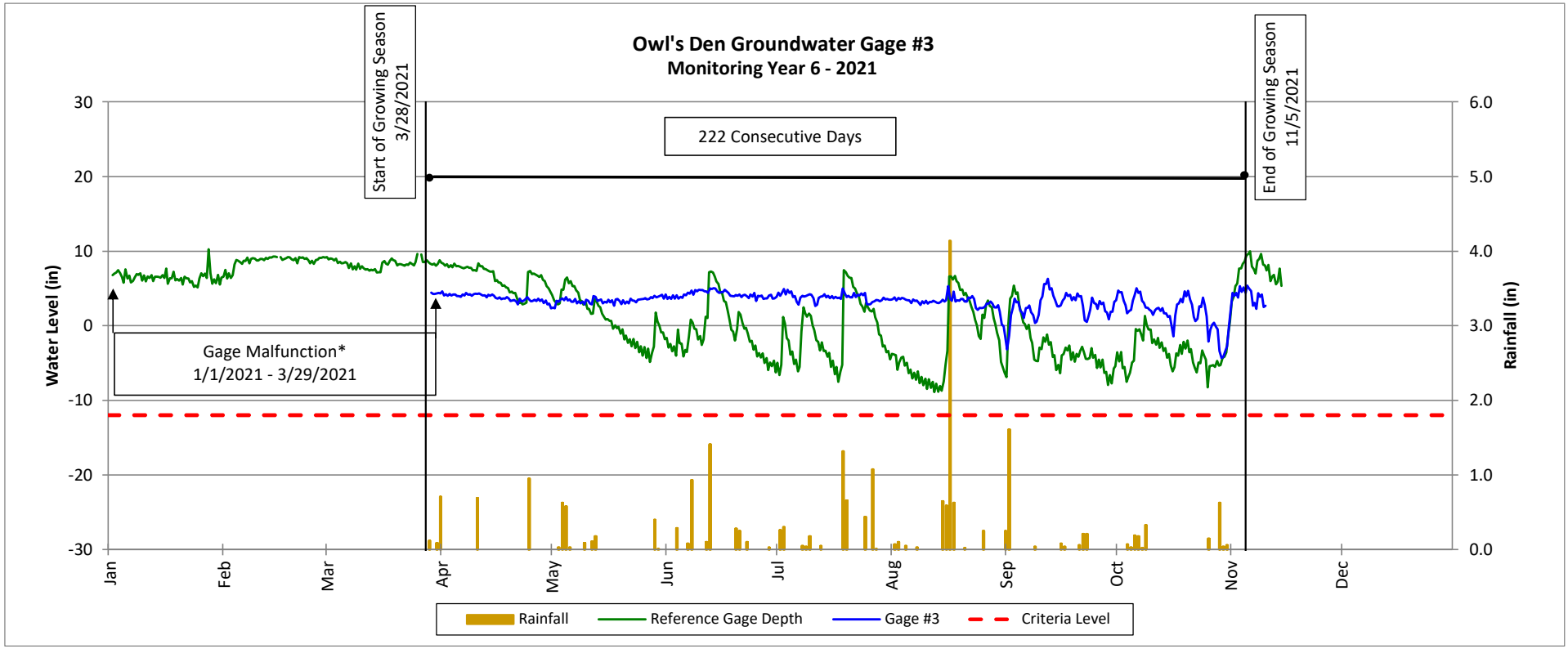
Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



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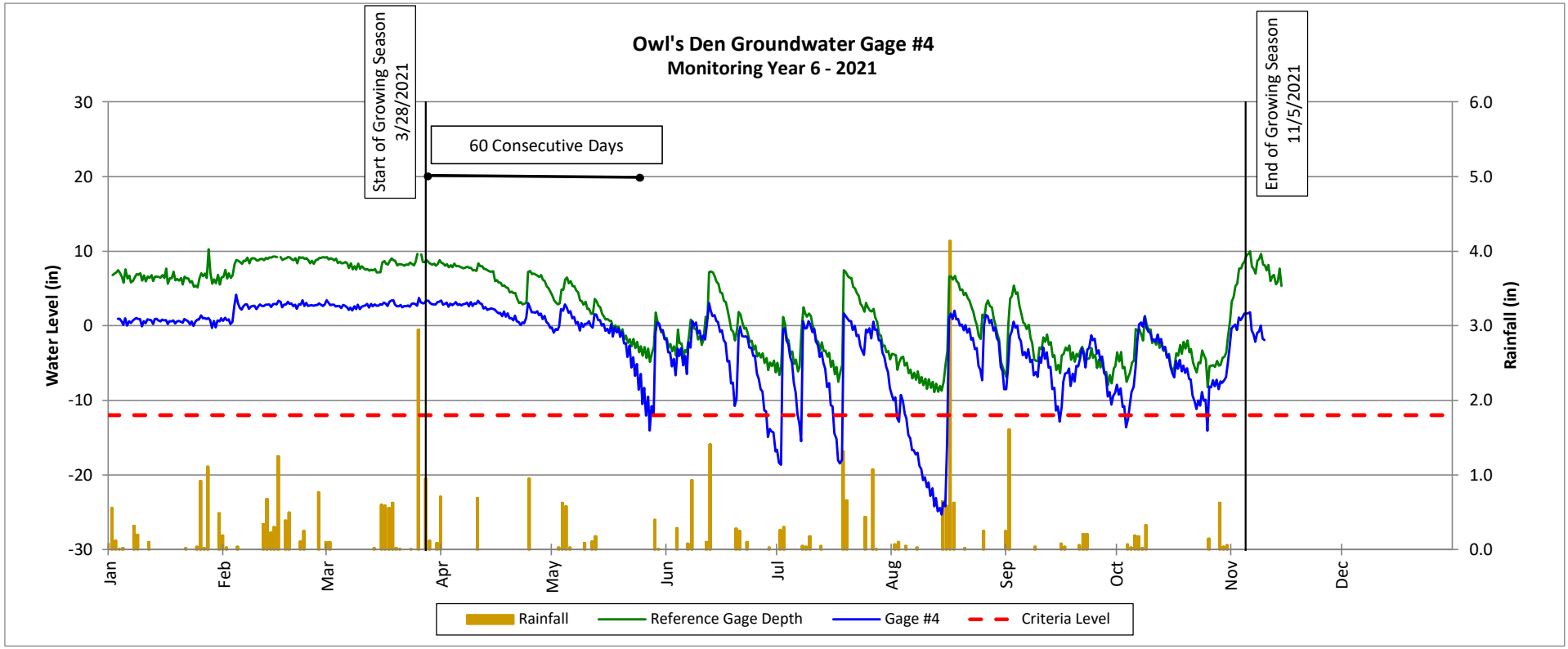
*Gage replaced on 3/29/2021

Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



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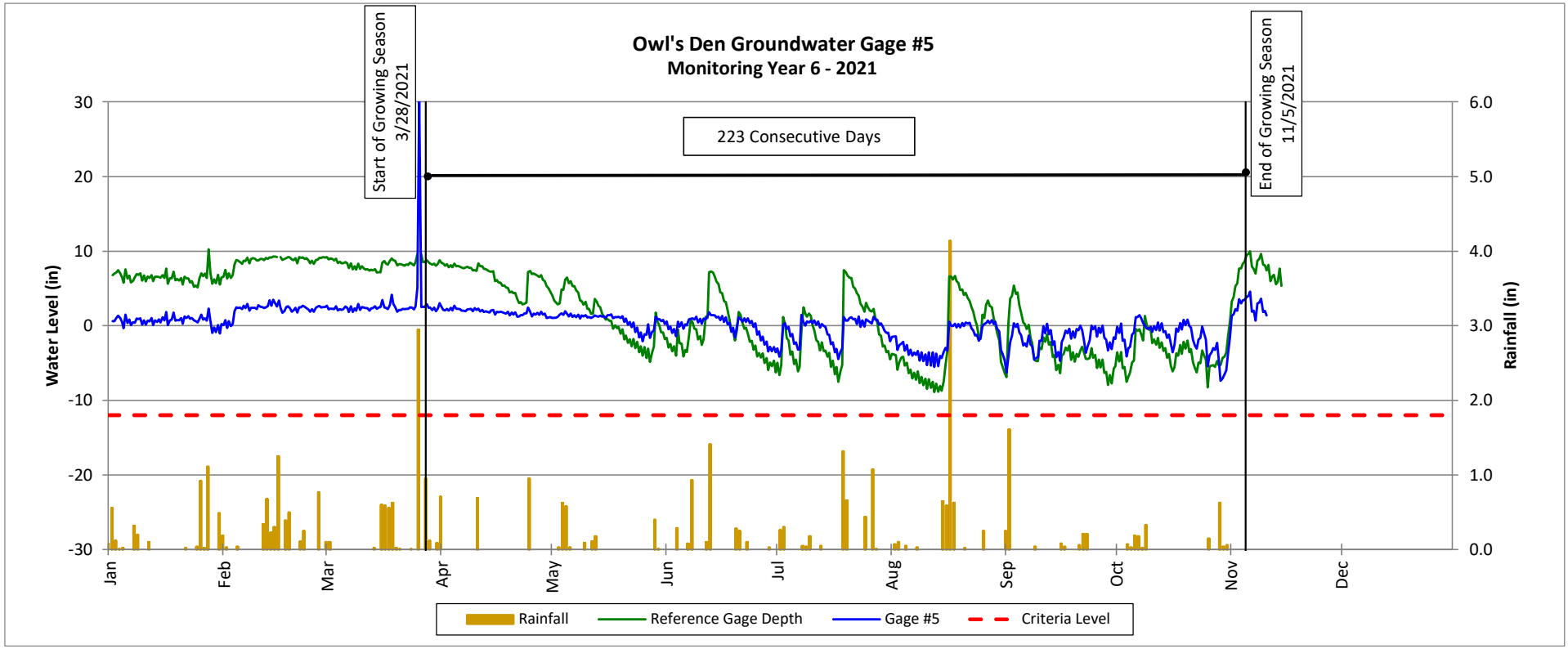
Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



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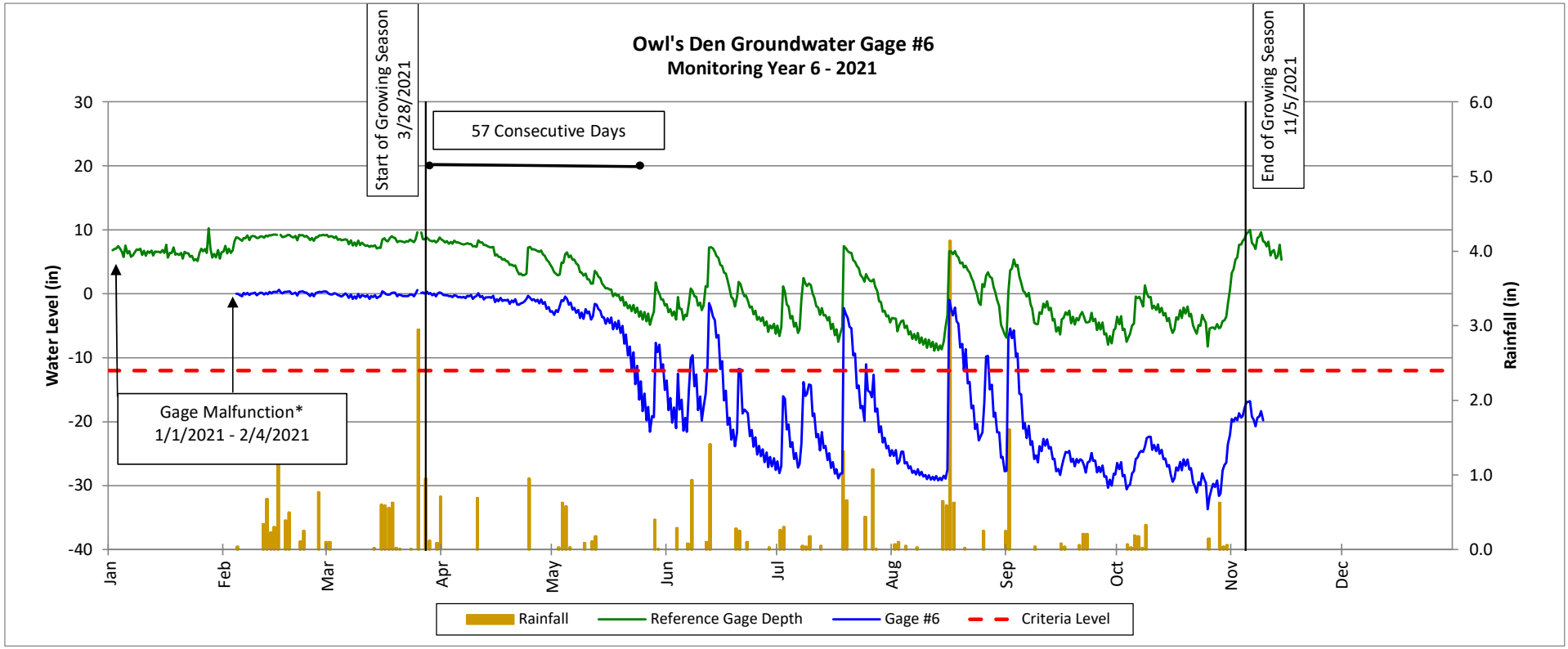
Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Rehabilitation

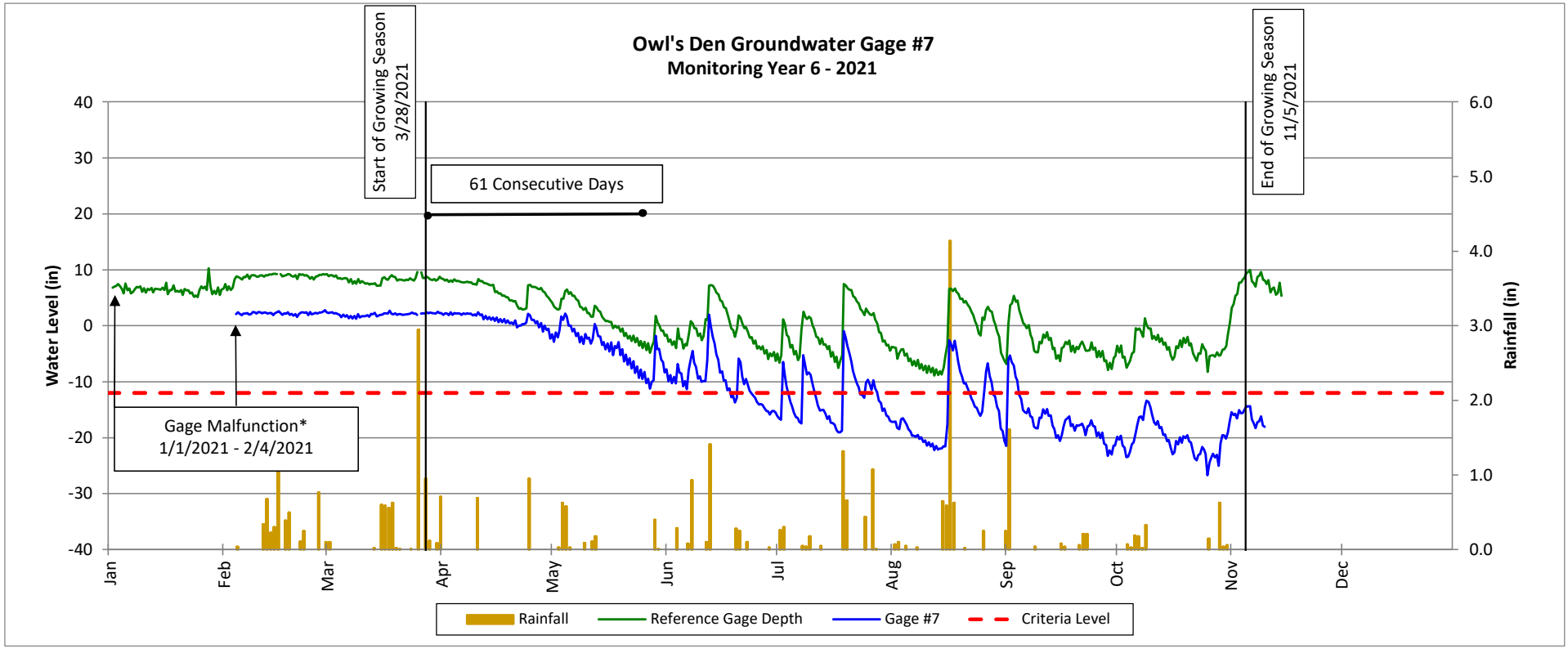


The Barotroll malfunctioned from 7/3/2021 to 7/17/2021 and 10/10/2021 to 11/10/2021; therefore, data for these ranges was calibrated from the Henry Fork Mitigation Site which is located in Catawba County, approximately 15 miles from the Owl's Den Mitigation Site.

*Gage replaced on 2/4/2021

Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



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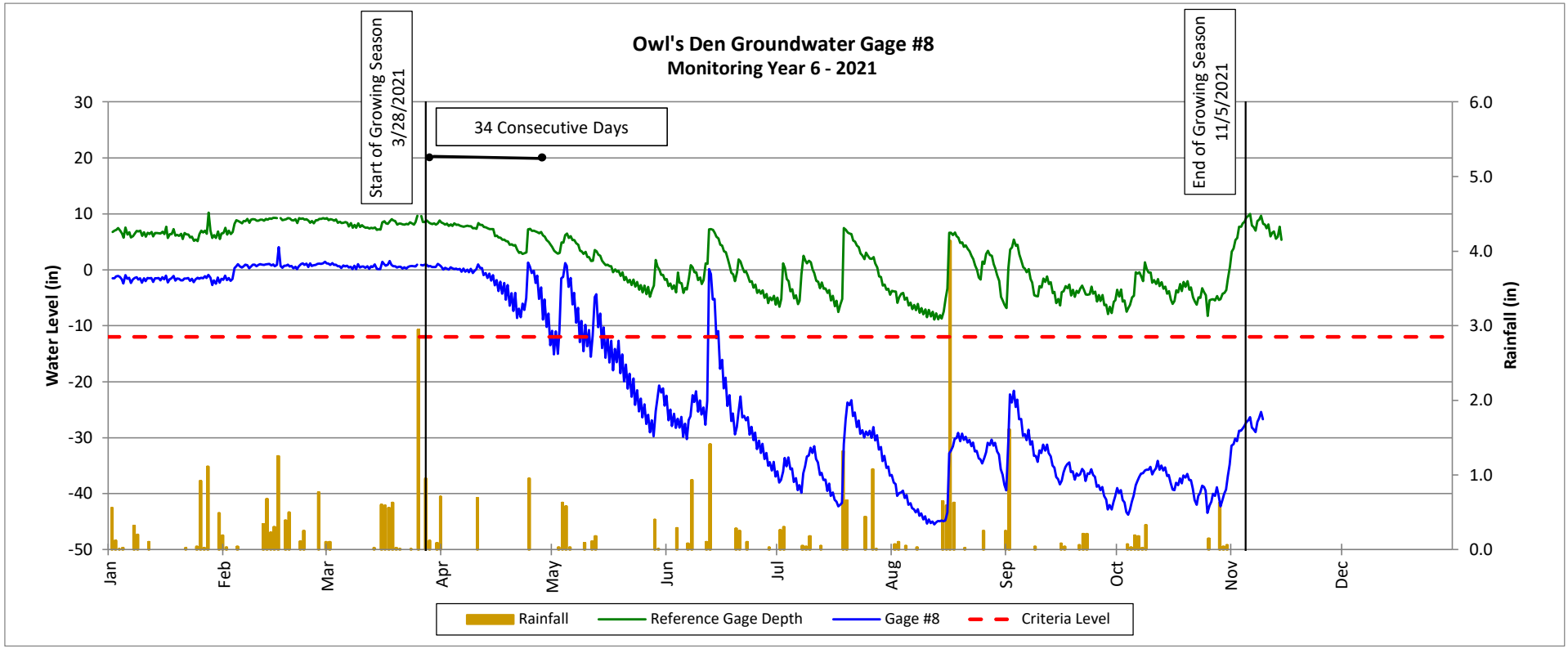
*Gage replaced on 2/4/2021

Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



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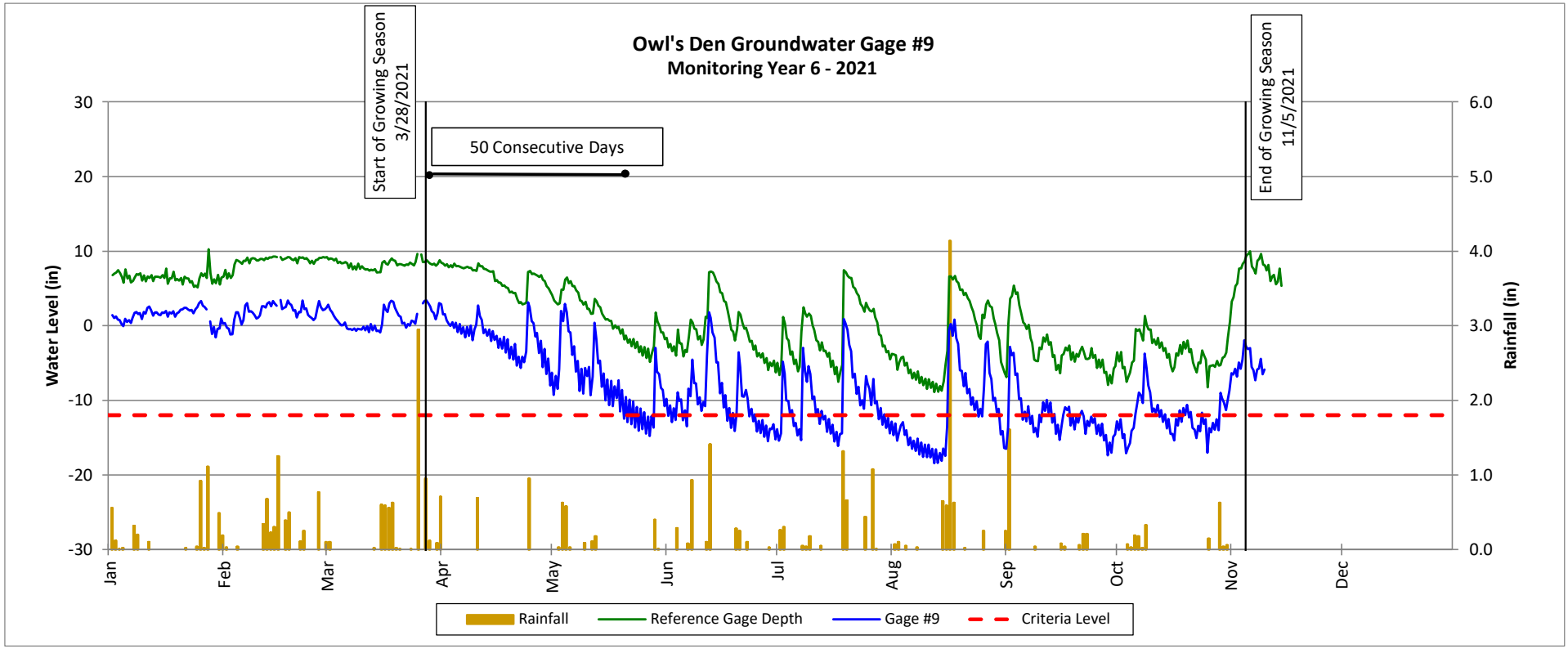
Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



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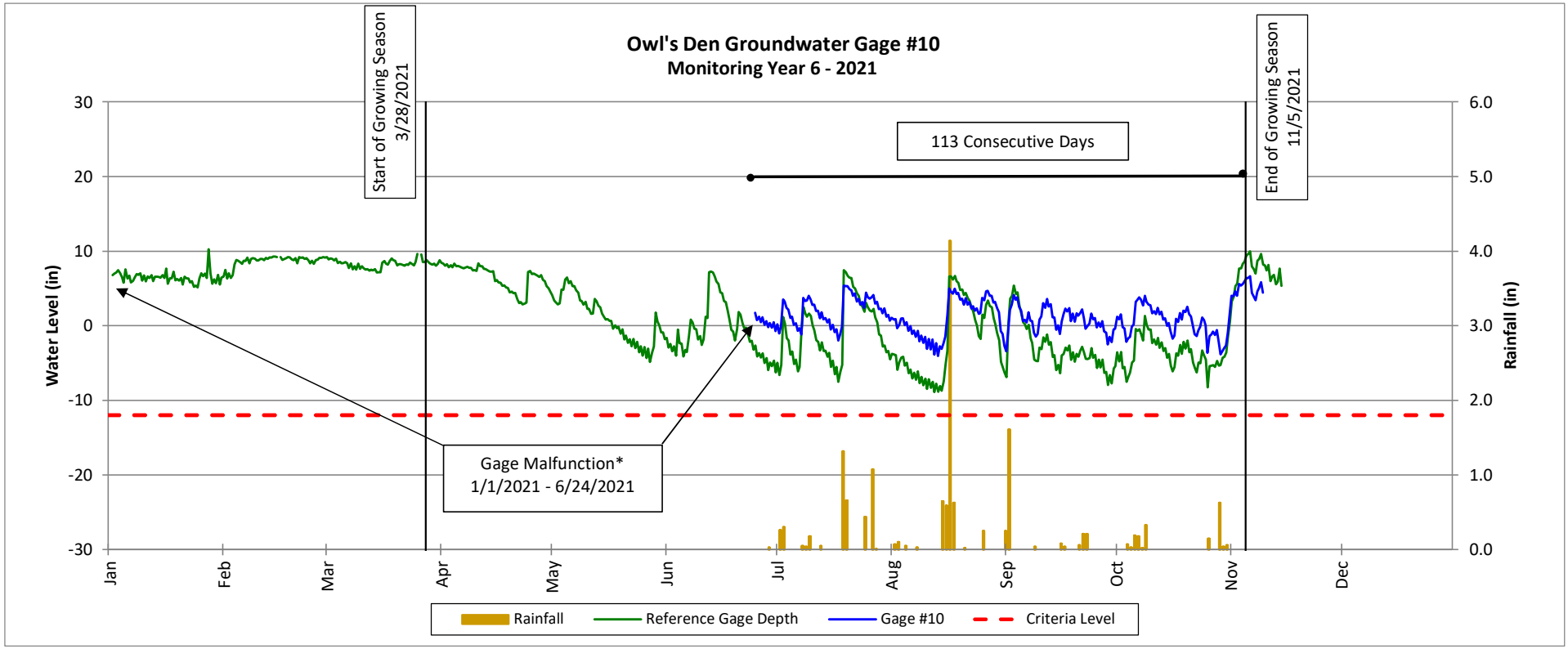
Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Rehabilitation



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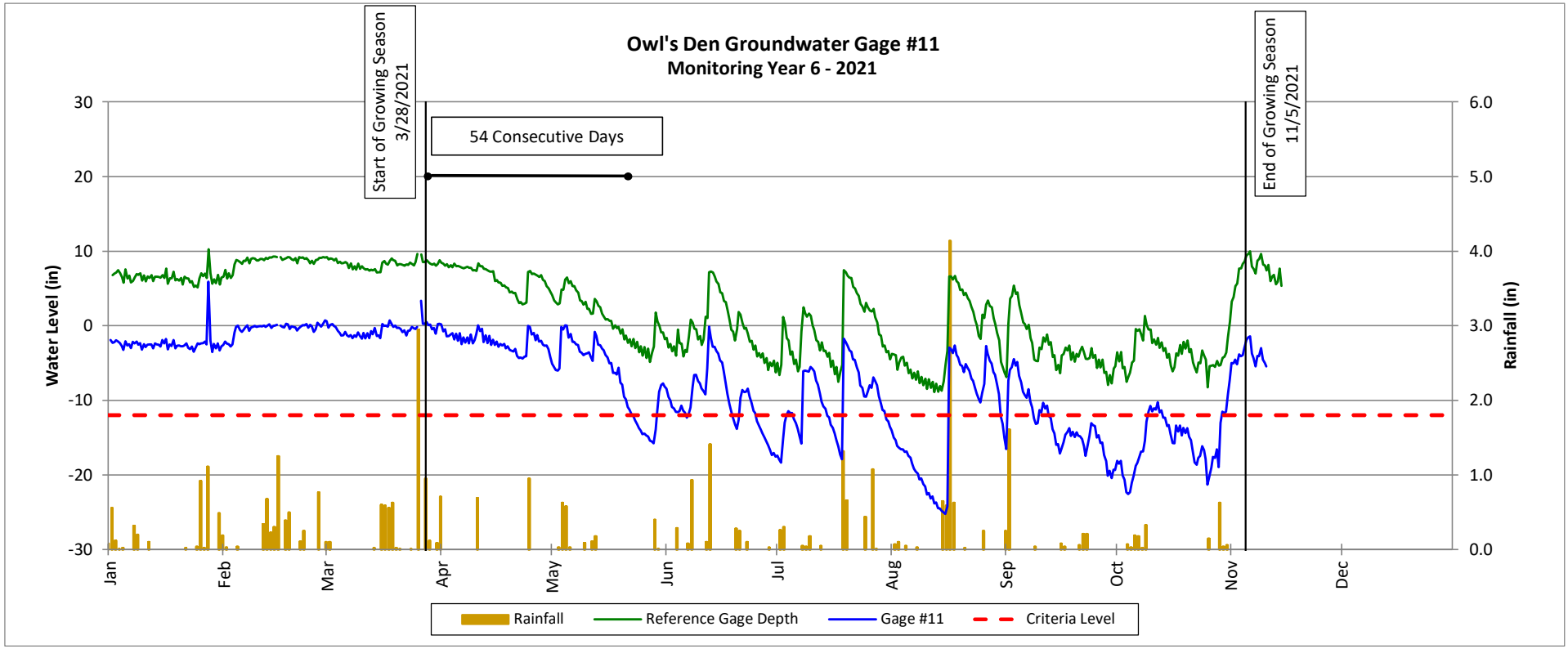
*Gage Malfunction. Gage replaced on 6/24/2021

Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



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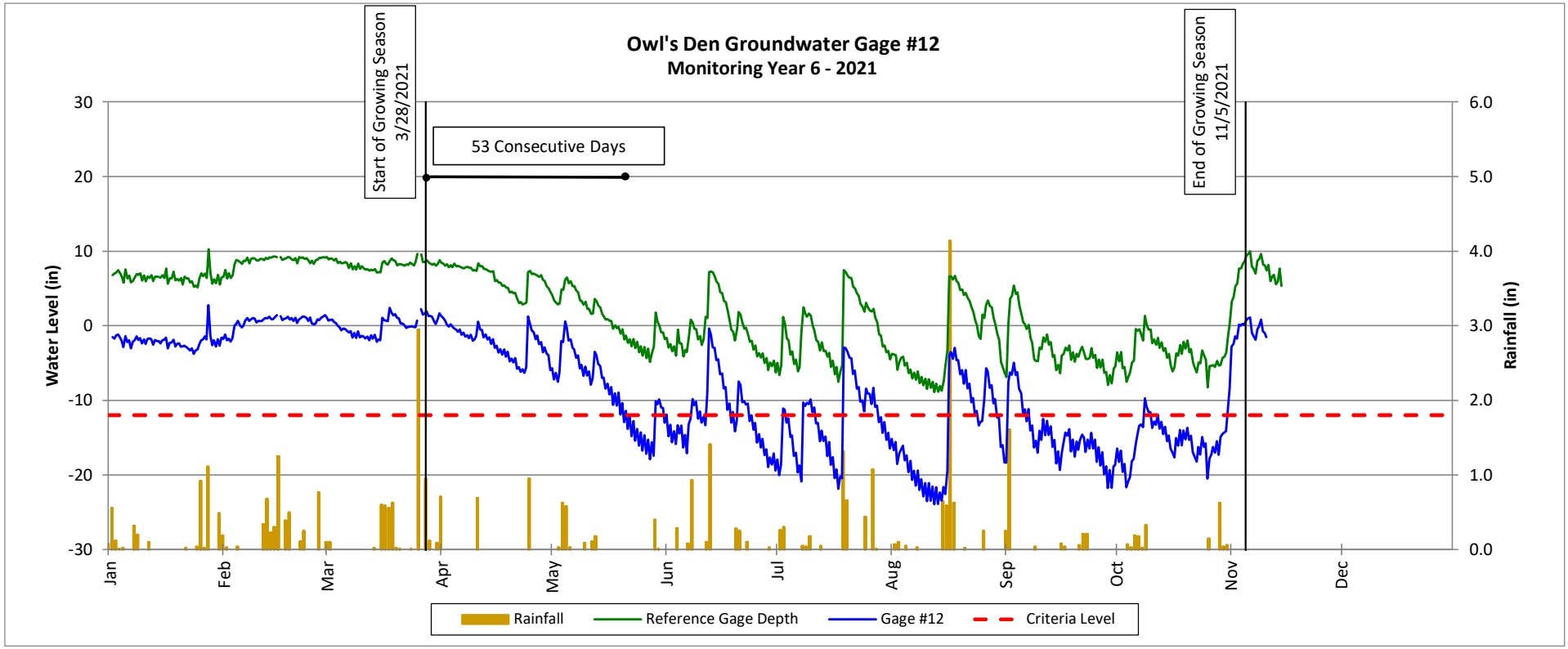
Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Re-establishment



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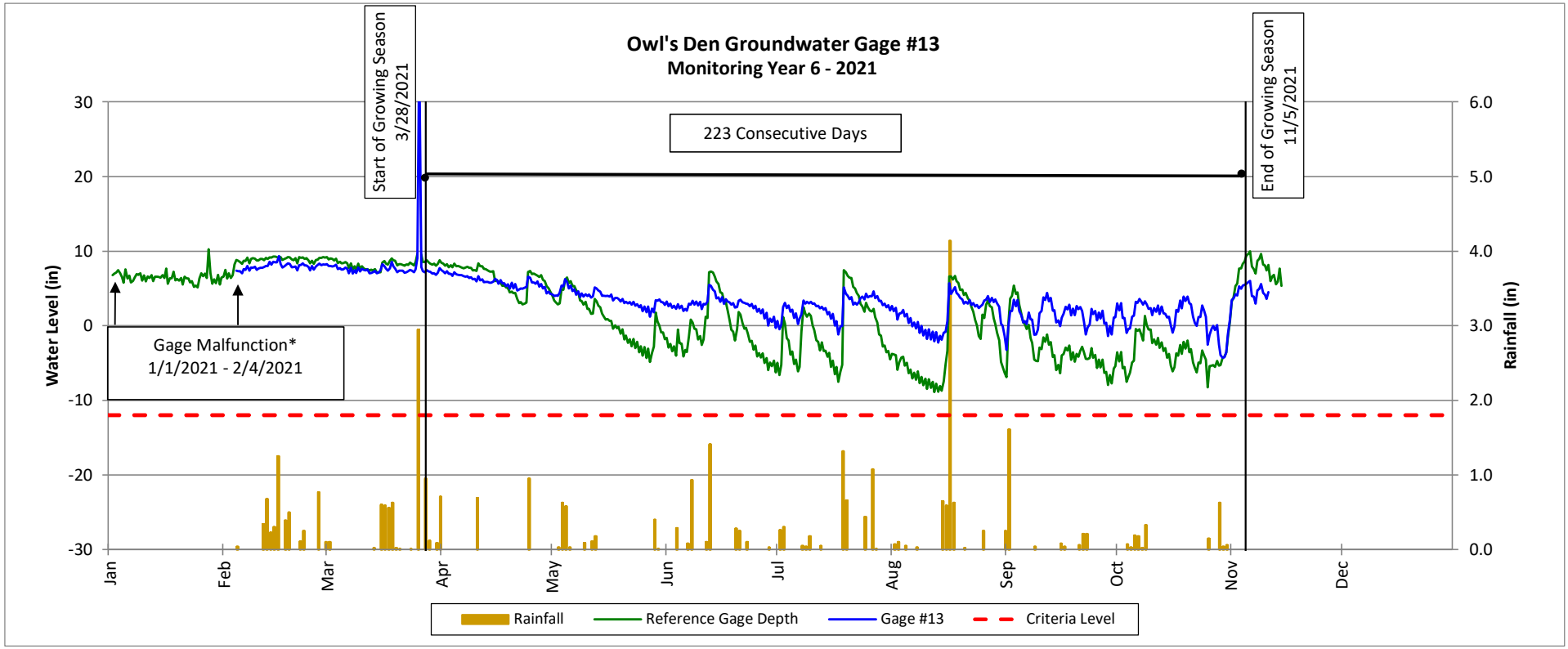
Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Rehabilitation



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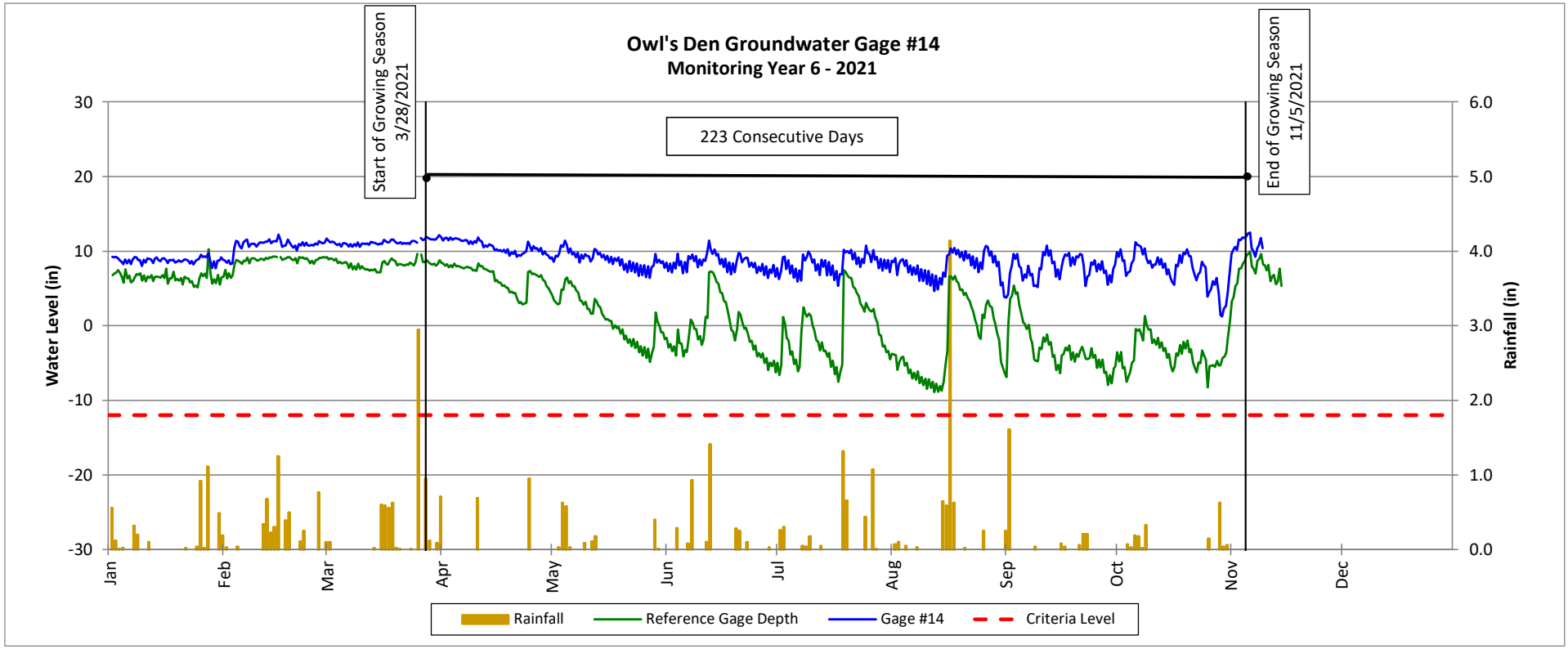
*Gage replaced on 2/4/2021

Groundwater Gage Plots

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Wetland Rehabilitation



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Groundwater Gage Plots

Owl's Den Mitigation Site
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Wetland Re-establishment

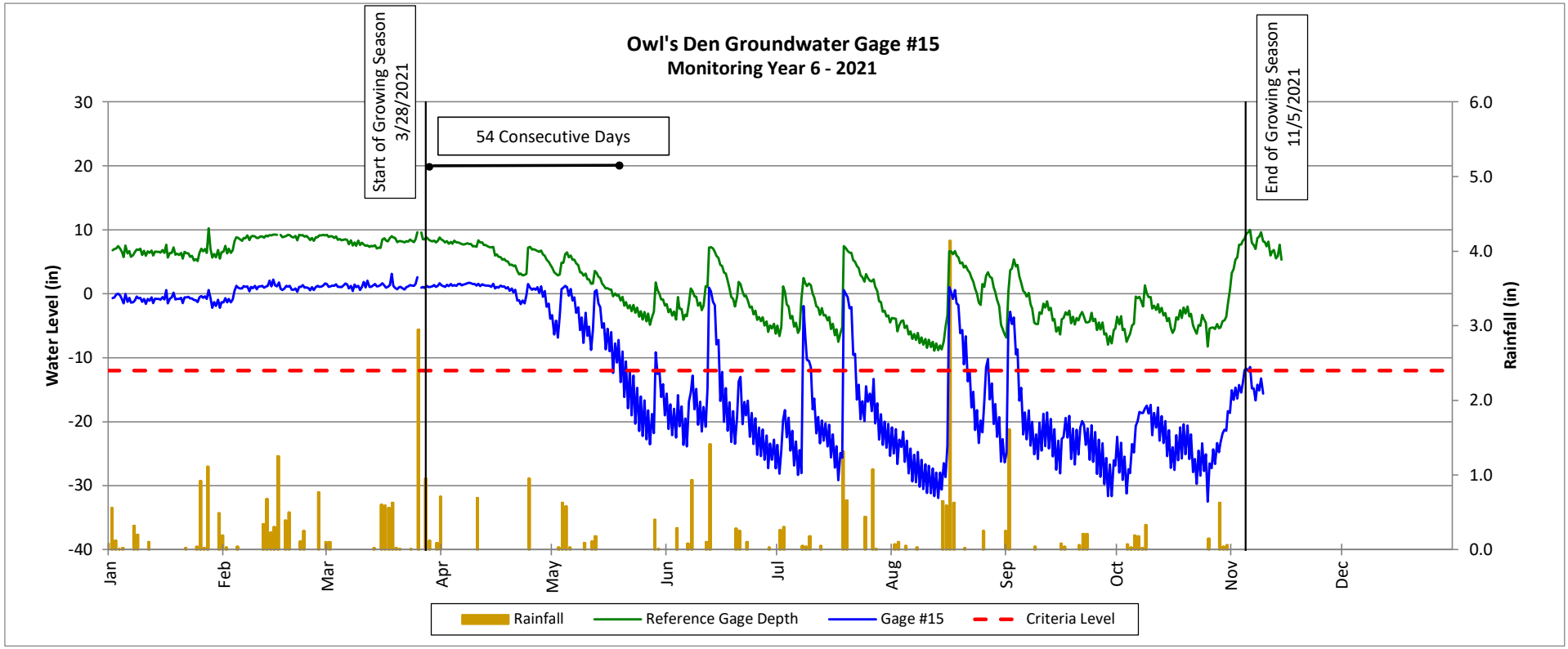

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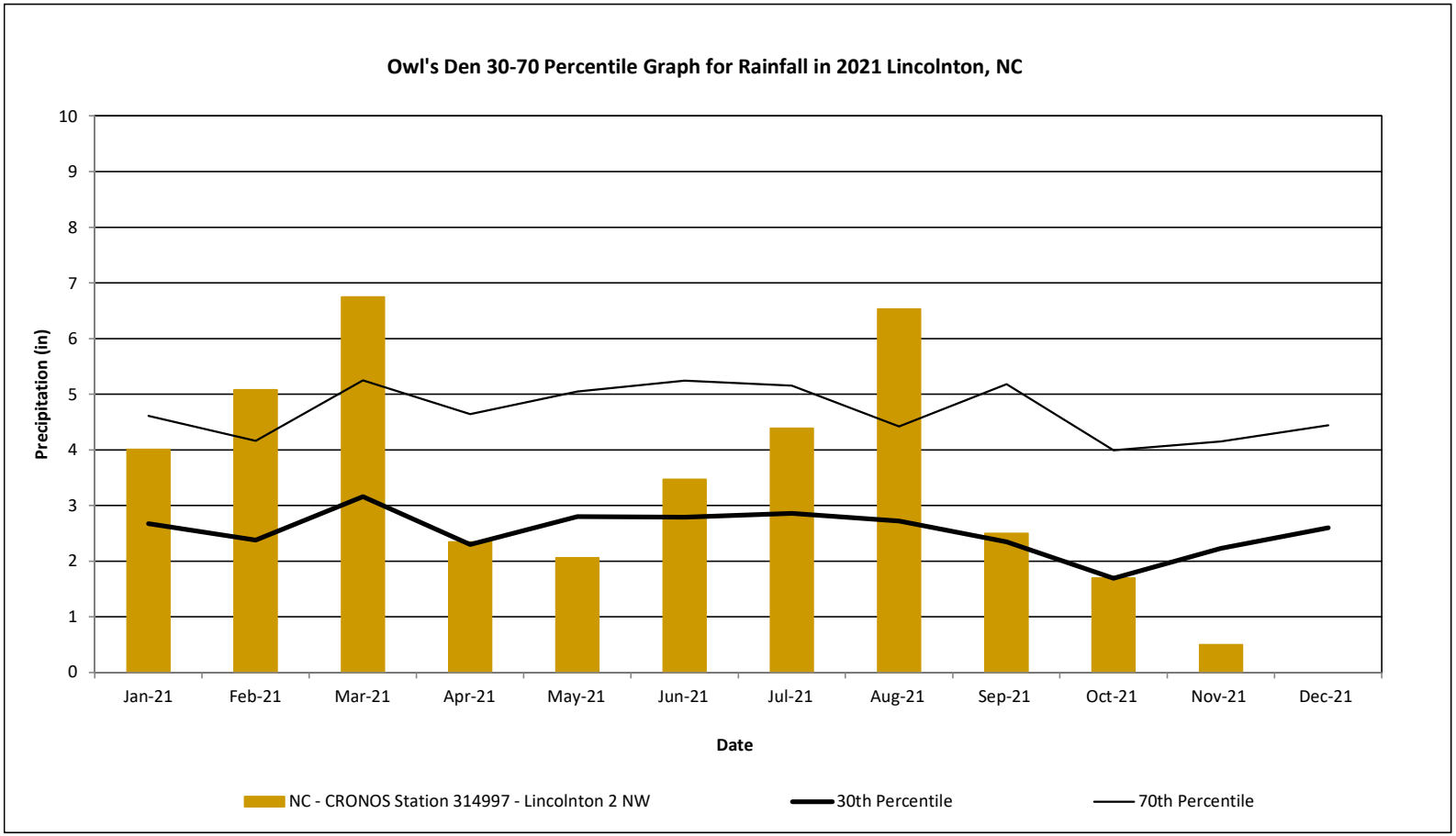
Table 15. Monthly Rainfall Plot

Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021



30th and 70th percentile rainfall data collected from weather station NC4997, in Lincolnton, NC (USDA, 2000).

APPENDIX 6. Supplemental Wetland Boring Data

WILDLANDS ENGINEERING

0 25 50 Feet

Figure 4.0 Soil Boring Map
Owl's Den Mitigation Site
DMS Project No. 95808
Monitoring Year 6 - 2021
Lincoln County, NC

Soil Profile Photographs

Pocket rod units in 10th of feet	
	
Core 1 - Hydric Soil Profile 0" - 9" – 5YR 4/6 (90%) 7.5YR 6/1 (10%) 9" - 17" – 10YR 5/1 (80%) 7.5YR 5/6 (20%)	Core 2 – Non-hydric Soil Profile 0" - 11" – 5YR 4/6 (95%) 7.5YR 5/2 (5%) 11" - 17"– 10YR 5/3 (95%) 7.5YR 4/6 (5%)