# MONITORING YEAR 3 ANNUAL REPORT
Final

**HOLMAN MILL MITIGATION SITE**
Alamance County, NC
NCDEQ Contract 005795
DMS ID No. 96316

Data Collection Period: January 2018 - October 2018
Draft Submission Date: November 7, 2018
Final Submission Date: December 10, 2018

**PREPARED FOR:**

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

| | | | | | |
|---|---|---|---|---|---|
| Mitigation Project Name | Holman Mill Stream Mitigation Project | County | Alamance | USACE Action ID | 2015-00019 |
| DMS ID | 96316 | Date Project Instituted | 2/21/2014 | NCDWR Permit No | 2014-0333 |
| River Basin | Cape Fear | Date Prepared | 5/22/2018 | | |
| Cataloging Unit | 03030002 | | | | |

| 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 Date (Wetland) |
| Potential Credits (Mitigation Plan) | | 3,915.200 | | | | | | | | | | | | |
| Potential Credits (As-Built Survey) | | 3,883.331 | | | | | | | | | | | | |
| 1 (Site Establishment) | N/A | | | | N/A | N/A | N/A | | | | N/A | | N/A | N/A |
| 2 (Year 0 / As-Built) | 30% | 1,164.999 | | | 2016 | 11/4/2016 | 30% | | | | 30% | | N/A | N/A |
| 3 (Year 1 Monitoring) | 10% | 388.333 | | | 2017 | 4/3/2017 | 10% | | | | 10% | | N/A | N/A |
| 4 (Year 2 Monitoring) | 10% | 388.333 | | | 2018 | 4/25/2018 | 10% | | | | 15% | | N/A | N/A |
| 5 (Year 3 Monitoring) | 10% | | | | 2019 | | 15% | | | | 20% | | N/A | N/A |
| 6 (Year 4 Monitoring) | 5% | | | | 2020 | | 5% | | | | 10% | | N/A | N/A |
| 7 (Year 5 Monitoring) | 10% | | | | 2021 | | 15% | | | | 15% | | N/A | N/A |
| 8 (Year 6 Monitoring) | 5% | | | | 2022 | | 5% | | | | N/A | | N/A | N/A |
| 9 (Year 7 Monitoring) | 10% | | | | 2023 | | 10% | | | | N/A | | N/A | N/A |
| Stream Bankfull Standard | 10% | 388.333 | | | 2017 | 4/25/2018 | N/A | | | | N/A | | | |
| Total Credits Released to Date | | 2,329.998 | | | | | | | | | | | | |

DEBITS (released credits only)

| Ratios | | | 1 | 1.5 | 3.38951 | 5 | 1 | 3 | 2 | 5 | 1 | 3 | 2 | 5 | 1 | 3 | 2 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stream Restoration | Stream Enhancement 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 |
| As-Built Amounts (feet and acres) | | | 1,706.000 | 293.000 | 6,718.000 | | | | | | | | | | | | | |
| As-Built Amounts (mitigation credits) | | | 1,706.000 | 195.333 | 1,981.997 | | | | | | | | | | | | | |
| Percentage Released | | | 60% | 60% | 60% | | | | | | | | | | | | | |
| Released Amounts (feet / acres) | | | 1,023.600 | 175.800 | 4,030.800 | | | | | | | | | | | | | |
| Released Amounts (credits) | | | 1,023.600 | 117.200 | 1,189.198 | | | | | | | | | | | | | |
| NCDWR Permit | USACE Action ID | Project Name | | | | | | | | | | | | | | | | |
| 2013-0517 | 2013-00557 | NCDOT TIP R-2413A / B - NC 68 Connector | 511.800 | 87.900 | 2,015.400 | | | | | | | | | | | | | |
| 2014-1226 | 2011-00317 | NCDOT TIP I-5110 - I-73 Improvements | 170.600 | | 666.140 | | | | | | | | | | | | | |
| | 2015-02641 | SR 1007 - Bridge 42 - Division 7 | | 29.300 | 5.660 | | | | | | | | | | | | | |
| 2013-0918 | 2005-21386 | NCDOT TIP U-2525B / C - Greensboro Eastern Loop | 341.200 | 58.600 | 1,343.600 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Remaining Amounts (feet / acres) | | | 0.000 | 0.000 | 0.000 | | | | | | | | | | | | | |
| Remaining Amounts (credits) | | | 0.000 | 0.000 | 0.000 | | | | | | | | | | | | | |

Contingencies (if any): None

Signature of Wilmington District Official Approving Credit Release

9/6/18
Date

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

**PREPARED BY:**


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**Jason Lorch**
jlorch@wildlandseng.com
Phone: 919.851.9986

## EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) completed a full delivery project at the Holman Mill Mitigation Site (Site) for the North Carolina Department of Environmental Quality Division of Mitigation Services (DMS) to restore and enhance a total of 8,717 linear feet (LF) of perennial and intermittent stream in Alamance County, NC. It is anticipated that the Site will generate 3,884 Stream Mitigation Units (SMUs) through the restoration and enhancement of six unnamed tributaries (UT to Pine Hill Branch, UT1, UT1A, UT2, UT2A, and UT2B). The project is located in the Cape Fear River Basin Hydrologic Unit Code (HUC) 03030002 (Cape Fear 02) near Snow Camp, NC (Figure 1) and is within the Cane Creek Targeted Local Watershed (TLW) (HUC 03030002050050). On-site streams flow into Cane Creek and eventually into the Haw River.

The Site is located within the Jordan Lake Water Supply Watershed, which has been designated as a Nutrient Sensitive Water. The TLW was identified in DMS's Cape Fear River Basin Restoration Priorities 2009 (RBRP) report. This RBRP plan identifies agricultural operations and degraded water quality based on "fair" and "good-fair" benthic ratings as the impairments in the Cane Creek watershed. The RBRP report also identifies the successful completion of a number of stream and wetland projects within the Cane Creek watershed. The Site fully supports the Cataloging Unit (CU)-wide functional objectives stated in the 2011 Request for Proposals to reduce and control nutrient inputs, reduce and control sediment inputs, and protect and augment Significant Natural Heritage Areas in the Cape Fear 02 River Basin.

The mitigation project is intended to provide numerous ecological benefits within the Cape Fear River Basin. While many of these benefits are limited to the Site project area; others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects. Expected improvements to water quality and ecological processes are outlined below as project goals and objectives. These project goals were established with careful consideration of the goals and objectives described in the RBRP and to meet the DMS's mitigation needs, while maximizing the ecological and water quality uplift within the watershed. The following project specific goals established in the mitigation plan (Wildlands, 2015) are to:

- Reduce fecal coliform, nitrogen, and phosphorous inputs by removing cattle from streams and establishing and augmenting a forested riparian corridor to intercept and process sediment and nutrients before they reach the channel during storm events;
- Reduce sediment loads by stabilizing eroding stream banks;
- Return a network of streams to a stable form that is capable of supporting biological functions;
- Install instream structures to improve bed and bank stability, create fish and macroinvertebrate habitat, and help oxygenate streamflows; and
- Protect existing high quality streams and forested buffers.

The project is helping meet the goals for the watershed and providing numerous ecological benefits within the Cape Fear River Basin. While many of these benefits are limited to the project area, others, such as pollutant removal and reduced sediment loading have farther-reaching effects. In addition, protected parcels downstream of this site promote cumulative project benefits within the watershed.

The Site construction and as-built surveys were completed between January and April 2016. A conservation easement is in place on 32.4 acres of the riparian corridors to protect them in perpetuity.

Monitoring Year 3 (MY3) assessments and site visits were completed between January and October 2018 to assess the conditions of the project. Overall, the Site has met the required vegetation and stream success criteria for MY3. The overall average stem density for the Site is 465 stems per acre and met the MY3 requirement of 320 stems per acre. All restored and enhanced streams are stable and

functioning as designed. Hydrologic monitoring stations with crest gages and pressure transducers were installed on the Site to document bankfull events on the restoration reaches. Multiple bankfull events were recorded on all restoration reaches during MY3 and two bankfull events were recorded on each reach during MY1 and MY2, resulting in attainment of the MY7 stream hydrology success criteria. A small beaver dam was backing water up onto the floodplain of UT2A and was removed in October. Two areas of low stem densities were observed on the Site and will be replanted in the Winter of 2018/2019.

## TABLE OF CONTENTS



## APPENDICES

# Section 1: PROJECT OVERVIEW

The Holman Mill Mitigation Site (Site) is located in the southern portion of Alamance County, southeast of Snow Camp off of Holman Mill Road (Figure 1). The Site is located within the Jordan Lake Water Supply Watershed (HUC 03030002050050) which has been designated as a Nutrient Sensitive Water. The Site is in in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The project watershed consists primarily of agricultural and wooded land. The drainage area for project site is 1,077 acres (1.68 square miles).

The project streams consist of six unnamed tributaries to Pine Hill Branch. Stream restoration reaches included UT1 (Reach 1 and 3), UT2 (Reach 3 and 4) and UT2A. Stream enhancement I (EI) and enhancement II (EII) reaches included UT1 (Reach 2 and 4), EII; UT2 (Reach 1), EII; UT2 (Reach 2), EI; UT2B, EII; UT1A, EII; and UT to Pine Hill Branch, EII. Mitigation work within the Site included restoration and enhancement of 8,717 linear feet (LF) of perennial and intermittent stream channels. The riparian areas were planted with native vegetation to improve habitat and protect water quality. The final mitigation plan was submitted and accepted by the DMS in May 2015. Construction activities were completed by Land Mechanic Designs, Inc. in March 2016. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in March 2016. Baseline monitoring (MY0) was conducted between January 2016 and April 2016. Annual monitoring will occur 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 the Site.

A conservation easement (32.4 ac; Deed Book 3472, Page 968; Deed Book 3472, Page 951) has been recorded and is in place along the stream riparian corridors to protect them in perpetuity within two tracts; a tract owned by the Russell B. Hadley Revocable Trust and a tract owned by the M. Darryl Lindley Revocable Trust, respectively. The project is expected to provide 3,884 SMU's by closeout.

A project vicinity map and directions are provided in Figure 1 and project components are illustrated in Figure 2.

## 1.1 Project Goals and Objectives

Prior to construction activities, the streams and vegetative communities on the Site had been severely impacted due to direct livestock access to the streams and riparian zones. Table 4 in Appendix 1 and Tables 10a through 10c in Appendix 4 present the pre-restoration conditions in detail.

This Site is intended to provide numerous ecological benefits within the Cape Fear River Basin. While many of these benefits are limited to the Site, others such as pollutant removal and reduced sediment loading have more far-reaching effects. Expected improvements to water quality and ecological processes are outlined below as project goals and objectives. These project goals were established with careful consideration of goals and objectives that were described in the RBRP and to meet the DMS mitigation needs while maximizing the ecological and water quality uplift within the watershed.

The following project goals and related objectives established in the mitigation plan (Wildlands, 2015) included:

The primary project goals will be:

- Reduce fecal coliform, nitrogen, and phosphorous inputs by removing cattle from streams and establishing and augmenting a forested riparian corridor to intercept and process sediment and nutrients before they reach the channel during storm events;
- Reduce sediment loads by stabilizing eroding stream banks;
- Return a network of streams to a stable form that is capable of supporting biological functions;

- Install instream structures to improve bed and bank stability, create fish and macroinvertebrate habitat, and help oxygenate streamflows; and
- Protect existing high-quality streams and forested buffers.

Secondary project objectives are expected to include:

- Improving instream nutrient cycling by incorporating woody debris into constructed riffles and bank stabilization measures;
- Reducing thermal loadings through establishment of riparian shading;
- Reconnecting channels with floodplains to raise the local water table; and
- Create and implement a stream and riparian area restoration design that is both natural and aesthetically pleasing.

## 1.2 Monitoring Year 3 Data Assessment

Annual monitoring and quarterly site visits were conducted during MY3 to assess the condition of the project. The vegetation and stream success criteria for the Site follows the approved success criteria presented in the Holman Mill Mitigation Project Mitigation Plan (Wildlands, 2015).

### 1.2.1 Vegetative Assessment

Planted woody vegetation is being monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008). A total of 12 standard 10-meter by 10-meter vegetation plots were established during the baseline monitoring within the project easement area.

The final vegetative success criteria will be the survival of 210 planted stems per acre at the end of the seven-year monitoring period (MY7). The interim measure of vegetative success will be the survival of at least 320 planted stems per acre at the end of year three of the monitoring period (MY3) and at least 260 stems per acre at the end of the fifth year of monitoring (MY5). Planted vegetation must average 10 feet in height at the end of the seventh year of monitoring. If this performance standard is met by MY5 and stem density is trending towards success (i.e., no less than 260 five-year-old stems per acre), monitoring of vegetation on the Site may be terminated provided written approval is provided by the United States Army Corps of Engineers in consultation with the NC Interagency Review Team.

The MY3 vegetative survey was completed in August 2018. The 2018 vegetation monitoring resulted in an average stem density of 465 planted stems per acre; meeting the interim requirement of 320 stems per acre required at MY3 and approximately 27% less than the baseline density recorded (634 stems per acre). When including volunteer stems, the average stems per acre is 965 for MY3. This exceeds the MY3 interim requirement of 320 stems per acre and is well above the MY5 interim requirement of 260 stems per acre. There is an average of 11 stems per plot as compared to 15 stems per plot in MY0. Eleven of the twelve vegetation plots are on track to meet the success criteria required for MY7 (Table 9, Appendix 3). Vegetation plot 12 did not meet the MY3 interim requirement with 243 stems per acre. However, when counting volunteer trees vegetation plot 12 had an average stem density of 1,012 stems per acre, which exceeds the MY3 interim requirement of 320 stems per acre. Green ash (*Fraxinus pennsylvanica*), sweet gum (*Liquidambar styraciflua*), American elm (*Ulmus americana),* and willow oak (*Quercus phellos*) volunteers were observed in vegetation plot 12 during MY3. 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

During MY3 two areas of low stem density were observed totaling 1.5 acres (Figure 3.0). Vegetation plot 12 is located in one of the areas and did not meet the MY3 interim success criteria of 320 planted stems per acre. The low stem density along UT2A was graded during construction, resulting in poor soils. This accompanied with dense herbaceous competition has resulted in poor growing conditions for planted trees. In the low stem density area along UT to Pine Hill Branch thick herbaceous competition has caused a high tree mortality rate. Supplemental planting will take place in these two areas during the winter of 2018/2019.

### 1.2.3 Stream Assessment

Morphological surveys for MY3 were conducted in March 2018 and all streams within the Site are stable. Cross sections at the Site show little to no change in the bankfull area, maximum depth ratio, or width-to-depth ratio. Bank height ratios fall within the appropriate Rosgen stream type parameters. Substrate materials in the restoration and enhancement reaches indicated maintenance of coarser materials in the riffle reaches and finer particles in the pools. Longitudinal profile surveys are not required on the project unless visual inspection indicates reach wide vertical instability. Refer to Appendix 2 for the visual stability assessment table, Current Condition Plan View (CCPV) map, and stream photographs. Refer to Appendix 4 for the morphological data and plots.

### 1.2.4 Stream Areas of Concern

One beaver dam was found along UT2A in October 2018 (Figure 3.2) backing water onto the floodplain. The beaver dam was removed and no damage was observed. Beaver activity is believed to occur during times of high flow on UT to Pine Hill Branch. When water levels reach baseflow, beaver activity is not observed within the UT2A area. The Site will be monitored during subsequent monitoring years for beaver activity.

### 1.2.5 Hydrology Assessment

At the end of the seven-year monitoring period, two or more bankfull events must have occurred in separate years within the restoration reaches. Multiple bankfull events were recorded on all restoration reaches during MY3 and multiple bankfull events were recorded on each reach during MY1 and MY2, resulting in attainment of the stream hydrology assessment criteria. Refer to Appendix 5 for hydrologic data.

### 1.2.6 Maintenance Plan

As described above in Section 1.2.2, trees will be replanted during the winter of 2018/2019 in the two low stem density areas shown on the CCPV Maps (Figures 3.0-3.2).

After Hurricane Florence, the Site was assessed on September 18, 2018 for any damage. The only damage on site was a section of downed fence from the high flow of UT to Pine Hill Branch. The portion of damaged fence will be repaired in 2019 when the area of the Site is dry enough to access. There are no livestock located on the property, so encroachment is not a concern.

## 1.3 Monitoring Year 3 Summary

Eleven of the 12 vegetation plots met the MY3 interim requirement of 320 planted stems per acre as noted in CCPV. When including volunteer species all 12 vegetation plots met the MY3 interim requirement. All streams within the Site are stable and functioning as designed. Multiple bankfull events in separate years have been documented on all restored stream reaches at the Site, resulting in fulfillment of the hydrologic success criteria. A beaver dam was removed from UT2A; and the Site will

continue to be monitored for beaver activity. Supplemental planting in two areas will take place in the Winter of 2018/2019. The damaged fence along UT to Pine Hill Branch will be repaired in 2019.

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 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 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. Hydrologic monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers (USACE, 2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

## Section 3: REFERENCES


Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E. 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, C.C., Rawlins, C.L., Potyondy, J.P. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique.* Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Lee, M.T., Peet, R.K., S.D., Wentworth, T.R. 2008. CVS-EEP Protocol for Recording Vegetation Version 4.2. Retrieved from http://cvs.bio.unc.edu/protocol/cvs-eep-protocol-v4.2-lev1-5.pdf.

Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.

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Rosgen, D.L. 1997. A Geomorphological Approach to Restoration of Incised Rivers. Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision. Center For Computational Hydroscience and Bioengineering, Oxford Campus, University of Mississippi, Pages 12-22.

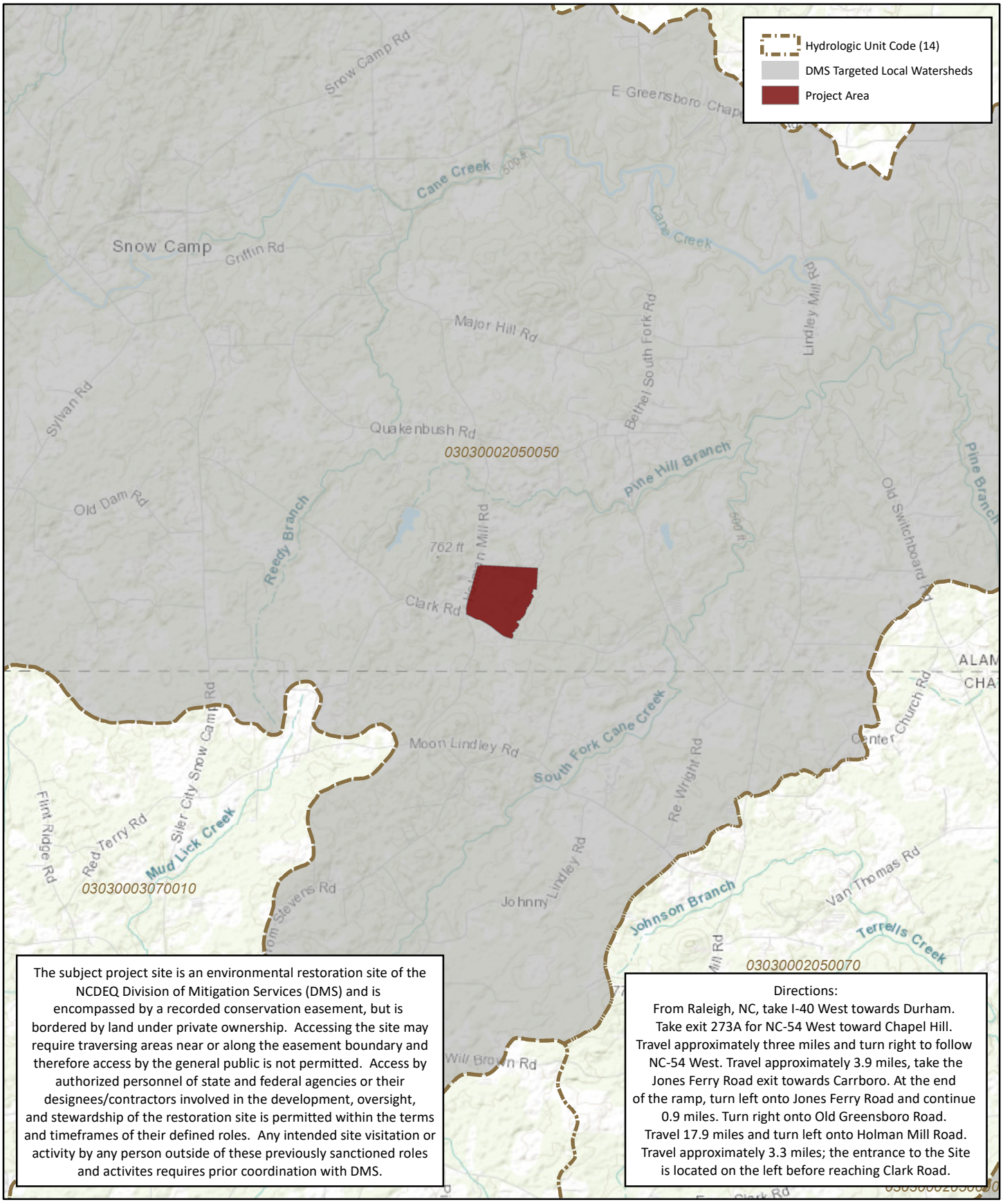
United States Army Corps of Engineers. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

United States Geological Survey. 1998. North Carolina Geology. http://www.geology.enr.state.nc.us/usgs/carolina.htm

Wildlands Engineering, Inc. 2016. Holman Mill Mitigation Site Baseline Monitoring Document and As-Built Baseline Report. DMS, Raleigh, NC.

Wildlands Engineering, Inc. 2015. Holman Mill Mitigation Project Mitigation Plan. DMS, Raleigh, NC.

# APPENDIX 1. General Figures and Tables

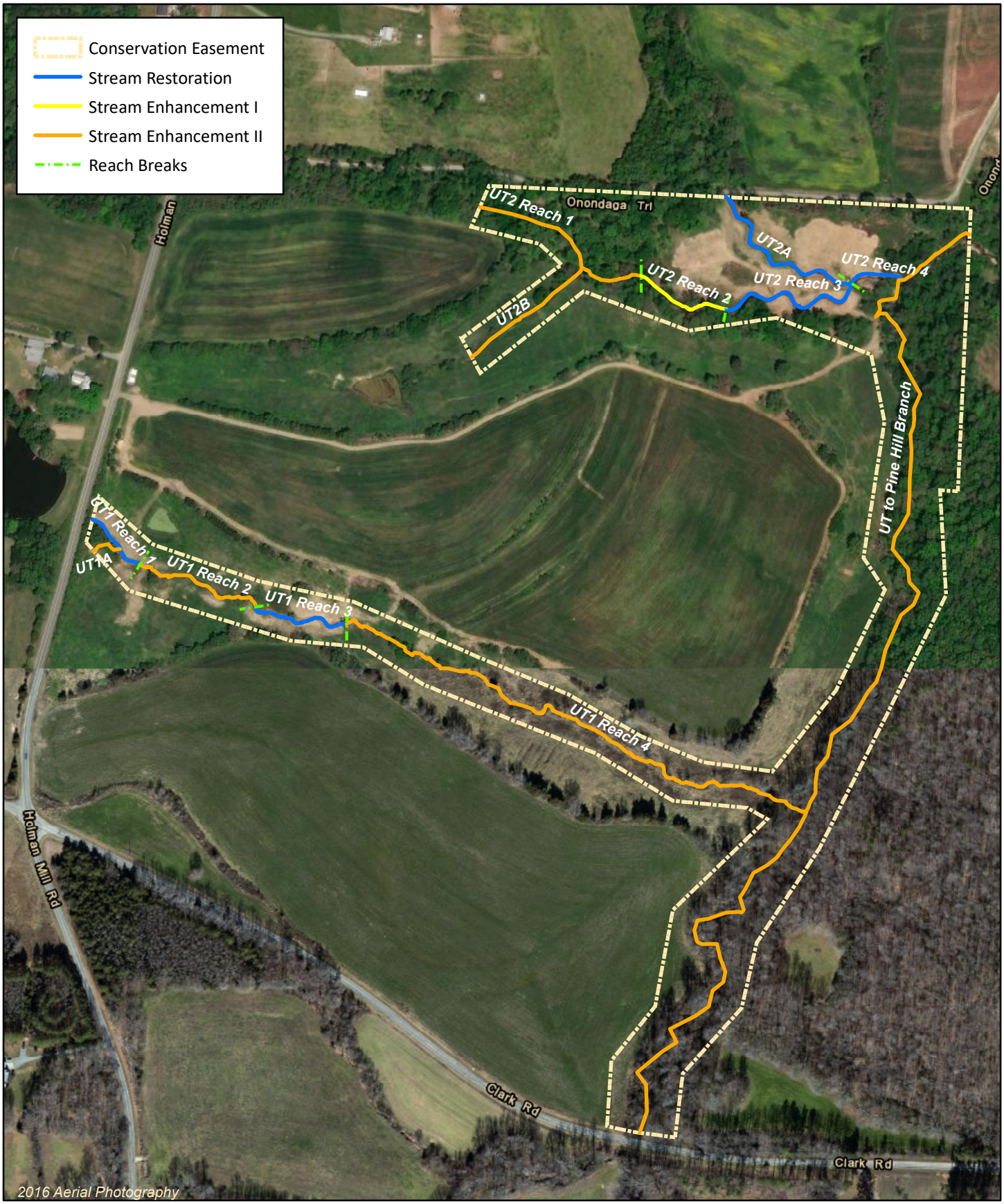



WILDLANDS ENGINEERING

0 0.5 1 Miles

Figure 1 Project Vicinity Map
Holman Mill Mitigation Site
DMS Project No. 96316
Monitoring Year 3 - 2018

*Alamance County, NC*




WILDLANDS ENGINEERING

0 200 400 Feet

Figure 2 Project Component/ Asset Map
Holman Mill Mitigation Site
DMS Project No. 96316
Monitoring Year 3 - 2018
*Alamance County, NC*

**Table 1. Project Components and Mitigation Credits**
Holman Mill Mitigation Site
DMS Project No. 96316
**Monitoring Year 3 - 2018**

| MITIGATION CREDITS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Stream | | Riparian Wetland | | Non-Riparian Wetland | | Buffer | Nitrogen Nutrient Offset | Phosphorous Nutrient Offset |
| Type | R | RE | R | RE | R | RE | | | |
| Totals | 3,884 | N/A | N/A | N/A | 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 | | | | | | | |
| UT to Pine Hill Branch | 600+00 - 635+26 | 3,526 | EII | Restoration | 3,526 | 5 | 705 |
| UT1 Reach 1 | 100+00-102+08 | 215 | P1 | Restoration | 208 | 1 | 208 |
| UT1 Reach 2 | 102+08 - 106+31 | 433 | EII | Restoration | 423 | 2.5 | 169 |
| UT1 Reach 3 | 106+31 - 109+40 | 331 | P1 | Restoration | 309 | 1 | 309 |
| UT1 Reach 4 | 109+40 - 125+98 | 1,687 | EII | Restoration | 1,658 | 2.5 | 663 |
| UT1A | 400+00 - 400+94 | 84 | EII | Restoration | 94 | 2.5 | 38 |
| UT2A | 300+00 - 305+40 | 468 | P1 | Restoration | 540 | 1 | 540 |
| UT2 Reach 1 | 200+00 - 205+88 | 588 | EII | Restoration | 588 | 2.5 | 235 |
| UT2 Reach2 | 205+88 - 208+81 | 298 | E1 | Restoration | 293 | 1.5 | 195 |
| UT2 Reach 3 | 208+81 - 213+63 | 396 | P1 | Restoration | 482 | 1 | 482 |
| UT2 Reach 4 | 213+63 - 215+30 | 242 | P1 | Restoration | 167 | 1 | 167 |
| UT2B | 500+00 - 504+29 | 429 | EII | Restoration | 429 | 2.5 | 172 |

| COMPONENT SUMMATION | | | | | | |
|---|---|---|---|---|---|---|
| Restoration Level | Stream (LF) | Riparian Wetland (acres) | | Non-Riparian Wetland (acres) | Buffer (acres) | Upland (acres) |
| | | Riverine | Non-Riverine | | | |
| Restoration | 1,706 | - | - | - | - | - |
| Enhancement | | - | - | - | - | - |
| Enhancement I | 293 | | | | | |
| Enhancement II | 6,718 | | | | | |
| Creation | | - | - | - | | |
| Preservation | - | - | - | - | | - |
| High Quality Preservation | - | - | - | - | | - |

**Table 2. Project Activity and Reporting History**
Holman Mill Mitigation Site
DMS Project No. 96316
**Monitoring Year 3 - 2018**

| Activity or Report | | Date Collection Complete | Completion or Scheduled Delivery |
|---|---|---|---|
| Mitigation Plan | | April 2014 - April 2015 | May 2015 |
| Final Design - Construction Plans | | May 2015 - October 2015 | October 2015 |
| Construction | | January 2016 - March 2016 | March 2016 |
| Temporary S&E mix applied to entire project area[1] | | March 2016 | March 2016 |
| Permanent seed mix applied to reach/segments[1] | | March 2016 | March 2016 |
| Bare root and live stake plantings for reach/segments | | March 2016 | March 2016 |
| Baseline Monitoring Document (Year 0) | Stream Survey | March 2016 | May 2016 |
| | Vegetation Survey | March 2016 | |
| Year 1 Monitoring | Stream Survey | September 2016 | December 2016 |
| | Vegetation Survey | September 2016 | |
| Year 2 Monitoring | Stream Survey | March 2017 | December 2017 |
| | Vegetation Survey | August 2017 | |
| Year 3 Monitoring | Stream Survey | March 2018 | December 2018 |
| | Vegetation Survey | August 2018 | |
| Year 4 Monitoring | Stream Survey | 2019 | December 2019 |
| | Vegetation Survey | 2019 | |
| Year 5 Monitoring | Stream Survey | 2020 | December 2020 |
| | Vegetation Survey | 2020 | |
| Year 6 Monitoring | Stream Survey | 2021 | December 2021 |
| | Vegetation Survey | 2021 | |
| Year 7 Monitoring | Stream Survey | 2022 | December 2022 |
| | Vegetation Survey | 2022 | |

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

**Table 3. Project Contact Table**
Holman Mill Mitigation Site
DMS Project No. 96316
**Monitoring Year 3 - 2018**

| | |
|---|---|
| **Designer**<br>Angela Allen, PE | **Wildlands Engineering, Inc.**<br>312 West Millbrook Road, Suite 225<br>Raleigh, NC 27609<br>919.851.9986, ext. 106 |
| **Construction Contractor** | **Land Mechanic Designs, Inc.**<br>126 Circle G Lane<br>Willow Spring, NC 27592 |
| **Planting Contractor** | **Bruton Natural Systems, Inc**<br>P.O. Box 1197<br>Fremont, NC 27830 |
| **Seeding Contractor** | **Land Mechanic Designs, Inc.**<br>126 Circle G Lane<br>Willow Spring, NC 27592 |
| **Seed Mix Sources** | **Green Resource, LLC** |
| **Nursery Stock Suppliers** | |
| **Bare Roots** | **Dykes and Son Nursery** |
| **Live Stakes** | **Bruton Natural Systems, Inc** |
| **Monitoring Performers**<br>Monitoring, POC | **Wildlands Engineering, Inc.**<br>Jason Lorch<br>919.851.9986, ext. 107 |

**Table 4. Project Information and Attributes**

Holman Mill Mitigation Site

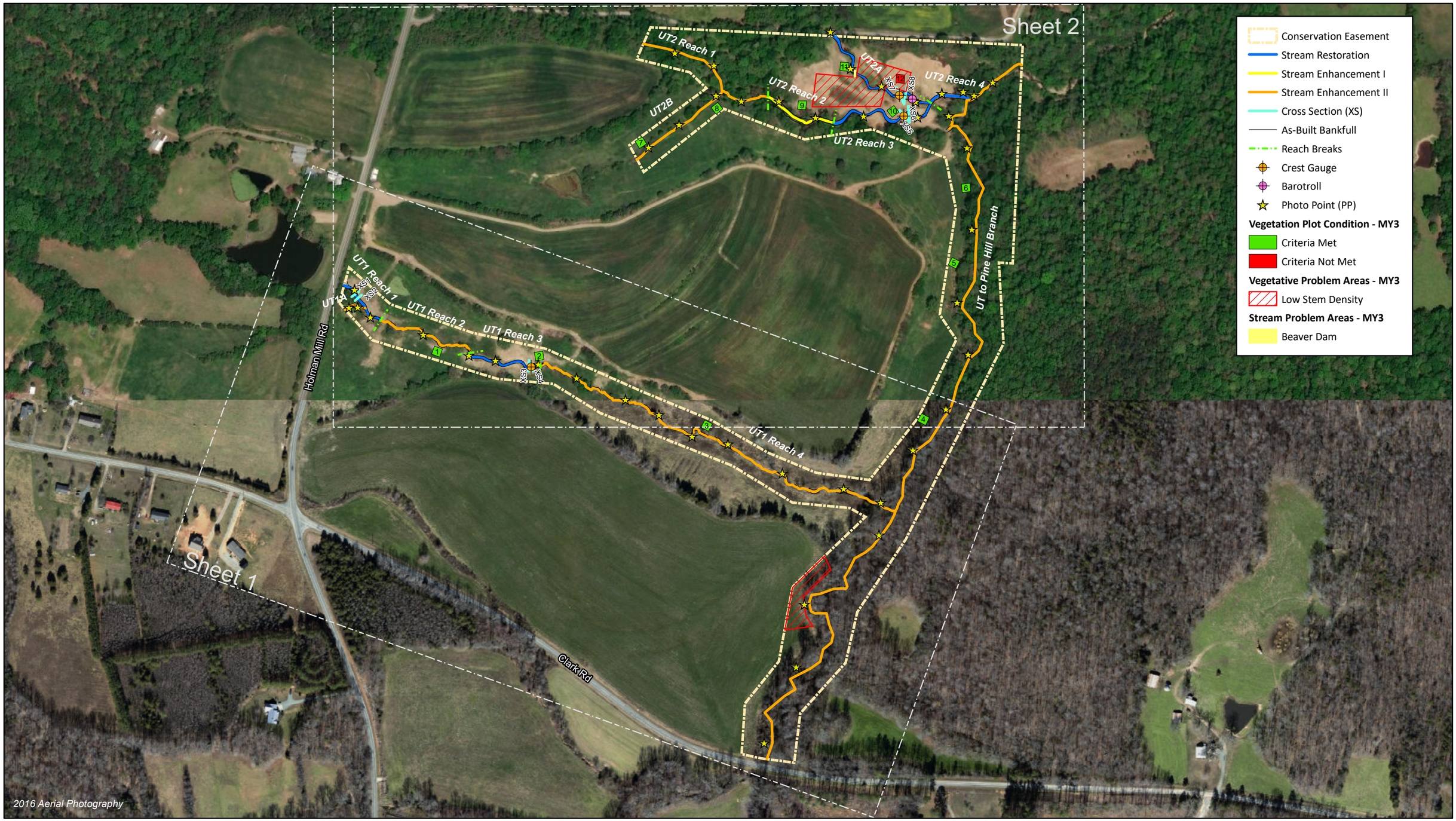
DMS Project No. 96316

**Monitoring Year 3 - 2018**

| PROJECT INFORMATION | | | | | | |
|---|---|---|---|---|---|---|
| Project Name | Holman Mill Mitigation Site | | | | | |
| County | Alamance County | | | | | |
| Project Area (acres) | 32.4 Acres | | | | | |
| Project Coordinates (latitude and longitude) | 35°51'310.12"N, 79°23'16.00"W | | | | | |
| **PROJECT WATERSHED SUMMARY INFORMATION** | | | | | | |
| Physiographic Province | Carolina Slate Belt of the Piedmont Physiographic Province | | | | | |
| River Basin | Cape Fear River | | | | | |
| USGS Hydrologic Unit 8-digit | 03030002 | | | | | |
| USGS Hydrologic Unit 14-digit | 03030002050050 | | | | | |
| DWR Sub-basin | 03-06-04 | | | | | |
| Project Drainage Area (acres) | 1,077 | | | | | |
| Project Drainage Area Percentage of Impervious Area | 3% | | | | | |
| CGIA Land Use Classification | 49% Forested/Scrubland, 42% Agriculture/Managed Herbaceous, 4% Pasture, 3% Watershed Impervious Cover, 2% Residential, <1% Open Water | | | | | |
| **REACH SUMMARY INFORMATION** | | | | | | |
| **Parameters** | **UT to Pine Hill Branch** | **UT1** | **UT1A** | **UT2** | **UT2A** | **UT2B** |
| Length of reach (linear feet) - Post-Restoration | 3,526 | 2,598 | 94 | 1,530 | 540 | 429 |
| Drainage area (acres) | 1,077 | 102 | 20 | 130 | 47 | 18 |
| NCDWR stream identification score | 44.5 | 33.5/30.5 | 25.5 | 35 | 36.75 | 26.5 |
| NCDWR Water Quality Classification | N/A | | | | | |
| Morphological Desription (stream type) | P | P | I | P | P | I |
| Evolutionary trend (Simon's Model) - Pre- Restoration | I | II | NA | III/IV | III/IV | NA |
| Underlying mapped soils | Georgeville silty clay loam, Local alluvial land, Herndon silt loam, Goldston Channery silt loam | | | | | |
| Drainage class | --- | --- | --- | --- | --- | --- |
| Soil Hydric status | --- | --- | --- | --- | --- | --- |
| Slope | --- | --- | --- | --- | --- | --- |
| FEMA classification | AE | AE | --- | AE | AE | --- |
| Native vegetation community | Piedmont bottomland forest, Bottomland hardwood forest | | | | | |
| Percent composition exotic invasive vegetation - Post-Restoration | 0% | | | | | |

| REGULATORY CONSIDERATIONS | | | |
|---|---|---|---|
| **Regulation** | **Applicable?** | **Resolved?** | **Supporting Documentation** |
| Waters of the United States - Section 404 | Yes | Yes | USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885. |
| Waters of the United States - Section 401 | Yes | Yes | |
| Division of Land Quality (Dam Safety) | No | N/A | N/A |
| Endangered Species Act | Yes | Yes | Holman Mill Mitigation Plan (2015); Wildlands determined "no effect" on Alamance County listed endangered species. |
| Historic Preservation Act | Yes | Yes | No historic resources were found to be impacted (letter from SHPO dated 3/24/14). |
| Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA) | No | N/A | N/A |
| FEMA Floodplain Compliance | Yes | Yes | UT to Pine Hill Branch and portions of UT2 and UT2A are located within the floodway and flood fringe (FEMA Zone AE, FIRM panel 8786). |
| Essential Fisheries Habitat | No | N/A | N/A |

**APPENDIX 2. Visual Assessment Data**



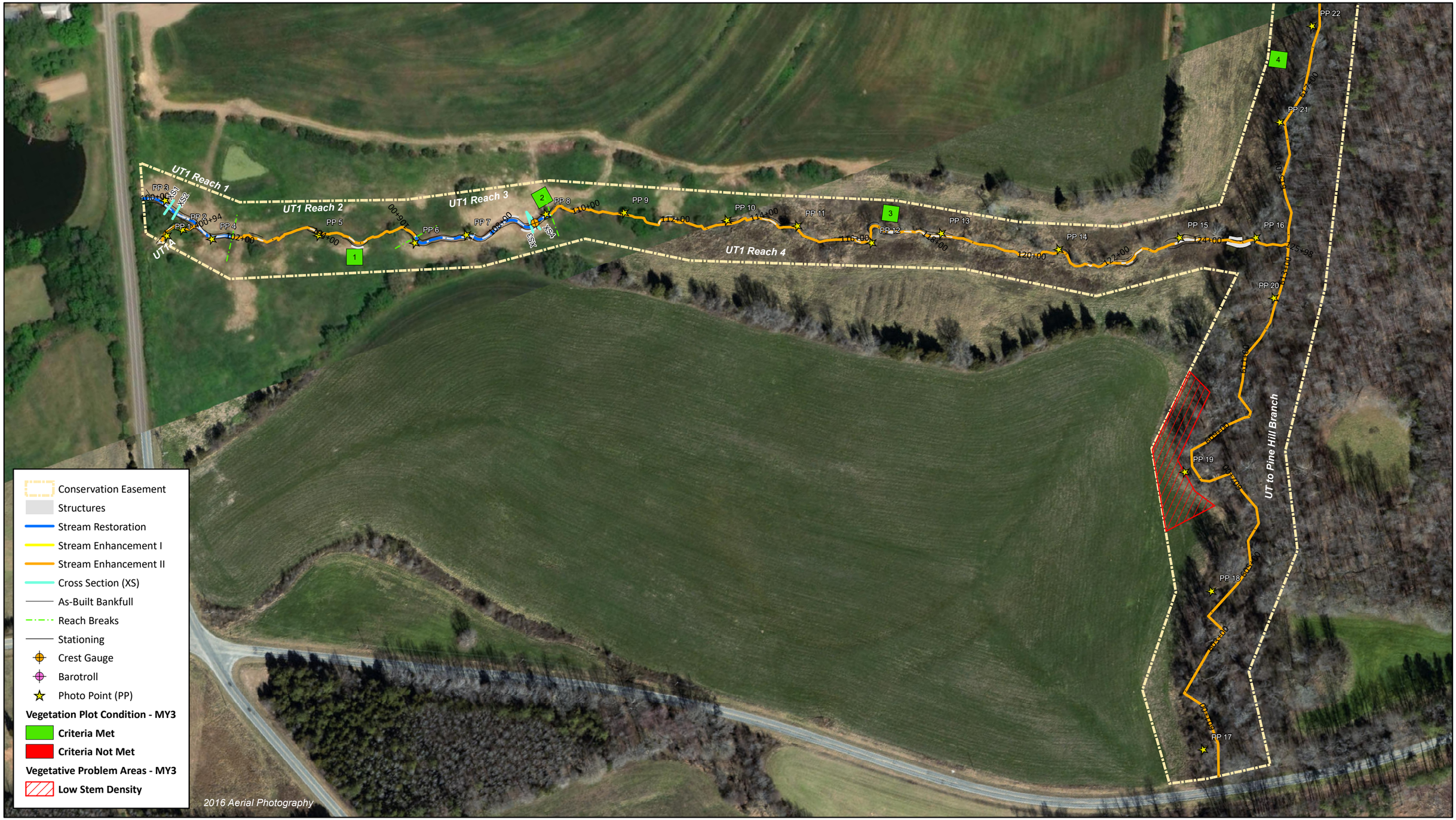

WILDLANDS ENGINEERING

0 175 350 525 700 Feet

N

Figure 3.0 Integrated Current Condition Plan View
(Key)
Holman Mill Mitigation Site
DMS Project No. 96316
Monitoring Year 3 - 2018

*Alamance County, NC*

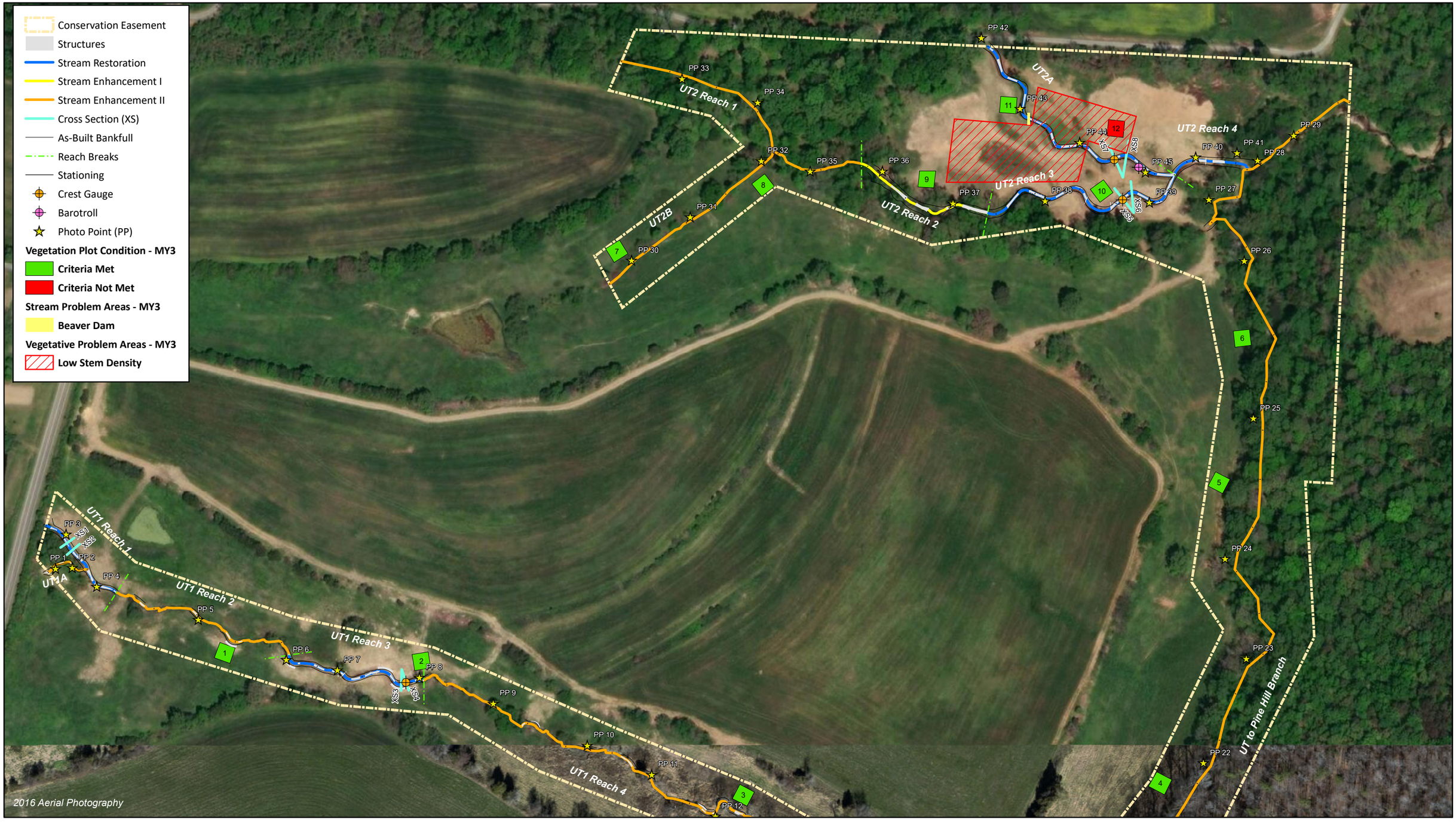



WILDLANDS ENGINEERING

0 125 250 375 500 Feet

Figure 3.1 Integrated Current Condition Plan View
Holman Mill Mitigation Site
DMS Project No. 96316
Monitoring Year 3 - 2018

*Alamance County, NC*




WILDLANDS ENGINEERING

0 125 250 375 500 Feet

N

Figure 3.2 Integrated Current Condition Plan View
Holman Mill Mitigation Site
DMS Project No. 96316
Monitoring Year 3 - 2018

*Alamance County, NC*

**Table 5a. Visual Stream Morphology Stability Assessment Table**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT1**

| 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 | 14 | 14 | | | 100% | | | |
| | **3. Meander Pool Condition** | Depth Sufficient | 13 | 13 | | | 100% | | | |
| | | Length Appropriate | 13 | 13 | | | 100% | | | |
| | **4. Thalweg Position** | Thalweg centering at upstream of meander bend (Run) | 12 | 12 | | | 100% | | | |
| | | Thalweg centering at downstream of meander bend (Glide) | 13 | 13 | | | 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. | 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 5b. Visual Stream Morphology Stability Assessment Table**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT1A**

| 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 | 3 | 3 | | | 100% | | | |
| | **3. Meander Pool Condition** | Depth Sufficient | n/a | n/a | | | n/a | | | |
| | | Length Appropriate | n/a | n/a | | | n/a | | | |
| | **4. Thalweg Position** | Thalweg centering at upstream of meander bend (Run) | n/a | n/a | | | n/a | | | |
| | | Thalweg centering at downstream of meander bend (Glide) | n/a | n/a | | | n/a | | | |
| | | | | | | | | | | |
| **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. | n/a | n/a | | | n/a | | | |
| | **2. Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | n/a | n/a | | | n/a | | | |
| | **2a. Piping** | Structures lacking any substantial flow underneath sills or arms. | n/a | n/a | | | n/a | | | |
| | **3. Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | n/a | n/a | | | n/a | | | |
| | **4. Habitat** | Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow. | n/a | n/a | | | n/a | | | |

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

**Table 5c. Visual Stream Morphology Stability Assessment Table**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT2**

| 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 | 14 | 14 | | | 100% | | | |
| | **3. Meander Pool Condition** | Depth Sufficient | 10 | 10 | | | 100% | | | |
| | | Length Appropriate | 10 | 10 | | | 100% | | | |
| | **4. Thalweg Position** | Thalweg centering at upstream of meander bend (Run) | 13 | 13 | | | 100% | | | |
| | | Thalweg centering at downstream of meander bend (Glide) | 13 | 13 | | | 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. | 3 | 3 | | | 100% | | | |
| | **2. Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 3 | 3 | | | 100% | | | |
| | **2a. Piping** | Structures lacking any substantial flow underneath sills or arms. | 3 | 3 | | | 100% | | | |
| | **3. Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | 3 | 3 | | | 100% | | | |
| | **4. Habitat** | Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow. | 3 | 3 | | | 100% | | | |

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

**Table 5d. Visual Stream Morphology Stability Assessment Table**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT2A**

| 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 | 11 | 11 | | | 100% | | | |
| | **3. Meander Pool Condition** | Depth Sufficient | 10 | 10 | | | 100% | | | |
| | | Length Appropriate | 10 | 10 | | | 100% | | | |
| | **4. Thalweg Position** | Thalweg centering at upstream of meander bend (Run) | 11 | 11 | | | 100% | | | |
| | | Thalweg centering at downstream of meander bend (Glide) | 10 | 10 | | | 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. | 2 | 2 | | | 100% | | | |
| | **2. Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 2 | 2 | | | 100% | | | |
| | **2a. Piping** | Structures lacking any substantial flow underneath sills or arms. | 2 | 2 | | | 100% | | | |
| | **3. Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | 2 | 2 | | | 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 riffles since they are evaluated in section 1.

**Table 5e. Visual Stream Morphology Stability Assessment Table**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT2B**

| 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 | n/a | n/a | | | n/a | | | |
| | **3. Meander Pool Condition** | Depth Sufficient | n/a | n/a | | | n/a | | | |
| | | Length Appropriate | n/a | n/a | | | n/a | | | |
| | **4. Thalweg Position** | Thalweg centering at upstream of meander bend (Run) | n/a | n/a | | | n/a | | | |
| | | Thalweg centering at downstream of meander bend (Glide) | n/a | n/a | | | n/a | | | |
| | | | | | | | | | | |
| **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. | n/a | n/a | | | n/a | | | |
| | **2. Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | n/a | n/a | | | n/a | | | |
| | **2a. Piping** | Structures lacking any substantial flow underneath sills or arms. | n/a | n/a | | | n/a | | | |
| | **3. Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | n/a | n/a | | | n/a | | | |
| | **4. Habitat** | Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow. | n/a | n/a | | | n/a | | | |

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

**Table 5f. Visual Stream Morphology Stability Assessment Table**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT to Pine Hill Branch**

| 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 | n/a | n/a | | | n/a | | | |
| | **3. Meander Pool Condition** | Depth Sufficient | n/a | n/a | | | n/a | | | |
| | | Length Appropriate | n/a | n/a | | | n/a | | | |
| | **4. Thalweg Position** | Thalweg centering at upstream of meander bend (Run) | n/a | n/a | | | n/a | | | |
| | | Thalweg centering at downstream of meander bend (Glide) | n/a | n/a | | | n/a | | | |
| | | | | | | | | | | |
| **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. | n/a | n/a | | | n/a | | | |
| | **2. Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | n/a | n/a | | | n/a | | | |
| | **2a. Piping** | Structures lacking any substantial flow underneath sills or arms. | n/a | n/a | | | n/a | | | |
| | **3. Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | n/a | n/a | | | n/a | | | |
| | **4. Habitat** | Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow. | n/a | n/a | | | n/a | | | |

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

**Table 6. Vegetation Condition Assessment Table**

Holman Mill Mitigation Project

DMS Project No. 96316

**Monitoring Year 3 - 2018**

**Planted Acreage** **14**

| 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% |
| **Low Stem Density Areas** | Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria. | 0.1 | 2 | 1.5 | 11% |
| | | **Total** | **2** | **1.5** | **11%** |
| **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 | 0 | 0 | 0% |
| | | **Cumulative Total** | **2** | **1.5** | **11%** |

**Easement Acreage** **32.4**

| 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 | 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 – looking upstream (03/20/2018)** | **PHOTO POINT 1 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 2 – looking upstream (03/20/2018)** | **PHOTO POINT 2 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 3 – looking upstream (03/20/2018)** | **PHOTO POINT 3 – looking downstream (03/20/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 4 – looking upstream (03/20/2018)** | **PHOTO POINT 4 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 5 – looking upstream (03/20/2018)** | **PHOTO POINT 5 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 6 – looking upstream (03/20/2018)** | **PHOTO POINT 6 – looking downstream (03/20/2018)** |

**PHOTO POINT 7 – looking upstream (03/20/2018)**

**PHOTO POINT 7 – looking downstream (03/20/2018)**

**PHOTO POINT 8 – looking upstream (03/20/2018)**

**PHOTO POINT 8 – looking downstream (03/20/2018)**

**PHOTO POINT 9 – looking upstream (03/20/2018)**

**PHOTO POINT 9 – looking downstream (03/20/2018)**

| | |
|---|---|
|  |  |
| **PHOTO POINT 10 – looking upstream (03/20/2018)** | **PHOTO POINT 10 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 11 – looking upstream (03/20/2018)** | **PHOTO POINT 11 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 12 – looking upstream (03/20/2018)** | **PHOTO POINT 12 – looking downstream (03/20/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 13 – looking upstream (03/20/2018)** | **PHOTO POINT 13 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 14 – looking upstream (03/20/2018)** | **PHOTO POINT 14 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 15 – looking upstream (03/20/2018)** | **PHOTO POINT 15 – looking downstream (03/20/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 16 – looking upstream (03/20/2018)** | **PHOTO POINT 16 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 17 – looking upstream (03/20/2018)** | **PHOTO POINT 17 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 18 – looking upstream (03/20/2018)** | **PHOTO POINT 18 – looking downstream (03/20/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 19 – looking upstream (03/20/2018)** | **PHOTO POINT 19 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 20 – looking upstream (03/20/2018)** | **PHOTO POINT 20 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 21 – looking upstream (03/20/2018)** | **PHOTO POINT 21 – looking downstream (03/20/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 22 – looking upstream (03/20/2018)** | **PHOTO POINT 22 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 23 – looking upstream (03/20/2018)** | **PHOTO POINT 23 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 24 – looking upstream (03/20/2018)** | **PHOTO POINT 24 – looking downstream (03/20/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 25 – looking upstream (03/20/2018)** | **PHOTO POINT 25 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 26 – looking upstream (03/20/2018)** | **PHOTO POINT 26 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 27 – looking upstream (03/20/2018)** | **PHOTO POINT 27 – looking downstream (03/20/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 28 – looking upstream (03/20/2018)** | **PHOTO POINT 28 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 29 – looking upstream (03/20/2018)** | **PHOTO POINT 29 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 30 – looking upstream (03/12/2018)** | **PHOTO POINT 30 – looking downstream (03/12/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 31 – looking upstream (03/12/2018)** | **PHOTO POINT 31 – looking downstream (03/12/2018)** |
|  |  |
| **PHOTO POINT 32 – looking upstream (03/12/2018)** | **PHOTO POINT 32 – looking downstream (03/12/2018)** |
|  |  |
| **PHOTO POINT 33 – looking upstream (03/12/2018)** | **PHOTO POINT 33 – looking downstream (03/12/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 34 – looking upstream (03/12/2018)** | **PHOTO POINT 34 – looking downstream (03/12/2018)** |
|  |  |
| **PHOTO POINT 35 – looking upstream (03/12/2018)** | **PHOTO POINT 35 – looking downstream (03/12/2018)** |
|  |  |
| **PHOTO POINT 36 – looking upstream (03/12/2018)** | **PHOTO POINT 36 – looking downstream (03/12/2018)** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 37 – looking upstream (03/12/2018)** | **PHOTO POINT 37 – looking downstream (03/12/2018)** |
|  |  |
| **PHOTO POINT 38 – looking upstream (03/20/2018)** | **PHOTO POINT 38 – looking downstream (03/20/2018)** |
|  |  |
| **PHOTO POINT 39 – looking upstream (03/20/2018)** | **PHOTO POINT 39 – looking downstream (03/20/2018)** |

**PHOTO POINT 40 – looking upstream (03/20/2018)**

**PHOTO POINT 40 – looking downstream (03/20/2018)**

**PHOTO POINT 41 – looking upstream (03/20/2018)**

**PHOTO POINT 41 – looking downstream (03/20/2018)**

**PHOTO POINT 42 – looking upstream (03/12/2018)**

**PHOTO POINT 42 – looking downstream (03/12/2018)**

**PHOTO POINT 43 – looking upstream (03/12/2018)**

**PHOTO POINT 43 – looking downstream (03/12/2018)**

**PHOTO POINT 44 – looking upstream (03/12/2018)**

**PHOTO POINT 44 – looking downstream (03/12/2018)**

**PHOTO POINT 45 – looking upstream (03/12/2018)**

**PHOTO POINT 45 – looking downstream (03/12/2018)**

# Vegetation Photographs

**Vegetation Plot 1** *(08/02/2018)*

**Vegetation Plot 2** *(08/02/2018)*

**Vegetation Plot 3** *(08/02/2018)*

**Vegetation Plot 4** *(08/02/2018)*

**Vegetation Plot 5** *(08/02/2018)*

**Vegetation Plot 6** *(08/02/2018)*


**Vegetation Plot 7** *(08/02/2018)*


**Vegetation Plot 8** *(08/02/2018)*


**Vegetation Plot 9** *(08/02/2018)*


**Vegetation Plot 10** *(08/02/2018)*


**Vegetation Plot 11** *(08/02/2018)*


**Vegetation Plot 12** *(08/02/2018)*

# APPENDIX 3. Vegetation Plot Data

### Table 7. Vegetation Plot Criteria Attainment Table

Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

| Plot | Success Criteria Met (Y/N) | Tract Mean |
|---|---|---|
| 1 | Y | 92% |
| 2 | Y | |
| 3 | Y | |
| 4 | Y | |
| 5 | Y | |
| 6 | Y | |
| 7 | Y | |
| 8 | Y | |
| 9 | Y | |
| 10 | Y | |
| 11 | Y | |
| 12 | N | |

**Table 8. CVS Vegetation Tables - Metadata**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

| | |
|---|---|
| **Report Prepared By** | Carolyn Lanza |
| **Date Prepared** | 8/7/2018 15:57 |
| **Database Name** | Holman Mill MY2- cvs-eep-entrytool-v2.5.0.mdb |
| **Database Location** | F:\Projects\005-02146 Holman Mill\Monitoring\Monitoring Year 3\Vegetation Assessment |
| **Computer Name** | JOELOVENSHIMER |
| **File Size** | 82616320 |
| **DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------** | |
| **Metadata** | Description of database file, the report worksheets, and a summary of project(s) and project data. |
| **Project Planted** | Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes. |
| **Project 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** | 96316 |
| **Project Name** | Holman Mill |
| **Description** | Stream Restoration Project |
| **Sampled Plots** | 12 |

**Table 9. Planted and Total Stem Counts**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

| | | | Current Plot Data (MY3 2018) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 96316-WEI-0001 | | | 96316-WEI-0002 | | | 96316-WEI-0003 | | | 96316-WEI-0004 | | | 96316-WEI-0005 | | |
| **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** |
| *Betula nigra* | River Birch | Tree | 6 | 6 | 6 | 4 | 4 | 4 | 3 | 3 | 3 | | | | 3 | 3 | 3 |
| *Calycanthus floridus* | Sweet-shrub | Shrub | | | | | | | | | | | | 1 | | | |
| *Fraxinus pennsylvanica* | Green Ash | Tree | 6 | 6 | 6 | 4 | 4 | 4 | 3 | 3 | 3 | 7 | 7 | 7 | 5 | 5 | 5 |
| *Juniperus virginiana* | Eastern Red Cedar | Tree | | | | | | | | | | | | | | | 1 |
| *Liquidambar styraciflua* | Sweet Gum | Tree | | | 10 | | | | | | | | | | | | 6 |
| *Liriodendron tulipifera* | Tulip Poplar | Tree | 1 | 1 | 1 | | | | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 |
| *Platanus occidentalis* | American Sycamore | Tree | | | | | | | | | | | | | 1 | 1 | 1 |
| *Quercus palustris* | Pin Oak | Tree | | | | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| *Quercus phellos* | Willow Oak | Tree | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | |
| *Rhus copallinum* | Winged Sumac | Shrub Tree | | | | | | | | | | | | | | | |
| *Salix nigra* | Black Willow | Tree | | | | | | | | | | | | | | | |
| *Symphoricarpos orbiculatus* | Coralberry | Shrub | | | 1 | | | | | | | | | | | | |
| *Ulmus alata* | Winged Elm | Tree | | | 1 | | | | | | | | | | | | |
| *Ulmus americana* | American Elm | Tree | | | | | | | | | | | | 3 | | | 3 |
| | | **Stem count** | 14 | 14 | 26 | 11 | 11 | 11 | 13 | 13 | 13 | 11 | 11 | 15 | 13 | 13 | 23 |
| | | **size (ares)** | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | |
| | | **size (ACRES)** | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | |
| | | **Species count** | 4 | 4 | 7 | 4 | 4 | 4 | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 8 |
| | | **Stems per ACRE** | 567 | 567 | 1052 | 445 | 445 | 445 | 526 | 526 | 526 | 445 | 445 | 607 | 526 | 526 | 931 |

**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**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

| | | | Current Plot Data (MY3 2018) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 96316-WEI-0006 | | | 96316-WEI-0007 | | | 96316-WEI-0008 | | | 96316-WEI-0009 | | | 96316-WEI-0010 | | |
| **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** |
| *Betula nigra* | River Birch | Tree | | | | | | | | | | 1 | 1 | 1 | 5 | 5 | 5 |
| *Calycanthus floridus* | Sweet-shrub | Shrub | | | | | | | | | | | | | | | |
| *Fraxinus pennsylvanica* | Green Ash | Tree | 7 | 7 | 8 | 3 | 3 | 3 | 5 | 5 | 5 | | | 7 | | | |
| *Juniperus virginiana* | Eastern Red Cedar | Tree | | | | | | | | | | | | | | | |
| *Liquidambar styraciflua* | Sweet Gum | Tree | | | 3 | | | 3 | | | 46 | | | 3 | | | 3 |
| *Liriodendron tulipifera* | Tulip Poplar | Tree | 1 | 1 | 1 | | | | | | | | | | | | |
| *Platanus occidentalis* | American Sycamore | Tree | | | | 2 | 2 | 2 | 4 | 4 | 4 | 9 | 9 | 9 | 2 | 2 | 2 |
| *Quercus palustris* | Pin Oak | Tree | 3 | 3 | 3 | 2 | 2 | 2 | | | | 1 | 1 | 1 | 1 | 1 | 1 |
| *Quercus phellos* | Willow Oak | Tree | | | | 5 | 5 | 5 | 4 | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 2 |
| *Rhus copallinum* | Winged Sumac | Shrub Tree | | | | | | | | | | | | | | | |
| *Salix nigra* | Black Willow | Tree | | | | | | | | | | | | | | | 7 |
| *Symphoricarpos orbiculatus* | Coralberry | Shrub | | | | | | | | | | | | | | | |
| *Ulmus alata* | Winged Elm | Tree | | | 5 | | | 8 | | | 9 | | | | | | 4 |
| *Ulmus americana* | American Elm | Tree | | | | | | | | | | | | | | | |
| | | **Stem count** | 11 | 11 | 20 | 12 | 12 | 23 | 13 | 13 | 68 | 13 | 13 | 23 | 10 | 10 | 24 |
| | | **size (ares)** | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | |
| | | **size (ACRES)** | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | |
| | | **Species count** | 3 | 3 | 5 | 4 | 4 | 6 | 3 | 3 | 5 | 4 | 4 | 6 | 4 | 4 | 7 |
| | | **Stems per ACRE** | 445 | 445 | 809 | 486 | 486 | 931 | 526 | 526 | 2752 | 526 | 526 | 931 | 405 | 405 | 971 |

**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

Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

| | | | Current Plot Data (MY3 2018) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 96316-WEI-0011 | | | 96316-WEI-0012 | | |
| **Scientific Name** | **Common Name** | **Species Type** | **PnoLS** | **P-all** | **T** | **PnoLS** | **P-all** | **T** |
| *Betula nigra* | River Birch | Tree | 4 | 4 | 4 | 1 | 1 | 1 |
| *Calycanthus floridus* | Sweet-shrub | Shrub | | | | | | |
| *Fraxinus pennsylvanica* | Green Ash | Tree | | | | | | 4 |
| *Juniperus virginiana* | Eastern Red Cedar | Tree | | | | | | |
| *Liquidambar styraciflua* | Sweet Gum | Tree | | | | | | 11 |
| *Liriodendron tulipifera* | Tulip Poplar | Tree | 1 | 1 | 1 | | | |
| *Platanus occidentalis* | American Sycamore | Tree | 2 | 2 | 2 | 3 | 3 | 3 |
| *Quercus palustris* | Pin Oak | Tree | 1 | 1 | 1 | 1 | 1 | 1 |
| *Quercus phellos* | Willow Oak | Tree | 3 | 3 | 3 | 1 | 1 | 2 |
| *Rhus copallinum* | Winged Sumac | Shrub Tree | | | 4 | | | |
| *Salix nigra* | Black Willow | Tree | | | | | | |
| *Symphoricarpos orbiculatus* | Coralberry | Shrub | | | | | | |
| *Ulmus alata* | Winged Elm | Tree | | | | | | |
| *Ulmus americana* | American Elm | Tree | | | | | | 3 |
| | | **Stem count** | 11 | 11 | 15 | 6 | 6 | 25 |
| | | **size (ares)** | | 1 | | | 1 | |
| | | **size (ACRES)** | | 0.02 | | | 0.02 | |
| | | **Species count** | 5 | 5 | 6 | 4 | 4 | 7 |
| | | **Stems per ACRE** | 445 | 445 | 607 | 243 | 243 | 1012 |

**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**

Holman Mill Mitigation Project

DMS Project No. 96316

**Monitoring Year 3 - 2018**

| | | | Annual Means | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MY3 (2018) | | | MY2 (2017) | | | MY1 (2016) | | | MY0 (2016) | | |
| Scientific Name | Common Name | Species Type | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T |
| *Betula nigra* | River Birch | Tree | 27 | 27 | 27 | 27 | 27 | 27 | 28 | 28 | 28 | 31 | 31 | 31 |
| *Calycanthus floridus* | Sweet-shrub | Shrub | | | 1 | | | | | | | | | |
| *Fraxinus pennsylvanica* | Green Ash | Tree | 40 | 40 | 52 | 42 | 42 | 44 | 39 | 39 | 39 | 39 | 39 | 39 |
| *Juniperus virginiana* | Eastern Red Cedar | Tree | | | 1 | | | 1 | | | | | | |
| *Liquidambar styraciflua* | Sweet Gum | Tree | | | 85 | | | 26 | | | | | | |
| *Liriodendron tulipifera* | Tulip Poplar | Tree | 13 | 13 | 13 | 14 | 14 | 16 | 33 | 33 | 33 | 35 | 35 | 35 |
| *Platanus occidentalis* | American Sycamore | Tree | 23 | 23 | 23 | 22 | 22 | 22 | 41 | 41 | 41 | 45 | 45 | 45 |
| *Quercus palustris* | Pin Oak | Tree | 15 | 15 | 15 | 15 | 15 | 15 | 18 | 18 | 18 | 18 | 18 | 18 |
| *Quercus phellos* | Willow Oak | Tree | 20 | 20 | 21 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| *Rhus copallinum* | Winged Sumac | Shrub Tree | | | 4 | | | | | | | | | |
| *Salix nigra* | Black Willow | Tree | | | 7 | | | 3 | | | | | | |
| *Symphoricarpos orbiculatus* | Coralberry | Shrub | | | 1 | | | | | | | | | |
| *Ulmus alata* | Winged Elm | Tree | | | 27 | | | 10 | | | | | | |
| *Ulmus americana* | American Elm | Tree | | | 9 | | | | | | | | | |
| | | **Stem count** | 138 | 138 | 286 | 140 | 140 | 184 | 179 | 179 | 179 | 188 | 188 | 188 |
| | | **size (ares)** | | 12 | | | 12 | | | 12 | | | 12 | |
| | | **size (ACRES)** | | 0.30 | | | 0.30 | | | 0.30 | | | 0.30 | |
| | | **Species count** | 6 | 6 | 14 | 6 | 6 | 10 | 6 | 6 | 6 | 6 | 6 | 6 |
| | | **Stems per ACRE** | 465 | 465 | 965 | 472 | 472 | 621 | 604 | 604 | 604 | 634 | 634 | 634 |

**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**
Holman Mill Mitigation Site
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT1**

| | | PRE-RESTORATION | | REFERENCE REACH DATA | | | | | | DESIGN | | AS-BUILT/BASELINE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Gage** | **UT1 - Reach 1/3** | | **Agony Acres UT1A-Reach 1** | | **UT to Polecat Creek** | | **UT to Varnals Creek** | | **UT1 - Reach 1/3** | | **UT1 - Reach 1/3** | |
| | | | | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** |
| **Dimension and Substrate - Riffle** | | | | | | | | | | | | | |
| Bankfull Width (ft) | N/A | 5.7 | | 9.1 | 10.4 | 5.3 | 10.9 | 9.3 | 10.5 | 7.8 | | 7.5 | 7.9 |
| Floodprone Width (ft) | | 12 | | >36 | | 25 | 65 | 20 | 64 | 15 | 65 | 23 | 24 |
| Bankfull Mean Depth | | 0.7 | | 1.0 | 1.2 | 1.0 | 1.1 | 1.1 | 1.2 | 0.6 | | 0.6 | |
| Bankfull Max Depth | | 1.0 | | 1.8 | | 1.4 | 1.7 | 1.5 | 1.7 | 0.8 | 1.0 | 0.9 | |
| Bankfull Cross Sectional Area ($ft^2$) | | 4.3 | | 10.7 | 11.3 | 5.4 | 12.4 | 10.3 | 12.3 | 4.3 | | 4.3 | 4.6 |
| Width/Depth Ratio | | 8.1 | | 7.3 | 10.1 | 5.2 | 9.6 | 8.1 | 9.3 | 14.1 | | 13.1 | 13.6 |
| Entrenchment Ratio | | 2.0 | | >3.9 | | 3.2 | 8.3 | 1.9 | 6.1 | 1.9 | 8.3 | 3.0 | 3.1 |
| Bank Height Ratio | | 2.2 | | 1.0 | | 1.0 | 1.1 | 0.9 | 1.0 | 0.9 | 1.1 | 1.0 | |
| D50 (mm) | | 33.1 | | --- | | --- | | --- | | --- | | 28.8 | 32.0 |
| **Profile** | | | | | | | | | | | | | |
| Riffle Length (ft) | N/A | --- | | --- | | --- | | --- | | --- | | 12.5 | 31.4 |
| Riffle Slope (ft/ft) | | --- | | N/A | | 0.0040 | 0.0470 | 0.0240 | 0.0570 | 0.0158 | 0.0661 | 0.0200 | 0.0690 |
| Pool Length (ft) | | --- | | --- | | --- | | --- | | --- | | 6.0 | 23.6 |
| Pool Max Depth (ft) | | --- | | 2.5 | | 1.8 | | 2.5 | 2.6 | 0.9 | 1.7 | 1.5 | 3.4 |
| Pool Spacing (ft) | | --- | | N/A | | 34 | 52 | 8 | 82 | 2 | 44 | 20 | 53 |
| Pool Volume ($ft^3$) | | --- | | --- | | --- | | --- | | --- | | --- | |
| **Pattern** | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | N/A | 62 | 82 | 21 | 93 | 28 | 50 | 15 | 45 | 12 | 69 | 11 | 45 |
| Radius of Curvature (ft) | | 56 | 90 | 14 | 60 | 19 | 50 | 8 | 47 | 10 | 45 | 9 | 37 |
| Rc:Bankfull Width (ft/ft) | | 6.2 | 9.9 | 1.5 | 5.8 | 2.0 | 5.3 | 0.6 | 3.2 | 1.3 | 5.8 | 1.2 | 4.7 |
| Meander Length (ft) | | 209 | 300 | N/A | | -- | -- | -- | -- | 25 | 128 | 31 | 75 |
| Meander Width Ratio | | 6.8 | 9.0 | 2.3 | 8.9 | 3.0 | 5.3 | 1.0 | 3.0 | 1.6 | 8.9 | 1.5 | 5.7 |
| **Substrate, Bed and Transport Parameters** | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | N/A | --- | | --- | | --- | | --- | | --- | | --- | |
| SC%/Sa%/G%/C%/B%/Be% | | --- | | --- | | --- | | --- | | --- | | --- | |
| d16/d35/d50/d84/d95/d100 | | 0.18/8.66/33.11/ 128/2655/>2048 | | --- | | --- | | --- | | --- | | 0.22/2.97/6.6/38.7/ 69.7/128 | |
| Reach Shear Stress (Competency) $lb/ft^2$ | | 1.6 | | --- | | --- | | --- | | 0.9 | | 0.7 | |
| Max part size (mm) mobilized at bankfull | | --- | | --- | | --- | | --- | | --- | | --- | |
| Stream Power (Capacity) $W/m^2$ | | --- | | --- | | --- | | --- | | --- | | --- | |
| **Additional Reach Parameters** | | | | | | | | | | | | | |
| Drainage Area (SM) | N/A | 0.16 | | 0.30 | | 0.41 | | 0.41 | | 0.16 | | 0.16 | |
| Watershed Impervious Cover Estimate (%) | | 2% | | --- | | --- | | --- | | 2% | | 2% | |
| Rosgen Classification | | B4 | | E4 | | E4 | | E4 | | C4 | | C4 | |
| Bankfull Velocity (fps) | | 3.0 | | 2.2 | 2.4 | 2.2 | 3.5 | 4.4 | 5.2 | 3.2 | | 3.5 | 3.6 |
| Bankfull Discharge (cfs) | | 14.0 | | 25.3 | | 20.3 | | 54.0 | | 14.0 | | 15.0 | 16.7 |
| Q-NFF regression | | --- | | --- | | --- | | --- | | --- | | --- | |
| Q-USGS extrapolation | | --- | | --- | | --- | | --- | | --- | | --- | |
| Q-Mannings | | --- | | --- | | --- | | --- | | --- | | --- | |
| Valley Length (ft) | | --- | | --- | | --- | | --- | | 468 | | 468 | |
| Channel Thalweg Length (ft) | | 2,648 | | --- | | --- | | --- | | 519 | | 517 | |
| Sinuosity | | 1.12 | | 1.35 | | 1.40 | | 1.20 | | 1.15 | 1.20 | 1.10 | |
| Water Surface Slope ($ft/ft)^2$ | | --- | | --- | | --- | | --- | | --- | | 0.0246 | |
| Bankfull Slope (ft/ft) | | 0.025 | | 0.004 | 0.028 | 0.012 | | 0.017 | | 0.015 | 0.03 | 0.0203 | |

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

**Table 10b. Baseline Stream Data Summary**
Holman Mill Mitigation Site
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT2**

| | | PRE-RESTORATION CONDITION | | REFERENCE REACH DATA | | | | | | DESIGN | | | | AS-BUILT/BASELINE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Gage** | **UT2 - Reach 3** | **UT2 - Reach 4** | **Agony Acres UT1A-Reach 1** | | **UT to Polecat Creek** | | **UT to Varnals Creek** | | **UT2 - Reach 3** | | **UT2 - Reach 4** | | **UT2 - Reach 3** | | **UT2 - Reach 4** | |
| | | | | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** |
| **Dimension and Substrate - Riffle** | | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | | 5.7 | 5.4 | 9.1 | 10.4 | 5.3 | 10.9 | 9.3 | 10.5 | 7.9 | | 11.2 | | 9.7 | | 9.7 | |
| Floodprone Width (ft) | | 12 | 26 | >36 | | 25 | 65 | 20 | 64 | 17 | 79 | 25 | 90 | 100 | | 100 | |
| Bankfull Mean Depth | | 0.7 | 0.8 | 1.0 | 1.2 | 1.0 | 1.1 | 1.1 | 1.2 | 0.6 | | 0.8 | | 0.5 | | 0.5 | |
| Bankfull Max Depth | | 1.0 | 1.5 | 1.8 | | 1.4 | 1.7 | 1.5 | 1.7 | 0.8 | 1.0 | 1.1 | 1.5 | 0.8 | | 0.8 | |
| Bankfull Cross Sectional Area ($ft^2$) | N/A | 4.3 | 4.1 | 10.7 | 11.3 | 5.4 | 12.4 | 10.3 | 12.3 | 4.4 | | 9.1 | | 4.5 | | 4.5 | |
| Width/Depth Ratio | | 8.1 | 6.8 | 7.3 | 10.1 | 5.2 | 9.6 | 8.1 | 9.3 | 14.0 | | 14.0 | | 20.5 | | 20.5 | |
| Entrenchment Ratio | | 2.0 | 4.7 | >3.9 | | 3.2 | 8.3 | 1.9 | 6.1 | 2.2 | 10.0 | 2.2 | 8.0 | 10.4 | | 10.4 | |
| Bank Height Ratio | | 2.2 | 2.1 | 1.0 | | 1.0 | 1.1 | 0.9 | 1.0 | 1.0 | 1.1 | 1.0 | 1.1 | 1.0 | | 1.0 | |
| D50 (mm) | | 33.1 | 0.7 | --- | | --- | | --- | | --- | | --- | | 11.4 | | 11.4 | |
| **Profile** | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | | --- | --- | --- | | --- | | --- | | --- | | --- | | 14.7 | 45.8 | 23.7 | 31.4 |
| Riffle Slope (ft/ft) | | --- | --- | N/A | | 0.0040 | 0.0470 | 0.024 | 0.057 | 0.0138 | 0.0598 | 0.0062 | 0.0264 | 0.0135 | 0.0288 | 0.0395* | 0.0592* |
| Pool Length (ft) | | --- | --- | --- | | --- | | --- | | --- | | --- | | 20.4 | 59.8 | 10.5 | 12.1 |
| Pool Max Depth (ft) | N/A | --- | 2.3 | 2.5 | | 1.8 | | 2.5 | 2.6 | 0.9 | 1.7 | 1.3 | 2.5 | 1.5 | 2.7 | 1.9 | 3.1 |
| Pool Spacing (ft) | | --- | --- | N/A | | 34 | 52 | 8 | 82 | 4 | 44 | 3 | 63 | 56 | 87 | 33 | 61 |
| Pool Volume ($ft^3$) | | --- | --- | --- | | --- | | --- | | --- | | --- | | --- | | --- | |
| **Pattern** | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | | 62 | 82 | 16 | 50 | 21 | 93 | 28 | 50 | 15 | 45 | 13 | 70 | 18 | 100 | 31 | 52 | 20 | |
| Radius of Curvature (ft) | | 56 | 90 | 10 | 47 | 14 | 60 | 19 | 50 | 8 | 47 | 10 | 46 | 15 | 65 | 18 | 42 | 45 | |
| Rc:Bankfull Width (ft/ft) | N/A | 6.2 | 9.9 | 1.2 | 5.6 | 1.5 | 5.8 | 2.0 | 5.3 | 0.6 | 3.2 | 1.3 | 5.8 | 1.3 | 5.8 | 1.9 | 4.3 | 4.6 | |
| Meander Length (ft) | | 209 | 300 | 42 | 192 | N/A | | -- | -- | -- | -- | 25 | 130 | 36 | 184 | 56 | 92 | 130 | |
| Meander Width Ratio | | 6.8 | 9.0 | 1.9 | 6.0 | 2.3 | 8.9 | 3.0 | 5.3 | 1.0 | 3.0 | 1.6 | 8.9 | 1.6 | 8.9 | 3.2 | 5.4 | 2.1 | |
| **Substrate, Bed and Transport Parameters** | | | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | | --- | --- | --- | | --- | | --- | | --- | | --- | | --- | | --- | |
| SC%/Sa%/G%/C%/B%/Be% | | --- | --- | --- | | --- | | --- | | --- | | --- | | --- | | --- | |
| d16/d35/d50/d84/d95/d100 | N/A | 0.18/8.66/33.11/ 128/2655/>2048 | SC/0.43/0.69/ 17.84/32.14/64 | --- | | --- | | --- | | --- | | --- | | SC/2.18/5.6/ 34.0/56.9/362.0 | | SC/2.18/5.6/ 34.0/56.9/362.0 | |
| Reach Shear Stress (Competency) $lb/ft^2$ | | 1.77 | 1.10 | --- | | --- | | --- | | 0.38 | | 0.59 | | 0.38 | | 0.44 | |
| Max part size (mm) mobilized at bankfull | | --- | --- | --- | | --- | | --- | | --- | | --- | | --- | | --- | |
| Stream Power (Capacity) $W/m^2$ | | --- | --- | --- | | --- | | --- | | --- | | --- | | --- | | --- | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | |
| Drainage Area (SM) | | 0.13 | 0.21 | 0.30 | | 0.41 | | 0.41 | | 0.13 | | 0.21 | | 0.13 | | 0.21 | |
| Watershed Impervious Cover Estimate (%) | | 2% | 2% | --- | | --- | | --- | | 2% | | 2% | | 2% | | 2% | |
| Rosgen Classification | | B4 | E5 | E4 | | E4 | | E4 | | C4 | | C4 | | C4 | | C4 | |
| Bankfull Velocity (fps) | | 3.0 | 2.9 | 2.2 | 2.4 | 2.2 | 3.5 | 4.4 | 5.2 | 2.9 | | 2.5 | | 2.6 | | N/A | |
| Bankfull Discharge (cfs) | | 13.0 | 22.0 | 25.3 | | 20.3 | | 54.0 | | 13.0 | | 22.0 | | 11.7 | | N/A | |
| Q-NFF regression | | --- | --- | | | --- | | --- | | --- | | --- | | --- | | --- | |
| Q-USGS extrapolation | N/A | --- | --- | | | --- | | --- | | --- | | --- | | --- | | --- | |
| Q-Mannings | | --- | --- | | | --- | | --- | | --- | | --- | | --- | | --- | |
| Valley Length (ft) | | --- | --- | --- | | --- | | --- | | 386 | | 152 | | --- | | --- | |
| Channel Thalweg Length (ft) | | 396 | 242 | --- | | --- | | --- | | 479 | | 210 | | 482 | | 167 | |
| Sinuosity | | 1.12 | 1.17 | 1.35 | | 1.40 | | 1.20 | | 1.15 | 1.25 | 1.13 | 1.20 | | | 1.05 | |
| Water Surface Slope ($ft/ft)^2$ | | --- | --- | --- | | --- | | --- | | --- | | --- | | 0.0119 | | 0.0237 | |
| Bankfull Slope (ft/ft) | | 0.0300 | 0.013 | 0.0040 | 0.028 | 0.012 | | 0.0170 | | 0.014 | | 0.02 | | 0.0120 | | 0.0176 | |

*: Alignment change during consturction created steeper riffles
(---): Data was not provided
N/A: Not Applicable

**Table 10c. Baseline Stream Data Summary**
Holman Mill Mitigation Site
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT2A**

| | | PRE-RESTORATION | REFERENCE REACH DATA | | | | | | DESIGN | | AS-BUILT/ BASELINE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Gage** | **UT2A** | **Agony Acres UT1A-Reach 1** | | **UT to Polecat Creek** | | **UT to Varnals Creek** | | **UT2A** | | **UT2A** | |
| | | | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** |
| **Dimension and Substrate - Riffle** | | | | | | | | | | | | |
| Bankfull Width (ft) | N/A | 5.1 | 9.1 | 10.4 | 5.3 | 10.9 | 9.3 | 10.5 | 6.4 | | 6.6 | |
| Floodprone Width (ft) | | 11.5 | >36 | | 25 | 65 | 20 | 64 | 14 | 80 | 100 | |
| Bankfull Mean Depth | | 0.4 | 1.0 | 1.2 | 1.0 | 1.1 | 1.1 | 1.2 | 0.5 | | 0.5 | |
| Bankfull Max Depth | | 0.9 | 1.8 | | 1.4 | 1.7 | 1.5 | 1.7 | 0.7 | 0.9 | 0.7 | |
| Bankfull Cross Sectional Area ($ft^2$) | | 2.1 | 10.7 | 11.3 | 5.4 | 12.4 | 10.3 | 12.3 | 3.3 | | 3.2 | |
| Width/Depth Ratio | | 12 | 7.3 | 10.1 | 5.2 | 9.6 | 8.1 | 9.3 | 13.0 | | 13.5 | |
| Entrenchment Ratio | | 2.3 | >3.9 | | 3.2 | 8.3 | 1.9 | 6.1 | 2.2 | 12.5 | 15.1 | |
| Bank Height Ratio | | 3.4 | 1.0 | | 1.0 | 1.1 | 0.9 | 1.0 | 0.9 | 1.1 | 1.0 | |
| D50 (mm) | | 3.2 | --- | | --- | | --- | | --- | | 18.3 | |
| **Profile** | | | | | | | | | | | | |
| Riffle Length (ft) | N/A | --- | --- | | --- | | --- | | --- | | 17.9 | 38.2 |
| Riffle Slope (ft/ft) | | --- | N/A | | 0.0040 | 0.0470 | 0.0240 | 0.0570 | 0.018 | 0.08 | 0.0007 | 0.0520 |
| Pool Length (ft) | | --- | --- | | --- | | --- | | --- | | 16.3 | 33.0 |
| Pool Max Depth (ft) | | 2.4 | 2.5 | | 1.8 | | 2.5 | 2.6 | 0.8 | 1.6 | 1.5 | 3.3 |
| Pool Spacing (ft) | | --- | N/A | | 34 | 52 | 8 | 82 | 2 | 36 | 29 | 62 |
| Pool Volume ($ft^3$) | | --- | --- | | --- | | --- | | --- | | --- | |
| **Pattern** | | | | | | | | | | | | |
| Channel Beltwidth (ft) | N/A | 15 | 30 | 21 | 93 | 28 | 50 | 15 | 45 | 10 | 57 | 25 | 40 |
| Radius of Curvature (ft) | | 5.8 | 33 | 14 | 60 | 19 | 50 | 8 | 47 | 8 | 37 | 11 | 31 |
| Rc:Bankfull Width (ft/ft) | | 1.1 | 6.5 | 1.5 | 5.8 | 2.0 | 5.3 | 0.6 | 3.2 | 1.3 | 5.8 | 1.7 | 4.7 |
| Meander Length (ft) | | 27 | 69 | N/A | | -- | -- | -- | -- | 20 | 105 | 41 | 61 |
| Meander Width Ratio | | 2.9 | 9.0 | 2.3 | 8.9 | 3.0 | 5.3 | 1.0 | 3.0 | 1.6 | 8.6 | 3.8 | 6.1 |
| **Substrate, Bed and Transport Parameters** | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | N/A | --- | --- | | --- | | --- | | --- | | --- | |
| SC%/Sa%/G%/C%/B%/Be% | | --- | --- | | --- | | --- | | --- | | --- | |
| d16/d35/d50/d84/d95/d100 | | 0.18/8.66/33.11/ 128/2655/>2048 | --- | | --- | | --- | | --- | | 3.15/11.86/18.3/ 43.5/101.2/362 | |
| Reach Shear Stress (Competency) $lb/ft^2$ | | 1.85 | --- | | --- | | --- | | 0.52 | | 0.45 | |
| Max part size (mm) mobilized at bankfull | | --- | --- | | --- | | --- | | --- | | --- | |
| Stream Power (Capacity) $W/m^2$ | | --- | --- | | --- | | --- | | --- | | --- | |
| **Additional Reach Parameters** | | | | | | | | | | | | |
| Drainage Area (SM) | N/A | 0.08 | 0.30 | | 0.41 | | 0.41 | | 0.08 | | 0.08 | |
| Watershed Impervious Cover Estimate (%) | | 2% | --- | | --- | | --- | | 2% | | 2% | |
| Rosgen Classification | | C4b | E4 | | E4 | | E4 | | C4 | | C4 | |
| Bankfull Velocity (fps) | | 2.5 | 2.2 | 2.4 | 2.2 | 3.5 | 4.4 | 5.2 | 3.1 | | 2.9 | |
| Bankfull Discharge (cfs) | | 9.0 | 25.3 | | 20.3 | | 54.0 | | 9.0 | | 8.6 | |
| Q-NFF regression | | --- | | | --- | | --- | | --- | | --- | |
| Q-USGS extrapolation | | --- | | | --- | | --- | | --- | | --- | |
| Q-Mannings | | --- | | | --- | | --- | | --- | | --- | |
| Valley Length (ft) | | --- | --- | | --- | | --- | | 480 | | 480 | |
| Channel Thalweg Length (ft) | | 468 | --- | | --- | | --- | | 540 | | 540 | |
| Sinuosity | | 1.15 | 1.35 | | 1.40 | | 1.20 | | 1.15 | 1.25 | 1.13 | |
| Water Surface Slope ($ft/ft)^2$ | | --- | --- | | --- | | --- | | --- | | 0.0129 | |
| Bankfull Slope (ft/ft) | | 0.023 | 0.0040 | 0.028 | 0.012 | | 0.0170 | | 0.007 | 0.018 | 0.0143 | |

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

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

Holman Mill Mitigation Site

DMS Project No. 96316

**Monitoring Year 3 - 2018**

| | UT1 Reach 1 | | | | | | | | | | | | | | | | UT1 Reach 3 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cross Section 1 (Riffle) | | | | | | | | Cross Section 2 (Pool) | | | | | | | | Cross Section 3 (Pool) | | | | | | | | Cross Section 4 (Riffle)[4] | | | | | | | |
| 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)[1] | 570.5 | 570.5 | 570.5 | 570.7 | | | | | 569.8 | 569.8 | 569.8 | 569.9 | | | | | 554.1 | 554.1 | 554.1 | 554.2 | | | | | 554.3 | 554.3 | 554.3 | 554.6 | | | | |
| Low Bank Elevation (ft) | 570.5 | 570.5 | 570.5 | 570.7 | | | | | 569.8 | 569.8 | 569.8 | 569.8 | | | | | 554.1 | 554.1 | 554.1 | 554.1 | | | | | 554.3 | 554.3 | 554.3 | 554.4 | | | | |
| Bankfull Width (ft) | 7.9 | 7.7 | 7.2 | 8.3 | | | | | 8.4 | 7.3 | 7.1 | 8.2 | | | | | 9.6 | 8.9 | 8.5 | 9.2 | | | | | 10.7 | 9.9 | 9.4 | 9.8 | | | | |
| Floodprone Width (ft) | 23.6 | 21.6 | 21.6 | 22.0 | | | | | N/A | N/A | N/A | N/A | | | | | N/A | N/A | N/A | N/A | | | | | 23.4 | 17.0 | 17.0 | 17.0 | | | | |
| Bankfull Mean Depth (ft) | 0.6 | 0.5 | 0.5 | 0.6 | | | | | 0.9 | 0.9 | 0.8 | 0.9 | | | | | 0.9 | 0.9 | 0.9 | 0.9 | | | | | 0.7 | 0.7 | 0.6 | 0.8 | | | | |
| Bankfull Max Depth (ft) | 0.9 | 0.8 | 0.8 | 1.1 | | | | | 1.6 | 1.5 | 1.4 | 1.5 | | | | | 1.8 | 1.9 | 1.7 | 1.7 | | | | | 1.3 | 1.2 | 1.1 | 1.4 | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 4.6 | 3.8 | 3.6 | 4.6 | | | | | 7.4 | 6.5 | 5.8 | 7.4 | | | | | 8.2 | 8.1 | 7.9 | 8.2 | | | | | 8.0 | 6.4 | 6.1 | 8.0 | | | | |
| Bankfull Width/Depth Ratio | 13.6 | 15.8 | 14.4 | 15.1 | | | | | 9.5 | 8.3 | 8.7 | 9.1 | | | | | 11.3 | 9.8 | 9.2 | 10.3 | | | | | 14.3 | 15.2 | 14.6 | 12.0 | | | | |
| Entrenchment Ratio[2] | 3.0 | 2.8 | 3.0 | 3.0 | | | | | N/A | N/A | N/A | N/A | | | | | N/A | N/A | N/A | N/A | | | | | 2.2 | 1.7 | 1.8 | 1.7 | | | | |
| Bankfull Bank Height Ratio[3] | 1.0 | 1.0 | 1.0 | 1.0 | | | | | N/A | N/A | N/A | N/A | | | | | N/A | N/A | N/A | N/A | | | | | 1.0 | 1.0 | 1.0 | <1.0 | | | | |
| | UT2 Reach 3 | | | | | | | | | | | | | | | | UT2A | | | | | | | | | | | | | |
| | Cross Section 5 (Riffle) | | | | | | | | Cross Section 6 (Pool) | | | | | | | | Cross Section 7 (Riffle) | | | | | | | | Cross Section 8 (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)[1] | 520.1 | 520.1 | 520.1 | 520.1 | | | | | 519.5 | 519.5 | 519.5 | 519.5 | | | | | 520.5 | 520.5 | 520.5 | 520.6 | | | | | 520.2 | 520.2 | 520.2 | 520.3 | | | | |
| Low Bank Elevation (ft) | 520.1 | 520.1 | 520.1 | 520.1 | | | | | 519.5 | 519.5 | 519.5 | 519.5 | | | | | 520.5 | 520.5 | 520.5 | 520.6 | | | | | 520.2 | 520.2 | 520.2 | 520.1 | | | | |
| Bankfull Width (ft) | 9.7 | 9.8 | 9.2 | 9.8 | | | | | 9.9 | 10.7 | 10.6 | 10.0 | | | | | 6.6 | 7.5 | 7.4 | 8.3 | | | | | 9.7 | 8.6 | 9.8 | 9.5 | | | | |
| Floodprone Width (ft) | 100.0 | 100.0 | 100.0 | 100.0 | | | | | N/A | N/A | N/A | N/A | | | | | 100.0 | 100.0 | 100.0 | 100.0 | | | | | N/A | N/A | N/A | N/A | | | | |
| Bankfull Mean Depth (ft) | 0.5 | 0.4 | 0.4 | 0.5 | | | | | 0.9 | 0.8 | 0.8 | 0.9 | | | | | 0.5 | 0.4 | 0.4 | 0.4 | | | | | 0.9 | 0.8 | 0.9 | 1.0 | | | | |
| Bankfull Max Depth (ft) | 0.8 | 0.9 | 0.9 | 0.9 | | | | | 1.6 | 1.7 | 1.6 | 1.7 | | | | | 0.7 | 0.7 | 0.7 | 0.9 | | | | | 1.5 | 1.6 | 1.6 | 1.7 | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 4.5 | 4.4 | 3.9 | 4.5 | | | | | 8.9 | 9.0 | 8.4 | 8.9 | | | | | 3.2 | 2.7 | 2.7 | 3.2 | | | | | 9.1 | 8.6 | 9.1 | 9.1 | | | | |
| Bankfull Width/Depth Ratio | 20.5 | 21.9 | 21.7 | 21.2 | | | | | 11.0 | 12.7 | 13.4 | 11.2 | | | | | 13.5 | 20.7 | 20.6 | 21.6 | | | | | 10.4 | 12.3 | 10.5 | 9.9 | | | | |
| Entrenchment Ratio[2] | 10.4 | 10.2 | 10.8 | 10.2 | | | | | N/A | N/A | N/A | N/A | | | | | 15.1 | 13.3 | 13.4 | 12.0 | | | | | N/A | N/A | N/A | N/A | | | | |
| Bankfull Bank Height Ratio[3] | 1.0 | 1.0 | 1.0 | 1.0 | | | | | N/A | N/A | N/A | N/A | | | | | 1.0 | 1.0 | 1.0 | <1.0 | | | | | N/A | N/A | N/A | N/A | | | | |

N/A: Not Applicable

[1]For MY3 through MY7 bankfull elevation was calculated using the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS.

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

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

[4] Cross Section 4 Bankful Elevation was changed at MY3. Base and MY1-2 was updated based off of new Bankfull Elevation.

**Table 12a. Monitoring Data - Stream Reach Data Summary**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT1 Reach 1**

| 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 - Riffle** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 7.9 | | 7.7 | | 7.2 | | 8.3 | | | | | | | | | |
| Floodprone Width (ft) | 24 | | 22 | | 22 | | 22 | | | | | | | | | |
| Bankfull Mean Depth | 0.6 | | 0.5 | | 0.5 | | 0.6 | | | | | | | | | |
| Bankfull Max Depth | 0.9 | | 0.8 | | 0.8 | | 1.1 | | | | | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 4.6 | | 3.8 | | 3.6 | | 4.6 | | | | | | | | | |
| Width/Depth Ratio | 13.6 | | 15.8 | | 14.4 | | 15.1 | | | | | | | | | |
| Entrenchment Ratio | 3.0 | | 2.8 | | 3 | | 3.0 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 1.0 | | 1.0 | | | | | | | | | |
| D50 (mm) | 32.0 | | 43.7 | | 7.1 | | 6.2 | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 12.5 | 31.4 | | | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.0200 | 0.0690 | | | | | | | | | | | | | | |
| Pool Length (ft) | 6.0 | 23.6 | | | | | | | | | | | | | | |
| Pool Max Depth (ft) | 1.5 | 3.4 | | | | | | | | | | | | | | |
| Pool Spacing (ft) | 20 | 53 | | | | | | | | | | | | | | |
| Pool Volume ($ft^3$) | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 11 | 45 | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 9 | 37 | | | | | | | | | | | | | | |
| Rc:Bankfull Width (ft/ft) | 1.1 | 4.7 | | | | | | | | | | | | | | |
| Meander Wave Length (ft) | 31 | 75 | | | | | | | | | | | | | | |
| Meander Width Ratio | 1.4 | 5.7 | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | | | | | | | | | | |
| Channel Thalweg Length (ft) | 208 | | | | | | | | | | | | | | | |
| Sinuosity (ft) | 1.1 | | | | | | | | | | | | | | | |
| Water Surface Slope (ft/ft) | 0.0246 | | | | | | | | | | | | | | | |
| Bankfull Slope (ft/ft) | 0.0203 | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | |
| d16/d35/d50/d84/d95/d100 | 0.22/2.97/6.6/38.7/ 69.7/128 | | SC/1.19/9.1/57.4/ 107.3/256 | | SC/SC/4.9/61.0/ 163.2/362 | | SC/SC/2.1/42.9/137.0/ 256 | | | | | | | | | |
| % of Reach with Eroding Banks | 0% | | 0% | | 0% | | 0% | | | | | | | | | |

(---): Data was not provided

**Table 12b. Monitoring Data - Stream Reach Data Summary**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT1 Reach 3**

| 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 - Riffle** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 10.7 | | 9.9 | | 9.4 | | 9.8 | | | | | | | | | |
| Floodprone Width (ft) | 23 | | 17 | | 17 | | 17 | | | | | | | | | |
| Bankfull Mean Depth | 0.7 | | 0.7 | | 0.6 | | 0.8 | | | | | | | | | |
| Bankfull Max Depth | 1.3 | | 1.2 | | 1.1 | | 1.4 | | | | | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 8.0 | | 6.4 | | 6.1 | | 8.0 | | | | | | | | | |
| Width/Depth Ratio | 14.3 | | 15.2 | | 14.6 | | 12.0 | | | | | | | | | |
| Entrenchment Ratio | 2.2 | | 1.7 | | 1.8 | | 1.7 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 1.0 | | <1.0 | | | | | | | | | |
| D50 (mm) | 28.8 | | 22.6 | | 23.6 | | 10.0 | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 12.5 | 31.4 | | | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.0200 | 0.0690 | | | | | | | | | | | | | | |
| Pool Length (ft) | 6.0 | 23.6 | | | | | | | | | | | | | | |
| Pool Max Depth (ft) | 1.5 | 3.4 | | | | | | | | | | | | | | |
| Pool Spacing (ft) | 20 | 53 | | | | | | | | | | | | | | |
| Pool Volume ($ft^3$) | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 11 | 45 | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 9 | 37 | | | | | | | | | | | | | | |
| Rc:Bankfull Width (ft/ft) | 0.8 | 3.5 | | | | | | | | | | | | | | |
| Meander Wave Length (ft) | 31 | 75 | | | | | | | | | | | | | | |
| Meander Width Ratio | 1.0 | 4.2 | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | | | | | | | | | | |
| Channel Thalweg Length (ft) | 309 | | | | | | | | | | | | | | | |
| Sinuosity (ft) | 1.1 | | | | | | | | | | | | | | | |
| Water Surface Slope (ft/ft) | 0.0246 | | | | | | | | | | | | | | | |
| Bankfull Slope (ft/ft) | 0.0203 | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | |
| d16/d35/d50/d84/d95/d100 | 0.22/2.97/6.6/38.7/ 69.7/128 | | SC/1.19/9.1/57.4/ 107.3/256 | | 0.75/13.14/23.6/63.4/ 138.2/256 | | SC/SC/2.1/42.9/137.0/ 256 | | | | | | | | | |
| % of Reach with Eroding Banks | 0% | | 0% | | 0% | | 0% | | | | | | | | | |

(---): Data was not provided

[1] Cross Section 4 Bankful Elevation was changed at MY3. As-Built/Baseline and MY1-2 was updated based off of new Bankfull Elevation.

**Table 12c. Monitoring Data - Stream Reach Data Summary**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT2 Reaches 3, 4**

| 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 - Riffle** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 9.7 | | 9.8 | | 9.2 | | 9.8 | | | | | | | | | |
| Floodprone Width (ft) | 100 | | 100 | | 100 | | 100 | | | | | | | | | |
| Bankfull Mean Depth | 0.5 | | 0.4 | | 0.4 | | 0.5 | | | | | | | | | |
| Bankfull Max Depth | 0.8 | | 0.9 | | 0.9 | | 0.9 | | | | | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 4.5 | | 4.4 | | 3.9 | | 4.5 | | | | | | | | | |
| Width/Depth Ratio | 20.5 | | 21.9 | | 21.7 | | 21.2 | | | | | | | | | |
| Entrenchment Ratio | 10.4 | | 10.2 | | 10.8 | | 10.2 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 1.0 | | 1.0 | | | | | | | | | |
| D50 (mm) | 11.4 | | 35.0 | | 41.3 | | 16.0 | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 15 | 46 | | | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.0135 | 0.0592 | | | | | | | | | | | | | | |
| Pool Length (ft) | 11 | 60 | | | | | | | | | | | | | | |
| Pool Max Depth (ft) | 1.5 | 3.1 | | | | | | | | | | | | | | |
| Pool Spacing (ft) | 33 | 61 | | | | | | | | | | | | | | |
| Pool Volume ($ft^3$) | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 20 | 52 | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 18 | 45 | | | | | | | | | | | | | | |
| Rc:Bankfull Width (ft/ft) | 1.9 | 4.6 | | | | | | | | | | | | | | |
| Meander Wave Length (ft) | 56 | 130 | | | | | | | | | | | | | | |
| Meander Width Ratio | 2.1 | 3.2 | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | | | | | | | | | | |
| Channel Thalweg Length (ft) | 649 | | | | | | | | | | | | | | | |
| Sinuosity (ft) | 1.15 | | | | | | | | | | | | | | | |
| Water Surface Slope (ft/ft) | 0.0119 | 0.0237 | | | | | | | | | | | | | | |
| Bankfull Slope (ft/ft) | 0.0120 | 0.0176 | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | |
| d16/d35/d50/d84/d95/d100 | SC/2.18/5.6/ 34.0/56.9/362.0 | | 1.0/9.17/24.5/53.7/ 77.8/128 | | 19.15/31.72/41.3/84.3/ 123.1/256 | | SC/2.50/11.0/53.7/98.3/1 80.3 | | | | | | | | | |
| % of Reach with Eroding Banks | 0% | | 0% | | 0% | | 0% | | | | | | | | | |

(---): Data was not provided

**Table 12d. Monitoring Data - Stream Reach Data Summary**
Holman Mill Mitigation Project
DMS Project No. 96316
**Monitoring Year 3 - 2018**

**UT2A**

| 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 - Riffle** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 6.6 | | 7.5 | | 7.4 | | 8.3 | | | | | | | | | |
| Floodprone Width (ft) | 100 | | 100 | | 100 | | 100 | | | | | | | | | |
| Bankfull Mean Depth | 0.5 | | 0.4 | | 0.4 | | 0.4 | | | | | | | | | |
| Bankfull Max Depth | 0.7 | | 0.7 | | 0.7 | | 0.9 | | | | | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 3.2 | | 2.7 | | 2.7 | | 3.2 | | | | | | | | | |
| Width/Depth Ratio | 13.5 | | 20.7 | | 20.6 | | 21.6 | | | | | | | | | |
| Entrenchment Ratio | 15.1 | | 13.3 | | 13.4 | | 12.0 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 1.0 | | <1.0 | | | | | | | | | |
| D50 (mm) | 18.3 | | 29.7 | | 7.1 | | 11.2 | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 17.9 | 38.2 | | | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.0007 | 0.0520 | | | | | | | | | | | | | | |
| Pool Length (ft) | 16.3 | 33.0 | | | | | | | | | | | | | | |
| Pool Max Depth (ft) | 1.5 | 3.3 | | | | | | | | | | | | | | |
| Pool Spacing (ft) | 29 | 62 | | | | | | | | | | | | | | |
| Pool Volume ($ft^3$) | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 25 | 40 | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 11 | 31 | | | | | | | | | | | | | | |
| Rc:Bankfull Width (ft/ft) | 1.7 | 4.7 | | | | | | | | | | | | | | |
| Meander Wave Length (ft) | 41 | 61 | | | | | | | | | | | | | | |
| Meander Width Ratio | 3.8 | 6.1 | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | | | | | | | | | | |
| Channel Thalweg Length (ft) | 540 | | | | | | | | | | | | | | | |
| Sinuosity (ft) | 1.10 | | | | | | | | | | | | | | | |
| Water Surface Slope (ft/ft) | 0.0129 | | | | | | | | | | | | | | | |
| Bankfull Slope (ft/ft) | 0.0143 | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | |
| d16/d35/d50/d84/d95/d100 | 3.15/11.86/18.3/43.5/ 101.2/362 | | .21/6.69/20.1/53.1/ 75.9/128 | | SC/0.87/1.9/32.0/ 75.9/128 | | SC/SC/11/45.0/86.6/ 2048.0 | | | | | | | | | |
| % of Reach with Eroding Banks | 0% | | 0% | | 0% | | 0% | | | | | | | | | |

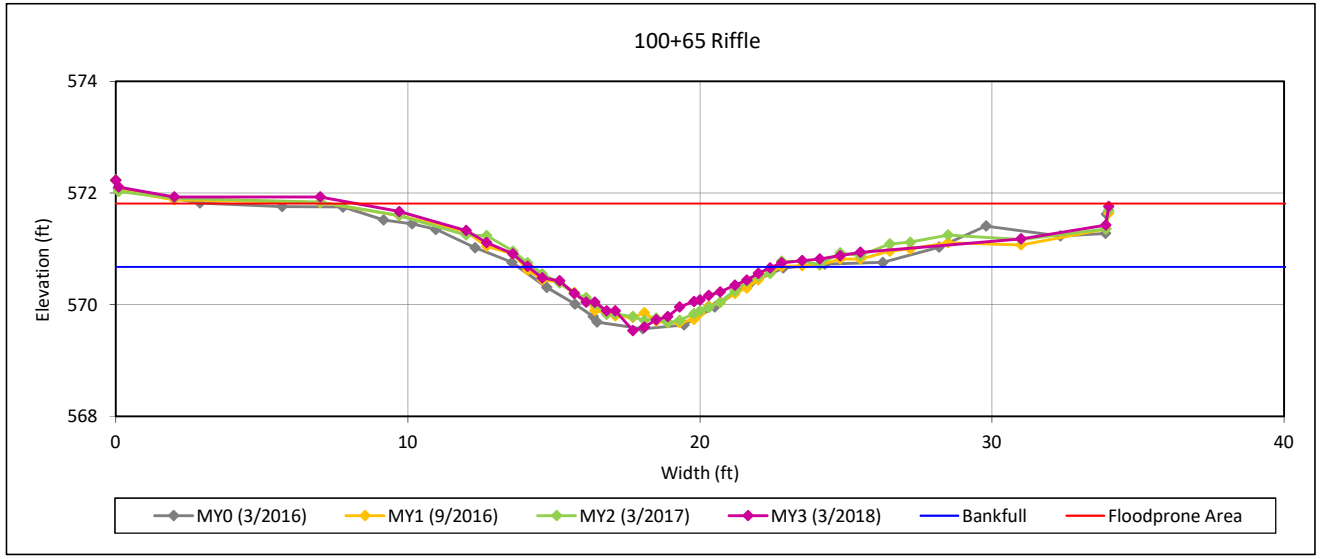
(---): Data was not provided

## Cross Section Plots

Holman Mill Mitigation Site (DMS Project No. 96316)

**Monitoring Year 3 - 2018**

**Cross Section 1-UT1**




| Bankfull Dimensions | |
|---|---|
| 4.6 | x-section area (ft.sq.) |
| 8.3 | width (ft) |
| 0.6 | mean depth (ft) |
| 1.1 | max depth (ft) |
| 8.7 | wetted perimeter (ft) |
| 0.5 | hydraulic radius (ft) |
| 15.1 | width-depth ratio |
| 25.0 | W flood prone area (ft) |
| 3.0 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 3/2018

Field Crew: Wildlands Engineering

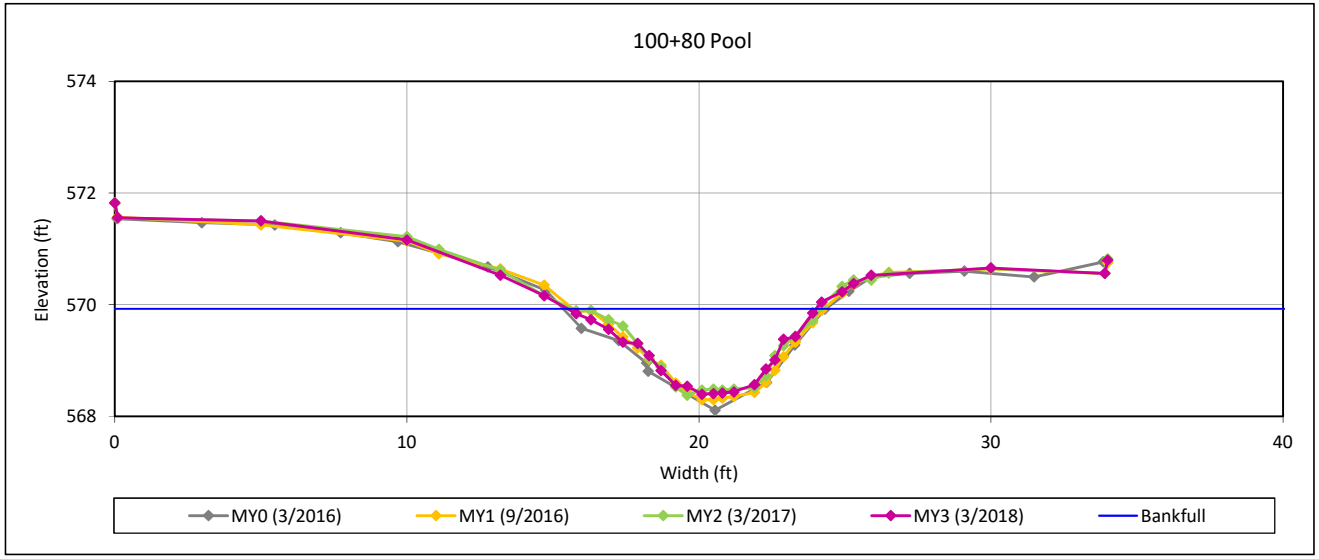
View Downstream

## Cross Section Plots

Holman Mill Mitigation Site (DMS Project No. 96316)

**Monitoring Year 3 - 2018**

**Cross Section 2-UT1**




| Bankfull Dimensions | |
|---|---|
| 7.4 | x-section area (ft.sq.) |
| 8.2 | width (ft) |
| 0.9 | mean depth (ft) |
| 1.5 | max depth (ft) |
| 9.0 | wetted perimeter (ft) |
| 0.8 | hydraulic radius (ft) |
| 9.1 | width-depth ratio |

Survey Date: 3/2018

Field Crew: Wildlands Engineering

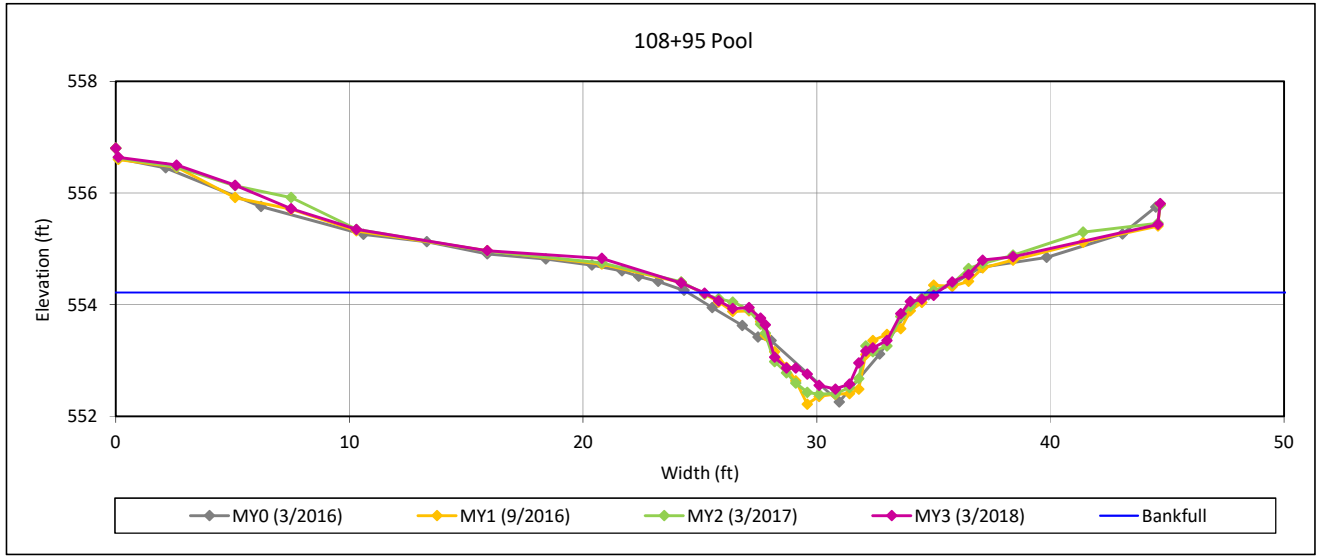
View Downstream

## Cross Section Plots

Holman Mill Mitigation Site (DMS Project No. 96316)

**Monitoring Year 3 - 2018**

**Cross Section 3-UT1**




| Bankfull Dimensions | |
|---|---|
| 8.2 | x-section area (ft.sq.) |
| 9.2 | width (ft) |
| 0.9 | mean depth (ft) |
| 1.7 | max depth (ft) |
| 10.2 | wetted perimeter (ft) |
| 0.8 | hydraulic radius (ft) |
| 10.3 | width-depth ratio |

Survey Date: 3/2018

Field Crew: Wildlands Engineering

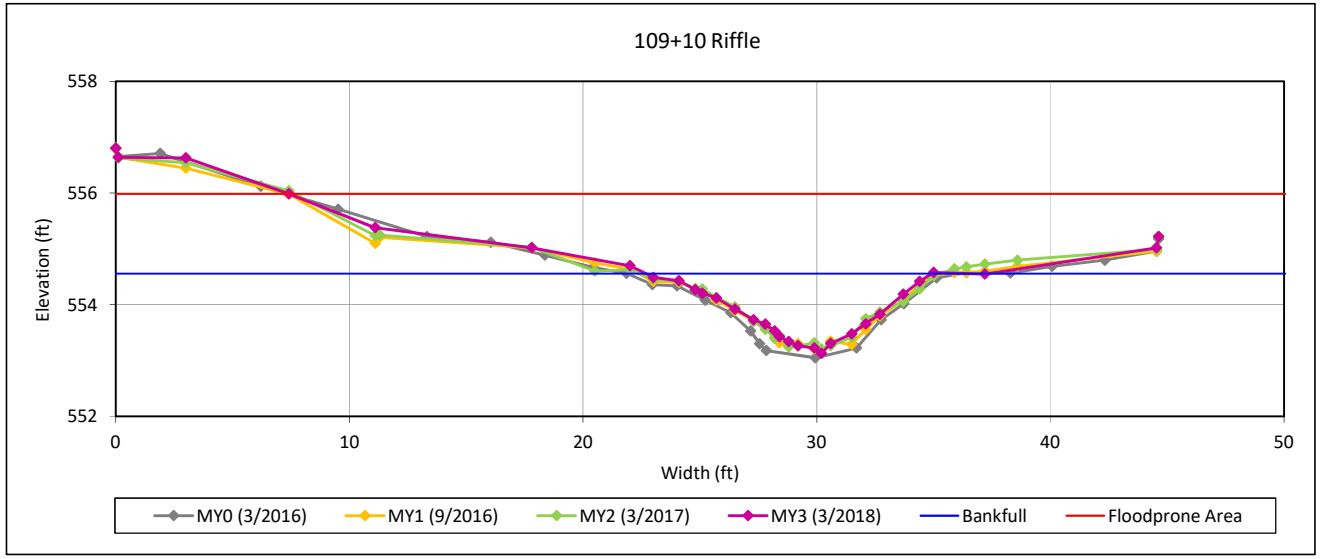
View Downstream

## Cross Section Plots

Holman Mill Mitigation Site (DMS Project No. 96316)

**Monitoring Year 3 - 2018**

**Cross Section 4-UT1**




| Bankfull Dimensions | |
|---|---|
| 8.0 | x-section area (ft.sq.) |
| 9.8 | width (ft) |
| 0.8 | mean depth (ft) |
| 1.4 | max depth (ft) |
| 10.2 | wetted perimeter (ft) |
| 0.8 | hydraulic radius (ft) |
| 12.0 | width-depth ratio |
| 17.0 | W flood prone area (ft) |
| 1.7 | entrenchment ratio |
| 0.9 | low bank height ratio |

Survey Date: 3/2018

Field Crew: Wildlands Engineering

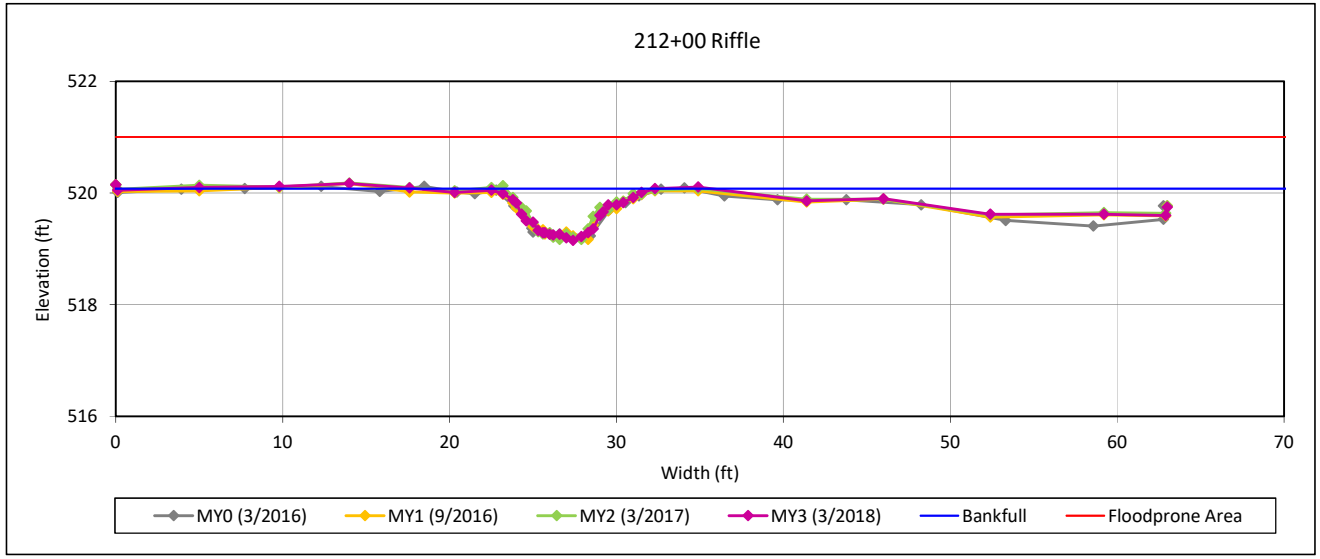
View Downstream

## Cross Section Plots

Holman Mill Mitigation Site (DMS Project No. 96316)

**Monitoring Year 3 - 2018**

**Cross Section 5-UT2**




| Bankfull Dimensions | |
|---|---|
| 4.5 | x-section area (ft.sq.) |
| 9.8 | width (ft) |
| 0.5 | mean depth (ft) |
| 0.9 | max depth (ft) |
| 10.1 | wetted perimeter (ft) |
| 0.4 | hydraulic radius (ft) |
| 21.2 | width-depth ratio |
| 100.0 | W flood prone area (ft) |
| 10.2 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 3/2018
Field Crew: Wildlands Engineering

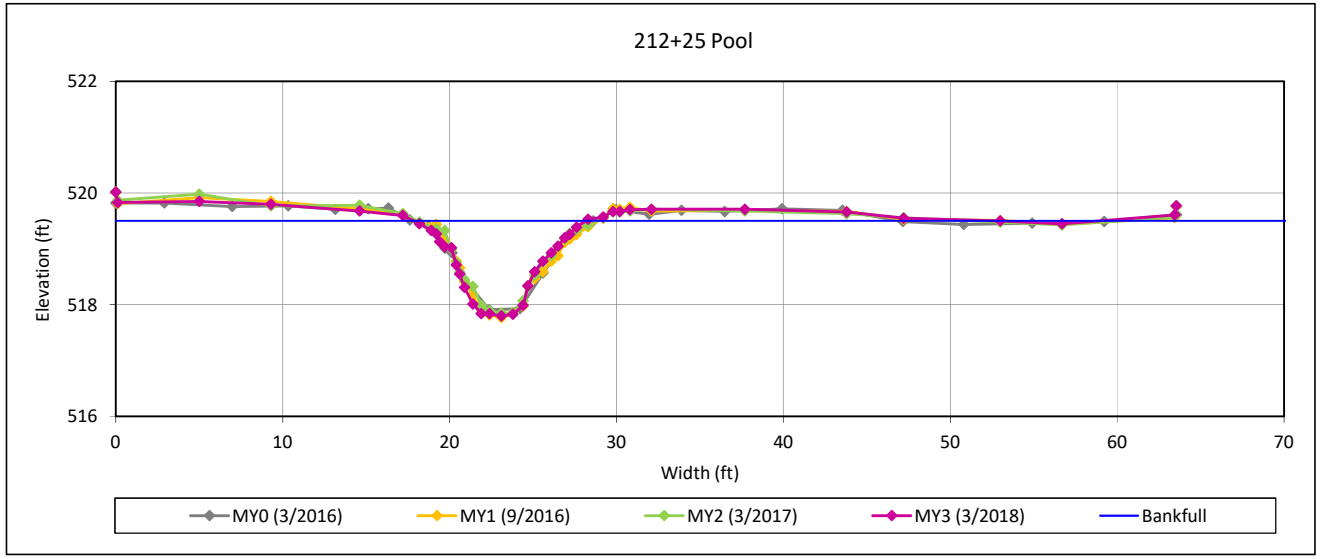
View Downstream

## Cross Section Plots

Holman Mill Mitigation Site (DMS Project No. 96316)

**Monitoring Year 3 - 2018**

**Cross Section 6-UT2**




| Bankfull Dimensions | |
|---|---|
| 8.9 | x-section area (ft.sq.) |
| 10.0 | width (ft) |
| 0.9 | mean depth (ft) |
| 1.7 | max depth (ft) |
| 10.8 | wetted perimeter (ft) |
| 0.8 | hydraulic radius (ft) |
| 11.2 | width-depth ratio |

Survey Date: 3/2018

Field Crew: Wildlands Engineering

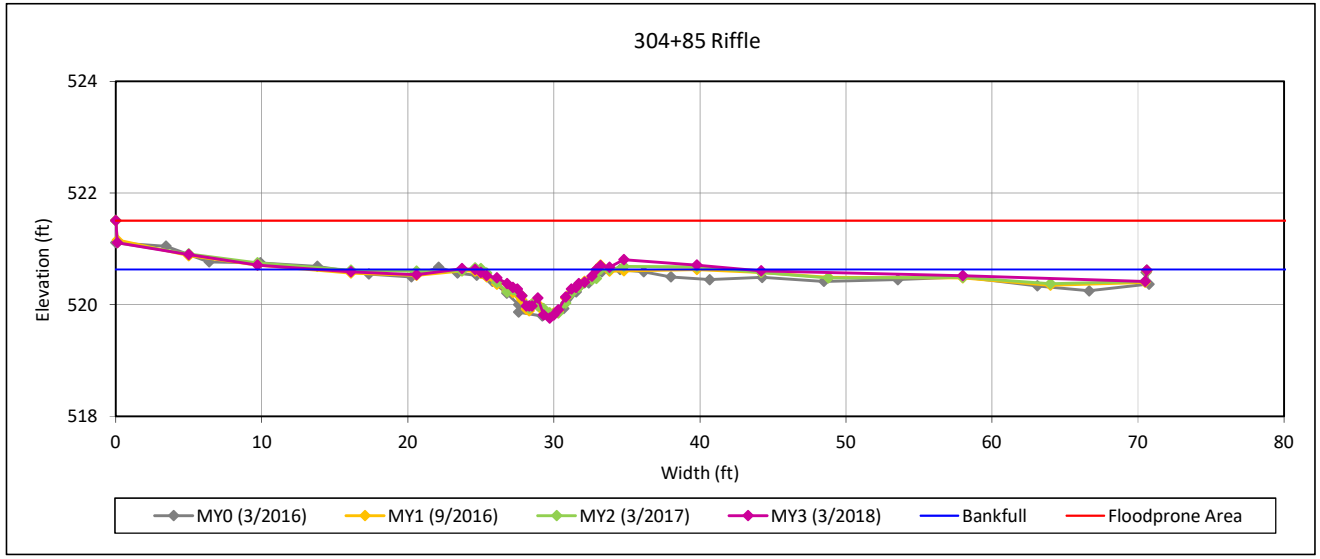
View Downstream

## Cross Section Plots

Holman Mill Mitigation Site (DMS Project No. 96316)

**Monitoring Year 3 - 2018**

**Cross Section 7-UT2A**




| Bankfull Dimensions | |
|---|---|
| 3.2 | x-section area (ft.sq.) |
| 8.3 | width (ft) |
| 0.4 | mean depth (ft) |
| 0.9 | max depth (ft) |
| 8.7 | wetted perimeter (ft) |
| 0.4 | hydraulic radius (ft) |
| 21.6 | width-depth ratio |
| 100.0 | W flood prone area (ft) |
| 12.0 | entrenchment ratio |
| 0.9 | low bank height ratio |

Survey Date: 3/2018

Field Crew: Wildlands Engineering

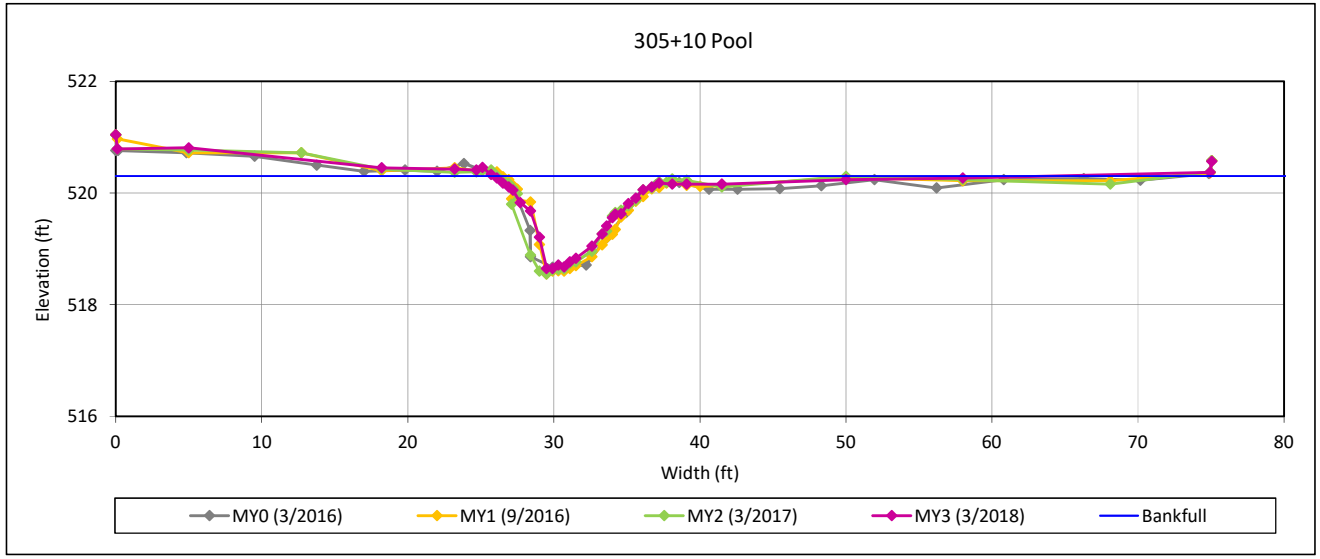
View Downstream

## Cross Section Plots

Holman Mill Mitigation Site (DMS Project No. 96316)

**Monitoring Year 3 - 2018**

**Cross Section 8-UT2A**




| Bankfull Dimensions | |
|---|---|
| 9.1 | x-section area (ft.sq.) |
| 9.5 | width (ft) |
| 1.0 | mean depth (ft) |
| 1.7 | max depth (ft) |
| 10.2 | wetted perimeter (ft) |
| 0.9 | hydraulic radius (ft) |
| 9.9 | width-depth ratio |

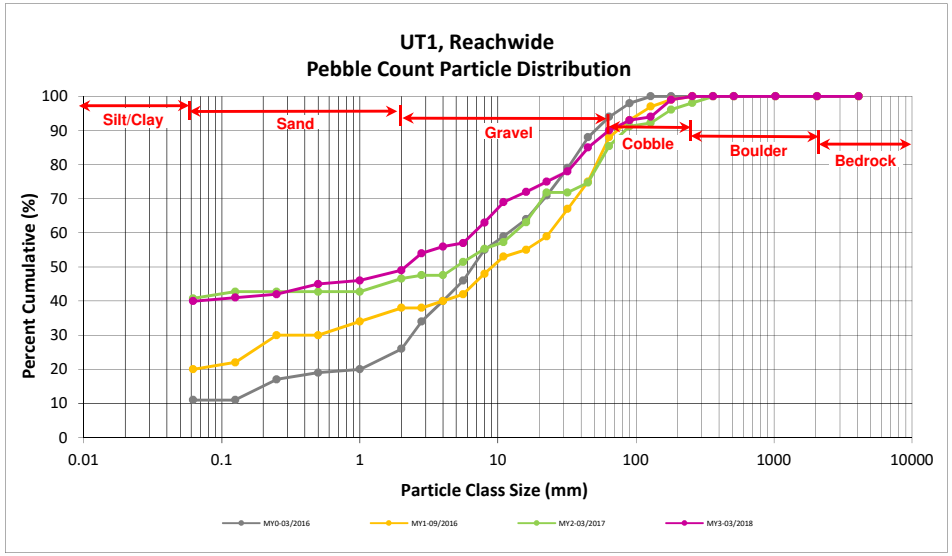
Survey Date: 3/2018
Field Crew: Wildlands Engineering

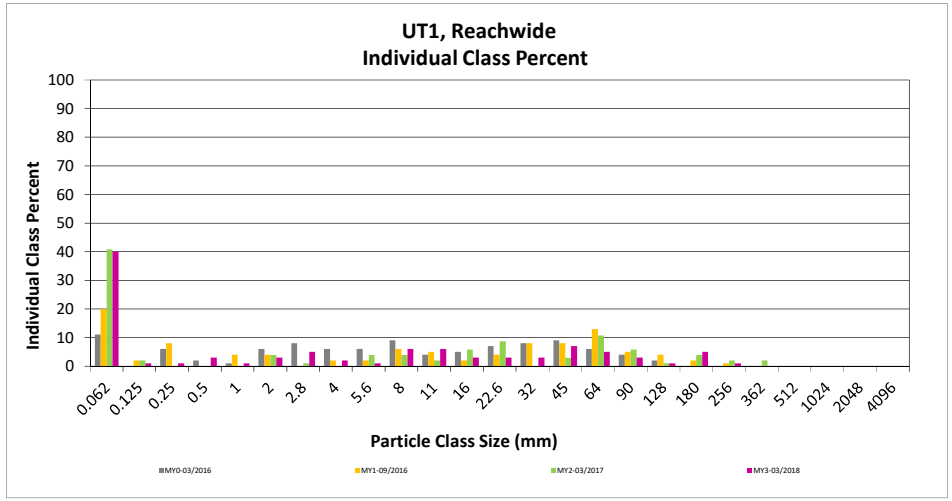
View Downstream

**Reachwide and Cross Section Pebble Count Plots**
**Holman Mill Mitigation Site (DMS Project No. 96316)**
**Monitoring Year 3 - 2018**
**UT1, Reachwide**

| Particle Class | | Diameter (mm) | | Particle Count | | | Reach Summary | |
|---|---|---|---|---|---|---|---|---|
| | | min | max | Riffle | Pool | Total | Class Percentage | Percent Cumulative |
| *SILT/CLAY* | Silt/Clay | 0.000 | 0.062 | 6 | 34 | 40 | 40 | 40 |
| *SAND* | Very fine | 0.062 | 0.125 | | 1 | 1 | 1 | 41 |
| | Fine | 0.125 | 0.250 | | 1 | 1 | 1 | 42 |
| | Medium | 0.25 | 0.50 | 2 | 1 | 3 | 3 | 45 |
| | Coarse | 0.5 | 1.0 | 1 | | 1 | 1 | 46 |
| | Very Coarse | 1.0 | 2.0 | 2 | 1 | 3 | 3 | 49 |
| *GRAVEL* | Very Fine | 2.0 | 2.8 | 4 | 1 | 5 | 5 | 54 |
| | Very Fine | 2.8 | 4.0 | 2 | | 2 | 2 | 56 |
| | Fine | 4.0 | 5.6 | 1 | | 1 | 1 | 57 |
| | Fine | 5.6 | 8.0 | 5 | 1 | 6 | 6 | 63 |
| | Medium | 8.0 | 11.0 | 4 | 2 | 6 | 6 | 69 |
| | Medium | 11.0 | 16.0 | 1 | 2 | 3 | 3 | 72 |
| | Coarse | 16.0 | 22.6 | 2 | 1 | 3 | 3 | 75 |
| | Coarse | 22.6 | 32 | 1 | 2 | 3 | 3 | 78 |
| | Very Coarse | 32 | 45 | 6 | 1 | 7 | 7 | 85 |
| | Very Coarse | 45 | 64 | 4 | 1 | 5 | 5 | 90 |
| *COBBLE* | Small | 64 | 90 | 2 | 1 | 3 | 3 | 93 |
| | Small | 90 | 128 | 1 | | 1 | 1 | 94 |
| | Large | 128 | 180 | 5 | | 5 | 5 | 99 |
| | Large | 180 | 256 | 1 | | 1 | 1 | 100 |
| *BOULDER* | Small | 256 | 362 | | | | | 100 |
| | Small | 362 | 512 | | | | | 100 |
| | Medium | 512 | 1024 | | | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | | | 100 |
| *BEDROCK* | Bedrock | 2048 | >2048 | | | | | 100 |
| | | | **Total** | **50** | **50** | **100** | **100** | **100** |

| Reachwide | |
|---|---|
| Channel materials (mm) | |
| $D_{16}$ = | Silt/Clay |
| $D_{35}$ = | Silt/Clay |
| $D_{50}$ = | 2.1 |
| $D_{84}$ = | 42.9 |
| $D_{95}$ = | 137.0 |
| $D_{100}$ = | 256.0 |

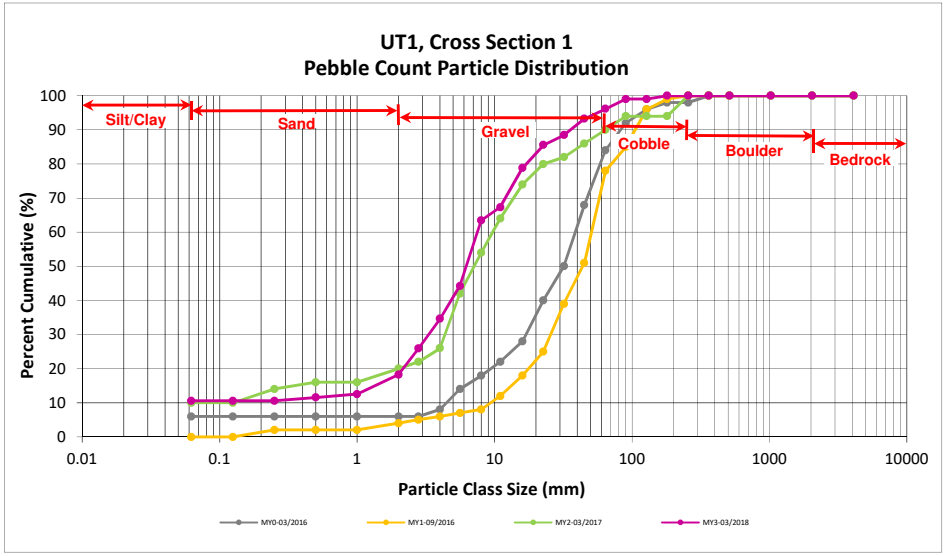


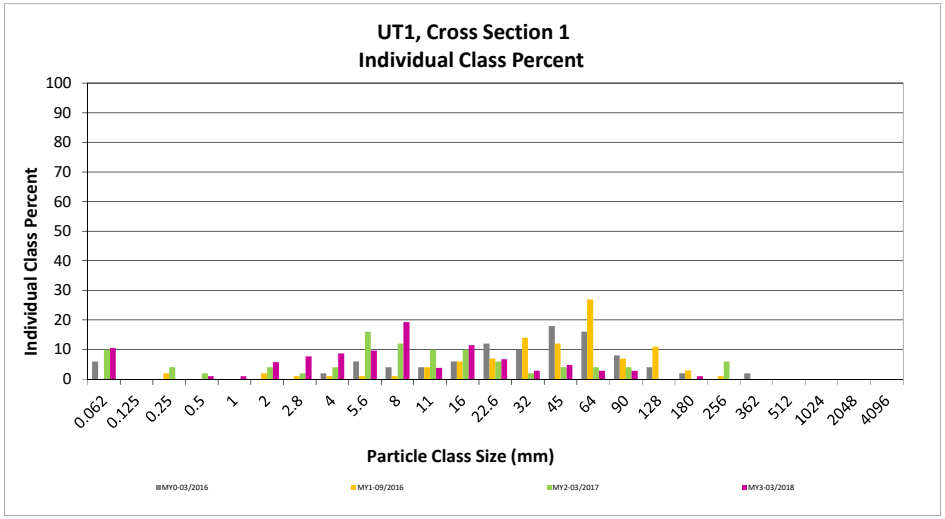



**Reachwide and Cross Section Pebble Count Plots**
**Holman Mill Mitigation Site (DMS Project No. 96316)**
**Monitoring Year 3 - 2018**
**UT1, Cross Section 1**

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|---|---|---|---|---|---|---|
| | | min | max | | Class Percentage | Percent Cumulative |
| *SILT/CLAY* | Silt/Clay | 0.000 | 0.062 | 11 | 11 | 11 |
| *SAND* | Very fine | 0.062 | 0.125 | | | 11 |
| | Fine | 0.125 | 0.250 | | | 11 |
| | Medium | 0.25 | 0.50 | 1 | 1 | 12 |
| | Coarse | 0.5 | 1.0 | 1 | 1 | 13 |
| | Very Coarse | 1.0 | 2.0 | 6 | 6 | 18 |
| *GRAVEL* | Very Fine | 2.0 | 2.8 | 8 | 8 | 26 |
| | Very Fine | 2.8 | 4.0 | 9 | 9 | 35 |
| | Fine | 4.0 | 5.6 | 10 | 10 | 44 |
| | Fine | 5.6 | 8.0 | 20 | 19 | 63 |
| | Medium | 8.0 | 11.0 | 4 | 4 | 67 |
| | Medium | 11.0 | 16.0 | 12 | 12 | 79 |
| | Coarse | 16.0 | 22.6 | 7 | 7 | 86 |
| | Coarse | 22.6 | 32 | 3 | 3 | 88 |
| | Very Coarse | 32 | 45 | 5 | 5 | 93 |
| | Very Coarse | 45 | 64 | 3 | 3 | 96 |
| *COBBLE* | Small | 64 | 90 | 3 | 3 | 99 |
| | Small | 90 | 128 | | | 99 |
| | Large | 128 | 180 | 1 | 1 | 100 |
| | Large | 180 | 256 | | | 100 |
| *BOULDER* | Small | 256 | 362 | | | 100 |
| | Small | 362 | 512 | | | 100 |
| | Medium | 512 | 1024 | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | 100 |
| *BEDROCK* | Bedrock | 2048 | >2048 | | | 100 |
| | | | **Total** | **104** | **100** | **100** |

| Cross Section 1 | |
|---|---|
| Channel materials (mm) | |
| $D_{16}$ = | 1.52 |
| $D_{35}$ = | 4.05 |
| $D_{50}$ = | 6.2 |
| $D_{84}$ = | 20.8 |
| $D_{95}$ = | 55.6 |
| $D_{100}$ = | 180.0 |

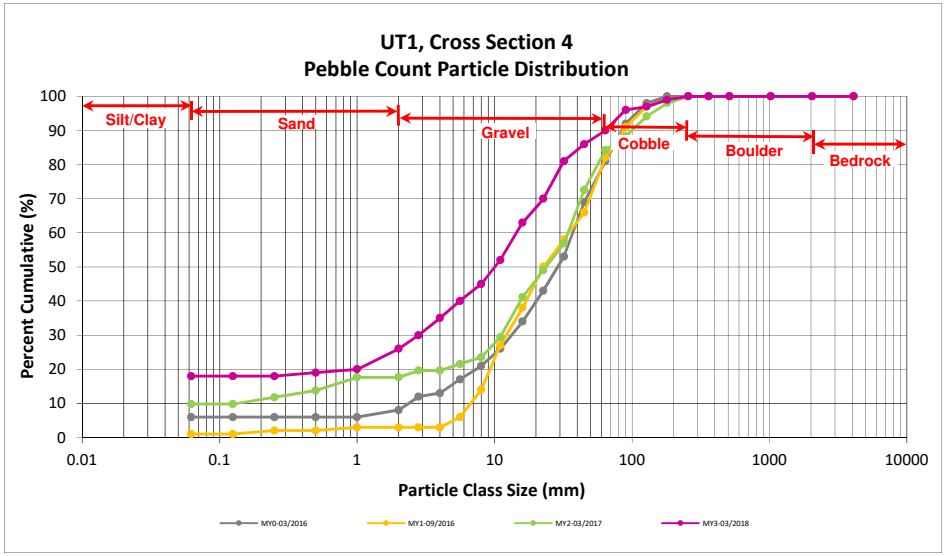


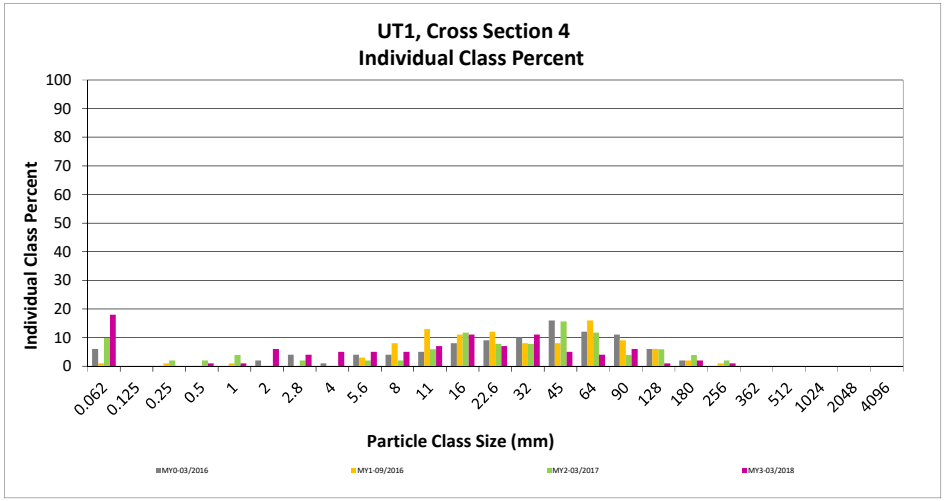



**Reachwide and Cross Section Pebble Count Plots**
**Holman Mill Mitigation Site (DMS Project No. 96316)**
**Monitoring Year 3 - 2018**
**UT1, Cross Section 4**

| Particle Class | | Diameter (mm) min | Diameter (mm) max | Riffle 100-Count | Summary: Class Percentage | Summary: Percent Cumulative |
|---|---|---|---|---|---|---|
| *SILT/CLAY* | Silt/Clay | 0.000 | 0.062 | 18 | 18 | 18 |
| *SAND* | Very fine | 0.062 | 0.125 | | | 18 |
| | Fine | 0.125 | 0.250 | | | 18 |
| | Medium | 0.25 | 0.50 | 1 | 1 | 19 |
| | Coarse | 0.5 | 1.0 | 1 | 1 | 20 |
| | Very Coarse | 1.0 | 2.0 | 6 | 6 | 26 |
| *GRAVEL* | Very Fine | 2.0 | 2.8 | 4 | 4 | 30 |
| | Very Fine | 2.8 | 4.0 | 5 | 5 | 35 |
| | Fine | 4.0 | 5.6 | 5 | 5 | 40 |
| | Fine | 5.6 | 8.0 | 5 | 5 | 45 |
| | Medium | 8.0 | 11.0 | 7 | 7 | 52 |
| | Medium | 11.0 | 16.0 | 11 | 11 | 63 |
| | Coarse | 16.0 | 22.6 | 7 | 7 | 70 |
| | Coarse | 22.6 | 32 | 11 | 11 | 81 |
| | Very Coarse | 32 | 45 | 5 | 5 | 86 |
| | Very Coarse | 45 | 64 | 4 | 4 | 90 |
| *COBBLE* | Small | 64 | 90 | 6 | 6 | 96 |
| | Small | 90 | 128 | 1 | 1 | 97 |
| | Large | 128 | 180 | 2 | 2 | 99 |
| | Large | 180 | 256 | 1 | 1 | 100 |
| *BOULDER* | Small | 256 | 362 | | | 100 |
| | Small | 362 | 512 | | | 100 |
| | Medium | 512 | 1024 | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | 100 |
| *BEDROCK* | Bedrock | 2048 | >2048 | | | 100 |
| | | | **Total** | **100** | **100** | **100** |

| Cross Section 4 | |
|---|---|
| Channel materials (mm) | |
| $D_{16}$ = | Silt/Clay |
| $D_{35}$ = | 4.00 |
| $D_{50}$ = | 10.0 |
| $D_{84}$ = | 39.3 |
| $D_{95}$ = | 85.0 |
| $D_{100}$ = | 256.0 |

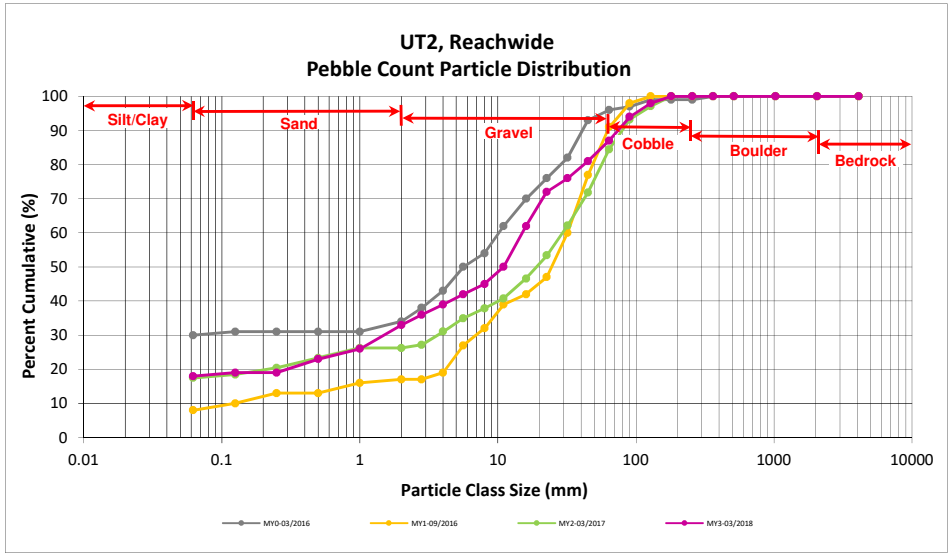


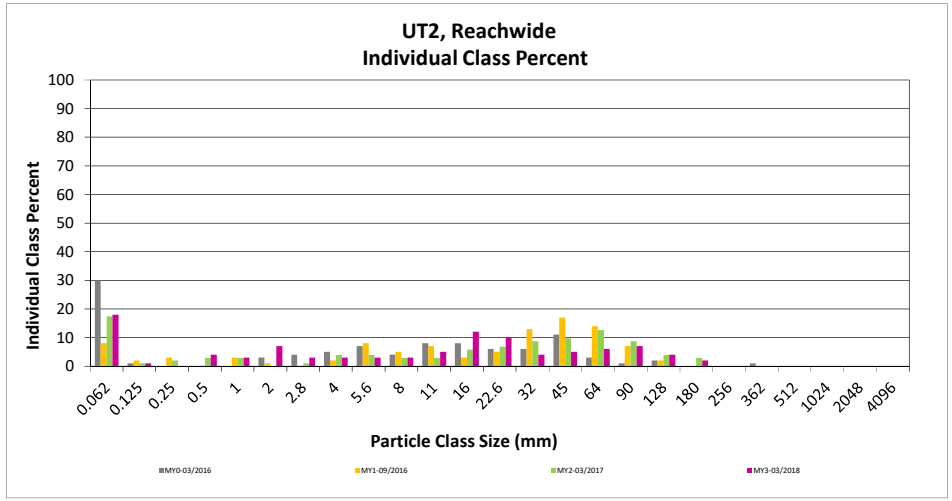



**Reachwide and Cross Section Pebble Count Plots**
**Holman Mill Mitigation Site (DMS Project No. 96316)**
**Monitoring Year 3 - 2018**
**UT2, Reachwide**

| Particle Class | | Diameter (mm) | | Particle Count | | | Reach Summary | |
|---|---|---|---|---|---|---|---|---|
| | | min | max | Riffle | Pool | Total | Class Percentage | Percent Cumulative |
| *SILT/CLAY* | Silt/Clay | 0.000 | 0.062 | | 18 | 18 | 18 | 18 |
| *SAND* | Very fine | 0.062 | 0.125 | 1 | | 1 | 1 | 19 |
| | Fine | 0.125 | 0.250 | | | | | 19 |
| | Medium | 0.25 | 0.50 | | 4 | 4 | 4 | 23 |
| | Coarse | 0.5 | 1.0 | | 3 | 3 | 3 | 26 |
| | Very Coarse | 1.0 | 2.0 | | 7 | 7 | 7 | 33 |
| *GRAVEL* | Very Fine | 2.0 | 2.8 | | 3 | 3 | 3 | 36 |
| | Very Fine | 2.8 | 4.0 | | 3 | 3 | 3 | 39 |
| | Fine | 4.0 | 5.6 | 1 | 2 | 3 | 3 | 42 |
| | Fine | 5.6 | 8.0 | | 3 | 3 | 3 | 45 |
| | Medium | 8.0 | 11.0 | 3 | 2 | 5 | 5 | 50 |
| | Medium | 11.0 | 16.0 | 11 | 1 | 12 | 12 | 62 |
| | Coarse | 16.0 | 22.6 | 8 | 2 | 10 | 10 | 72 |
| | Coarse | 22.6 | 32 | 4 | | 4 | 4 | 76 |
| | Very Coarse | 32 | 45 | 4 | 1 | 5 | 5 | 81 |
| | Very Coarse | 45 | 64 | 6 | | 6 | 6 | 87 |
| *COBBLE* | Small | 64 | 90 | 6 | 1 | 7 | 7 | 94 |
| | Small | 90 | 128 | 4 | | 4 | 4 | 98 |
| | Large | 128 | 180 | 2 | | 2 | 2 | 100 |
| | Large | 180 | 256 | | | | | 100 |
| *BOULDER* | Small | 256 | 362 | | | | | 100 |
| | Small | 362 | 512 | | | | | 100 |
| | Medium | 512 | 1024 | | | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | | | 100 |
| *BEDROCK* | Bedrock | 2048 | >2048 | | | | | 100 |
| | | | **Total** | **50** | **50** | **100** | **100** | **100** |

| Reachwide | |
|---|---|
| Channel materials (mm) | |
| $D_{16}$ = | Silt/Clay |
| $D_{35}$ = | 2.50 |
| $D_{50}$ = | 11.0 |
| $D_{84}$ = | 53.7 |
| $D_{95}$ = | 98.3 |
| $D_{100}$ = | 180.0 |

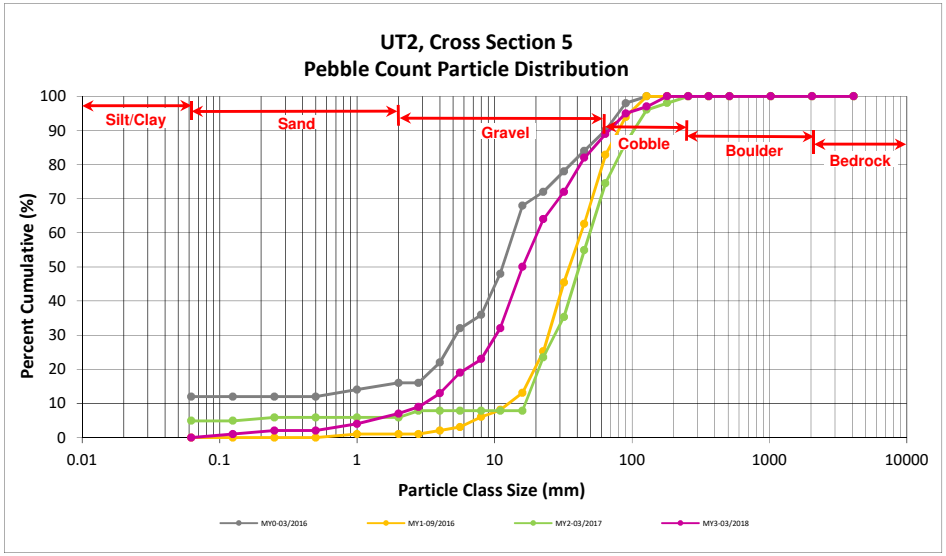


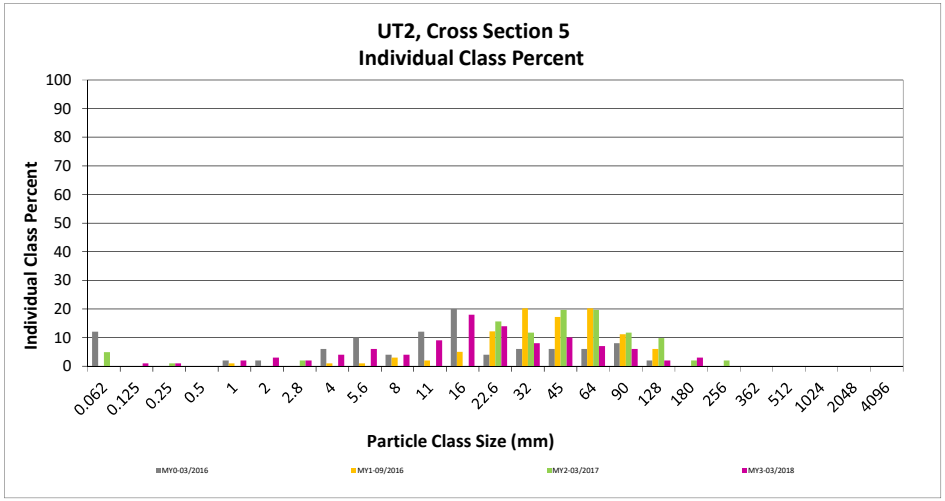



**Reachwide and Cross Section Pebble Count Plots**
**Holman Mill Mitigation Site (DMS Project No. 96316)**
**Monitoring Year 3 - 2018**
**UT2, Cross Section 5**

| Particle Class | | Diameter (mm) min | Diameter (mm) max | Riffle 100-Count | Summary: Class Percentage | Summary: Percent Cumulative |
|---|---|---|---|---|---|---|
| *SILT/CLAY* | Silt/Clay | 0.000 | 0.062 | | | 0 |
| *SAND* | Very fine | 0.062 | 0.125 | 1 | 1 | 1 |
| | Fine | 0.125 | 0.250 | 1 | 1 | 2 |
| | Medium | 0.25 | 0.50 | | | 2 |
| | Coarse | 0.5 | 1.0 | 2 | 2 | 4 |
| | Very Coarse | 1.0 | 2.0 | 3 | 3 | 7 |
| *GRAVEL* | Very Fine | 2.0 | 2.8 | 2 | 2 | 9 |
| | Very Fine | 2.8 | 4.0 | 4 | 4 | 13 |
| | Fine | 4.0 | 5.6 | 6 | 6 | 19 |
| | Fine | 5.6 | 8.0 | 4 | 4 | 23 |
| | Medium | 8.0 | 11.0 | 9 | 9 | 32 |
| | Medium | 11.0 | 16.0 | 18 | 18 | 50 |
| | Coarse | 16.0 | 22.6 | 14 | 14 | 64 |
| | Coarse | 22.6 | 32 | 8 | 8 | 72 |
| | Very Coarse | 32 | 45 | 10 | 10 | 82 |
| | Very Coarse | 45 | 64 | 7 | 7 | 89 |
| *COBBLE* | Small | 64 | 90 | 6 | 6 | 95 |
| | Small | 90 | 128 | 2 | 2 | 97 |
| | Large | 128 | 180 | 3 | 3 | 100 |
| | Large | 180 | 256 | | | 100 |
| *BOULDER* | Small | 256 | 362 | | | 100 |
| | Small | 362 | 512 | | | 100 |
| | Medium | 512 | 1024 | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | 100 |
| *BEDROCK* | Bedrock | 2048 | >2048 | | | 100 |
| | | | **Total** | **100** | **100** | **100** |

| Cross Section 5 | |
|---|---|
| Channel materials (mm) | |
| $D_{16}$ = | 4.73 |
| $D_{35}$ = | 11.71 |
| $D_{50}$ = | 16.0 |
| $D_{84}$ = | 49.8 |
| $D_{95}$ = | 90.0 |
| $D_{100}$ = | 180.0 |

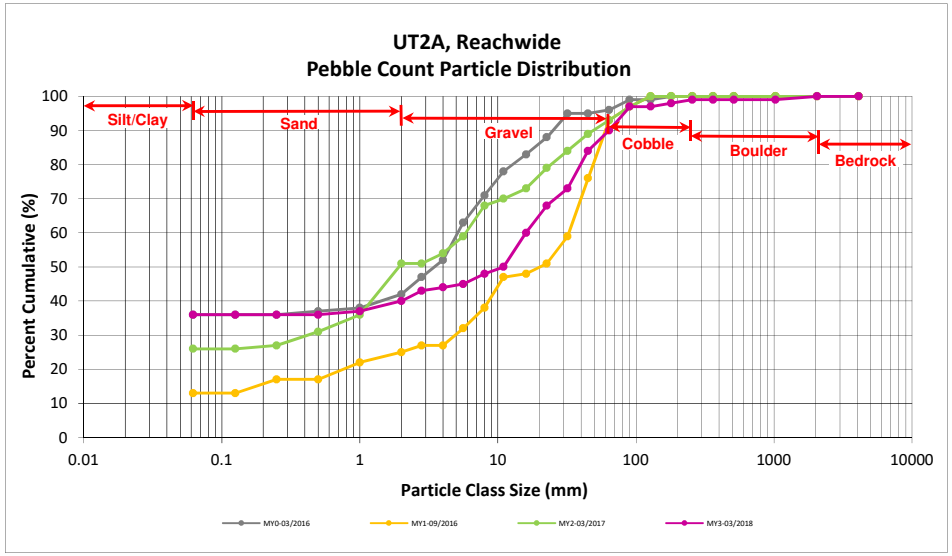


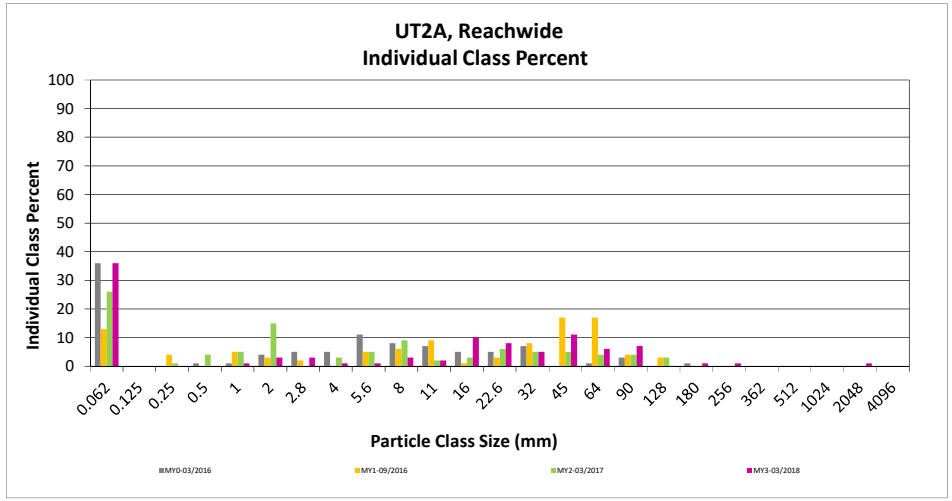



**Reachwide and Cross Section Pebble Count Plots**
**Holman Mill Mitigation Site (DMS Project No. 96316)**
**Monitoring Year 3 - 2018**
**UT2A, Reachwide**

| Particle Class | | Diameter (mm) | | Particle Count | | | Reach Summary | |
|---|---|---|---|---|---|---|---|---|
| | | min | max | Riffle | Pool | Total | Class Percentage | Percent Cumulative |
| *SILT/CLAY* | Silt/Clay | 0.000 | 0.062 | 4 | 32 | 36 | 36 | 36 |
| *SAND* | Very fine | 0.062 | 0.125 | | | | | 36 |
| | Fine | 0.125 | 0.250 | | | | | 36 |
| | Medium | 0.25 | 0.50 | | | | | 36 |
| | Coarse | 0.5 | 1.0 | | 1 | 1 | 1 | 37 |
| | Very Coarse | 1.0 | 2.0 | 2 | 1 | 3 | 3 | 40 |
| *GRAVEL* | Very Fine | 2.0 | 2.8 | 3 | | 3 | 3 | 43 |
| | Very Fine | 2.8 | 4.0 | 1 | | 1 | 1 | 44 |
| | Fine | 4.0 | 5.6 | 1 | | 1 | 1 | 45 |
| | Fine | 5.6 | 8.0 | 3 | | 3 | 3 | 48 |
| | Medium | 8.0 | 11.0 | 2 | | 2 | 2 | 50 |
| | Medium | 11.0 | 16.0 | 9 | 1 | 10 | 10 | 60 |
| | Coarse | 16.0 | 22.6 | 6 | 2 | 8 | 8 | 68 |
| | Coarse | 22.6 | 32 | 3 | 2 | 5 | 5 | 73 |
| | Very Coarse | 32 | 45 | 5 | 6 | 11 | 11 | 84 |
| | Very Coarse | 45 | 64 | 4 | 2 | 6 | 6 | 90 |
| *COBBLE* | Small | 64 | 90 | 4 | 3 | 7 | 7 | 97 |
| | Small | 90 | 128 | | | | | 97 |
| | Large | 128 | 180 | 1 | | 1 | 1 | 98 |
| | Large | 180 | 256 | 1 | | 1 | 1 | 99 |
| *BOULDER* | Small | 256 | 362 | | | | | 99 |
| | Small | 362 | 512 | | | | | 99 |
| | Medium | 512 | 1024 | | | | | 99 |
| | Large/Very Large | 1024 | 2048 | 1 | | 1 | 1 | 100 |
| *BEDROCK* | Bedrock | 2048 | >2048 | | | | | 100 |
| | | | **Total** | **50** | **50** | **100** | **100** | **100** |

| Reachwide | |
|---|---|
| **Channel materials (mm)** | |
| $D_{16}$ = | Silt/Clay |
| $D_{35}$ = | Silt/Clay |
| $D_{50}$ = | 11.0 |
| $D_{84}$ = | 45.0 |
| $D_{95}$ = | 81.6 |
| $D_{100}$ = | 2048.0 |

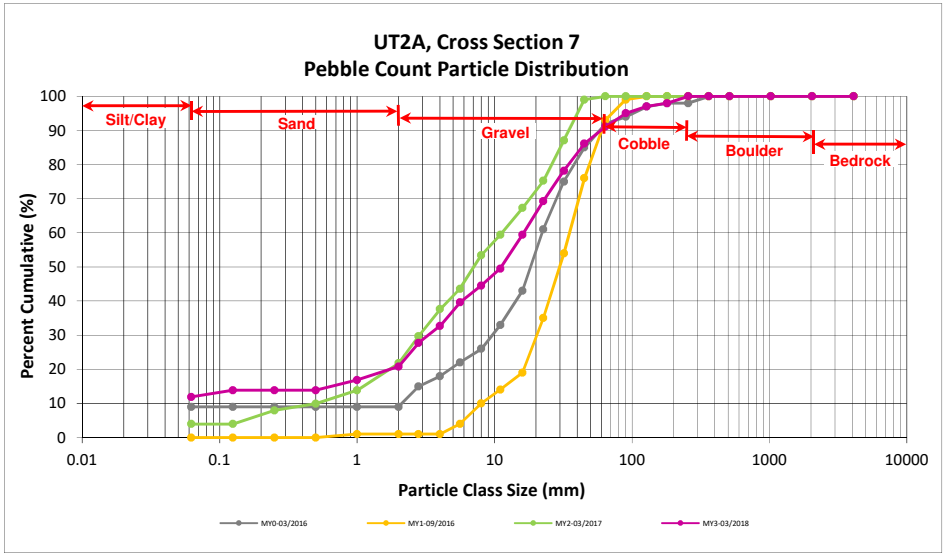


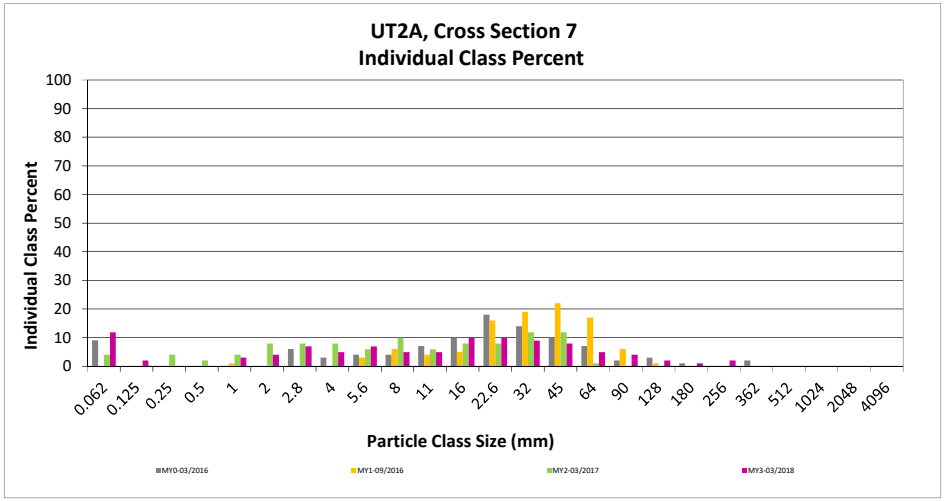



**Reachwide and Cross Section Pebble Count Plots**
**Holman Mill Mitigation Site (DMS Project No. 96316)**
**Monitoring Year 3 - 2018**
**UT2A, Cross Section 7**

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|---|---|---|---|---|---|---|
| | | min | max | | Class Percentage | Percent Cumulative |
| *SILT/CLAY* | Silt/Clay | 0.000 | 0.062 | 12 | 12 | 12 |
| *SAND* | Very fine | 0.062 | 0.125 | 2 | 2 | 14 |
| | Fine | 0.125 | 0.250 | | | 14 |
| | Medium | 0.25 | 0.50 | | | 14 |
| | Coarse | 0.5 | 1.0 | 3 | 3 | 17 |
| | Very Coarse | 1.0 | 2.0 | 4 | 4 | 21 |
| *GRAVEL* | Very Fine | 2.0 | 2.8 | 7 | 7 | 28 |
| | Very Fine | 2.8 | 4.0 | 5 | 5 | 33 |
| | Fine | 4.0 | 5.6 | 7 | 7 | 40 |
| | Fine | 5.6 | 8.0 | 5 | 5 | 45 |
| | Medium | 8.0 | 11.0 | 5 | 5 | 50 |
| | Medium | 11.0 | 16.0 | 10 | 10 | 59 |
| | Coarse | 16.0 | 22.6 | 10 | 10 | 69 |
| | Coarse | 22.6 | 32 | 9 | 9 | 78 |
| | Very Coarse | 32 | 45 | 8 | 8 | 86 |
| | Very Coarse | 45 | 64 | 5 | 5 | 91 |
| *COBBLE* | Small | 64 | 90 | 4 | 4 | 95 |
| | Small | 90 | 128 | 2 | 2 | 97 |
| | Large | 128 | 180 | 1 | 1 | 98 |
| | Large | 180 | 256 | 2 | 2 | 100 |
| *BOULDER* | Small | 256 | 362 | | | 100 |
| | Small | 362 | 512 | | | 100 |
| | Medium | 512 | 1024 | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | 100 |
| *BEDROCK* | Bedrock | 2048 | >2048 | | | 100 |
| | | | **Total** | **101** | **100** | **100** |

| Cross Section 7 | |
|---|---|
| Channel materials (mm) | |
| $D_{16}$ = | 0.82 |
| $D_{35}$ = | 4.48 |
| $D_{50}$ = | 11.2 |
| $D_{84}$ = | 41.0 |
| $D_{95}$ = | 89.6 |
| $D_{100}$ = | 256.0 |



# APPENDIX 5. Hydrology Summary Data

### Table 13. Verification of Bankfull Events

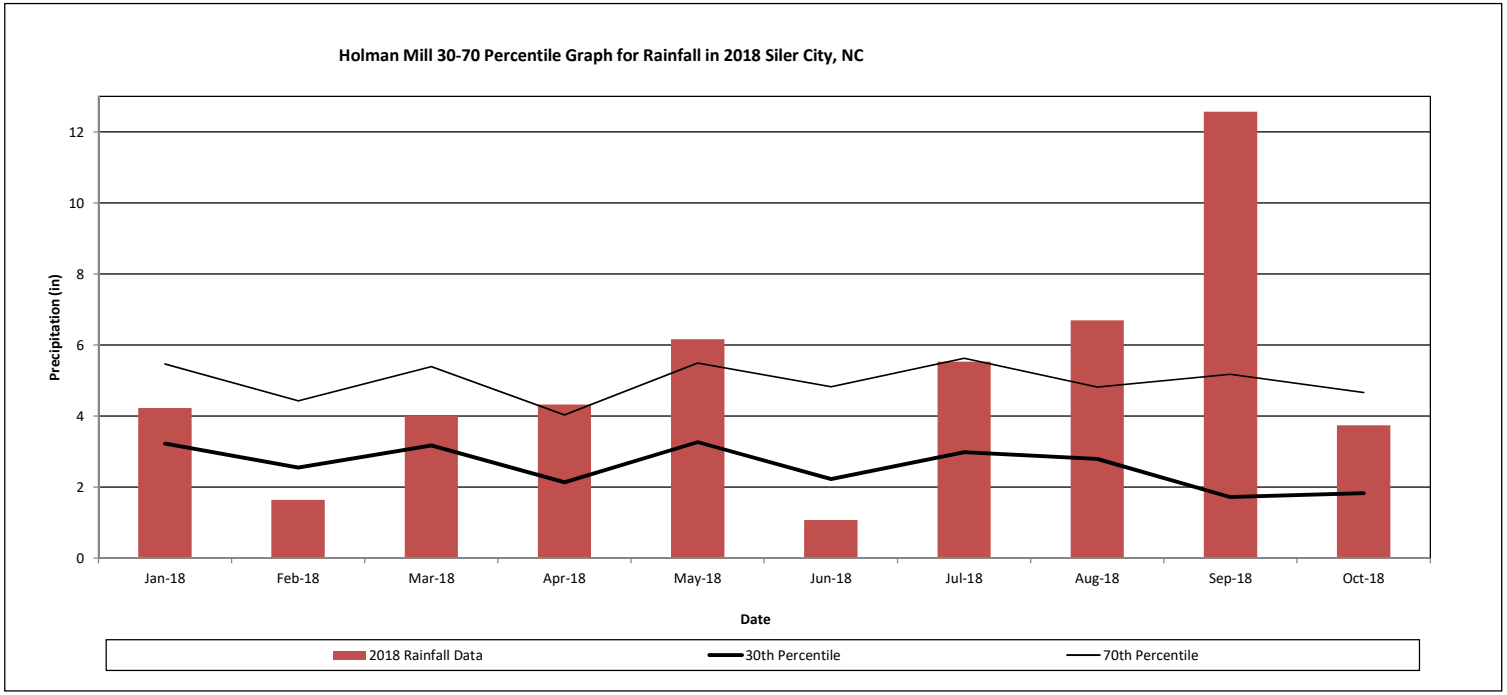
Holman Mill Mitigation Site
DMS Project No. 96316
**Monitoring Year 3 - 2018**

| Reach | MY1 | | MY2 | | MY3 | | Method |
|---|---|---|---|---|---|---|---|
| | Date of Data Collection | Date of Occurrence | Date of Data Collection | Date of Occurrence | Date of Data Collection | Date of Occurrence | |
| UT1 | 9/6/2016 | 7/31/2016 | 3/8/2017 | 4/24/2017 | 8/6/2018 | 8/8/2018 | Crest Gage/ Pressure Transducer |
| | 10/11/2016 | 10/8/2016 | 10/17/2017 | 6/20/2017 | 10/19/2018 | 9/17/2018* | |
| UT2 | 9/6/2016 | 7/31/2016 | 3/8/2017 | 4/24/2017 | 8/6/2018 | 8/8/2018 | |
| | 10/11/2016 | 10/8/2016 | 10/17/2017 | 6/20/2017 | 10/19/2018 | 9/17/2018* | |
| UT2A | 9/6/2016 | 7/31/2016 | 3/8/2017 | 4/24/2017 | 8/6/2018 | 8/8/2018 | |
| | 10/11/2016 | 10/8/2016 | 10/17/2017 | 6/20/2017 | 10/19/2018 | 9/17/2018* | |

*Hurricane Florence

### Monthly Rainfall Data

Holman Mill Mitigation Site
DMS Project No. 96316
**Monitoring Year 3 - 2018**




[1] 2018 monthly rainfall from USDA Station SILER CITY (317924)
[2] 30th and 70th percentile rainfall data collected from weather station Siler City 2 S, NC7924 (USDA, 2002).