



MONITORING YEAR 2 ANNUAL REPORT

Final

AGONY ACRES MITIGATION SITE

Guilford County, NC
NCDEQ Contract 004949
DMS Project Number 95716

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PREPARED FOR:



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EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) completed a full delivery project at the Agony Acres Mitigation Site (Site) for the North Carolina Division of Mitigation Services (DMS) to restore, enhance, and preserve a total of 9,195 linear feet (LF) of perennial and intermittent stream in Guilford County, NC. The Site provides 6,596 Stream Mitigation Units (SMUs) and 3.0 Buffer Mitigation Units (BMUs). The Site is located in the Reedy Fork Watershed within Cape Fear River Basin Hydrologic Unit Code (HUC) 03030002 (Cape Fear 02) near Ossipee, NC (Figure 1). The streams are all unnamed tributaries (UT) to Reedy Fork and are referred to herein as UT1, UT1A, UT1B, and UT2. The Site also includes 3.0 acres of riparian buffer restoration along Reedy Fork and UT1.

The Site is located within the Jordan Lake Water Supply Watershed which has been designated as a Nutrient Sensitive Water. The Site's watershed is within Cape Fear local watershed HUC 03030002020070, which was not identified as a Cape Fear 02 Targeted Local Watershed (TLW) in DMS's 2009 Cape Fear River Basin Restoration Priority (RBRP) plan; however, this local watershed was later designated as a Targeted Resource Area (TRA) in the 2011 Request for Proposals (RFP) in the Cape Fear 02. The Agony Acres Mitigation Site fully supports the Cataloging Unit (CU)-wide functional objectives stated in the 2011 RFP 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 Site will contribute to meeting the CU-wide Functional Improvement Objectives by establishing the following project goals:

- Reduce sediment inputs by removing cattle from streams and restoring degraded and eroding stream channels;
- Return a network of streams to a stable form that is capable of supporting biological functions;
- Reduce fecal coliform, nitrogen, and phosphorous inputs through removing cattle from streams and establishing and augmenting a forested riparian corridor;
- Protect existing high quality streams and forested buffers; and
- Improve and protect hydrologic inputs to the adjacent Reedy Fork Aquatic Habitat Significant Natural Heritage Area.

The project is helping meet the goals for the watershed outlined in the RBRP and provide numerous ecological benefits within the Cape Fear River Basin. While many of these benefits are limited to the Agony Acres project area, others, such as pollutant removal, reduced sediment loading, and improved aquatic and terrestrial habitat, have farther-reaching effects.

Stream restoration and enhancement construction efforts were completed in September 2014. Baseline as-built monitoring activities (MY0) were completed between October and December 2014. A conservation easement is in place on 30.78 acres of stream and riparian corridors to protect them in perpetuity.

Monitoring Year 2 (MY2) assessment and site visits were completed between January and August, 2016 to assess the conditions of the project. Overall, the Site has met the required vegetation and stream success criteria for MY2. The overall average stem density for the Site at MY2 is 531 stems per acre, which is greater than the 320 stems per acre density required for MY3. All restored and enhanced streams are stable and functioning as designed. UT1B has two pressure transducers installed to monitor stream flow. Baseflow must be present for at least some portion of the year (most likely in the winter/early spring) during years with normal rainfall conditions. Both stream gages on UT1B met the hydrologic criteria for MY2 (Appendix 5).

AGONY ACRES MITIGATION SITE
Monitoring Year 2 Annual Report

TABLE OF CONTENTS

Section 1: PROJECT OVERVIEW1

 1.1 Project Goals and Objectives 2

 1.2 Monitoring Year 2 Data Assessment..... 3

 1.2.1 Vegetative Assessment 3

 1.2.2 Vegetation Areas of Concern 4

 1.2.3 Stream Assessment..... 4

 1.2.4 Stream Areas of Concern 4

 1.2.5 Hydrology Assessment..... 4

 1.2.6 Maintenance Plan 5

 1.3 Monitoring Year 2 Summary..... 5

Section 2: METHODOLOGY.....6

Section 3: REFERENCES7

APPENDICES

| | |
|--|---|
| Appendix 1 | General Tables and Figures |
| Figure 1 | Project Vicinity Map |
| Figure 2 | Project Component/ Asset Map |
| Table 1 | Project Components and Mitigation Credits |
| Table 2 | Project Activity and Reporting History |
| Table 3 | Project Contact Table |
| Table 4 | Project Information and Attributes |
| Appendix 2 | Visual Assessment Data |
| Figures 3.0 - 3.3 | Integrated Current Condition Plan View |
| Tables 5a-d | Visual Stream Morphology Stability Assessment Table |
| Table 6 | Vegetation Condition Assessment Table |
| Stream Photographs | |
| Vegetation Photographs | |
| Appendix 3 | Vegetation Plot Data |
| Table 7 | Vegetation Plot Criteria Attainment |
| Table 8 | CVS Vegetation Plot Metadata |
| Table 9 | Planted and Total Stem Counts |
| Appendix 4 | Morphological Summary Data and Plots |
| Tables 10a-d | Baseline Stream Data Summary |
| Table 11 | Morphology and Hydraulic Summary (Dimensional Parameters – Cross Section) |
| Tables 12a-f | Monitoring Data – Stream Reach Data Summary |
| Cross Section Plots | |
| Reachwide and Cross Section Pebble Count Plots | |
| Appendix 5 | Hydrology Summary Data and Plots |
| Table 13 | Verification of Bankfull Events |
| Monthly Rainfall Data | |
| Stream Flow Gage Plots | |

Section 1: PROJECT OVERVIEW

The Agony Acres Mitigation Site (Site) is located in northeastern Guilford County, north of Gibsonville (Figure 1). From Gibsonville take NC 61 north 5.5 miles. Turn right on Sockwell Road and travel 1.4 miles. The project site is located north of Sockwell Road and is bound on the north by Reedy Fork. The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province. The project watershed is classified as approximately 65% managed herbaceous cover, 30% mixed upland hardwoods, 3% cultivated, 2% southern yellow pine, and the remaining 1% is low intensity development. The drainage area for the Agony Acres Mitigation Site is 358 acres.

The Site is located in the Reedy Fork Watershed within the Jordan Lake Water Supply Watershed which has been designated a Nutrient Sensitive Water. The project streams flow directly into Reedy Fork which flows into the Haw River and eventually into the Jordan Lake Reservoir. The Site's watershed is within Hydrologic Unit Code (HUC) 03030002020070 which was not identified as a Cape Fear 02 Targeted Local Watershed (TLW) in DMS's 2009 Cape Fear River Basin Restoration Priority (RBRP) plan; however, this HUC was later designated as a Targeted Resource Area (TRA) in the 2011 Request for Proposals (RFP) in the Cape Fear 02. The Site connects to Reedy Fork and three separate but connected Significant Natural Heritage areas. Reedy Fork Aquatic Habitat, Reedy Fork Slopes at NC 61, and Altamahaw Alluvial Forest are all listed on the NC Natural Heritage GIS database and are immediately adjacent to the Site. There are also records for several state threatened, special concern, and significantly rare mussel species in Reedy Fork.

DMS completed a Local Watershed Plan (LWP) in 2008 on the HUC immediately downstream which begins at the confluence of Reedy Fork and the Haw River and includes Travis and Tickle Creeks. The Site is located less than one mile outside of the LWP area and has a very similar land use pattern. The 2008 Little Alamance, Travis, and Tickle Creeks LWP identified nutrient inputs from agriculture and stream bank erosion in altered reaches as major stressors within this TLW. The Site was identified as a stream and buffer restoration and cattle exclusion opportunity to improve water quality and buffers within the TRA.

The Site consists of four tributaries to Reedy Fork which are located within the North Carolina Division of Water Resources (NCDWR) subbasin 03-06-02 of the Cape Fear River Basin. The project stream reaches include UT1, UT1A, UT1B, and UT2.

Mitigation work within the Site included restoration, enhancement, and preservation of 9,195 linear feet (LF) of perennial and intermittent stream channel and 3.0 acres (ac) of riparian buffer restoration. The Site provides 6,596 Stream Mitigation Units (SMUs) and 3.0 Buffer Mitigation Units (BMUs). The stream areas were also planted with native vegetation to improve habitat and protect water quality.

The final mitigation plan was submitted and accepted by the DMS in March 2014. Construction activities were completed by Land Mechanic Designs, Inc. in September 2014. The planting was completed by Bruton Natural Systems, Inc. in December 2014. The baseline as-built survey was completed by Kee Mapping and Surveying, in October 2014. Annual monitoring will be conducted for seven years with the close-out anticipated to occur in 2022 given the success criteria are met. Appendix 1 provides more detailed project activity, history, contact information, directions, and watershed/site background information for this project.



1.1 Project Goals and Objectives

Prior to construction activities, the stream channels exhibited varying degrees of degradation across the Site. The Site was used as agricultural and pasture land and most of the buffers had been reduced to narrow corridors. Cattle had free access to the streams, which resulted in sporadic degraded stream banks and poor bed forms.

The stream channels on the Site that were restored were previously incised and overwidened in many locations, likely as a result of historic channelization. The alterations of the Site to promote cattle grazing and farming resulted in elimination of many of the ecological functions of this small stream complex. Specifically, functional losses at the Site included degraded aquatic habitat, altered hydrology (related to loss of floodplain connection and lowered water table), and reduction of quality and amount of riparian wetland habitats and related water quality benefits. Ongoing bank erosion was also occurring at some locations due to high, overly steep banks and lack of bank vegetation. Table 4 in Appendix 1 and Tables 10a-d in Appendix 4 present the pre-restoration conditions in detail.

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 Agony Acres Mitigation 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 and completed with careful consideration of goals and objectives that were described in the RBRP and to meet the North Carolina Division of Mitigation Service's (DMS) mitigation needs while maximizing the ecological and water quality uplift within the watershed.

The following project specific goals established in the Agony Acres Mitigation Plan (Wildlands, 2014) include:

- Reduce sediment inputs by removing cattle from streams and restoring degraded and eroding stream channels;
- Return a network of streams to a stable form that is capable of supporting biological functions important to sensitive species within and adjacent to the project site;
- Reduce fecal coliform, nitrogen, and phosphorous inputs through removing cattle from streams and establishing and augmenting a forested riparian corridor;
- Protect existing high quality streams and forested buffers that provide habitat important to sensitive species within and adjacent to the project site;
- Improve and protect hydrologic inputs to the adjacent Reedy Fork Aquatic Habitat Significant Natural Heritage Area; and
- Improve and protect hydrologic inputs to Reedy Fork, which is listed as impaired on the 2012 NC 303(d) list for impaired aquatic life and for elevated fecal coliform levels.

The project goals will be addressed through the following project objectives:

- On-site nutrient inputs were decreased by removing cattle from streams, re-establishing floodplain connectivity, and filtering on-site runoff through buffer zones. Off-site nutrient input will be absorbed on-site by filtering flood flows through restored floodplain areas, where flood flow will spread through native vegetation. Vegetation is expected to uptake excess nutrients.
- Stream bank erosion which contributes sediment load to the creeks was greatly reduced, if not eliminated, in the project area. Eroding stream banks were stabilized using bioengineering, natural channel design techniques, and grading to reduce bank angles and bank height. Storm flow containing grit and fine sediment is filtered through restored floodplain areas, where flow



will spread through native vegetation. Spreading flood flows also reduces velocity and allows sediment to settle out. Sediment transport capacity of restored reaches was improved so that capacity balances more closely to load. Sediment load reduction will be monitored through assessing bank stability with cross section surveys and visual assessment through photo documentation which serves as an accepted surrogate for direct turbidity measurements.

- Restored riffle/pool sequences promote aeration of water and create deep water zones, helping to lower water temperature. Establishment and maintenance of riparian buffers creates long-term shading of the channel flow to minimize thermal heating. Lower water temperatures will help maintain dissolved oxygen concentrations.
- In-stream structures were constructed to improve habitat diversity and trap detritus. Wood habitat structures were included in the stream as part of the restoration design. Such structures include log drops and rock structures that incorporate woody debris and native onsite rock.
- Adjacent buffer and riparian habitats were restored with native vegetation as part of the project. Native vegetation provides cover and food for terrestrial creatures. Native plant species were planted and invasive species treated. Eroding and unstable areas were stabilized with vegetation as part of this project.
- The restored land is protected in perpetuity through a conservation easement.

The design streams were restored to the appropriate form based on the surrounding landscape, climate, and natural vegetation communities but also with strong consideration to existing watershed conditions and trajectory. Specifically, the site design was developed to restore a small stream complex directly adjacent to Reedy Fork. Other key factors addressed in the design were to create stable habitats, improve riparian buffers, and restore the natural migration patterns for fish spawning. Figure 2 and Table 1 in Appendix 1 present the stream mitigation components for the Agony Acres Mitigation Site.

1.2 Monitoring Year 2 Data Assessment

Annual monitoring and quarterly site visits were conducted during MY2 to assess the condition of the project. The stream and buffer success criteria for the Site follow the approved success criteria presented in the Agony Acres Mitigation Plan (Wildlands, 2014).

1.2.1 Vegetative Assessment

Planted woody vegetation is being monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-DMS Level 2 Protocol (Lee et al., 2006). A total of 16 vegetation plots were established during the baseline monitoring within the project easement areas. All of the plots were installed using a standard 10 meter by 10 meter plot. The final vegetative success criteria for the stream restoration and enhancement areas will be the survival of 210 planted stems per acre in the riparian corridor at the end of the required 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 the third monitoring year (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 in each plot at the end of the seventh year of monitoring. If this success criteria 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 final vegetative success criteria for the buffer restoration areas will be the survival of 320 planted stems per acre in the riparian corridor at the end of the required monitoring period (MY5). However, Wildlands plans to monitor these areas the same as the rest of the project for seven years and have the same success criteria of 210 stems per acre at the end of MY7.

The MY2 vegetative survey was completed in June 2016. The 2016 vegetation monitoring resulted in an average stem density of 531 stems per acre, which is greater than the interim requirement of 320 stems per acre required at MY3, but approximately 18% less than the baseline density recorded at MY0, 650 stems per acre, in January 2015. There is an average of 13 stems per plot which is a slight decrease from 16 stems per plot in MY1. All but one of the 16 plots are on track to meet the success criteria required for MY7 (Table 9, Appendix 3). Plot 10 had a planted stem density of 283 stems per acre. This plot will be monitored and supplemental planting will be performed as necessary. 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

Tree of heaven (*Ailanthus altissima*) was observed growing sporadically in the easement downstream of the confluence of UT1 and UT1B. The seedlings were either pulled out of the ground by hand, or cut and stem treated with glyphosate during MY2. This area will continue to be monitored for new seedlings and will be treated with the appropriate herbicide as needed. Since portions of the adjacent land are in an organic farm, spraying herbicide is not allowed within 30 feet of active pasture or cropland. Any tree of heaven that is within 30 feet of active pasture or cropland will be pulled out of the ground and no herbicides will be used.

An area less than one acre in size along Reedy Fork; near vegetation plot 10, has a low planted stem density. Supplemental planting will be performed in this area during the fall/winter of 2016. Native trees from the original plant list will be used to supplement this area. Refer to the Integrated Current Condition Plan View Map (CCPV) in Appendix 2 for this area of low stem density.

1.2.3 Stream Assessment

Morphological surveys for the MY2 were conducted in March 2016. All streams within the Site are stable with little to no erosion and have met the success criteria for MY2. Refer to Appendix 2 for the visual assessment table, CCPV Map, and reference photographs. Refer to Appendix 4 for the morphological data and plots.

While there have been some minor post-construction adjustments within the restored channels; the cross sections show little to no change in the bankfull area, maximum depth, or width-to-depth ratio. Surveyed riffle cross sections fell within the parameters defined for channels of the appropriate Rosgen stream type. Pebble counts indicated coarser materials in the riffle features and smaller particles in the pool features.

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

1.2.4 Stream Areas of Concern

No stream areas of concern were identified during MY2.

1.2.5 Hydrology Assessment

Two bankfull flow events must be documented on the restoration and enhancement reaches within the seven-year monitoring period. The two bankfull events must occur in separate years. In addition, the presence of baseflow must be documented along portions of UT1B constructed with a Priority I restoration approach. Baseflow must be present for at least some portion of the year (most likely in the winter/early spring) during years with normal rainfall conditions.



Multiple bankfull events were recorded during MY2 at the Site. UT1B and UT2 each showed two bankfull events and UT1 and UT1A each recorded one bankfull event. During MY1, each stream recorded at least one bankfull event. Therefore, the Site has met the stream hydrology criteria. UT1B did show presence of baseflow for most of MY2. There were periods in the summer where baseflow went below ground surface but the rest of the year the channel had baseflow. UT1B has met baseflow criteria for both MY1 and MY2. Refer to Appendix 5 for hydrologic data and graphs.

1.2.6 Maintenance Plan

The area along Reedy Fork; near vegetation plot 10, will be planted during the fall/winter of 2016 as described in section 1.2.2 above.

1.3 Monitoring Year 2 Summary

Stream, vegetation, and hydrology criteria have been met for MY2 on the Site. All streams within the Site are stable and functioning as designed. The average stem density for the Site is on track to meeting the MY7 success criteria; with all but one individual vegetation plot meeting the MY2 success criteria as noted in the CCPV Map. All streams on the Site have recorded bankfull events and UT1B has shown the presence of baseflow for some portion of the year. Therefore, hydrology criteria has been met for MY2.

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 Plan View Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcView. Crest gages were installed in surveyed riffle cross sections and monitored quarterly. Hydrology attainment installation and monitoring methods are in accordance with the USACE (USACE, 2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-DMS Level 2 Protocol (Lee et al., 2006). Reporting follows the DMS Monitoring Report Template and Guidance Version 1.3 (DMS, 2010).



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.
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APPENDIX 1. General Tables and Figures

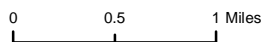
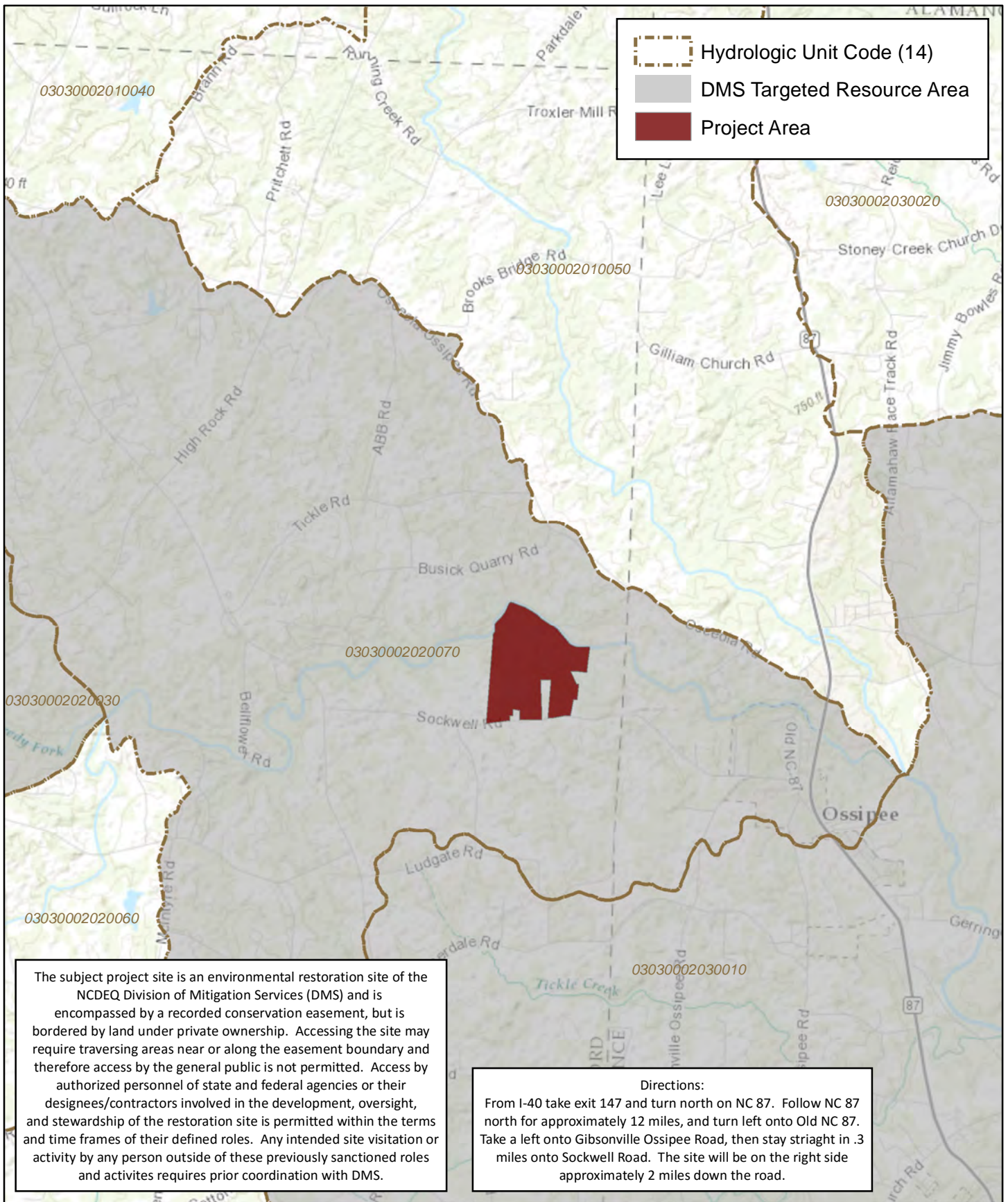


Figure 1 Project Vicinity Map
 Agony Acres Mitigation Site
 DMS Project No. 95716
 Monitoring Year 2 - 2016

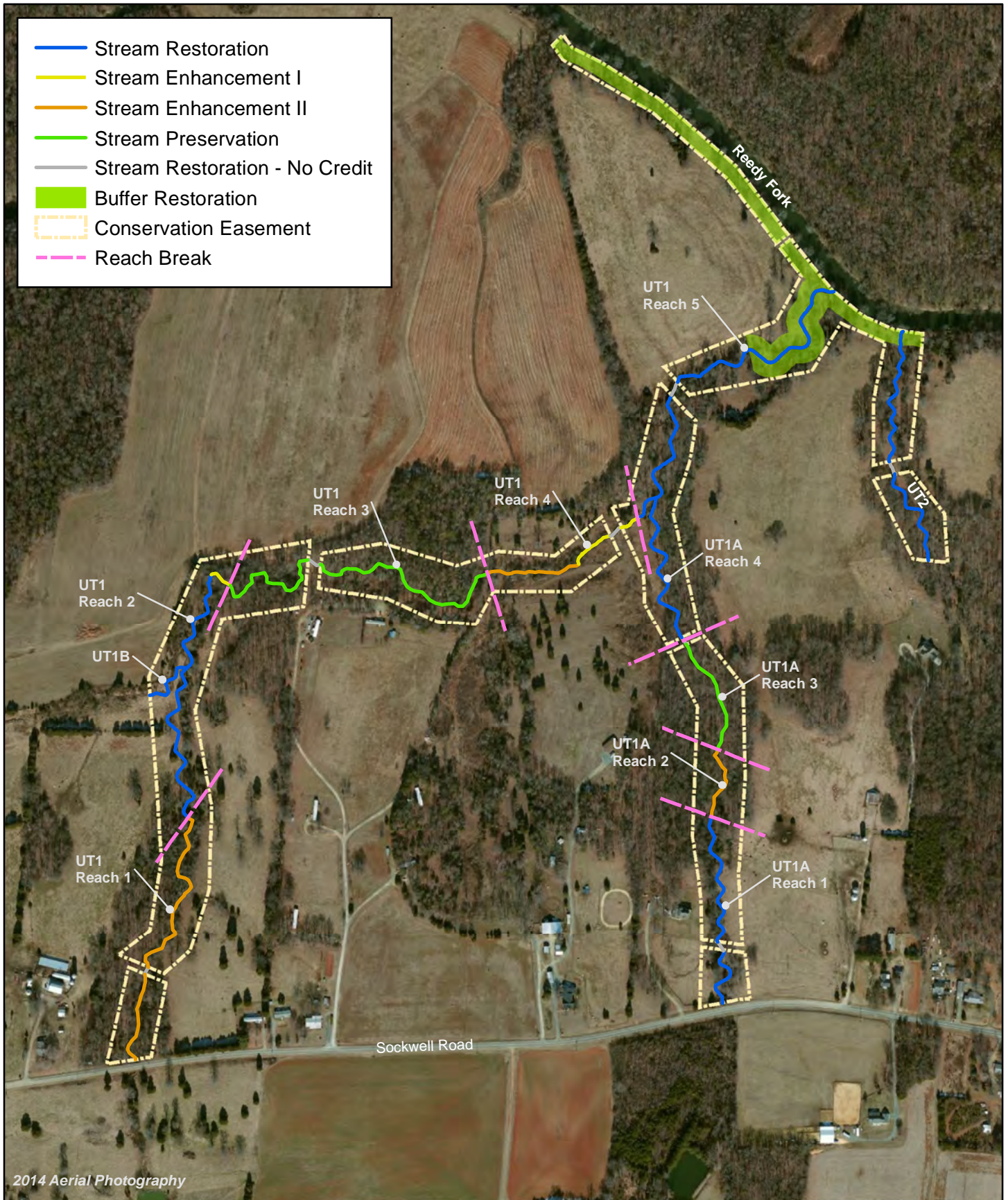


Figure 2 Project Component/ Asset Map
 Agony Acres Mitigation Site
 DMS Project No.95716
 Monitoring Year 2 - 2016

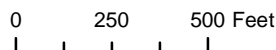


Table 1. Project Components and Mitigation Credits
 Agony Acres Mitigation Site (DMS Project No.95716)
 Monitoring Year 2 - 2016

| MITIGATION CREDITS | | | | | | | | | |
|-------------------------------|------------------------------------|---------------------------|------------------|---------------------------------------|------------------------------|------------------|--------------------|--------------------------|-----------------------------|
| | Stream | | Riparian Wetland | | Non-Riparian Wetland | | Buffer | Nitrogen Nutrient Offset | Phosphorous Nutrient Offset |
| Type | R | RE | R | RE | R | RE | | | |
| Totals | 6,235 | 361 | N/A | N/A | N/A | N/A | 3.0 | 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 | | | | | | | | | |
| UT1-Reach 1 (DOT ROW) | 100+00 to 100+14 | 14 | EII | Enhancement (No Credit) | 14 | --- | --- | | |
| UT1-Reach 1 | 100+14 to 103+62; 103+93 to 111+24 | 1,079 | EII | Enhancement | 1,079 | 2.5 | 432 | | |
| UT1-Reach 1 (Easement Break) | 103+62 to 103+93 | 31 | EII | Enhancement (No Credit) | 31 | --- | --- | | |
| UT1-Reach 2 | 111+24 to 122+61 | 1,039 | P1 | Restoration | 1,137 | 1 | 1,137 | | |
| UT1-Reach 2 | 122+61 to 123+54 | 93 | EI | Enhancement | 93 | 1.5 | 62 | | |
| UT1-Reach 3 | 123+54 to 128+73; 129+29 to 137+60 | 1,350 | | Preservation | 1,350 | 5 | 270 | | |
| UT1-Reach 3 (Easement Break) | 128+73 to 129+29 | 56 | | Preservation (No Credit) | 56 | --- | --- | | |
| UT1-Reach 4 | 137+60 to 141+15 | 355 | EII | Enhancement | 355 | 2.5 | 142 | | |
| UT1-Reach 4 | 141+15 to 142+90; 143+44 to 144+29 | 260 | EI | Enhancement | 260 | 1.5 | 173 | | |
| UT1-Reach 4 (Easement Break) | 142+90 to 143+44 | 54 | EI | Enhancement (No Credit) | 54 | --- | --- | | |
| UT1-Reach 5 | 144+29 to 150+08; 150+62 to 159+64 | 1,355 | P1/2 | Restoration | 1,481 | 1 | 1,481 | | |
| UT1-Reach 5 (Easement Break) | 150+08 to 150+62 | 65 | P1 | Restoration (No Credit) | 54 | --- | --- | | |
| UT1A-Reach 1 (DOT ROW) | 200+00 to 200+05 | 5 | P1 | Restoration (No Credit) | 5 | --- | --- | | |
| UT1A-Reach 1 | 200+05 to 202+69; 203+09 to 208+57 | 738 | P1 | Restoration | 812 | 1 | 812 | | |
| UT1A-Reach 1 (Easement Break) | 202+69 to 203+09 | 32 | P1 | Restoration (No Credit) | 40 | --- | --- | | |
| UT1A-Reach 2 | 208+57 to 211+49 | 292 | EII | Enhancement | 292 | 2.5 | 117 | | |
| UT1A-Reach 3 | 211+49 to 216+06 | 457 | | Preservation | 457 | 5 | 91 | | |
| UT1A-Reach 3 (Easement Break) | 216+06 to 216+36 | 30 | EII | Enhancement (No Credit) | 30 | --- | --- | | |
| UT1A-Reach 4 | 216+36 to 223+02 | 461 | P1 | Restoration | 666 | 1 | 666 | | |
| UT1B | 300+00 to 302+32 | 243 | P1 | Restoration | 232 | 1 | 232 | | |
| UT2 | 400+00 to 404+19; 404+70 to 410+32 | 975 | P1 | Restoration | 981 | 1 | 981 | | |
| UT2 (Easement Break) | 404+19 to 404+70 | 53 | P1/2 | Restoration (No Credit) | 51 | --- | --- | | |
| COMPONENT SUMMATION | | | | | | | | | |
| Restoration Level | Stream (LF) | Riparian Wetland (acres) | | Non-Riparian Wetland (acres) | Buffer (acres) | Upland (acres) | | | |
| | | Riverine | Non-Riverine | | | | | | |
| Restoration | 5,309 | - | - | - | 3.0 | - | | | |
| Enhancement | | - | - | - | - | - | | | |
| Enhancement I | 353 | | | | | | | | |
| Enhancement II | 1,726 | | | | | | | | |
| Creation | | - | - | - | | | | | |
| Preservation | 1,807 | - | - | - | | - | | | |
| High Quality Preservation | - | - | - | - | | - | | | |

N/A: not applicable

Table 2. Project Activity and Reporting History
 Agony Acres Mitigation Site (DMS Project No.95716)
 Monitoring Year 2 -2016

| Activity or Report | Date Collection Complete | Completion or Scheduled Delivery |
|---|--------------------------------|----------------------------------|
| Mitigation Plan | October 2013- March 2014 | March 2014 |
| Final Design - Construction Plans | April 2014- June 2014 | June 2014 |
| Construction | June 2014- September 2014 | September 2014 |
| Temporary S&E mix applied to entire project area ¹ | September 2014 | September 2014 |
| Permanent seed mix applied to reach/segments | September 2014 | September 2014 |
| Bare root and live stake plantings for reach/segments | December 2014 | December 2014 |
| Baseline Monitoring Document (Year 0) | October 2014- December 2014 | February 2015 |
| Year 1 Monitoring | March 2015- October 2015 | December 2015 |
| Year 2 Monitoring | August 2016 | December 2016 |
| Year 3 Monitoring | 2017 | December 2017 |
| Year 4 Monitoring | 2018 | December 2018 |
| Year 5 Monitoring | 2019 | December 2019 |
| Year 6 Monitoring | 2020 | December 2020 |
| Year 7 Monitoring | 2021 | December 2021 |

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

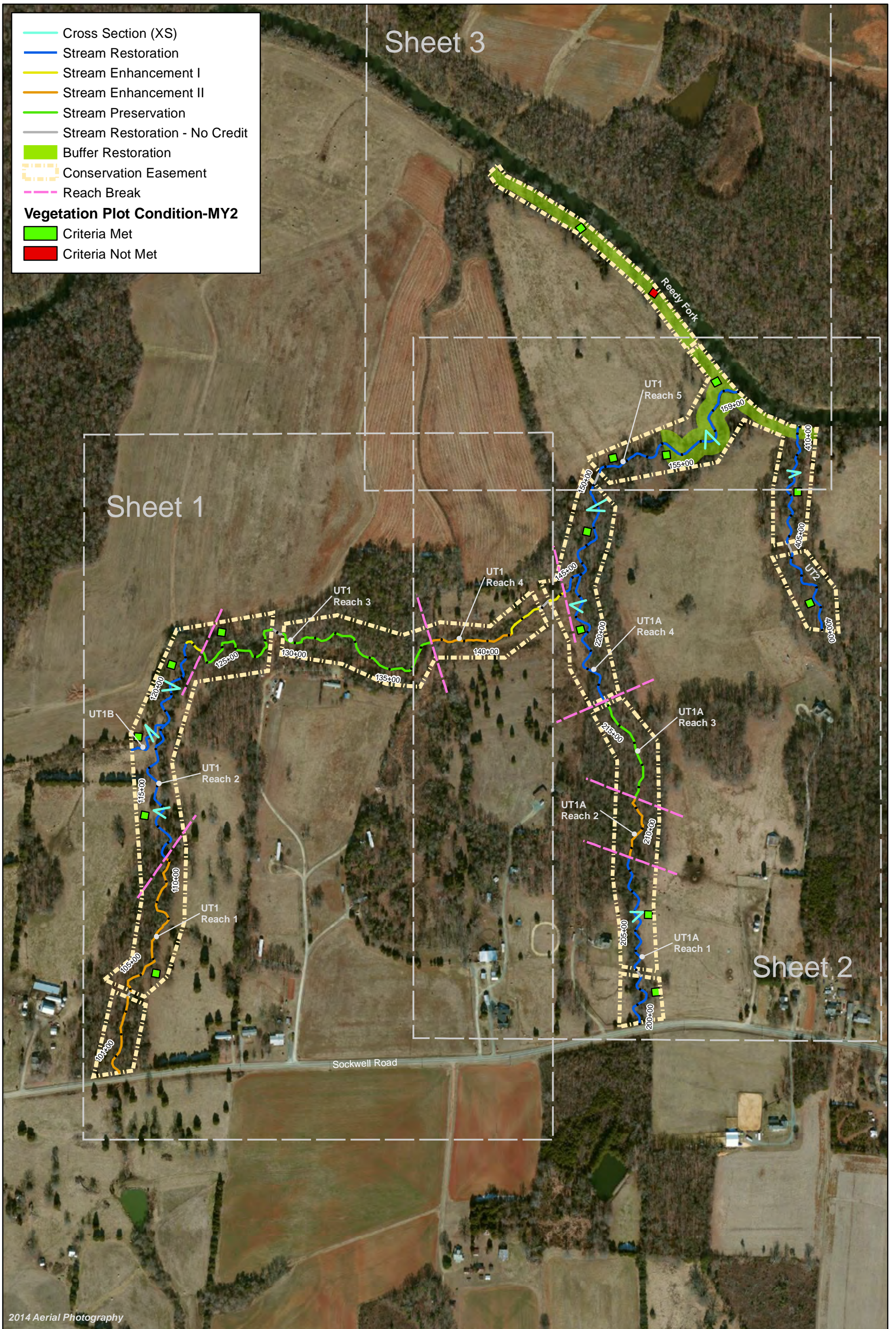
Table 3. Project Contact Table
 Agony Acres Mitigation Site (DMS Project No.95716)
 Monitoring Year 2 - 2016

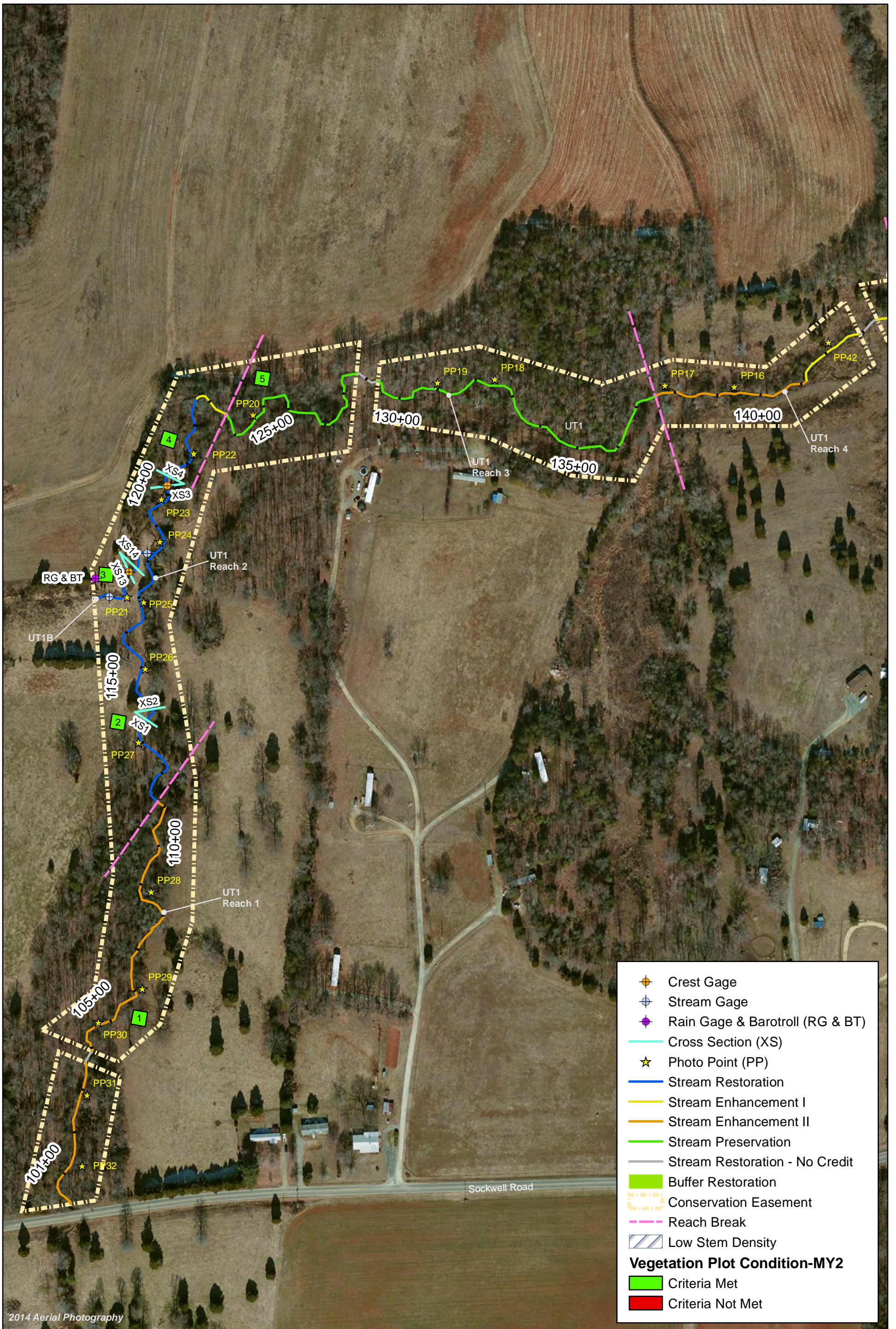
| | |
|---|---|
| Designer Nicole Macaluso, PE, CFM | Wildlands Engineering, Inc. 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986 |
| Construction Contractor | Land Mechanic Designs, Inc. 126 Circle G Lane Willow Spring, NC 27592 |
| Planting Contractor | Bruton Natural Systems, Inc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

Table 4. Project Information and Attributes
 Agony Acres Mitigation Site (DMS Project No.95716)
 Monitoring Year 2 - 2016

| PROJECT INFORMATION | | | | | | |
|---|--|---------------------|---|--------|--------|-----|
| Project Name | Agony Acres Mitigation Site | | | | | |
| County | Guilford County | | | | | |
| Project Area (acres) | 30.78 acres | | | | | |
| Project Coordinates (latitude and longitude) | 36° 10' 40" N, 79° 33' 02" W | | | | | |
| PROJECT WATERSHED SUMMARY INFORMATION | | | | | | |
| Physiographic Province | Piedmont | | | | | |
| River Basin | Cape Fear River | | | | | |
| USGS Hydrologic Unit 8-digit | 03030002 | | | | | |
| USGS Hydrologic Unit 14-digit | 03030002020070 | | | | | |
| DWR Sub-basin | 03-06-02 | | | | | |
| Project Drainage Area (acres) | 358 acres | | | | | |
| Project Drainage Area Percentage of Impervious Area | <1% | | | | | |
| CGIA Land Use Classification | 65% Managed Herbaceous Cover, 30% Mixed Upland Hardwoods, 3% Cultivated, 2% Southern Yellow Pine, <1% Low Intensity Development | | | | | |
| REACH SUMMARY INFORMATION | | | | | | |
| Parameters | UT1 - Reaches 1 -3 | UT1 - Reaches 4 & 5 | UT1A | UT1B | UT2 | |
| Length of reach (linear feet) - Post-Restoration | 3,760 | 2,204 | 2,302 | 232 | 1,032 | |
| Drainage area (acres) | 228 | 358 | 103 | 61 | 61 | |
| NCDWR stream identification score | 42.5 | 46.5 | 41 | 29.25 | 32.25 | |
| NCDWR Water Quality Classification | WS-V | | | | | |
| Morphological Description (stream type) | P | P | P/I | P | P | |
| Evolutionary trend (Simon's Model) - Pre- Restoration | I, III | III, IV | I, II/III | II/III | II/III | |
| Underlying mapped soils | Cecil sandy loam, Congaree loam, Coronaca clay loam, Enon fine sandy loam, Enon clay loam, Madison clay loam, Mecklenburg sandy clay loam, Wehadkee loam | | | | | |
| Drainage class | --- | --- | --- | --- | --- | --- |
| Soil Hydric status | --- | --- | --- | --- | --- | --- |
| Slope | --- | --- | --- | --- | --- | --- |
| FEMA classification | N/A | | | | | |
| Native vegetation community | Piedmont bottomland forest | | | | | |
| Percent composition exotic invasive vegetation -Post-Restoration | 0% | | | | | |
| REGULATORY CONSIDERATIONS | | | | | | |
| Regulation | Applicable? | Resolved? | Supporting Documentation | | | |
| Waters of the United States - Section 404 | Yes | Yes | USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885. | | | |
| Waters of the United States - Section 401 | Yes | Yes | USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885. | | | |
| Division of Land Quality (Dam Safety) | No | N/A | N/A | | | |
| Endangered Species Act | Yes | Yes | Agony Acres Mitigation Plan; Wildlands determined "no effect" on Guilford County listed endangered species. | | | |
| Historic Preservation Act | Yes | Yes | No historic resources were found to be impacted (letter from SHPO dated 1/15/13). | | | |
| Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA) | No | N/A | N/A | | | |
| FEMA Floodplain Compliance | N/A | N/A | The project streams do not have an associated regulatory floodplain; however portions of UT1, UT1A, and UT2 are located within the floodway and flood fringe of Reedy Fork (FEMA Zone AE, FIRM panels 8838 and 8848). | | | |
| Essential Fisheries Habitat | No | N/A | N/A | | | |

APPENDIX 2. Visual Assessment Data





| | |
|--------------------------------------|---------------------------------|
| | Crest Gage |
| | Stream Gage |
| | Rain Gage & Barotroll (RG & BT) |
| | Cross Section (XS) |
| | Photo Point (PP) |
| | Stream Restoration |
| | Stream Enhancement I |
| | Stream Enhancement II |
| | Stream Preservation |
| | Stream Restoration - No Credit |
| | Buffer Restoration |
| | Conservation Easement |
| | Reach Break |
| | Low Stem Density |
| Vegetation Plot Condition-MY2 | |
| | Criteria Met |
| | Criteria Not Met |

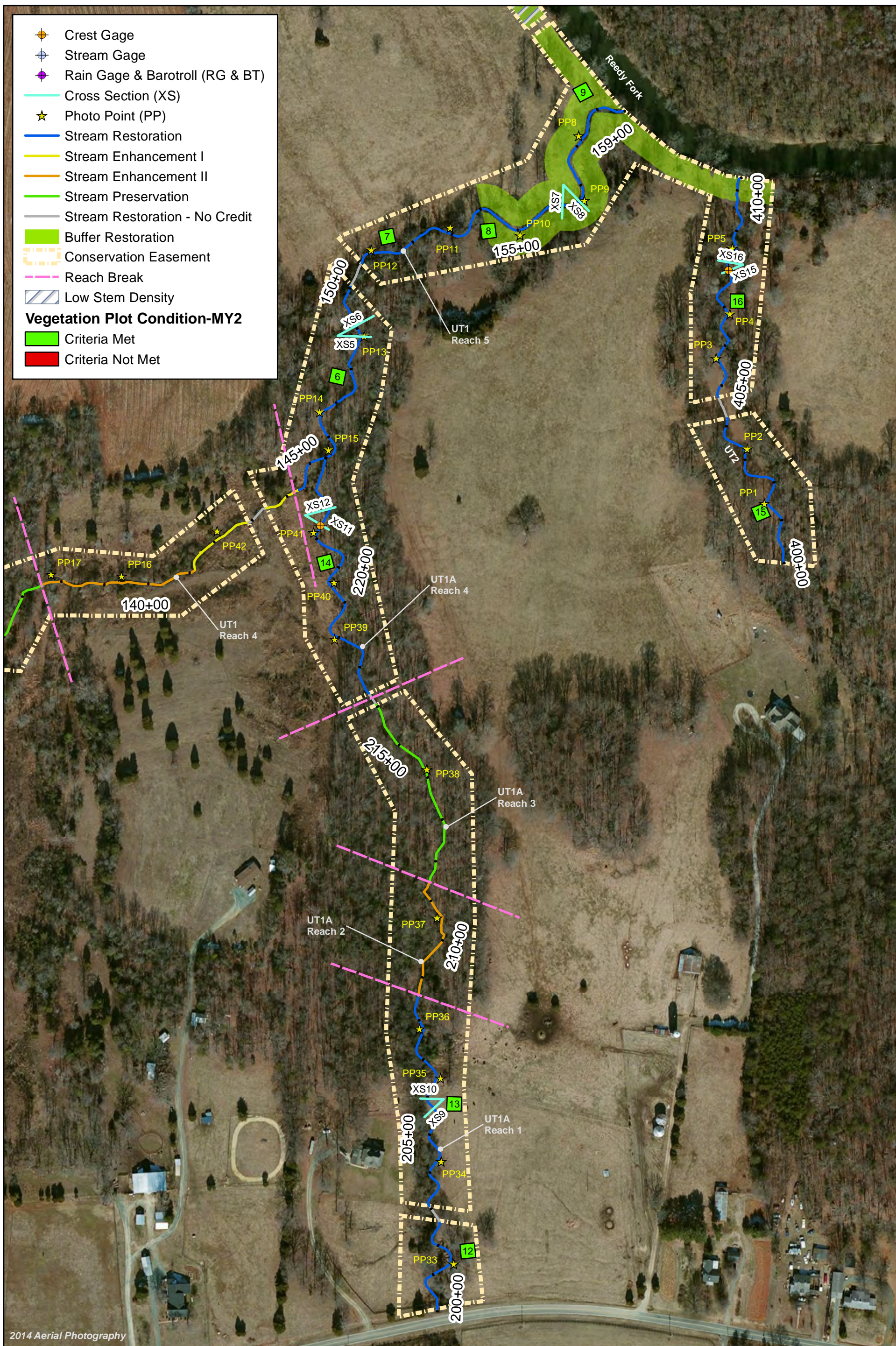
2014 Aerial Photography



0 250 500 Feet



Figure 3.1 Integrated Current Condition Plan View
 (Sheet 1 of 3)
 Agony Acres Mitigation Site
 DMS Project No.95716
 Monitoring Year 2 - 2016
 Guilford County, NC



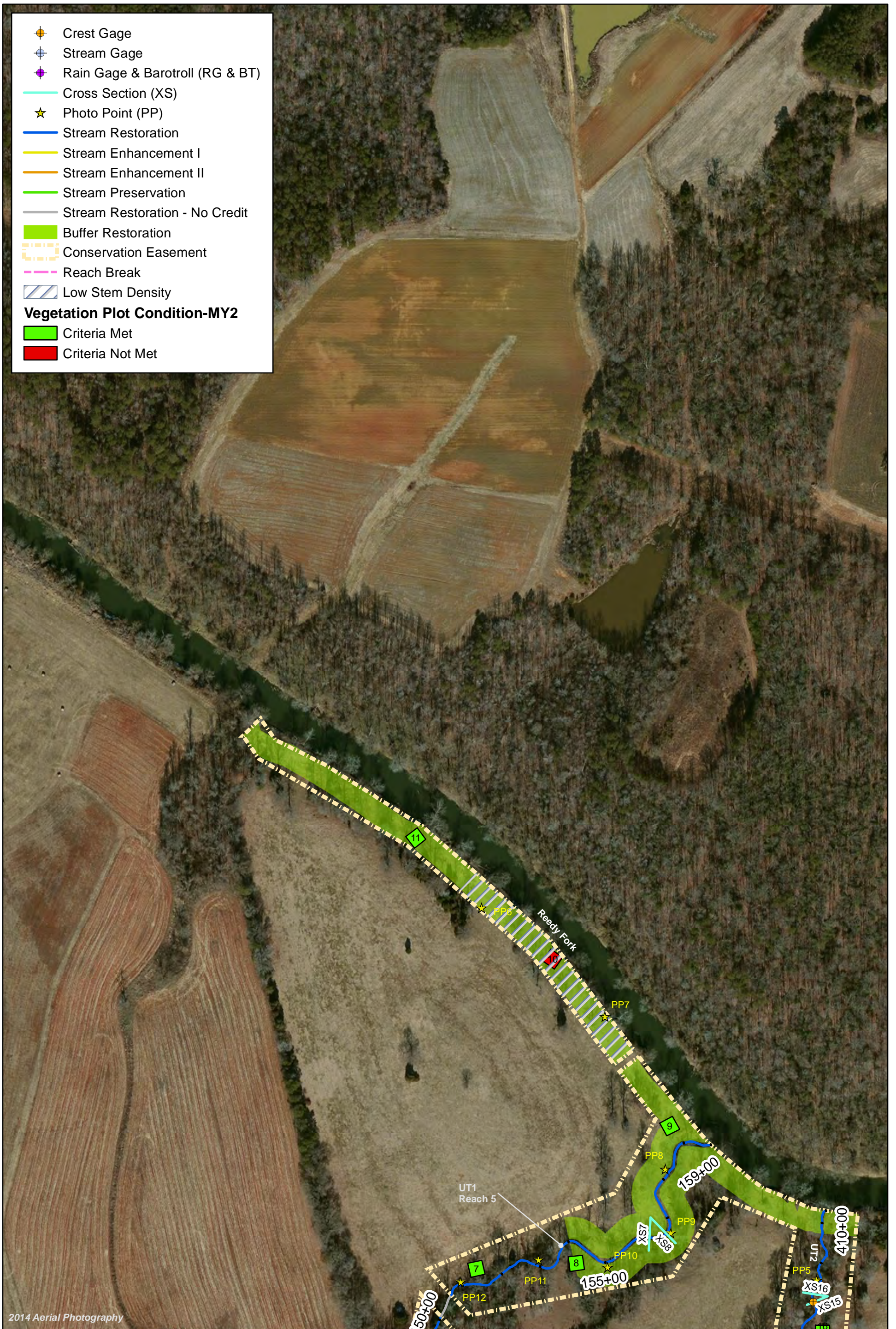


Table 5a. Visual Stream Morphology Stability Assessment Table

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

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 | 42 | 42 | | | 100% | | | |
| | 3. Meander Pool Condition | Depth Sufficient | 39 | 39 | | | 100% | | | |
| | | Length Appropriate | 39 | 39 | | | 100% | | | |
| | 4. Thalweg Position | Thalweg centering at upstream of meander bend (Run) | 39 | 39 | | | 100% | | | |
| Thalweg centering at downstream of meander bend (Glide) | | 39 | 39 | 100% | | | | | | |
| 2. Bank | 1. Scoured/Eroded | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | 0 | 0 | 100% | n/a | n/a | n/a |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat | | | 0 | 0 | 100% | n/a | n/a | n/a |
| | 3. Mass Wasting | Bank slumping, caving, or collapse | | | 0 | 0 | 100% | n/a | n/a | n/a |
| TOTALS | | | | | 0 | 0 | 100% | n/a | n/a | n/a |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs | 16 | 16 | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill | 16 | 16 | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms | 16 | 16 | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does not exceed 15% | 16 | 16 | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow | 16 | 16 | | | 100% | | | |

Table 5b. Visual Stream Morphology Stability Assessment Table

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

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 | 26 | 26 | | 100% | | | | |
| | 3. Meander Pool Condition | Depth Sufficient | 26 | 26 | | 100% | | | | |
| | | Length Appropriate | 26 | 26 | | 100% | | | | |
| | 4. Thalweg Position | Thalweg centering at upstream of meander bend (Run) | 26 | 26 | | 100% | | | | |
| Thalweg centering at downstream of meander bend (Glide) | | 26 | 26 | 100% | | | | | | |
| 2. Bank | 1. Scoured/Eroded | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | 0 | 0 | 100% | n/a | n/a | n/a |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat | | | 0 | 0 | 100% | n/a | n/a | n/a |
| | 3. Mass Wasting | Bank slumping, caving, or collapse | | | 0 | 0 | 100% | n/a | n/a | n/a |
| TOTALS | | | | | 0 | 0 | 100% | n/a | n/a | n/a |
| 3. Engineered Structures | 1. 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% | | | |

Table 5c. Visual Stream Morphology Stability Assessment Table

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1B

| 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 | 6 | 6 | | | 100% | | | |
| | 3. Meander Pool Condition | Depth Sufficient | 5 | 5 | | | 100% | | | |
| | | Length Appropriate | 5 | 5 | | | 100% | | | |
| | 4. Thalweg Position | Thalweg centering at upstream of meander bend (Run) | 5 | 5 | | | 100% | | | |
| Thalweg centering at downstream of meander bend (Glide) | | 5 | 5 | 100% | | | | | | |
| 2. Bank | 1. Scoured/Eroded | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | 0 | 0 | 100% | n/a | n/a | n/a |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat | | | 0 | 0 | 100% | n/a | n/a | n/a |
| | 3. Mass Wasting | Bank slumping, caving, or collapse | | | 0 | 0 | 100% | n/a | n/a | n/a |
| TOTALS | | | | | 0 | 0 | 100% | n/a | n/a | n/a |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs | 1 | 1 | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill | 1 | 1 | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms | 1 | 1 | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does not exceed 15% | 1 | 1 | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow | 1 | 1 | | | 100% | | | |

Table 5d. Visual Stream Morphology Stability Assessment Table

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

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 | 20 | 20 | | | 100% | | | |
| | 3. Meander Pool Condition | Depth Sufficient | 21 | 21 | | | 100% | | | |
| | | Length Appropriate | 21 | 21 | | | 100% | | | |
| | 4. Thalweg Position | Thalweg centering at upstream of meander bend (Run) | 21 | 21 | | | 100% | | | |
| Thalweg centering at downstream of meander bend (Glide) | | 21 | 21 | 100% | | | | | | |
| 2. Bank | 1. Scoured/Eroded | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | 0 | 0 | 100% | n/a | n/a | n/a |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat | | | 0 | 0 | 100% | n/a | n/a | n/a |
| | 3. Mass Wasting | Bank slumping, caving, or collapse | | | 0 | 0 | 100% | n/a | n/a | n/a |
| TOTALS | | | | | 0 | 0 | 100% | n/a | n/a | n/a |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs | 5 | 5 | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill | 5 | 5 | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms | 5 | 5 | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does not exceed 15% | 5 | 5 | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow | 5 | 5 | | | 100% | | | |

Table 6. Vegetation Condition Assessment Table
 Agony Acres Mitigation Site (DMS Project No. 95716)
 Monitoring Year 2 - 2016

Planted Acreage 18

| Vegetation Category | Definitions | Mapping Threshold (Ac) | Number of Polygons | Combined Acreage | % of Planted Acreage |
|--|---|------------------------|-------------------------|------------------|----------------------|
| Bare Areas | Very limited cover of both woody and herbaceous material | 0.1 | 0 | 0 | 0.0% |
| Low Stem Density Areas | Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria. | 0.1 | 1 | 0.7 | 3.6% |
| | | | Total | 1 | 3.6% |
| 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 | 1 | 4% |

Easement Acreage 31

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

**STREAM PHOTOGRAPHS
UT2
Monitoring Year 2**



PHOTO POINT 1 – looking upstream (03/15/2016)



PHOTO POINT 1 – looking downstream (03/15/2016)



PHOTO POINT 2 – looking upstream (03/15/2016)



PHOTO POINT 2 – looking downstream (03/15/2016)





PHOTO POINT 3 – looking upstream (03/15/2016)



PHOTO POINT 3 – looking downstream (03/15/2016)



PHOTO POINT 4 – looking upstream (03/15/2016)



PHOTO POINT 4 – looking downstream (03/15/2016)



PHOTO POINT 5 – looking upstream (03/15/2016)



PHOTO POINT 5 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
Reedy Fork (Buffer)
Monitoring Year 2



PHOTO POINT 6 – looking upstream (03/15/2016)



PHOTO POINT 6 – looking downstream (03/15/2016)



PHOTO POINT 7 – looking upstream (03/15/2016)



PHOTO POINT 7 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
UT1 Reach 5
Monitoring Year 2



PHOTO POINT 8 – looking upstream (03/15/2016)



PHOTO POINT 8 – looking downstream (03/15/2016)



PHOTO POINT 9 – looking upstream (03/15/2016)



PHOTO POINT 9 – looking downstream (03/15/2016)





PHOTO POINT 10 – looking upstream (03/15/2016)



PHOTO POINT 10 – looking downstream (03/15/2016)



PHOTO POINT 11 – looking upstream (03/15/2016)



PHOTO POINT 11 – looking downstream (03/15/2016)



PHOTO POINT 12 – looking upstream (03/15/2016)



PHOTO POINT 12 – looking downstream (03/15/2016)





PHOTO POINT 13 – looking upstream (03/15/2016)



PHOTO POINT 13 – looking downstream (03/15/2016)



PHOTO POINT 14 – looking upstream (03/15/2016)



PHOTO POINT 14 – looking downstream (03/15/2016)



PHOTO POINT 15 – looking upstream (03/15/2016)



PHOTO POINT 15 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
UT1 Reach 4
Monitoring Year 2



PHOTO POINT 16 – looking upstream (03/15/2016)



PHOTO POINT 16 – looking downstream (03/15/2016)



PHOTO POINT 17 – looking upstream (03/15/2016)



PHOTO POINT 17 – looking downstream (03/15/2016)





PHOTO POINT 42 – looking upstream (03/15/2016)



PHOTO POINT 42 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
UT1 Reach 3
Monitoring Year 2



PHOTO POINT 18 – looking upstream (03/15/2016)



PHOTO POINT 18 – looking downstream (03/15/2016)



PHOTO POINT 19 – looking upstream (03/15/2016)



PHOTO POINT 19 – looking downstream (03/15/2016)





PHOTO POINT 20 – looking upstream (03/15/2016)



PHOTO POINT 20 – looking downstream (03/15/2016)



**STREAM PHOTOGRAPHS
UT1B
Monitoring Year 2**



PHOTO POINT 21 – looking upstream (03/15/2016)



PHOTO POINT 21 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
UT1 Reach 2
Monitoring Year 2



PHOTO POINT 22 – looking upstream (03/15/2016)



PHOTO POINT 22 – looking downstream (03/15/2016)



PHOTO POINT 23 – looking upstream (03/15/2016)



PHOTO POINT 23 – looking downstream (03/15/2016)





PHOTO POINT 24 – looking upstream (03/15/2016)



PHOTO POINT 24 – looking downstream (03/15/2016)



PHOTO POINT 25 – looking upstream (03/15/2016)



PHOTO POINT 25 – looking downstream (03/15/2016)



PHOTO POINT 26 – looking upstream (03/15/2016)



PHOTO POINT 26 – looking downstream (03/15/2016)





PHOTO POINT 27 – looking upstream (03/15/2016)



PHOTO POINT 27 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
UT1 Reach 1
Monitoring Year 2



PHOTO POINT 28 – looking upstream (03/15/2016)



PHOTO POINT 28 – looking downstream (03/15/2016)



PHOTO POINT 29 – looking upstream (03/15/2016)



PHOTO POINT 29 – looking downstream (03/15/2016)





PHOTO POINT 30 – looking upstream (03/15/2016)



PHOTO POINT 30 – looking downstream (03/15/2016)



PHOTO POINT 31 – looking upstream (03/15/2016)



PHOTO POINT 31 – looking downstream (03/15/2016)



PHOTO POINT 32 – looking upstream (03/15/2016)



PHOTO POINT 32 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
UT1A Reach 1
Monitoring Year 2



PHOTO POINT 33 – looking upstream (03/15/2016)



PHOTO POINT 33 – looking downstream (03/15/2016)



PHOTO POINT 34 – looking upstream (03/15/2016)



PHOTO POINT 34 – looking downstream (03/15/2016)





PHOTO POINT 35 – looking upstream (03/15/2016)



PHOTO POINT 35 – looking downstream (03/15/2016)



PHOTO POINT 36 – looking upstream (03/15/2016)



PHOTO POINT 36 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
UT1A Reach 2
Monitoring Year 2



PHOTO POINT 37 – looking upstream (03/15/2016)



PHOTO POINT 37 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
UT1A Reach 3
Monitoring Year 2



PHOTO POINT 38 – looking upstream (03/15/2016)



PHOTO POINT 38 – looking downstream (03/15/2016)



STREAM PHOTOGRAPHS
UT1A Reach 4
Monitoring Year 2



PHOTO POINT 39 – looking upstream (03/15/2016)



PHOTO POINT 39 – looking downstream (03/15/2016)



PHOTO POINT 40 – looking upstream (03/15/2016)



PHOTO POINT 40 – looking downstream (03/15/2016)





PHOTO POINT 41 – looking upstream (03/15/2016)



PHOTO POINT 41 – looking downstream (03/15/2016)



VEGETATION PHOTOGRAPHS
Agony Acres
Monitoring Year 2



VEG PLOT 1 (06/16/2016)



VEG PLOT 2 (06/16/2016)



VEG PLOT 3 (06/16/2016)



VEG PLOT 4 (06/16/2016)





VEG PLOT 5 (06/16/2016)



VEG PLOT 6 (06/16/2016)



VEG PLOT 7 (06/16/2016)



VEG PLOT 8 (06/16/2016)



VEG PLOT 9 (06/16/2016)



VEG PLOT 10 (06/16/2016)





VEG PLOT 11 (06/16/2016)



VEG PLOT 12 (06/16/2016)



VEG PLOT 13 (06/16/2016)



VEG PLOT 14 (06/16/2016)



VEG PLOT 15 (06/16/2016)



VEG PLOT 16 (06/16/2016)



APPENDIX 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment
 Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 2 - 2016

| Plot | MY1 Success Criteria Met (Y/N) | Tract Mean |
|------|--------------------------------|------------|
| 1 | Y | 94% |
| 2 | Y | |
| 3 | Y | |
| 4 | Y | |
| 5 | Y | |
| 6 | Y | |
| 7 | Y | |
| 8 | Y | |
| 9 | Y | |
| 10 | N | |
| 11 | Y | |
| 12 | Y | |
| 13 | Y | |
| 14 | Y | |
| 15 | Y | |
| 16 | Y | |

Table 8. CVS Vegetation Plot Metadata

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

| | |
|---|---|
| Database name | Agony Acres- MY2- v2.3.1.mdb |
| Database location | F:\Projects\005-02136 Agony Acres\Monitoring\Monitoring Year 2\Vegetation Assessment |
| Computer name | JASON-PC |
| File size | 68157440 |
| DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT | |
| Metadata | Description of database file, the report worksheets, and a summary of project(s) and project data. |
| Proj, planted | Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes. |
| Proj, total stems | Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems. |
| Plots | List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.). |
| Vigor | Frequency distribution of vigor classes for stems for all plots. |
| Vigor by Spp | Frequency distribution of vigor classes listed by species. |
| Damage | List of most frequent damage classes with number of occurrences and percent of total stems impacted by each. |
| Damage by Spp | Damage values tallied by type for each species. |
| Damage by Plot | Damage values tallied by type for each plot. |
| Planted Stems by Plot and Spp | A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded. |
| ALL Stems by Plot and spp | A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded. |
| PROJECT SUMMARY | |
| Project Code | 95716 |
| project Name | Agony Acres Mitigation Site |
| Description | Stream & Buffer Site |
| River Basin | Cape Fear |
| Sampled Plots | 16 |

Table 9. Planted and Total Stem Counts

Agony Acres Mitigation Site (DMS Project No.95716)

Monitoring Year 2 -2016

| | | | Current Plot Data (MY2 2016) | | | | | | | | | | | | | | |
|-------------------------|--------------------|--------------|------------------------------|-------|------|----------------|-------|-------|----------------|-------|-------|----------------|-------|-------|----------------|-------|-------|
| Scientific Name | Common Name | Species Type | 95716-WEI-0001 | | | 95716-WEI-0002 | | | 95716-WEI-0003 | | | 95716-WEI-0004 | | | 95716-WEI-0005 | | |
| | | | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T |
| Acer negundo | boxelder | Tree | | | | | | | | | | | | | | | |
| Acer rubrum | red maple | Tree | | | | | | | | | | | | | | | |
| Alnus serrulata | tag alder | Shrub | 1 | 1 | 1 | | | | 2 | 2 | 2 | 1 | 1 | 1 | | | |
| Betula nigra | river birch | Tree | | | | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | | | |
| Cornus amomum | silky dogwood | Shrub | | | | | | | | | | | | 1 | | | |
| Fraxinus pennsylvanica | green ash | Tree | 5 | 5 | 5 | 4 | 4 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| Ilex opaca | American holly | Tree | | | 1 | | | | | | | | | | | | |
| Juglans nigra | black walnut | Tree | | | | | | | | | | | | | | | |
| Liquidambar styraciflua | sweetgum | Tree | | | 5 | | | | | | | | | | | | |
| Liriodendron tulipifera | tuliptree | Tree | | | 7 | | | | | | | | | | | | |
| Platanus occidentalis | American sycamore | Tree | 4 | 4 | 4 | | | | 4 | 4 | 4 | 4 | 4 | 9 | 2 | 2 | 2 |
| Quercus michauxii | swamp chestnut oak | Tree | | | | | | | 1 | 1 | 1 | 2 | 2 | 2 | 5 | 5 | 5 |
| Quercus pagoda | cherrybark oak | Tree | 2 | 2 | 2 | 4 | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 2 | | | |
| Quercus phellos | willow oak | Tree | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| Quercus rubra | northern red oak | Tree | | | | | | | | | | | | | | | |
| Stem count | | | 14 | 14 | 27 | 11 | 11 | 11 | 16 | 16 | 16 | 15 | 15 | 21 | 10 | 10 | 10 |
| size (ares) | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | |
| size (ACRES) | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | |
| Species count | | | 5 | 5 | 8 | 4 | 4 | 4 | 7 | 7 | 7 | 7 | 7 | 8 | 4 | 4 | 4 |
| Stems per ACRE | | | 566.6 | 566.6 | 1093 | 445.2 | 445.2 | 445.2 | 647.5 | 647.5 | 647.5 | 607 | 607 | 849.8 | 404.7 | 404.7 | 404.7 |

Color Coding for Table

- 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

Agony Acres Mitigation Site (DMS Project No.95716)

Monitoring Year 2 -2016

| | | | Current Plot Data (MY2 2016) | | | | | | | | | | | | | | |
|-------------------------|--------------------|--------------|------------------------------|-------|------|----------------|-------|-----|----------------|-------|-----|----------------|-------|------|----------------|-------|-------|
| Scientific Name | Common Name | Species Type | 95716-WEI-0006 | | | 95716-WEI-0007 | | | 95716-WEI-0008 | | | 95716-WEI-0009 | | | 95716-WEI-0010 | | |
| | | | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T |
| Acer negundo | boxelder | Tree | | | | | | | | | | | | | | | |
| Acer rubrum | red maple | Tree | | | 20 | | | | | | | | | 10 | | | |
| Alnus serrulata | tag alder | Shrub | 4 | 4 | 4 | | | | | | | 1 | 1 | 1 | | | |
| Betula nigra | river birch | Tree | 3 | 3 | 3 | 4 | 4 | 4 | 1 | 1 | 1 | | | | | | |
| Cornus amomum | silky dogwood | Shrub | | | | | | | | | | | | | | | |
| Fraxinus pennsylvanica | green ash | Tree | 2 | 2 | 2 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 11 | 2 | 2 | 2 |
| Ilex opaca | American holly | Tree | | | 2 | | | | | | | | | | | | |
| Juglans nigra | black walnut | Tree | | | | | | | | | | | | | | | |
| Liquidambar styraciflua | sweetgum | Tree | | | 20 | | | | | | | | | | | | |
| Liriodendron tulipifera | tuliptree | Tree | | | 20 | | | | | | | | | | | | |
| Platanus occidentalis | American sycamore | Tree | 2 | 2 | 22 | 3 | 3 | 3 | 6 | 6 | 6 | 7 | 7 | 7 | 1 | 1 | 1 |
| Quercus michauxii | swamp chestnut oak | Tree | 2 | 2 | 2 | 4 | 4 | 4 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| Quercus pagoda | cherrybark oak | Tree | 1 | 1 | 1 | | | | | | | | | | 2 | 2 | 2 |
| Quercus phellos | willow oak | Tree | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 |
| Quercus rubra | northern red oak | Tree | | | 20 | | | | | | | | | | | | |
| Stem count | | | 14 | 14 | 116 | 15 | 15 | 15 | 15 | 15 | 15 | 16 | 16 | 31 | 7 | 7 | 7 |
| size (ares) | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | |
| size (ACRES) | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | |
| Species count | | | 6 | 6 | 11 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 6 | 5 | 5 | 5 |
| Stems per ACRE | | | 566.6 | 566.6 | 4694 | 607 | 607 | 607 | 607 | 607 | 607 | 647.5 | 647.5 | 1255 | 283.3 | 283.3 | 283.3 |

Color Coding for Table

- 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

Agony Acres Mitigation Site (DMS Project No.95716)

Monitoring Year 2 -2016

| | | | Current Plot Data (MY2 2016) | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------|--------------|------------------------------|-------|-------|----------------|-------|-------|----------------|-------|-------|----------------|-------|------|----------------|-------|-------|----------------|-------|------|
| Scientific Name | Common Name | Species Type | 95716-WEI-0011 | | | 95716-WEI-0012 | | | 95716-WEI-0013 | | | 95716-WEI-0014 | | | 95716-WEI-0015 | | | 95716-WEI-0016 | | |
| | | | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T |
| Acer negundo | boxelder | Tree | | | | | | | | | | | | | | | | | | |
| Acer rubrum | red maple | Tree | | | | | | | | | | | | | | | | | | |
| Alnus serrulata | tag alder | Shrub | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Betula nigra | river birch | Tree | 2 | 2 | 2 | | | | 2 | 2 | 2 | 2 | 2 | 2 | | | | | | |
| Cornus amomum | silky dogwood | Shrub | | | | | | | | | | | | | | | 1 | | | |
| Fraxinus pennsylvanica | green ash | Tree | 8 | 8 | 9 | 2 | 2 | 2 | 2 | 2 | 2 | | | | 3 | 3 | 5 | 2 | 2 | 24 |
| Ilex opaca | American holly | Tree | | | | | | | | | | | | | | | | | | |
| Juglans nigra | black walnut | Tree | | | | | | | | | | | | | | | | | | |
| Liquidambar styraciflua | sweetgum | Tree | | | 2 | | | | | | | | | | | | | | | 3 |
| Liriodendron tulipifera | tuliptree | Tree | | | | | | | | | | | | | | | | | | 20 |
| Platanus occidentalis | American sycamore | Tree | 3 | 3 | 3 | 4 | 4 | 4 | | | | 3 | 3 | 23 | 4 | 4 | 4 | 3 | 3 | 23 |
| Quercus michauxii | swamp chestnut oak | Tree | | | | 2 | 2 | 2 | 6 | 6 | 6 | 4 | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 2 |
| Quercus pagoda | cherrybark oak | Tree | | | | 1 | 1 | 1 | 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 | 1 | 1 | 1 | 4 | 4 | 4 |
| Quercus rubra | northern red oak | Tree | | | | | | | | | | | | 20 | | | | | | |
| Stem count | | | 15 | 15 | 18 | 11 | 11 | 11 | 13 | 13 | 13 | 13 | 13 | 73 | 12 | 12 | 19 | 13 | 13 | 78 |
| size (ares) | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | |
| size (ACRES) | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | |
| Species count | | | 5 | 5 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 6 | 6 | 8 | 6 | 6 | 8 | 6 | 6 | 8 |
| Stems per ACRE | | | 607 | 607 | 728.4 | 445.2 | 445.2 | 445.2 | 526.1 | 526.1 | 526.1 | 526.1 | 526.1 | 2954 | 485.6 | 485.6 | 768.9 | 526.1 | 526.1 | 3157 |

Color Coding for Table

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

Agony Acres Mitigation Site (DMS Project No.95716)

Monitoring Year 2 -2016

| Scientific Name | Common Name | Species Type | Annual Means | | | | | | | | |
|-------------------------|--------------------|--------------|--------------|-------|------|------------|-------|-------|------------|-------|-----|
| | | | MY2 (2016) | | | MY1 (2015) | | | MY0 (2015) | | |
| | | | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T |
| Acer negundo | boxelder | Tree | | | | | | 2 | | | |
| Acer rubrum | red maple | Tree | | | 30 | | | 10 | | | |
| Alnus serrulata | tag alder | Shrub | 15 | 15 | 15 | 26 | 26 | 26 | 27 | 27 | 27 |
| Betula nigra | river birch | Tree | 20 | 20 | 20 | 27 | 27 | 27 | 28 | 28 | 28 |
| Cornus amomum | silky dogwood | Shrub | | | 2 | | | | | | |
| Fraxinus pennsylvanica | green ash | Tree | 52 | 52 | 82 | 55 | 55 | 56 | 55 | 55 | 55 |
| Ilex opaca | American holly | Tree | | | 3 | | | | | | |
| Juglans nigra | black walnut | Tree | | | | | | 1 | | | |
| Liquidambar styraciflua | sweetgum | Tree | | | 30 | | | 10 | | | |
| Liriodendron tulipifera | tuliptree | Tree | | | 71 | | | 32 | | | |
| Platanus occidentalis | American sycamore | Tree | 50 | 50 | 115 | 56 | 56 | 101 | 56 | 56 | 56 |
| Quercus michauxii | swamp chestnut oak | Tree | 35 | 35 | 35 | 36 | 36 | 36 | 36 | 36 | 36 |
| Quercus pagoda | cherrybark oak | Tree | 20 | 20 | 20 | 25 | 25 | 25 | 25 | 25 | 25 |
| Quercus phellos | willow oak | Tree | 18 | 18 | 18 | 30 | 30 | 30 | 30 | 30 | 30 |
| Quercus rubra | northern red oak | Tree | | | 40 | | | 10 | | | |
| Stem count | | | 210 | 210 | 481 | 255 | 255 | 366 | 257 | 257 | 257 |
| size (ares) | | | 16 | | | 16 | | | 16 | | |
| size (ACRES) | | | 0.40 | | | 0.40 | | | 0.40 | | |
| Species count | | | 7 | 7 | 13 | 7 | 7 | 13 | 7 | 7 | 7 |
| Stems per ACRE | | | 531.1 | 531.1 | 1217 | 645 | 645 | 925.7 | 650 | 650 | 650 |

Color Coding for Table

- 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
 Agony Acres Mitigation Site (DMS Project No. 95716)
 Monitoring Year 2 - 2016

UT1

| | | PRE-RESTORATION CONDITION | | | REFERENCE REACH DATA | | | | | | | | | DESIGN | | | | AS-BUILT/BASELINE | | | | | |
|--|------|-----------------------------|-----------------------------|---------------|---|--------|---------------------|--------|-----------------|--------|-----------------|--------|------------------|--------|---------------|--------|---------------|-----------------------|-----------------------------|------|---------------|------|-----|
| Parameter | Gage | UT1 - Reach 2 | | UT1 - Reach 5 | Onsite Reference Reach - UT1A - Reach 3 | | UT to Polecat Creek | | Spencer Creek 1 | | Spencer Creek 2 | | UT To Cane Creek | | UT1 - Reach 2 | | UT1 - Reach 5 | | UT1 - Reach 2 | | UT1 - Reach 5 | | |
| | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| Dimension and Substrate - Riffle | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | N/A | 6.5 | 13.9 | 16.0 | 11.1 | 5.3 | 10.9 | 10.7 | 11.2 | 6.3 | 9.3 | 11.5 | 12.3 | 10.2 | 12.8 | 10.2 | 10.4 | 11.9 | 13.6 | | | | |
| Floodprone Width (ft) | | 10 | 20 | >50 | 25 | 25 | 65 | 60 | >114 | 14 | 125 | 31 | | 22 | 51 | 28 | 64 | 60 | 100 | 200 | | | |
| Bankfull Mean Depth | | 0.8 | 1.5 | 4.3 | 0.7 | 1.0 | 1.1 | 1.6 | 1.8 | 0.8 | 1.0 | 0.8 | 1.0 | 0.8 | 0.9 | 0.6 | 0.9 | 0.8 | 0.9 | | | | |
| Bankfull Max Depth | | 1.4 | 1.9 | 5.2 | 1.0 | 1.4 | 1.7 | 2.1 | 2.6 | 1.0 | 1.2 | 1.2 | 1.6 | 1.0 | 1.2 | 1.1 | 1.4 | 1.3 | 1.6 | | | | |
| Bankfull Cross Sectional Area (ft ²) | | 5.2 | 24.6 | 59.0 | 7.4 | 5.4 | 12.4 | 17.8 | 19.7 | 6.6 | 8.7 | 8.9 | 12.2 | 7.9 | 12.0 | 6.2 | 9.0 | 9.1 | 11.9 | | | | |
| Width/Depth Ratio | | 8.2 | 3.3 | 10.4 | 16.6 | 5.2 | 9.6 | 5.8 | 7.1 | 7.9 | 9.3 | 12.3 | 14.4 | 13.1 | 13.6 | 12.0 | 16.8 | 15.5 | 15.7 | | | | |
| Entrenchment Ratio | | 1.5 | 1.2 | >3.6 | 2 | 3.2 | 8.3 | 5.5 | >10.2 | 1.7 | 4.3 | >2.5 | | 2.2 | 5.0 | 2.2 | 5.0 | 5.9 | 9.6 | 14.7 | 16.8 | | |
| Bank Height Ratio | | 2.3 | 1.0 | 2.0 | 1.0 | 1.0 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | -- | -- | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | | | |
| D50 (mm) | | 3.47 | 14.60 | | | | | | | | | | | | | | | Silt/Clay | 0.11 | | | | |
| Profile | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | N/A | | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 13.9 | 73.2 | 23.7 | 81.3 | | |
| Riffle Slope (ft/ft) | | --- | --- | N/A | 0.0040 | 0.0470 | 0.0130 | 0.0184 | 0.0343 | 0.0188 | 0.0704 | 0.0148 | 0.0453 | 0.0118 | 0.0363 | 0.0078 | 0.0317 | 0.0090 | 0.0304 | | | | |
| Pool Length (ft) | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 17.2 | 42.8 | 17.6 | 76.6 | | |
| Pool Max Depth (ft) | | 2.4 | 2.5 | 1.6 | 1.8 | 3.3 | 1.2 | 1.8 | 2.6 | 0.9 | 3.2 | 1.1 | 3.9 | 1.6 | 3.7 | 2.0 | 4.9 | | | | | | |
| Pool Spacing (ft) | | --- | --- | N/A | 34 | 52 | 71 | 9 | 46 | 27 | 73 | 13 | 67 | 17 | 84 | 31 | 78 | 35 | 103 | | | | |
| Pool Volume (ft ³) | | | | | | | | | | | | | | | | | | | | | | | |
| Pattern | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | N/A | 12 | 20 | 48 | 157 | N/A | 28 | 50 | 38 | 41 | 10 | 50 | 102 | 16 | 74 | 20 | 93 | 20 | 68 | 34 | 72 | | |
| Radius of Curvature (ft) | | 6 | 18 | 13 | 86 | N/A | 19 | 50 | 11 | 15 | 12 | 85 | 23 | 38 | 18 | 31 | 23 | 38 | 18 | 26 | 23 | 38 | |
| Rc:Bankfull Width (ft/ft) | | 0.8 | 2.3 | 1.6 | 10.9 | N/A | 2.0 | 5.3 | 1.3 | 1.4 | 1.9 | 9.1 | 2.0 | 3.1 | 1.8 | 3.0 | 1.8 | 3.0 | 1.8 | 2.5 | 1.9 | 2.8 | |
| Meander Length (ft) | | 27 | 45 | 176 | 260 | N/A | -- | -- | -- | -- | 53 | 178 | -- | -- | 31 | 151 | 38 | 192 | 70 | 120 | 97 | 160 | |
| Meander Width Ratio | | 1.5 | 2.5 | 6.1 | 19.9 | N/A | 3.0 | 5.3 | 3.4 | 3.6 | 1.6 | 5.4 | 8.3 | 8.9 | 1.6 | 7.3 | 1.6 | 7.3 | 2.0 | 6.5 | 2.9 | 5.3 | |
| Substrate, Bed and Transport Parameters | | | | | | | | | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | N/A | | | | | | | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | | | | | | | | |
| d16/d35/d50/d84/d95/d100 | | 0.33/1.88/3.47/45.0/117/256 | 0.18/3.2/14.6/128/234/>2048 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | SC/SC/41.3/79.2/128.0 | SC/SC/0.11/45.0/104.7/180.0 | | | | |
| Reach Shear Stress (Competency) lb/ft ² | | 0.43 | 1.26 | | | | | | | | | | | 0.49 | 0.63 | | | | | | | | |
| Max part size (mm) mobilized at bankfull | | | | | | | | | | | | | | | | | | | | | | | |
| Stream Power (Capacity) W/m ² | | | | | | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | | | | | | |
| Drainage Area (SM) | N/A | 0.25 | 0.56 | 0.15 | 0.41 | 0.96 | 0.37 | 0.29 | 0.25 | 0.56 | 0.25 | 0.56 | 0.25 | 0.56 | 0.25 | 0.56 | 0.25 | 0.56 | 0.25 | 0.56 | 0.25 | 0.56 | |
| Watershed Impervious Cover Estimate (%) | | <1% | <1% | --- | --- | --- | --- | --- | <1% | <1% | <1% | <1% | <1% | <1% | <1% | <1% | <1% | <1% | <1% | <1% | <1% | <1% | |
| Rosgen Classification | | G4 | E4, G4 | B3 | E4 | E4 | E4 | C4/E4 | C4 | C4 | C4 | C4 | C4 | C4 | C4 | C4 | C4 | C4 | C4 | C4 | C4 | C4 | |
| Bankfull Velocity (fps) | | 2.7 | 1.7 | 5.7 | 4.9 | 2.2 | 3.5 | 4.9 | 5.4 | 5.0 | 5.6 | 3.8 | 2.5-5 | 2.5-5 | 2.6 | 3.4 | 3.3 | 3.6 | | | | | |
| Bankfull Discharge (cfs) | | 14 | 129 | 37 | 20 | 97 | 35 | 40 | 25.0 | 46.0 | 17.0 | 30.9 | 30.3 | 42.9 | | | | | | | | | |
| Q-NFF regression | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| Q-USGS extrapolation | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| Q-Mannings | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| Valley Length (ft) | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 907 | 1,232 | --- | --- | --- | --- | --- | --- | --- | |
| Channel Thalweg Length (ft) | | 1,132 | 1,417 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,114 | 1,488 | --- | --- | --- | --- | --- | --- | --- | |
| Sinuosity | | 1.14 | 1.24 | 1.04 | 1.40 | 2.32 | 1.00 | 1.30 | 1.40 | 1.20 | 1.30 | 1.20 | 1.30 | 1.20 | 1.30 | 1.20 | 1.30 | 1.20 | 1.30 | 1.20 | 1.30 | | |
| Water Surface Slope (ft/ft) ² | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| Bankfull Slope (ft/ft) | | 0.0093 | 0.0190 | 0.0005 | 0.0130 | 0.0490 | 0.0120 | 0.0047 | 0.0190 | 0.0220 | 0.0150 | 0.0070 | 0.0150 | 0.0054 | 0.0172 | 0.0096 | 0.0104 | | | | | | |

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

Table 10b. Baseline Stream Data Summary
 Agony Acres Mitigation Site (DMS Project No. 95716)
 Monitoring Year 2 - 2016

UT1A

| Parameter | Gage | PRE-RESTORATION CONDITION | | REFERENCE REACH DATA | | | | | | | | | | DESIGN | | | | AS-BUILT/BASELINE | | | | |
|--|------|---------------------------|-----------------------------|---|--------|---------------------|--------|-----------------|--------|-----------------|--------|------------------|--------|----------------|--------|----------------|--------|-------------------|----------------------------|----------------------------|-----|-----|
| | | UT1A - Reach 1 | UT1A - Reach 4 | Onsite Reference Reach - UT1A - Reach 3 | | UT to Polecat Creek | | Spencer Creek 1 | | Spencer Creek 2 | | UT To Cane Creek | | UT1A - Reach 1 | | UT1A - Reach 4 | | UT1A - Reach 1 | | UT1A - Reach 4 | | |
| | | | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | |
| Dimension and Substrate - Riffle | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | N/A | 5.8 | 9.3 | 11.1 | 5.3 | 10.9 | 10.7 | 11.2 | 6.3 | 9.3 | 11.5 | 12.3 | 8.0 | 8.2 | 8.0 | 8.1 | | | | | | |
| Floodprone Width (ft) | | 15 | >80 | 25 | 25 | 65 | 60 | >114 | 14 | 125 | 31 | 18 | 40 | 18 | 41 | 50 | 200 | | | | | |
| Bankfull Mean Depth | | 1.1 | 1.0 | 0.7 | 1.0 | 1.1 | 1.6 | 1.8 | 0.8 | 1.0 | 0.8 | 1.0 | 0.6 | 0.6 | 0.5 | 0.6 | | | | | | |
| Bankfull Max Depth | | 1.4 | 1.5 | 1.0 | 1.4 | 1.7 | 2.1 | 2.6 | 1 | 1.2 | 1.2 | 1.6 | 0.7 | 0.9 | 0.8 | 1.0 | 0.9 | 1.8 | | | | |
| Bankfull Cross Sectional Area (ft ²) | | 6.3 | 9.3 | 7.4 | 5.4 | 12.4 | 17.8 | 19.7 | 6.6 | 8.7 | 8.9 | 12.2 | 4.8 | 5.0 | 4.0 | 5.0 | | | | | | |
| Width/Depth Ratio | | 5.3 | 9.0 | 16.6 | 5.2 | 9.6 | 5.8 | 7.1 | 7.9 | 9.3 | 12.3 | 14.4 | 13.4 | 13.6 | 15.9 | 13.2 | | | | | | |
| Entrenchment Ratio | | 2.6 | >8.6 | 2 | 3.2 | 8.3 | 5.5 | >10.2 | 1.7 | 4.3 | >2.5 | 2.2 | 5.0 | 2.2 | 5.0 | 6.3 | 24.8 | | | | | |
| Bank Height Ratio | | 1.7 | 1.5 | 1.0 | 1.0 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | -- | -- | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | | | | | |
| D50 (mm) | | 4.31 | 5.06 | | | | | | | | | | | | | 1.41 | 0.25 | | | | | |
| Profile | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | N/A | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 15.5 | 42.0 | 20.5 | 51.9 | | | | |
| Riffle Slope (ft/ft) | | --- | --- | N/A | 0.0040 | 0.0470 | 0.0130 | 0.0184 | 0.0343 | 0.0188 | 0.0704 | 0.0148 | 0.0453 | 0.0212 | 0.0652 | 0.0077 | 0.0505 | 0.0109 | 0.0449 | | | |
| Pool Length (ft) | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.4 | 52.2 | 9.1 | 35.5 | | | |
| Pool Max Depth (ft) | | 1.8 | 3.6 | 1.6 | 1.8 | 3.3 | 1.2 | 1.8 | 2.6 | 0.7 | 2.4 | 0.7 | 2.5 | 1.6 | 3.5 | 1.4 | 3.1 | | | | | |
| Pool Spacing (ft) | | --- | --- | N/A | 34 | 52 | 71 | 9 | 46 | 27 | 73 | 10 | 53 | 11 | 54 | 20 | 85 | 45 | 82 | | | |
| Pool Volume (ft ³) | | | | | | | | | | | | | | | | | | | | | | |
| Pattern | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | N/A | 30 | 35 | N/A | N/A | N/A | 28 | 50 | 38 | 41 | 10 | 50 | 102 | 13 | 58 | 13 | 60 | 24 | 60 | 35 | 55 | |
| Radius of Curvature (ft) | | 12 | 57 | N/A | N/A | N/A | 19 | 50 | 11 | 15 | 12 | 85 | 23 | 38 | 14 | 24 | 15 | 25 | 14 | 23 | 15 | 23 |
| Rc:Bankfull Width (ft/ft) | | 1.5 | 7.2 | N/A | N/A | N/A | 2.0 | 5.3 | 1.3 | 1.4 | 1.9 | 9.1 | 2.0 | 3.1 | 1.8 | 3.0 | 1.8 | 3.0 | 1.8 | 2.9 | 1.9 | 2.8 |
| Meander Length (ft) | | 89 | 104 | N/A | N/A | N/A | -- | -- | -- | -- | 53 | 178 | -- | -- | 24 | 120 | 25 | 123 | 70 | 112 | 96 | 117 |
| Meander Width Ratio | | 3.8 | 4.4 | N/A | N/A | N/A | 3.0 | 5.3 | 3.4 | 3.6 | 1.6 | 5.4 | 8.3 | 8.9 | 1.6 | 7.3 | 1.6 | 7.3 | 3.0 | 7.5 | 4.3 | 6.8 |
| Substrate, Bed and Transport Parameters | | | | | | | | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | N/A | | | | | | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | | | | | | | |
| d16/d35/d50/d84/d95/d100 | | 0.15/2.18/4.31/16/139/256 | 0.45/2.71/5.06/67.7/122/362 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | SC/SC/1.41/33.4/64.0/128.0 | SC/SC/0.25/26.2/75.9/180.0 | | |
| Reach Shear Stress (Competency) lb/ft ² | | 0.50 | 1.76 | | | | | | | | | | | | 0.48 | 0.54 | | | 0.38 | 0.49 | | |
| Max part size (mm) mobilized at bankfull | | | | | | | | | | | | | | | | | | | | | | |
| Stream Power (Capacity) W/m ² | | | | | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | | | | | |
| Drainage Area (SM) | N/A | 0.12 | 0.16 | 0.15 | 0.41 | 0.96 | 0.37 | 0.29 | 0.12 | 0.16 | 0.12 | 0.16 | | | | | | | | | | |
| Watershed Impervious Cover Estimate (%) | | <1% | <1% | --- | --- | --- | --- | --- | --- | <1% | <1% | <1% | <1% | | | | | | | | | |
| Rosgen Classification | | E4 | E4 | B3 | E4 | E4 | E4 | C4/E4 | C4 | C4 | C4 | C4 | | | | | | | | | | |
| Bankfull Velocity (fps) | | 3.3 | 5.2 | 4.9 | 2.2 | 3.5 | 4.9 | 5.4 | 5.0 | 5.6 | 3.8 | 2.5-5 | 2.5-5 | 2.6 | 3.0 | | | | | | | |
| Bankfull Discharge (cfs) | | 21 | 50 | 37 | 20 | 97 | 35 | 40 | 14.0 | 17.0 | 15.9 | 15.0 | | | | | | | | | | |
| Q-NFF regression | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | | | | | | | | |
| Q-USGS extrapolation | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | | | | | | | | |
| Q-Mannings | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | | | | | | | | |
| Valley Length (ft) | | --- | --- | --- | --- | --- | --- | --- | --- | --- | 673 | 530 | | | | | | | | | | |
| Channel Thalweg Length (ft) | | 770 | 461 | --- | --- | --- | --- | --- | --- | --- | 849 | 650 | 857 | 666 | | | | | | | | |
| Sinuosity | | 1.12 | 1.03 | 1.04 | 1.40 | 2.32 | 1.00 | 1.30 | 1.40 | 1.20 | 1.30 | 1.20 | 1.30 | 1.21 | 1.25 | | | | | | | |
| Water Surface Slope (ft/ft) ² | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.0126 | N/A | | | | | | | |
| Bankfull Slope (ft/ft) | | 0.0095 | 0.0150 | 0.0490 | 0.0120 | 0.0047 | 0.0190 | 0.0220 | 0.0150 | 0.0103 | 0.0175 | 0.0141 | 0.0153 | 0.0137 | 0.0129 | | | | | | | |

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

Table 10c. Baseline Stream Data Summary
 Agony Acres Mitigation Site (DMS Project No. 95716)
 Monitoring Year 2 - 2016

UT1B

| Parameter | Gage | PRE-RESTORATION | | REFERENCE REACH DATA | | | | | | | | DESIGN | | AS-BUILT/BASELINE | | | | |
|--|------|-----------------|--------|---|--------|---------------------|--------|-----------------|--------|-----------------|--------|------------------|--------|-------------------|------|-------------------------|-----------|--|
| | | UT1B | | Onsite Reference Reach - UT1A - Reach 3 | | UT to Polecat Creek | | Spencer Creek 1 | | Spencer Creek 2 | | UT To Cane Creek | | UT1B | | | | |
| | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | | | |
| Dimension and Substrate - Riffle | | | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | N/A | 4.9 | 11.1 | 5.3 | 10.9 | 10.7 | 11.2 | 6.3 | 9.3 | 11.5 | 12.3 | 7.3 | | 7.7 | | | | |
| Floodprone Width (ft) | | 36 | 25 | 25 | 65 | 60 | >114 | 14 | 125 | 31 | | 16 | 37 | 70 | | | | |
| Bankfull Mean Depth | | 1.1 | 0.7 | 1.0 | 1.1 | 1.6 | 1.8 | 0.8 | 1.0 | 0.8 | 1.0 | 0.6 | | 0.5 | | | | |
| Bankfull Max Depth | | 1.9 | 1.0 | 1.4 | 1.7 | 2.1 | 2.6 | 1.0 | 1.2 | 1.2 | 1.6 | 0.7 | 0.9 | 0.7 | | | | |
| Bankfull Cross Sectional Area (ft ²) | | 5.4 | 7.4 | 5.4 | 12.4 | 17.8 | 19.7 | 6.6 | 8.7 | 8.9 | 12.2 | 5.2 | | 3.5 | | | | |
| Width/Depth Ratio | | 4.4 | 16.6 | 5.2 | 9.6 | 5.8 | 7.1 | 7.9 | 9.3 | 12.3 | 14.4 | 12.6 | | 17.0 | | | | |
| Entrenchment Ratio | | 7.5 | 2.3 | 3.2 | 8.3 | 5.5 | >10.2 | 1.7 | 4.3 | >2.5 | | 2.2 | 5.0 | 9.1 | | | | |
| Bank Height Ratio | | 1.6 | 1.0 | 1.0 | 1.1 | 1.0 | | 1.0 | 1.0 | -- | -- | 1.0 | 1.0 | 1.0 | | | | |
| D50 (mm) | | --- | | | | | | | | | | | | | | | Silt/Clay | |
| Profile | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | N/A | --- | | --- | | --- | | --- | | --- | | --- | | --- | | 12.1 | 24.4 | |
| Riffle Slope (ft/ft) | | --- | N/A | 0.0040 | 0.0470 | 0.0130 | 0.0184 | 0.0343 | 0.0188 | 0.0704 | 0.0222 | 0.0680 | 0.0219 | 0.0425 | | | | |
| Pool Length (ft) | | --- | --- | | --- | | --- | | --- | | --- | | --- | | 11.9 | 30.9 | | |
| Pool Max Depth (ft) | | 2.5 | 1.6 | 1.8 | | 3.3 | | 1.2 | 1.8 | 2.6 | | 0.7 | 2.4 | 1.7 | 2.5 | | | |
| Pool Spacing (ft) | | --- | N/A | 34 | 52 | 71 | | 9 | 46 | 27 | 73 | 9 | 48 | 30 | 45 | | | |
| Pool Volume (ft ³) | | | | | | | | | | | | | | | | | | |
| Pattern | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | N/A | N/A | N/A | N/A | 28 | 50 | 38 | 41 | 10 | 50 | 102 | | 12 | 53 | 25 | 40 | | |
| Radius of Curvature (ft) | | N/A | N/A | N/A | 19 | 50 | 11 | 15 | 12 | 85 | 23 | 38 | 13 | 22 | 14 | 20 | | |
| Rc:Bankfull Width (ft/ft) | | N/A | N/A | N/A | 2.0 | 5.3 | 1.3 | 1.4 | 1.9 | 9.1 | 2.0 | 3.1 | 1.8 | 3.0 | 1.8 | 2.6 | | |
| Meander Length (ft) | | N/A | N/A | N/A | -- | -- | -- | -- | 53 | 178 | -- | -- | 22 | 110 | 60 | 72 | | |
| Meander Width Ratio | | N/A | N/A | N/A | 3.0 | 5.3 | 3.4 | 3.6 | 1.6 | 5.4 | 8.3 | 8.9 | 1.6 | 7.3 | 3.2 | 5.2 | | |
| Substrate, Bed and Transport Parameters | | | | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | N/A | | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | | | |
| d16/d35/d50/d84/d95/d100 | | --- | --- | --- | | --- | | --- | | --- | | --- | | --- | | SC/SC/SC/19.5/40.2/90.0 | | |
| Reach Shear Stress (Competency) lb/ft ² | | --- | | | | | | | | | | | | | | | | |
| Max part size (mm) mobilized at bankfull | | --- | | | | | | | | | | | | | | | | |
| Stream Power (Capacity) W/m ² | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | |
| Drainage Area (SM) | N/A | 0.10 | 0.15 | 0.41 | | 0.96 | | 0.37 | | 0.29 | | 0.10 | | 0.10 | | | | |
| Watershed Impervious Cover Estimate (%) | | <1% | --- | --- | | --- | | --- | | --- | | --- | | --- | | | | |
| Rosgen Classification | | E4 | B3 | E4 | | E4 | | E4 | | C4/E4 | | C4 | | C4 | | | | |
| Bankfull Velocity (fps) | | 4.6 | 4.9 | 2.2 | 3.5 | 4.9 | 5.4 | 5.0 | 5.6 | 3.8 | | 1.5-4 | | 1.9 | | | | |
| Bankfull Discharge (cfs) | | 25 | 37 | 20 | | 97 | | 35 | | 40 | | 11 | | 6.6 | | | | |
| Q-NFF regression | | --- | | | | | | | | | | | | | | | | |
| Q-USGS extrapolation | | --- | | | | | | | | | | | | | | | | |
| Q-Mannings | | --- | | | | | | | | | | | | | | | | |
| Valley Length (ft) | | --- | --- | --- | | --- | | --- | | --- | | --- | | 199 | | | | |
| Channel Thalweg Length (ft) | | 243 | --- | --- | | --- | | --- | | --- | | --- | | 219 | | 232 | | |
| Sinuosity | | 1.06 | 1.04 | 1.40 | | 2.32 | | 1.00 | 1.30 | 1.40 | | 1.20 | 1.30 | 1.34 | | | | |
| Water Surface Slope (ft/ft) ² | | --- | --- | --- | | --- | | --- | | --- | | --- | | --- | | 0.0095 | | |
| Bankfull Slope (ft/ft) | | 0.0200 | 0.0490 | 0.0120 | | 0.0047 | | 0.0190 | 0.0220 | 0.0150 | | 0.0100 | 0.0200 | 0.0181 | | | | |

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

Table 10d. Baseline Stream Data Summary
 Agony Acres Mitigation Site (DMS Project No. 95716)
 Monitoring Year 2 - 2016

UT2

| Parameter | Gage | PRE-RESTORATION | | REFERENCE REACH DATA | | | | | | | | DESIGN | | AS-BUILT/BASELINE | | | |
|--|------|-----------------------------|--------|---|--------|---------------------|--------|-----------------|--------|-----------------|--------|------------------|--------|-------------------|-----------------------|-----|-----|
| | | UT2 | | Onsite Reference Reach - UT1A - Reach 3 | | UT to Polecat Creek | | Spencer Creek 1 | | Spencer Creek 2 | | UT To Cane Creek | | UT2 | | UT2 | |
| | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| Dimension and Substrate - Riffle | | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | N/A | 6.2 | 9.6 | 11.1 | 5.3 | 10.9 | 10.7 | 11.2 | 6.3 | 9.3 | 11.5 | 12.3 | 6.6 | 6.7 | | | |
| Floodprone Width (ft) | | >20 | | 25 | 25 | 65 | 60 | >114 | 14 | 125 | 31 | | 15 | 33 | 50 | | |
| Bankfull Mean Depth | | 0.6 | 1.1 | 0.7 | 1.0 | 1.1 | 1.6 | 1.8 | 0.8 | 1.0 | 0.8 | 1.0 | 0.5 | | 0.5 | | |
| Bankfull Max Depth | | 1.0 | 2.0 | 1.0 | 1.4 | 1.7 | 2.1 | 2.6 | 1.0 | 1.2 | 1.2 | 1.6 | 0.6 | 0.8 | 0.7 | | |
| Bankfull Cross Sectional Area (ft ²) | | 5.2 | 7.0 | 7.4 | 5.4 | 12.4 | 17.8 | 19.7 | 6.6 | 8.7 | 8.9 | 12.2 | 3.4 | | 3.4 | | |
| Width/Depth Ratio | | 5.5 | 15.5 | 16.6 | 5.2 | 9.6 | 5.8 | 7.1 | 7.9 | 9.3 | 12.3 | 14.4 | 12.8 | | 12.9 | | |
| Entrenchment Ratio | | >2.4 | | 2.3 | 3.2 | 8.3 | 5.5 | >10.2 | 1.7 | 4.3 | >2.5 | | 2.2 | 5.0 | 7.5 | | |
| Bank Height Ratio | | 1.0 | 2.1 | 1.0 | 1.0 | 1.1 | 1.0 | | 1.0 | 1.0 | -- | -- | 1.0 | 1.0 | 1.0 | | |
| D50 (mm) | | | 2.11 | | | | | | | | | | | | Silt/Clay | | |
| Profile | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | N/A | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 13.9 | 51.7 | | |
| Riffle Slope (ft/ft) | | --- | N/A | 0.0040 | 0.0470 | 0.0130 | 0.0184 | 0.0343 | 0.0188 | 0.0704 | 0.0179 | 0.0549 | 0.0146 | 0.0525 | | | |
| Pool Length (ft) | | --- | | --- | --- | --- | --- | --- | --- | --- | --- | --- | 10.0 | 28.4 | | | |
| Pool Max Depth (ft) | | 1.4 | 1.6 | 1.8 | 3.3 | 1.2 | 1.8 | 2.6 | 0.6 | 2.1 | 1.0 | 2.4 | | | | | |
| Pool Spacing (ft) | | --- | N/A | 34 | 52 | 71 | 9 | 46 | 27 | 73 | 9 | 44 | 25 | 66 | | | |
| Pool Volume (ft ³) | | | | | | | | | | | | | | | | | |
| Pattern | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | N/A | 32 | 54 | N/A | 28 | 50 | 38 | 41 | 10 | 50 | 102 | | 11 | 48 | 19 | 50 | |
| Radius of Curvature (ft) | | 12 | 43 | N/A | 19 | 50 | 11 | 15 | 12 | 85 | 23 | 38 | 12 | 20 | 12 | 20 | |
| Rc:Bankfull Width (ft/ft) | | 1.5 | 5.4 | N/A | 2.0 | 5.3 | 1.3 | 1.4 | 1.9 | 9.1 | 2.0 | 3.1 | 1.8 | 3.0 | 1.8 | 3.0 | |
| Meander Length (ft) | | 102 | 103 | N/A | -- | -- | -- | -- | 53 | 178 | -- | -- | 20 | 99 | 58 | 98 | |
| Meander Width Ratio | | 4.1 | 6.8 | N/A | 3.0 | 5.3 | 3.4 | 3.6 | 1.6 | 5.4 | 8.3 | 8.9 | 1.6 | 7.3 | 2.8 | 7.5 | |
| Substrate, Bed and Transport Parameters | | | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | N/A | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | | |
| d16/d35/d50/d84/d95/d100 | | 0.2/0.68/2.11/20.7/98.3/256 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | SC/SC/30.2/64.0/128.0 | | |
| Reach Shear Stress (Competency) lb/ft ² | | --- | | | | | | | | | | | | | 0.64 | | |
| Max part size (mm) mobilized at bankfull | | | | | | | | | | | | | | | | | |
| Stream Power (Capacity) W/m ² | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | |
| Drainage Area (SM) | N/A | 0.09 | 0.15 | 0.41 | 0.96 | 0.37 | 0.29 | 0.09 | 0.09 | | | | | | | | |
| Watershed Impervious Cover Estimate (%) | | <1% | --- | --- | --- | --- | --- | --- | <1% | <1% | | | | | | | |
| Rosgen Classification | | E4 | B3 | E4 | E4 | E4 | C4/E4 | C4 | C4 | | | | | | | | |
| Bankfull Velocity (fps) | | 3.0 | 5.1 | 4.9 | 2.2 | 3.5 | 4.9 | 5.4 | 5.0 | 5.6 | 3.8 | 2.5-5 | 3.4 | | | | |
| Bankfull Discharge (cfs) | | 23 | 37 | 20 | 97 | 35 | 40 | 11.0 | 11.5 | | | | | | | | |
| Q-NFF regression | | --- | | | | | | | | | | | | | | | |
| Q-USGS extrapolation | | --- | | | | | | | | | | | | | | | |
| Q-Mannings | | --- | | | | | | | | | | | | | | | |
| Valley Length (ft) | | --- | --- | --- | --- | --- | --- | 905 | --- | | | | | | | | |
| Channel Thalweg Length (ft) | | 1,028 | --- | --- | --- | --- | --- | 1,023 | 1,032 | | | | | | | | |
| Sinuosity | | 1.06 | 1.04 | 1.40 | 2.32 | 1.00 | 1.30 | 1.40 | 1.20 | 1.30 | 1.16 | | | | | | |
| Water Surface Slope (ft/ft) ² | | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.0207 | | | | | | |
| Bankfull Slope (ft/ft) | | 0.0130 | 0.0220 | 0.0490 | 0.0120 | 0.0047 | 0.0190 | 0.0220 | 0.0150 | 0.0121 | 0.0231 | 0.0195 | | | | | |

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

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

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

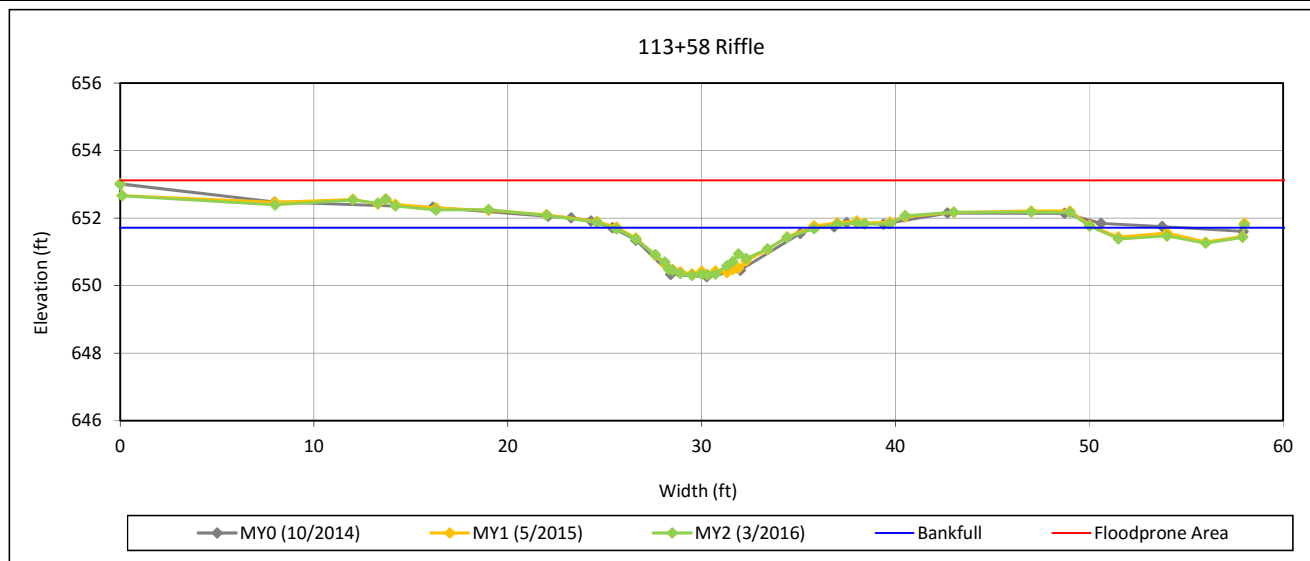
| UT1 Reach 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-------|---------------------------|-------|-----|-----|-----|-----|-----|--------------------------|-------|-------|-----|-----|--------------|-----|---------------------------|-------|-------|-------|-----|-----|-----|-------------------------|-------|-------|-------|-----|-----|-----|-----|-----|-----|
| | | Cross Section 1 (Riffle) | | | | | | | Cross Section 2 (Pool) | | | | | | | Cross Section 3 (Riffle) | | | | | | | Cross Section 4 (Pool) | | | | | | | | | |
| Dimension and Substrate | Base | MY1 | MY2 | MY3 | MY4 | MY5 | MY6 | MY7 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | MY6 | MY7 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | MY6 | MY7 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | MY6 | MY7 |
| <i>based on fixed bankfull elevation (ft)</i> | 651.7 | 651.7 | 651.7 | | | | | | 651.0 | 651.0 | 651.0 | | | | | | 644.0 | 644.0 | 644.0 | | | | | 643.6 | 643.6 | 643.6 | | | | | | |
| Bankfull Width (ft) | 10.4 | 9.9 | 10.5 | | | | | | 9.6 | 9.3 | 9.3 | | | | | | 10.6 | 10.2 | 9.7 | | | | | 13.5 | 13.7 | 12.9 | | | | | | |
| Floodprone Width (ft) | 100 | 100 | 100 | | | | | | N/A | N/A | N/A | | | | | | 60 | 60 | 60 | | | | | N/A | N/A | N/A | | | | | | |
| Bankfull Mean Depth (ft) | 0.9 | 0.8 | 0.7 | | | | | | 1.2 | 1.1 | 1.2 | | | | | | 0.6 | 0.6 | 0.5 | | | | | 1.1 | 1.0 | 1.0 | | | | | | |
| Bankfull Max Depth (ft) | 1.4 | 1.4 | 1.4 | | | | | | 2.1 | 1.9 | 2.0 | | | | | | 1.1 | 1.1 | 1.1 | | | | | 1.9 | 1.8 | 1.9 | | | | | | |
| Bankfull Cross Sectional Area (ft ²) | 9.0 | 8.0 | 7.8 | | | | | | 11.6 | 10.4 | 11.2 | | | | | | 6.2 | 6.2 | 5.3 | | | | | 14.7 | 14.2 | 13.3 | | | | | | |
| Bankfull Width/Depth Ratio | 12.0 | 12.2 | 14.2 | | | | | | 7.9 | 8.3 | 7.7 | | | | | | 18.2 | 16.7 | 17.7 | | | | | 12.4 | 13.2 | 12.5 | | | | | | |
| Bankfull Entrenchment Ratio | 9.6 | 10.1 | 9.5 | | | | | | N/A | N/A | N/A | | | | | | 5.6 | 5.9 | 6.2 | | | | | N/A | N/A | N/A | | | | | | |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | | | | | | 1.0 | 1.0 | 1.0 | | | | | | 1.0 | 1.0 | 1.0 | | | | | 1.0 | 1.0 | 1.0 | | | | | | |
| d50 (mm) | 18.0 | 64.0 | 10.4 | | | | | | N/A | N/A | N/A | | | | | | 13.3 | 46.6 | 22.6 | | | | | N/A | N/A | N/A | | | | | | |
| UT1 Reach 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Cross Section 5 (Pool) | | | | | | | Cross Section 6 (Riffle) | | | | | | | Cross Section 7 (Riffle) | | | | | | | Cross Section 8 (Pool) | | | | | | | | | |
| <i>based on fixed bankfull elevation (ft)</i> | 610.4 | 610.4 | 610.4 | | | | | | 610.0 | 610.0 | 610.0 | | | | | | 600.9 | 600.9 | 600.9 | | | | | 600.6 | 600.6 | 600.6 | | | | | | |
| Bankfull Width (ft) | 15.9 | 16.5 | 16.7 | | | | | | 15.3 | 15.2 | 16.0 | | | | | | 11.9 | 11.9 | 11.8 | | | | | 15.2 | 15.7 | 16.1 | | | | | | |
| Floodprone Width (ft) | N/A | N/A | N/A | | | | | | 200 | 200 | 200 | | | | | | 200 | 200 | 200 | | | | | N/A | N/A | N/A | | | | | | |
| Bankfull Mean Depth (ft) | 1.2 | 1.1 | 1.2 | | | | | | 0.8 | 0.8 | 0.8 | | | | | | 0.8 | 0.8 | 0.8 | | | | | 1.4 | 1.4 | 1.3 | | | | | | |
| Bankfull Max Depth (ft) | 2.4 | 2.2 | 2.4 | | | | | | 1.6 | 1.7 | 1.8 | | | | | | 1.3 | 1.5 | 1.4 | | | | | 2.7 | 2.8 | 2.8 | | | | | | |
| Bankfull Cross Sectional Area (ft ²) | 18.5 | 18.1 | 19.3 | | | | | | 12.0 | 12.6 | 12.5 | | | | | | 9.1 | 10.1 | 9.3 | | | | | 21.3 | 21.8 | 21.1 | | | | | | |
| Bankfull Width/Depth Ratio | 13.6 | 15.1 | 14.4 | | | | | | 19.5 | 18.4 | 20.5 | | | | | | 15.7 | 14.0 | 14.9 | | | | | 10.9 | 11.3 | 12.3 | | | | | | |
| Bankfull Entrenchment Ratio | N/A | N/A | N/A | | | | | | 13.1 | 13.1 | 12.5 | | | | | | 16.8 | 16.8 | 17.0 | | | | | N/A | N/A | N/A | | | | | | |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | | | | | | 1.0 | 1.0 | 1.0 | | | | | | 1.0 | 1.0 | 1.0 | | | | | 1.0 | 1.0 | 1.0 | | | | | | |
| d50 (mm) | N/A | N/A | N/A | | | | | | 15.4 | 30.8 | 57.9 | | | | | | 16.0 | 52.1 | 70.5 | | | | | N/A | N/A | N/A | | | | | | |
| UT1A Reach 1 | | | | | | | | | | | | | | UT1A Reach 4 | | | | | | | | | | | | | | | | | | |
| | | Cross Section 9 (Riffle) | | | | | | | Cross Section 10 (Pool) | | | | | | | Cross Section 11 (Riffle) | | | | | | | Cross Section 12 (Pool) | | | | | | | | | |
| <i>based on fixed bankfull elevation (ft)</i> | 656.4 | 656.4 | 656.4 | | | | | | 656.0 | 656.0 | 656.0 | | | | | | 615.8 | 615.8 | 615.8 | | | | | 615.1 | 615.1 | 615.1 | | | | | | |
| Bankfull Width (ft) | 8.0 | 7.3 | 7.2 | | | | | | 10.5 | 10.0 | 10.2 | | | | | | 8.1 | 8.2 | 8.2 | | | | | 10.6 | 10.5 | 10.5 | | | | | | |
| Floodprone Width (ft) | 50 | 50 | 50 | | | | | | N/A | N/A | N/A | | | | | | 200 | 200 | 200 | | | | | N/A | N/A | N/A | | | | | | |
| Bankfull Mean Depth (ft) | 0.5 | 0.5 | 0.5 | | | | | | 0.7 | 0.7 | 0.7 | | | | | | 0.6 | 0.8 | 0.8 | | | | | 1.2 | 1.2 | 1.2 | | | | | | |
| Bankfull Max Depth (ft) | 0.9 | 0.9 | 0.8 | | | | | | 1.5 | 1.2 | 1.3 | | | | | | 1.8 | 1.9 | 1.9 | | | | | 2.7 | 2.6 | 2.6 | | | | | | |
| Bankfull Cross Sectional Area (ft ²) | 4.0 | 3.9 | 3.8 | | | | | | 7.8 | 7.0 | 6.7 | | | | | | 5.0 | 6.6 | 6.5 | | | | | 12.3 | 13.2 | 13.1 | | | | | | |
| Bankfull Width/Depth Ratio | 15.9 | 13.7 | 13.8 | | | | | | 14.1 | 14.4 | 15.5 | | | | | | 13.2 | 10.1 | 10.4 | | | | | 9.1 | 8.4 | 8.4 | | | | | | |
| Bankfull Entrenchment Ratio | 6.3 | 6.8 | 6.9 | | | | | | N/A | N/A | N/A | | | | | | 24.8 | 24.4 | 24.4 | | | | | N/A | N/A | N/A | | | | | | |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | | | | | | 1.0 | 1.0 | 1.0 | | | | | | 1.0 | 1.0 | 1.0 | | | | | 1.0 | 1.0 | 1.0 | | | | | | |
| d50 (mm) | 18.0 | 17.8 | 25.2 | | | | | | N/A | N/A | N/A | | | | | | 18.3 | 42.1 | 28.5 | | | | | N/A | N/A | N/A | | | | | | |
| UT1B | | | | | | | | | | | | | | UT2 | | | | | | | | | | | | | | | | | | |
| | | Cross Section 13 (Riffle) | | | | | | | Cross Section 14 (Pool) | | | | | | | Cross Section 15 (Riffle) | | | | | | | Cross Section 16 (Pool) | | | | | | | | | |
| <i>based on fixed bankfull elevation (ft)</i> | 647.1 | 647.1 | 647.1 | | | | | | 646.9 | 646.9 | 646.9 | | | | | | 602.9 | 602.9 | 602.9 | | | | | 602.4 | 602.4 | 602.4 | | | | | | |
| Bankfull Width (ft) | 7.7 | 7.8 | 7.7 | | | | | | 9.7 | 10.1 | 9.8 | | | | | | 7.1 | 7.0 | 6.8 | | | | | 9.5 | 9.5 | 9.9 | | | | | | |
| Floodprone Width (ft) | 70 | 70 | 70 | | | | | | N/A | N/A | N/A | | | | | | 50 | 50 | 50 | | | | | N/A | N/A | N/A | | | | | | |
| Bankfull Mean Depth (ft) | 0.5 | 0.5 | 0.4 | | | | | | 0.8 | 0.7 | 0.7 | | | | | | 0.5 | 0.5 | 0.5 | | | | | 0.6 | 0.6 | 0.6 | | | | | | |
| Bankfull Max Depth (ft) | 0.7 | 0.9 | 0.8 | | | | | | 1.4 | 1.3 | 1.4 | | | | | | 0.7 | 0.9 | 0.9 | | | | | 1.3 | 1.3 | 1.3 | | | | | | |
| Bankfull Cross Sectional Area (ft ²) | 3.5 | 3.6 | 3.2 | | | | | | 7.8 | 7.2 | 7.2 | | | | | | 3.4 | 3.8 | 3.5 | | | | | 5.8 | 5.5 | 5.8 | | | | | | |
| Bankfull Width/Depth Ratio | 17.0 | 16.9 | 18.3 | | | | | | 12.1 | 14.2 | 13.5 | | | | | | 14.7 | 12.9 | 13.5 | | | | | 15.5 | 16.3 | 16.8 | | | | | | |
| Bankfull Entrenchment Ratio | 9.1 | 9.0 | 9.1 | | | | | | N/A | N/A | N/A | | | | | | 7.0 | 7.2 | 7.3 | | | | | N/A | N/A | N/A | | | | | | |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | | | | | | 1.0 | 1.0 | 1.0 | | | | | | 1.0 | 1.0 | 1.0 | | | | | 1.0 | 1.0 | 1.0 | | | | | | |
| d50 (mm) | 21.3 | 43.9 | 26.9 | | | | | | N/A | N/A | N/A | | | | | | 19.7 | 25.0 | 23.5 | | | | | N/A | N/A | N/A | | | | | | |

Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 1-UT1 Reach 2



Bankfull Dimensions

| | |
|-------|-------------------------|
| 7.8 | x-section area (ft.sq.) |
| 10.5 | width (ft) |
| 0.7 | mean depth (ft) |
| 1.4 | max depth (ft) |
| 11.1 | wetted parimeter (ft) |
| 0.7 | hyd radi (ft) |
| 14.2 | width-depth ratio |
| 100.0 | W flood prone area (ft) |
| 9.5 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 3/2016
Field Crew: Wildlands Engineering



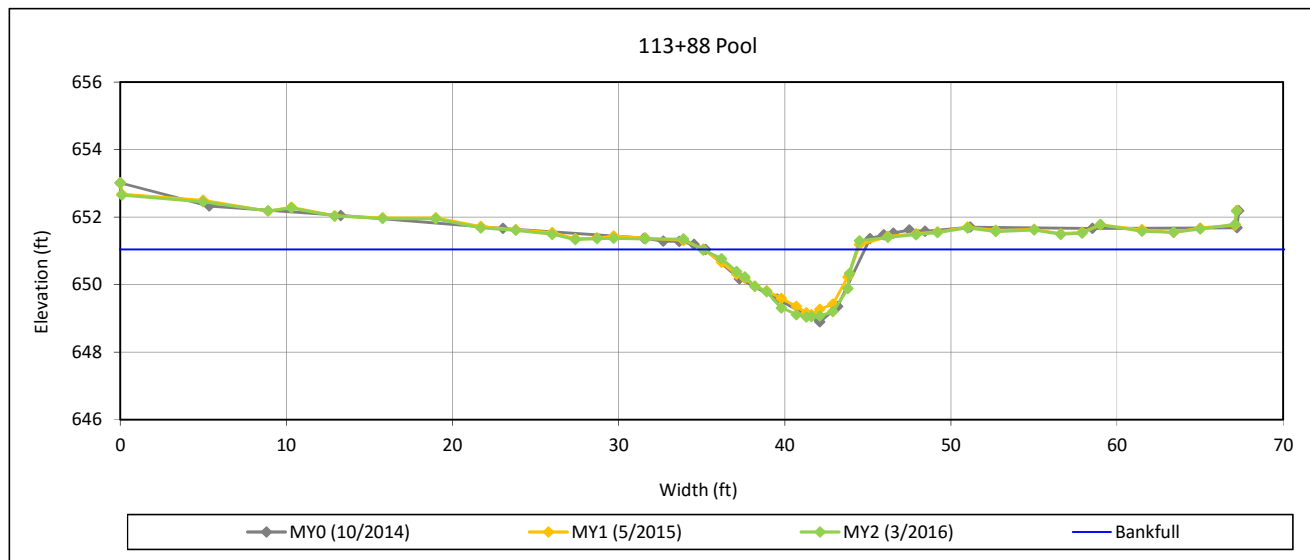
View Downstream

Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 2-UT1 Reach 2



Bankfull Dimensions

| | |
|------|-------------------------|
| 11.2 | x-section area (ft.sq.) |
| 9.3 | width (ft) |
| 1.2 | mean depth (ft) |
| 2.0 | max depth (ft) |
| 10.7 | wetted perimeter (ft) |
| 1.1 | hyd radi (ft) |
| 7.7 | width-depth ratio |

Survey Date: 3/2016
Field Crew: Wildlands Engineering



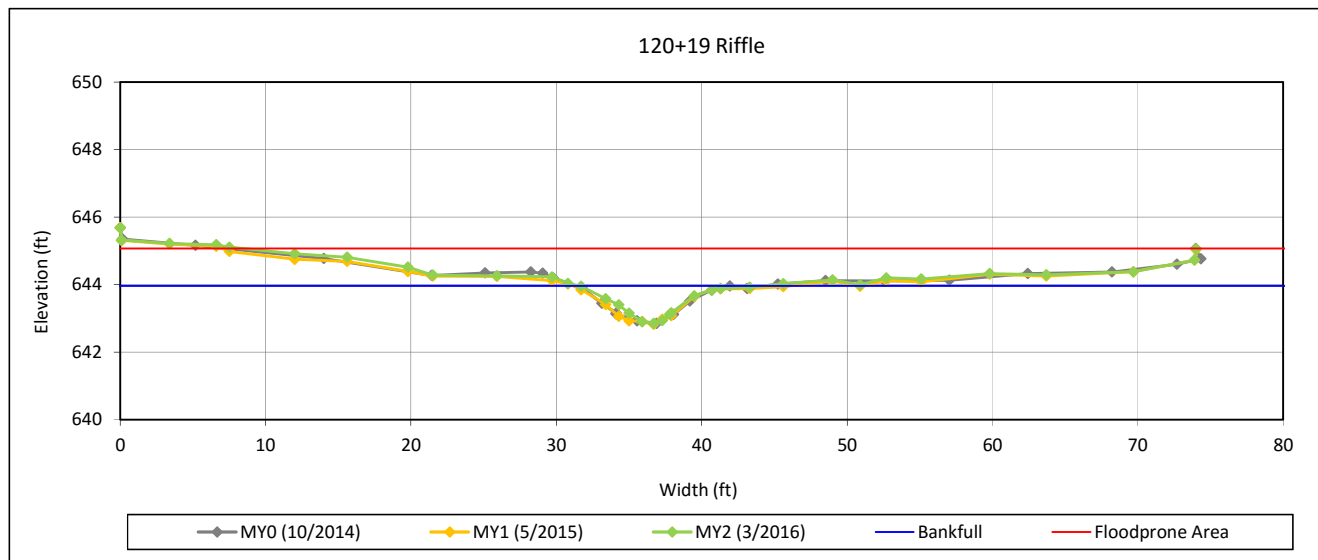
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Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 3-UT1 Reach 2



Bankfull Dimensions

| | |
|------|-------------------------|
| 5.3 | x-section area (ft.sq.) |
| 9.7 | width (ft) |
| 0.5 | mean depth (ft) |
| 1.1 | max depth (ft) |
| 10.0 | wetted parimeter (ft) |
| 0.5 | hyd radi (ft) |
| 17.7 | width-depth ratio |
| 60.0 | W flood prone area (ft) |
| 6.2 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 3/2016

Field Crew: Wildlands Engineering



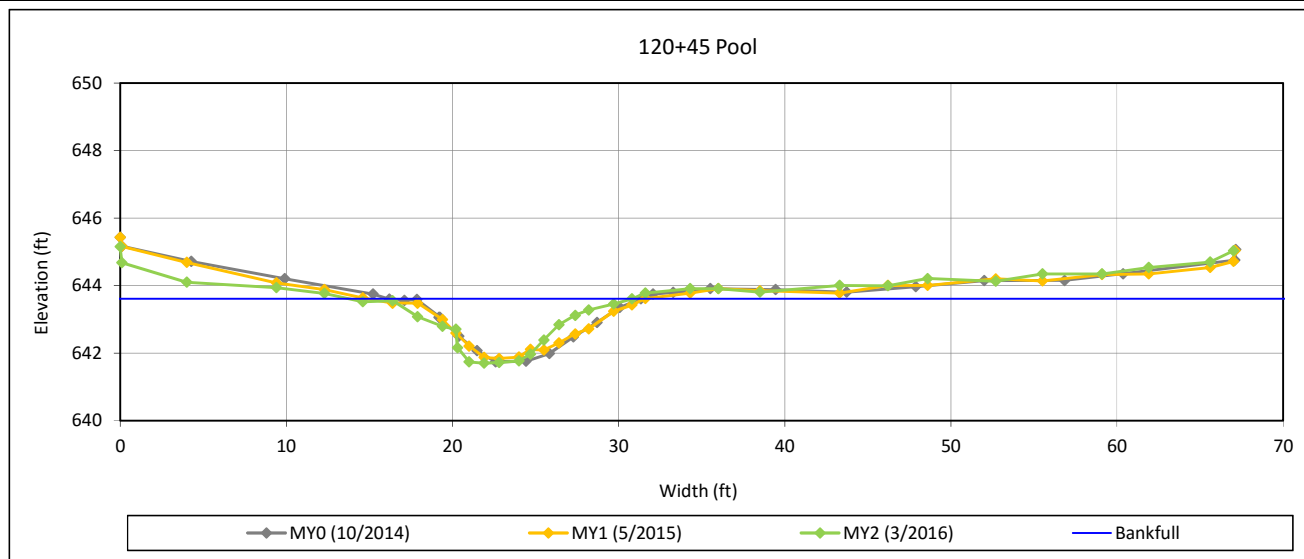
View Downstream

Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 4-UT1 Reach 2



Bankfull Dimensions

| | |
|------|-------------------------|
| 13.3 | x-section area (ft.sq.) |
| 12.9 | width (ft) |
| 1.0 | mean depth (ft) |
| 1.9 | max depth (ft) |
| 13.8 | wetted parimeter (ft) |
| 1.0 | hyd radi (ft) |
| 12.5 | width-depth ratio |

Survey Date: 3/2016
Field Crew: Wildlands Engineering



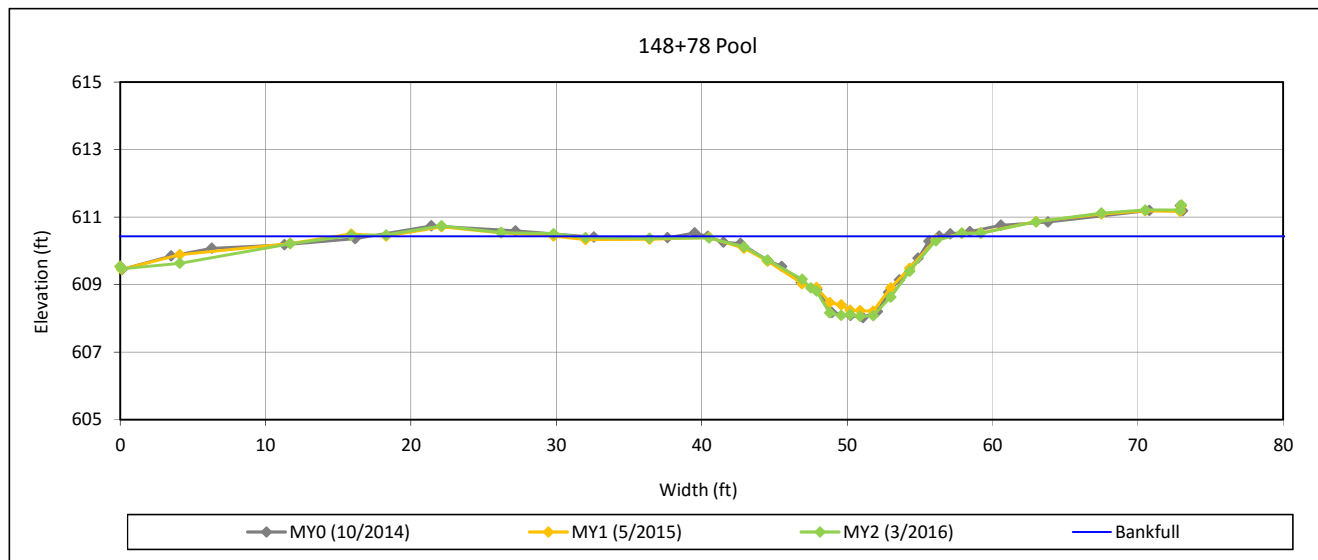
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Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 5-UT1 Reach 5



Bankfull Dimensions

| | |
|------|-------------------------|
| 19.3 | x-section area (ft.sq.) |
| 16.7 | width (ft) |
| 1.2 | mean depth (ft) |
| 2.4 | max depth (ft) |
| 17.6 | wetted parimeter (ft) |
| 1.1 | hyd radi (ft) |
| 14.4 | width-depth ratio |

Survey Date: 3/2016
Field Crew: Wildlands Engineering



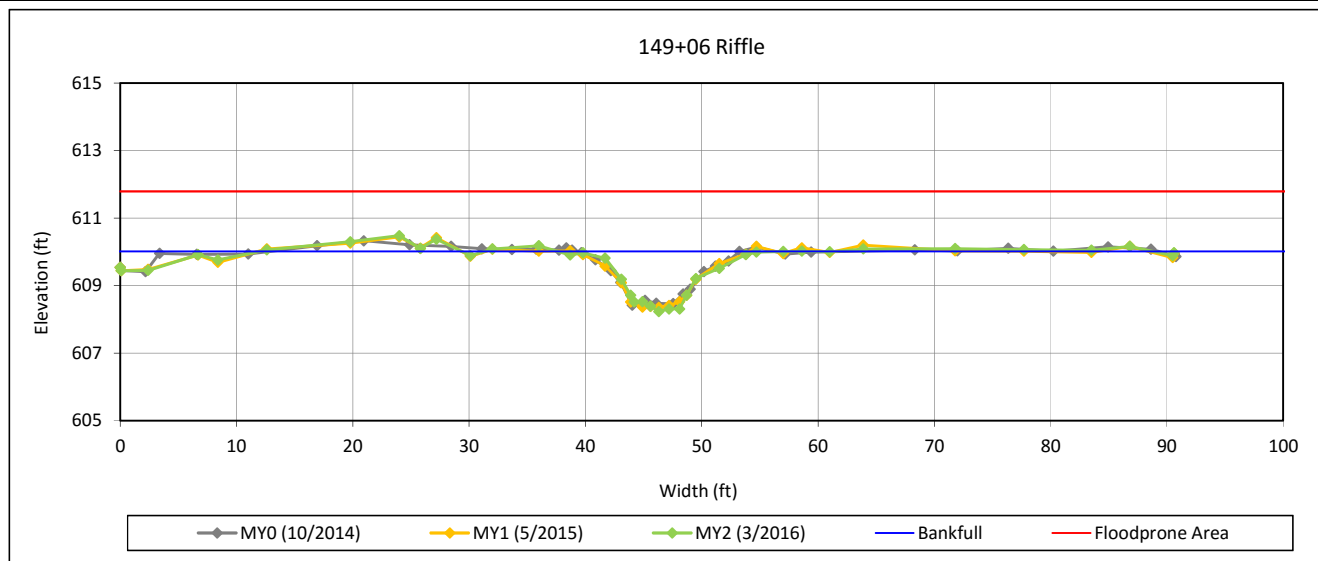
View Downstream

Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 6-UT1 Reach 5



Bankfull Dimensions

| | |
|-------|-------------------------|
| 12.5 | x-section area (ft.sq.) |
| 16.0 | width (ft) |
| 0.8 | mean depth (ft) |
| 1.8 | max depth (ft) |
| 16.7 | wetted parimeter (ft) |
| 0.7 | hyd radi (ft) |
| 20.5 | width-depth ratio |
| 200.0 | W flood prone area (ft) |
| 12.5 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 3/2016

Field Crew: Wildlands Engineering



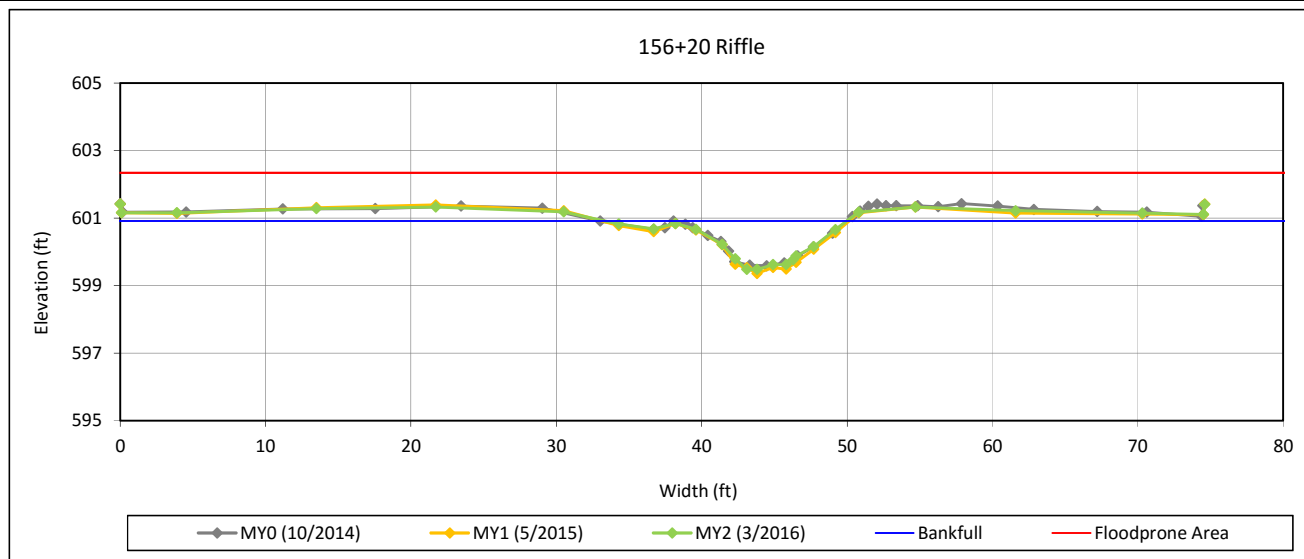
View Downstream

Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 7-UT1 Reach 5



Bankfull Dimensions

| | |
|-------|-------------------------|
| 9.3 | x-section area (ft.sq.) |
| 11.8 | width (ft) |
| 0.8 | mean depth (ft) |
| 1.4 | max depth (ft) |
| 12.2 | wetted parimeter (ft) |
| 0.8 | hyd radi (ft) |
| 14.9 | width-depth ratio |
| 200.0 | W flood prone area (ft) |
| 17.0 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 3/2016

Field Crew: Wildlands Engineering



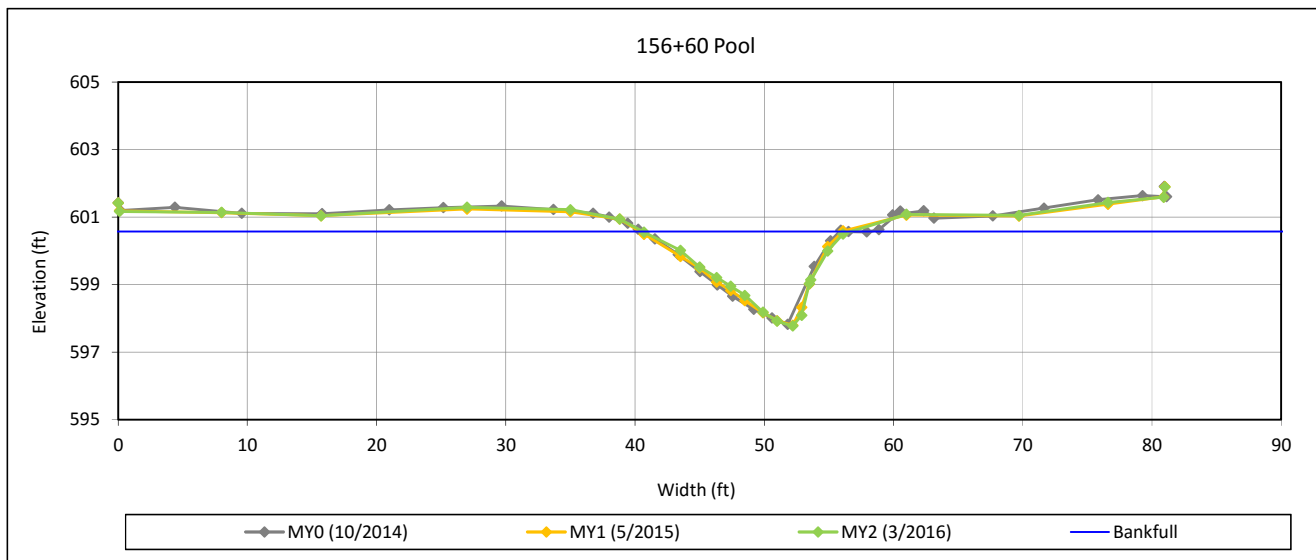
View Downstream

Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 8-UT1 Reach 5



Bankfull Dimensions

| | |
|------|-------------------------|
| 21.1 | x-section area (ft.sq.) |
| 16.1 | width (ft) |
| 1.3 | mean depth (ft) |
| 2.8 | max depth (ft) |
| 17.4 | wetted parimeter (ft) |
| 1.2 | hyd radi (ft) |
| 12.3 | width-depth ratio |

Survey Date: 3/2016
Field Crew: Wildlands Engineering



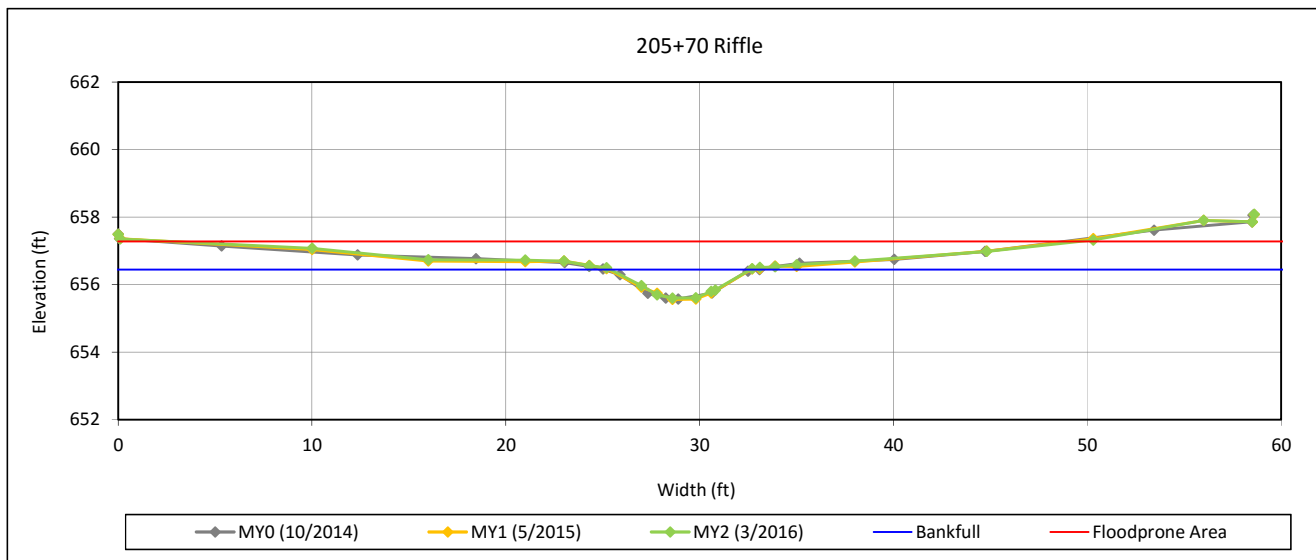
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Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 9-UT1A Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 3.8 | x-section area (ft.sq.) |
| 7.2 | width (ft) |
| 0.5 | mean depth (ft) |
| 0.8 | max depth (ft) |
| 7.4 | wetted parimeter (ft) |
| 0.5 | hyd radi (ft) |
| 13.8 | width-depth ratio |
| 50.0 | W flood prone area (ft) |
| 6.9 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 3/2016

Field Crew: Wildlands Engineering



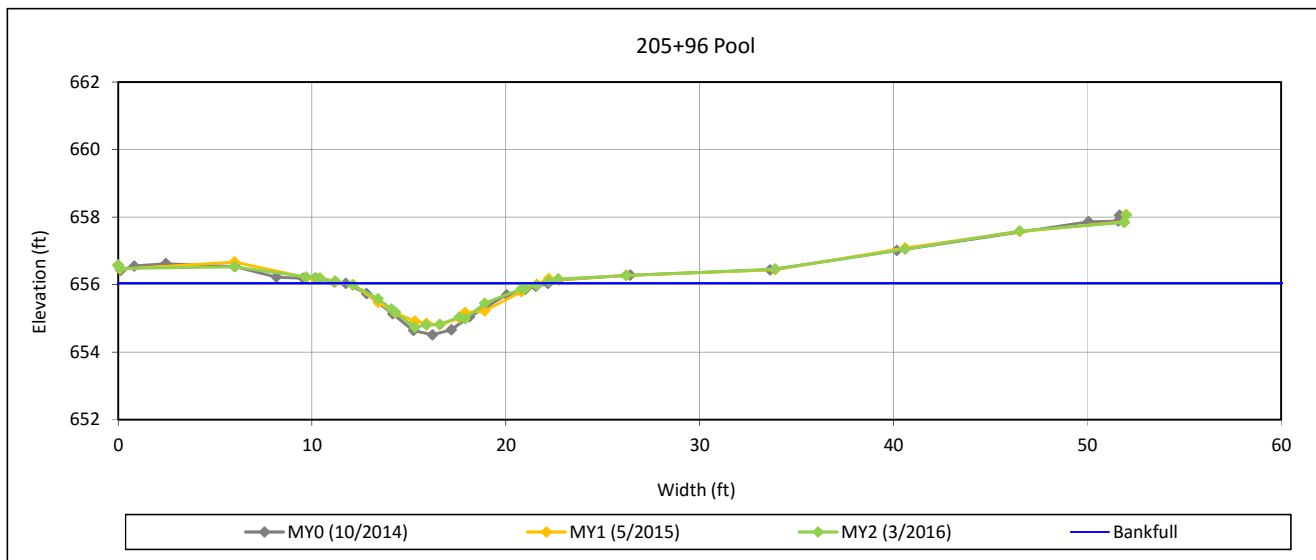
View Downstream

Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 10-UT1A Reach 1



Bankfull Dimensions

| | |
|------|-------------------------|
| 6.7 | x-section area (ft.sq.) |
| 10.2 | width (ft) |
| 0.7 | mean depth (ft) |
| 1.3 | max depth (ft) |
| 10.6 | wetted parimeter (ft) |
| 0.6 | hyd radi (ft) |
| 15.5 | width-depth ratio |

Survey Date: 3/2016
Field Crew: Wildlands Engineering

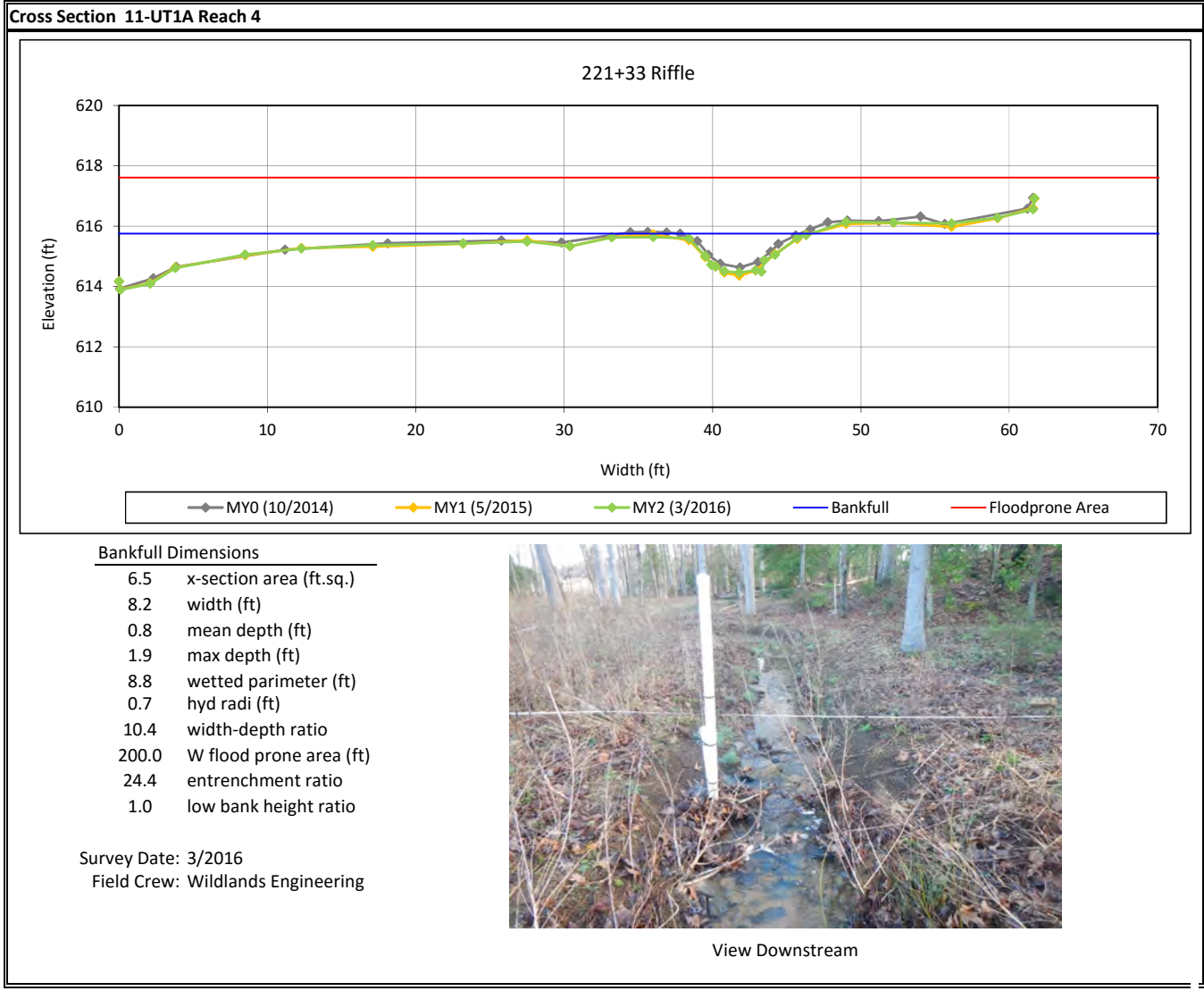


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Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

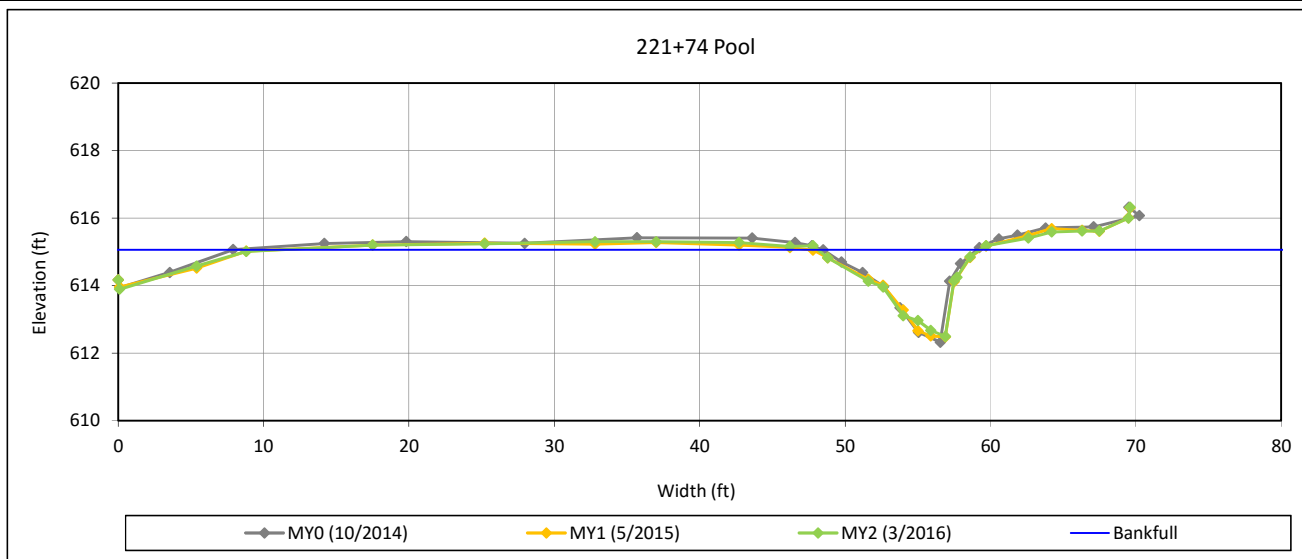


Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 12-UT1A Reach 4



Bankfull Dimensions

- 13.1 x-section area (ft.sq.)
- 10.5 width (ft)
- 1.2 mean depth (ft)
- 2.6 max depth (ft)
- 12.3 wetted parimeter (ft)
- 1.1 hyd radi (ft)
- 8.4 width-depth ratio

Survey Date: 3/2016
Field Crew: Wildlands Engineering



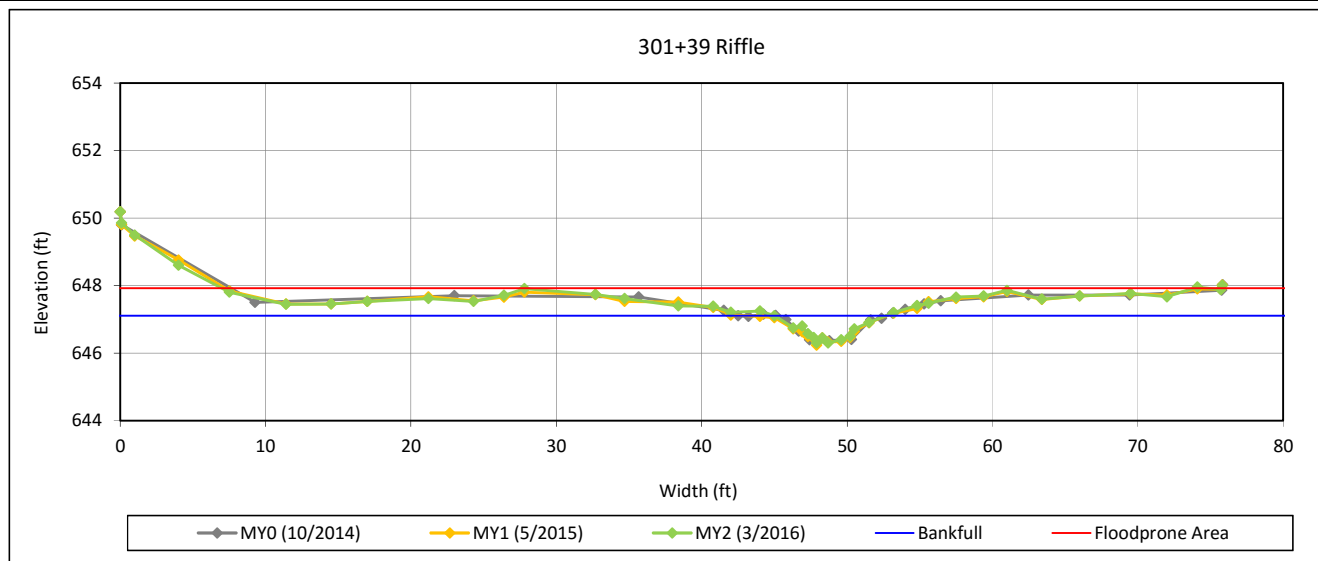
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Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 13-UT1B



Bankfull Dimensions

| | |
|------|-------------------------|
| 3.2 | x-section area (ft.sq.) |
| 7.7 | width (ft) |
| 0.4 | mean depth (ft) |
| 0.8 | max depth (ft) |
| 8.0 | wetted perimeter (ft) |
| 0.4 | hyd radi (ft) |
| 18.3 | width-depth ratio |
| 70.0 | W flood prone area (ft) |
| 9.1 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 3/2016

Field Crew: Wildlands Engineering



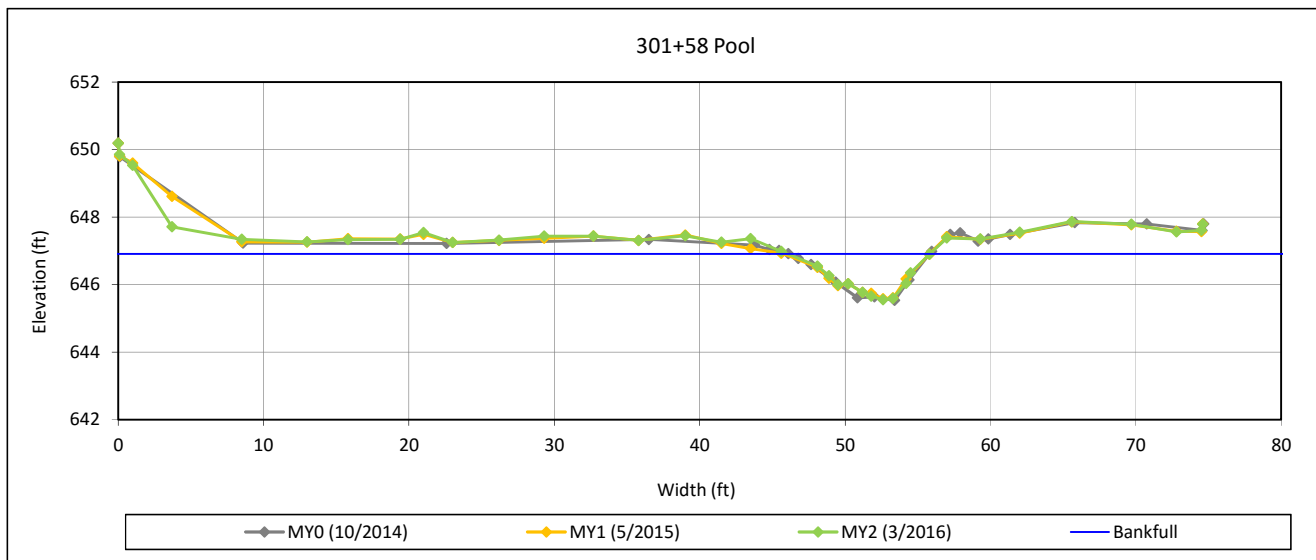
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Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 14-UT1B



Bankfull Dimensions

| | |
|------|-------------------------|
| 7.2 | x-section area (ft.sq.) |
| 9.8 | width (ft) |
| 0.7 | mean depth (ft) |
| 1.4 | max depth (ft) |
| 10.4 | wetted parimeter (ft) |
| 0.7 | hyd radi (ft) |
| 13.5 | width-depth ratio |

Survey Date: 3/2016
Field Crew: Wildlands Engineering



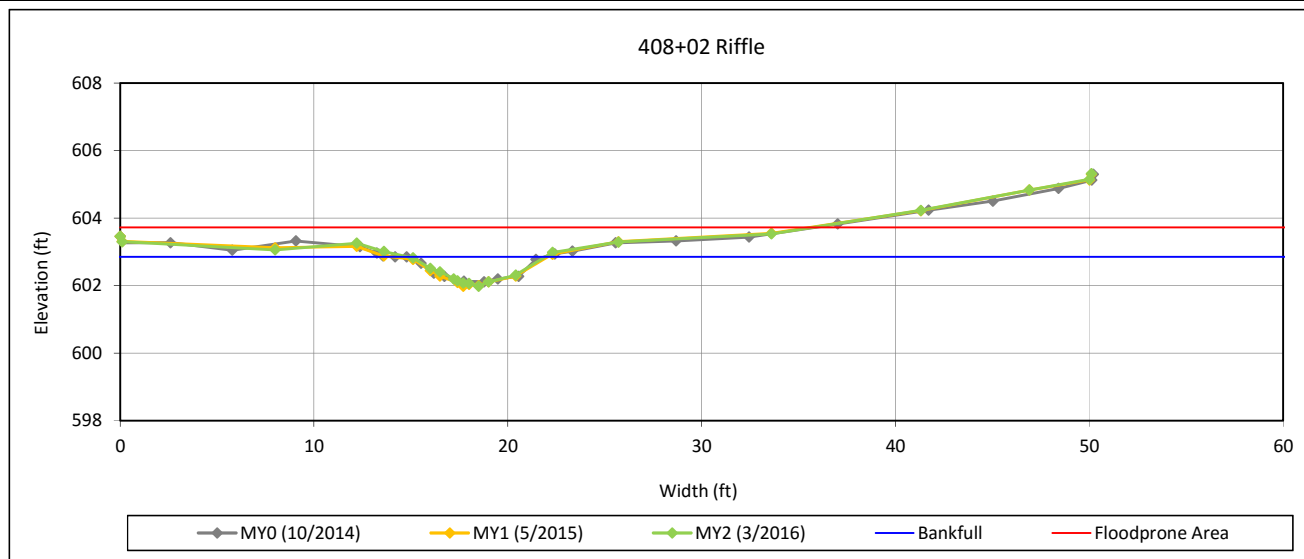
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Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 15-UT2



Bankfull Dimensions

| | |
|------|-------------------------|
| 3.5 | x-section area (ft.sq.) |
| 6.8 | width (ft) |
| 0.5 | mean depth (ft) |
| 0.9 | max depth (ft) |
| 7.1 | wetted parimeter (ft) |
| 0.5 | hyd radi (ft) |
| 13.5 | width-depth ratio |
| 50.0 | W flood prone area (ft) |
| 7.3 | entrenchment ratio |
| 1.0 | low bank height ratio |

Survey Date: 3/2016

Field Crew: Wildlands Engineering



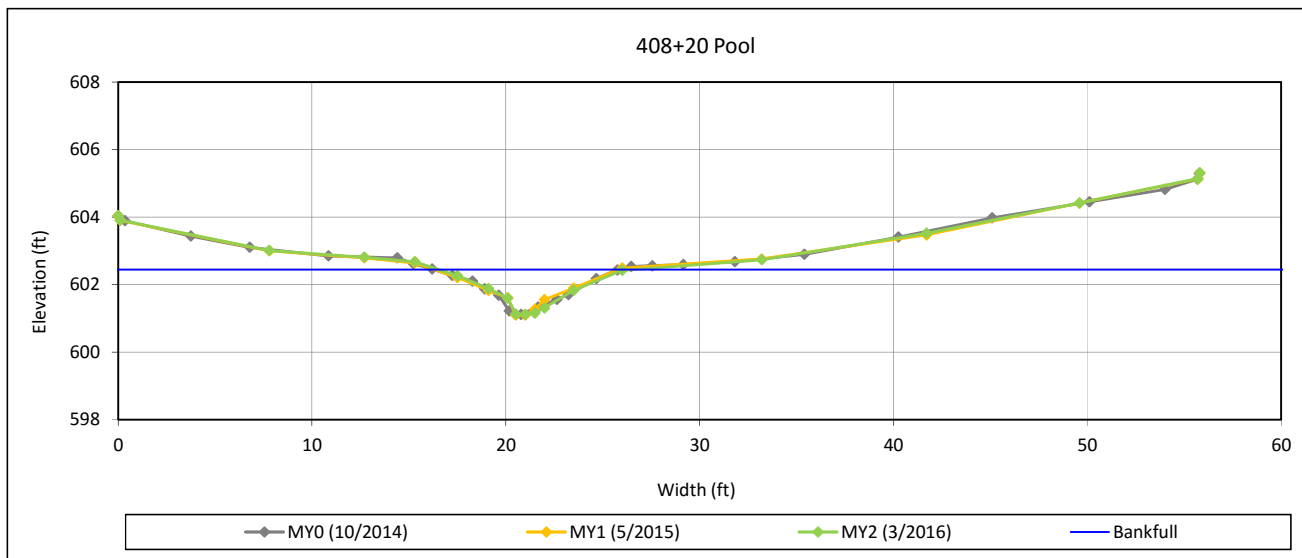
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Cross Section Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

Cross Section 16-UT2



Bankfull Dimensions

| | |
|------|-------------------------|
| 5.8 | x-section area (ft.sq.) |
| 9.9 | width (ft) |
| 0.6 | mean depth (ft) |
| 1.3 | max depth (ft) |
| 10.4 | wetted parimeter (ft) |
| 0.6 | hyd radi (ft) |
| 16.8 | width-depth ratio |

Survey Date: 3/2016
Field Crew: Wildlands Engineering



View Downstream

Reachwide and Cross Section Pebble Count Plots

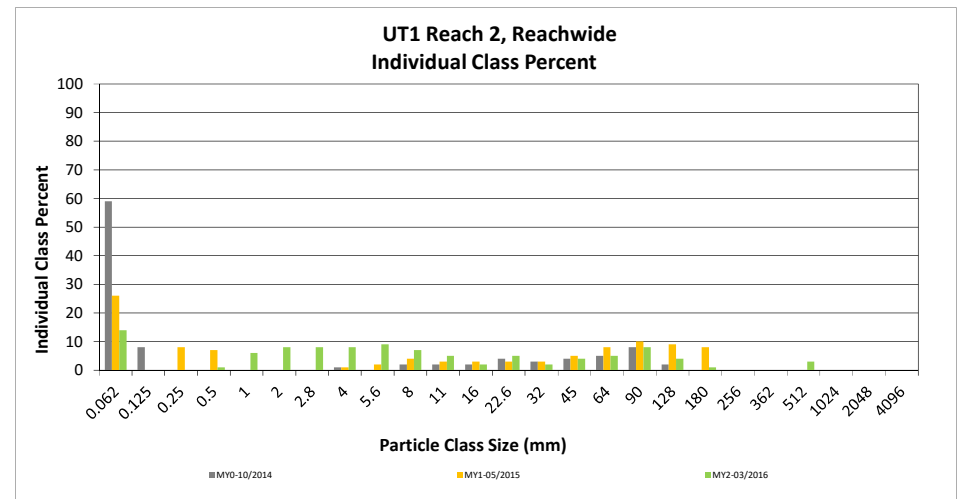
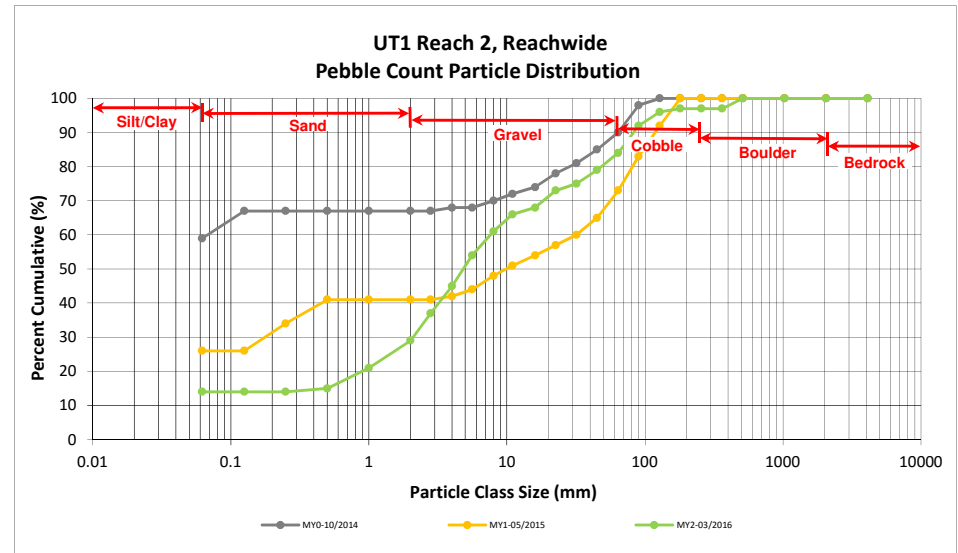
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1 Reach 2, 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 | 8 | 14 | 14 | 14 |
| SAND | Very fine | 0.062 | 0.125 | | | | | 14 |
| | Fine | 0.125 | 0.250 | | | | | 14 |
| | Medium | 0.25 | 0.50 | | 1 | 1 | 1 | 15 |
| | Coarse | 0.5 | 1.0 | 3 | 3 | 6 | 6 | 21 |
| | Very Coarse | 1.0 | 2.0 | 4 | 4 | 8 | 8 | 29 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 3 | 5 | 8 | 8 | 37 |
| | Very Fine | 2.8 | 4.0 | 4 | 4 | 8 | 8 | 45 |
| | Fine | 4.0 | 5.6 | 3 | 6 | 9 | 9 | 54 |
| | Fine | 5.6 | 8.0 | 3 | 4 | 7 | 7 | 61 |
| | Medium | 8.0 | 11.0 | 2 | 3 | 5 | 5 | 66 |
| | Medium | 11.0 | 16.0 | 1 | 1 | 2 | 2 | 68 |
| | Coarse | 16.0 | 22.6 | 4 | 1 | 5 | 5 | 73 |
| | Coarse | 22.6 | 32 | 2 | | 2 | 2 | 75 |
| | Very Coarse | 32 | 45 | 4 | | 4 | 4 | 79 |
| | Very Coarse | 45 | 64 | 5 | | 5 | 5 | 84 |
| COBBLE | Small | 64 | 90 | 8 | | 8 | 8 | 92 |
| | Small | 90 | 128 | 4 | | 4 | 4 | 96 |
| | Large | 128 | 180 | 1 | | 1 | 1 | 97 |
| | Large | 180 | 256 | | | | | 97 |
| BOULDER | Small | 256 | 362 | | | | | 97 |
| | Small | 362 | 512 | 3 | | 3 | 3 | 100 |
| | Medium | 512 | 1024 | | | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | | | 100 |
| BEDROCK | Bedrock | 2048 | >2048 | | | | | 100 |
| Total | | | | 60 | 40 | 100 | 100 | 100 |

| Reachwide Channel materials (mm) | |
|----------------------------------|-------|
| D ₁₆ = | 0.56 |
| D ₃₅ = | 2.57 |
| D ₅₀ = | 4.8 |
| D ₈₄ = | 64.0 |
| D ₉₅ = | 117.2 |
| D ₁₀₀ = | 512.0 |



Reachwide and Cross Section Pebble Count Plots

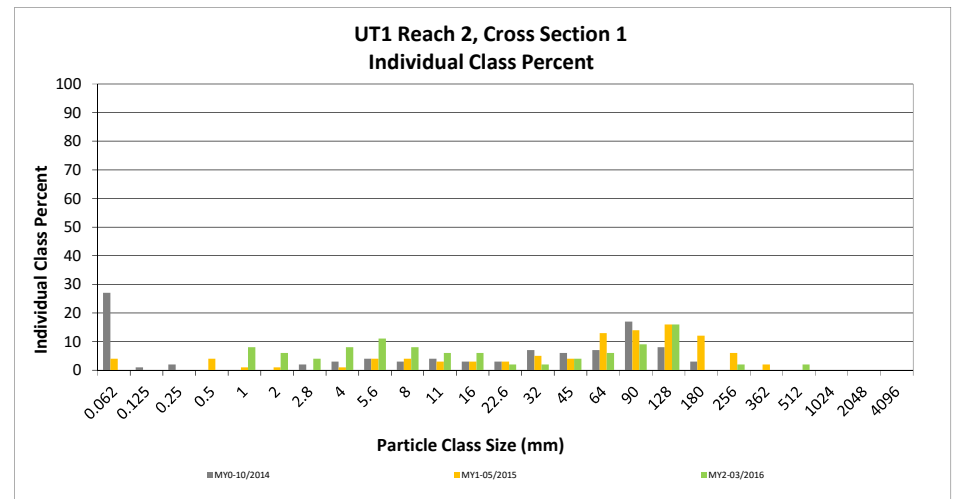
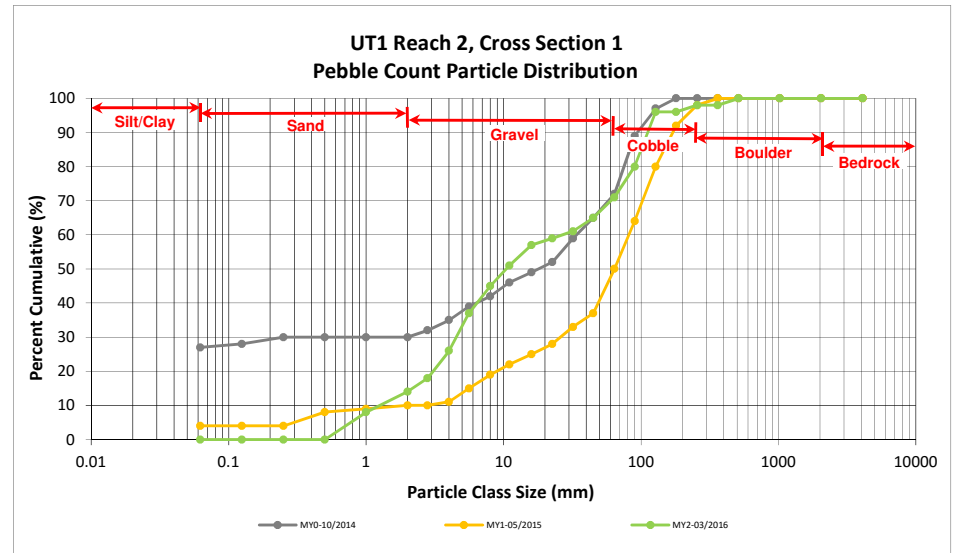
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1 Reach 2, Cross Section 1

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|------------------|------------------|---------------|-------|------------------|------------------|--------------------|
| | | min | max | | Class Percentage | Percent Cumulative |
| <i>SILT/CLAY</i> | Silt/Clay | 0.000 | 0.062 | | | 0 |
| SAND | Very fine | 0.062 | 0.125 | | | 0 |
| | Fine | 0.125 | 0.250 | | | 0 |
| | Medium | 0.25 | 0.50 | | | 0 |
| | Coarse | 0.5 | 1.0 | 8 | 8 | 8 |
| | Very Coarse | 1.0 | 2.0 | 6 | 6 | 14 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 4 | 4 | 18 |
| | Very Fine | 2.8 | 4.0 | 8 | 8 | 26 |
| | Fine | 4.0 | 5.6 | 11 | 11 | 37 |
| | Fine | 5.6 | 8.0 | 8 | 8 | 45 |
| | Medium | 8.0 | 11.0 | 6 | 6 | 51 |
| | Medium | 11.0 | 16.0 | 6 | 6 | 57 |
| | Coarse | 16.0 | 22.6 | 2 | 2 | 59 |
| | Coarse | 22.6 | 32 | 2 | 2 | 61 |
| | Very Coarse | 32 | 45 | 4 | 4 | 65 |
| | Very Coarse | 45 | 64 | 6 | 6 | 71 |
| COBBLE | Small | 64 | 90 | 9 | 9 | 80 |
| | Small | 90 | 128 | 16 | 16 | 96 |
| | Large | 128 | 180 | | | 96 |
| | Large | 180 | 256 | 2 | 2 | 98 |
| BOULDER | Small | 256 | 362 | | | 98 |
| | Small | 362 | 512 | 2 | 2 | 100 |
| | Medium | 512 | 1024 | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | 100 |
| BEDROCK | Bedrock | 2048 | >2048 | | | 100 |
| Total | | | | 100 | 100 | 100 |

| Cross Section 1 | |
|------------------------|-------|
| Channel materials (mm) | |
| D ₁₆ = | 2.37 |
| D ₃₅ = | 5.27 |
| D ₅₀ = | 10.4 |
| D ₈₄ = | 98.3 |
| D ₉₅ = | 125.2 |
| D ₁₀₀ = | 512.0 |



Reachwide and Cross Section Pebble Count Plots

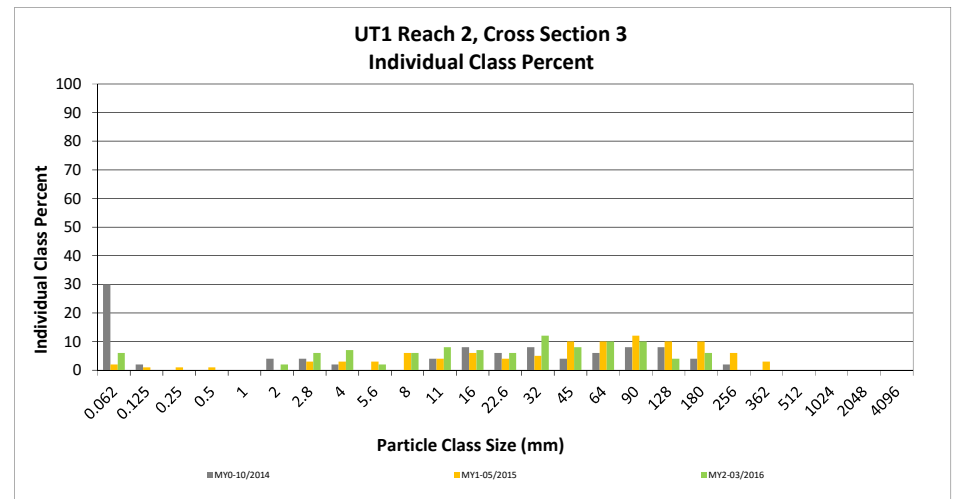
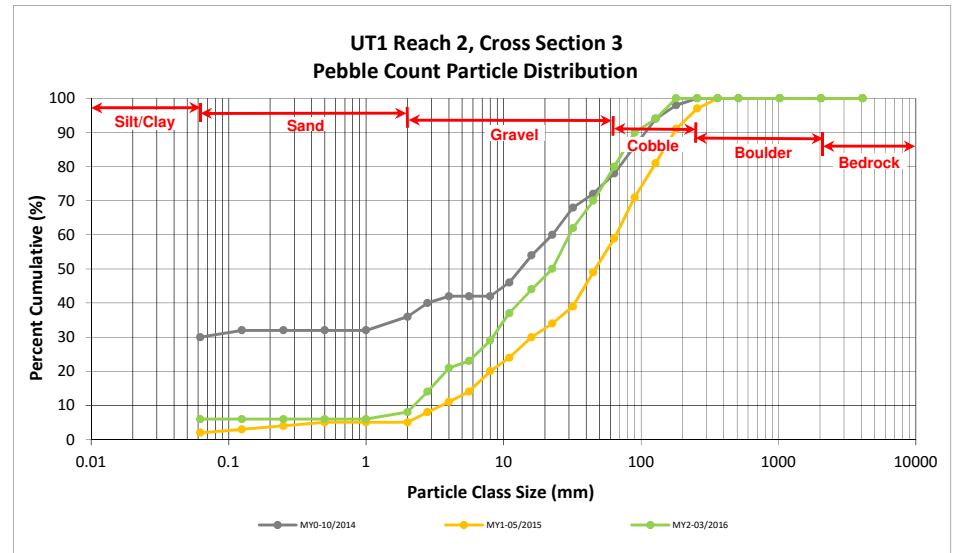
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1 Reach 2, Cross Section 3

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|------------------|------------------|---------------|-------|------------------|------------------|--------------------|
| | | min | max | | Class Percentage | Percent Cumulative |
| <i>SILT/CLAY</i> | Silt/Clay | 0.000 | 0.062 | 6 | 6 | 6 |
| SAND | Very fine | 0.062 | 0.125 | | | 6 |
| | Fine | 0.125 | 0.250 | | | 6 |
| | Medium | 0.25 | 0.50 | | | 6 |
| | Coarse | 0.5 | 1.0 | | | 6 |
| | Very Coarse | 1.0 | 2.0 | 2 | 2 | 8 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 6 | 6 | 14 |
| | Very Fine | 2.8 | 4.0 | 7 | 7 | 21 |
| | Fine | 4.0 | 5.6 | 2 | 2 | 23 |
| | Fine | 5.6 | 8.0 | 6 | 6 | 29 |
| | Medium | 8.0 | 11.0 | 8 | 8 | 37 |
| | Medium | 11.0 | 16.0 | 7 | 7 | 44 |
| | Coarse | 16.0 | 22.6 | 6 | 6 | 50 |
| | Coarse | 22.6 | 32 | 12 | 12 | 62 |
| | Very Coarse | 32 | 45 | 8 | 8 | 70 |
| | Very Coarse | 45 | 64 | 10 | 10 | 80 |
| COBBLE | Small | 64 | 90 | 10 | 10 | 90 |
| | Small | 90 | 128 | 4 | 4 | 94 |
| | Large | 128 | 180 | 6 | 6 | 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 3 | |
|------------------------|-------|
| Channel materials (mm) | |
| D ₁₆ = | 3.10 |
| D ₃₅ = | 10.16 |
| D ₅₀ = | 22.6 |
| D ₈₄ = | 73.4 |
| D ₉₅ = | 135.5 |
| D ₁₀₀ = | 180.0 |



Reachwide and Cross Section Pebble Count Plots

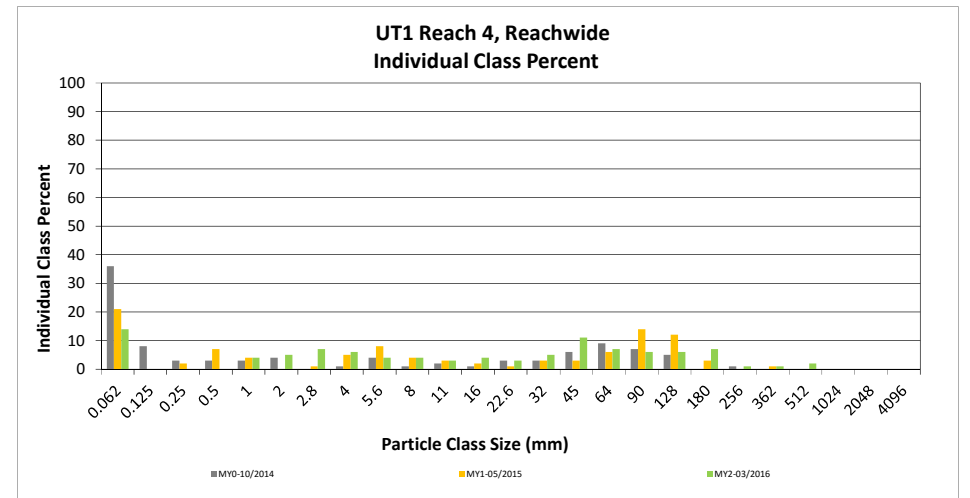
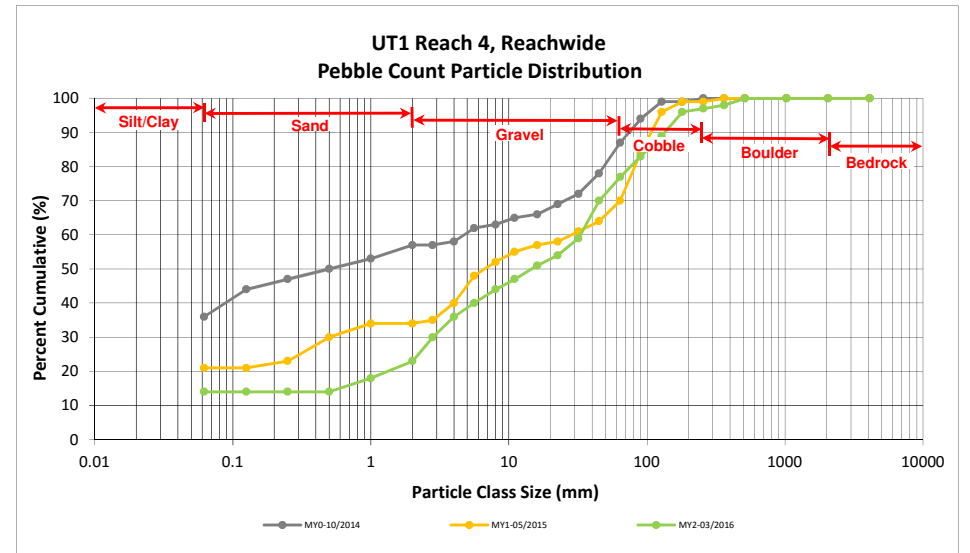
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1 Reach 4, 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 | 10 | 14 | 14 | 14 |
| SAND | Very fine | 0.062 | 0.125 | | | | | 14 |
| | Fine | 0.125 | 0.250 | | | | | 14 |
| | Medium | 0.25 | 0.50 | | | | | 14 |
| | Coarse | 0.5 | 1.0 | | 4 | 4 | 4 | 18 |
| | Very Coarse | 1.0 | 2.0 | 1 | 4 | 5 | 5 | 23 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 1 | 6 | 7 | 7 | 30 |
| | Very Fine | 2.8 | 4.0 | 1 | 5 | 6 | 6 | 36 |
| | Fine | 4.0 | 5.6 | | 4 | 4 | 4 | 40 |
| | Fine | 5.6 | 8.0 | 1 | 3 | 4 | 4 | 44 |
| | Medium | 8.0 | 11.0 | 2 | 1 | 3 | 3 | 47 |
| | Medium | 11.0 | 16.0 | 4 | | 4 | 4 | 51 |
| | Coarse | 16.0 | 22.6 | 3 | | 3 | 3 | 54 |
| | Coarse | 22.6 | 32 | 5 | | 5 | 5 | 59 |
| | Very Coarse | 32 | 45 | 10 | 1 | 11 | 11 | 70 |
| | Very Coarse | 45 | 64 | 7 | | 7 | 7 | 77 |
| COBBLE | Small | 64 | 90 | 5 | 1 | 6 | 6 | 83 |
| | Small | 90 | 128 | 5 | 1 | 6 | 6 | 89 |
| | Large | 128 | 180 | 7 | | 7 | 7 | 96 |
| | Large | 180 | 256 | 1 | | 1 | 1 | 97 |
| BOULDER | Small | 256 | 362 | 1 | | 1 | 1 | 98 |
| | Small | 362 | 512 | 2 | | 2 | 2 | 100 |
| | Medium | 512 | 1024 | | | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | | | 100 |
| BEDROCK | Bedrock | 2048 | >2048 | | | | | 100 |
| Total | | | | 60 | 40 | 100 | 100 | 100 |

| Reachwide Channel materials (mm) | |
|----------------------------------|-------|
| D ₁₆ = | 0.71 |
| D ₃₅ = | 3.77 |
| D ₅₀ = | 14.6 |
| D ₈₄ = | 95.4 |
| D ₉₅ = | 171.4 |
| D ₁₀₀ = | 512.0 |



Reachwide and Cross Section Pebble Count Plots

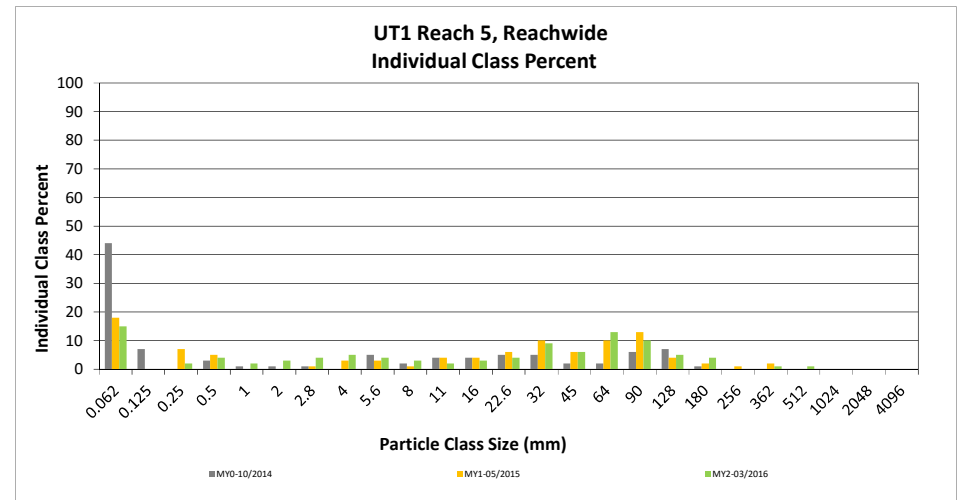
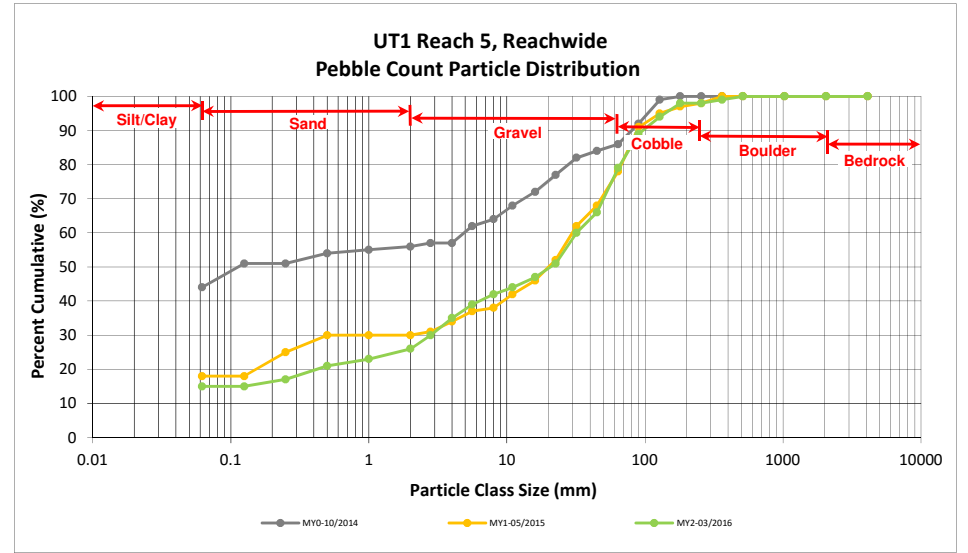
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1 Reach 5, 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 | 1 | 14 | 15 | 15 | 15 |
| SAND | Very fine | 0.062 | 0.125 | | | | | 15 |
| | Fine | 0.125 | 0.250 | | 2 | 2 | 2 | 17 |
| | Medium | 0.25 | 0.50 | 1 | 3 | 4 | 4 | 21 |
| | Coarse | 0.5 | 1.0 | | 2 | 2 | 2 | 23 |
| | Very Coarse | 1.0 | 2.0 | | 3 | 3 | 3 | 26 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 1 | 3 | 4 | 4 | 30 |
| | Very Fine | 2.8 | 4.0 | 2 | 3 | 5 | 5 | 35 |
| | Fine | 4.0 | 5.6 | 2 | 2 | 4 | 4 | 39 |
| | Fine | 5.6 | 8.0 | 1 | 2 | 3 | 3 | 42 |
| | Medium | 8.0 | 11.0 | | 2 | 2 | 2 | 44 |
| | Medium | 11.0 | 16.0 | 2 | 1 | 3 | 3 | 47 |
| | Coarse | 16.0 | 22.6 | 4 | | 4 | 4 | 51 |
| | Coarse | 22.6 | 32 | 7 | 2 | 9 | 9 | 60 |
| | Very Coarse | 32 | 45 | 5 | 1 | 6 | 6 | 66 |
| | Very Coarse | 45 | 64 | 13 | | 13 | 13 | 79 |
| COBBLE | Small | 64 | 90 | 10 | | 10 | 10 | 89 |
| | Small | 90 | 128 | 5 | | 5 | 5 | 94 |
| | Large | 128 | 180 | 4 | | 4 | 4 | 98 |
| | Large | 180 | 256 | | | | | 98 |
| BOULDER | Small | 256 | 362 | 1 | | 1 | 1 | 99 |
| | Small | 362 | 512 | 1 | | 1 | 1 | 100 |
| | Medium | 512 | 1024 | | | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | | | 100 |
| BEDROCK | Bedrock | 2048 | >2048 | | | | | 100 |
| Total | | | | 60 | 40 | 100 | 100 | 100 |

| Reachwide Channel materials (mm) | |
|----------------------------------|-------|
| D ₁₆ = | 0.18 |
| D ₃₅ = | 4.00 |
| D ₅₀ = | 20.7 |
| D ₈₄ = | 75.9 |
| D ₉₅ = | 139.4 |
| D ₁₀₀ = | 512.0 |



Reachwide and Cross Section Pebble Count Plots

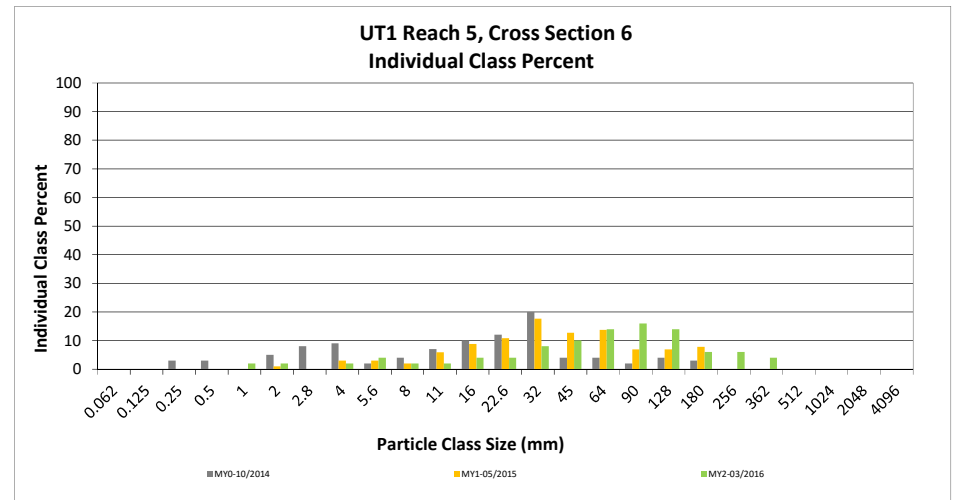
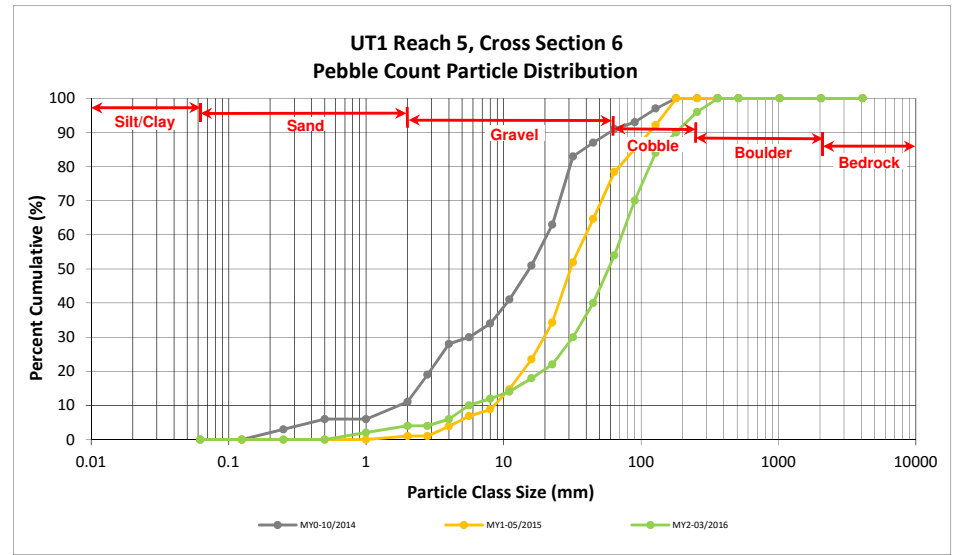
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1 Reach 5, Cross Section 6

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|------------------|------------------|---------------|-------|------------------|------------------|--------------------|
| | | min | max | | Class Percentage | Percent Cumulative |
| <i>SILT/CLAY</i> | Silt/Clay | 0.000 | 0.062 | | | 0 |
| SAND | Very fine | 0.062 | 0.125 | | | 0 |
| | Fine | 0.125 | 0.250 | | | 0 |
| | Medium | 0.25 | 0.50 | | | 0 |
| | Coarse | 0.5 | 1.0 | 2 | 2 | 2 |
| | Very Coarse | 1.0 | 2.0 | 2 | 2 | 4 |
| GRAVEL | Very Fine | 2.0 | 2.8 | | | 4 |
| | Very Fine | 2.8 | 4.0 | 2 | 2 | 6 |
| | Fine | 4.0 | 5.6 | 4 | 4 | 10 |
| | Fine | 5.6 | 8.0 | 2 | 2 | 12 |
| | Medium | 8.0 | 11.0 | 2 | 2 | 14 |
| | Medium | 11.0 | 16.0 | 4 | 4 | 18 |
| | Coarse | 16.0 | 22.6 | 4 | 4 | 22 |
| | Coarse | 22.6 | 32 | 8 | 8 | 30 |
| | Very Coarse | 32 | 45 | 10 | 10 | 40 |
| | Very Coarse | 45 | 64 | 14 | 14 | 54 |
| COBBLE | Small | 64 | 90 | 16 | 16 | 70 |
| | Small | 90 | 128 | 14 | 14 | 84 |
| | Large | 128 | 180 | 6 | 6 | 90 |
| | Large | 180 | 256 | 6 | 6 | 96 |
| BOULDER | Small | 256 | 362 | 4 | 4 | 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 6 | |
|------------------------|-------|
| Channel materials (mm) | |
| D ₁₆ = | 13.27 |
| D ₃₅ = | 37.95 |
| D ₅₀ = | 57.9 |
| D ₈₄ = | 128.0 |
| D ₉₅ = | 241.4 |
| D ₁₀₀ = | 362.0 |



Reachwide and Cross Section Pebble Count Plots

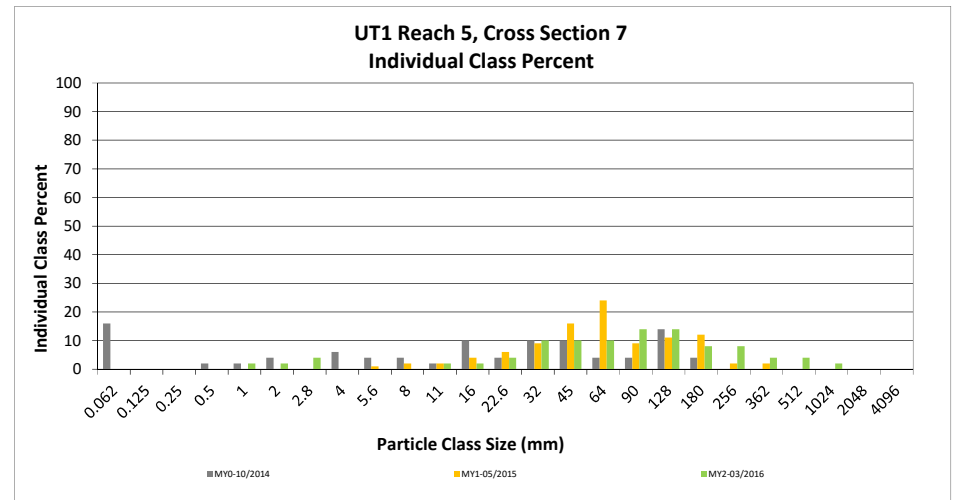
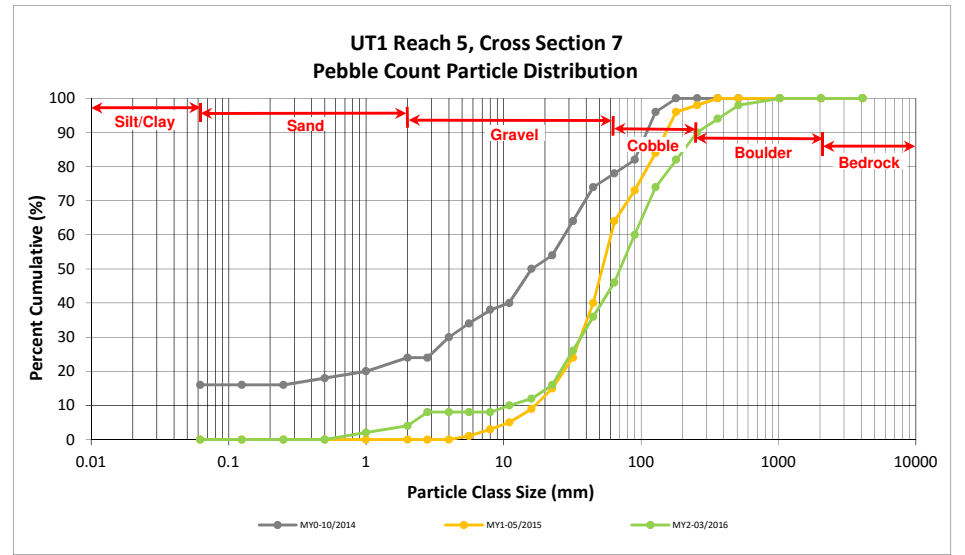
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1 Reach 5, Cross Section 7

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|------------------|------------------|---------------|-------|------------------|------------------|--------------------|
| | | min | max | | Class Percentage | Percent Cumulative |
| <i>SILT/CLAY</i> | Silt/Clay | 0.000 | 0.062 | | | 0 |
| SAND | Very fine | 0.062 | 0.125 | | | 0 |
| | Fine | 0.125 | 0.250 | | | 0 |
| | Medium | 0.25 | 0.50 | | | 0 |
| | Coarse | 0.5 | 1.0 | 2 | 2 | 2 |
| | Very Coarse | 1.0 | 2.0 | 2 | 2 | 4 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 4 | 4 | 8 |
| | Very Fine | 2.8 | 4.0 | | | 8 |
| | Fine | 4.0 | 5.6 | | | 8 |
| | Fine | 5.6 | 8.0 | | | 8 |
| | Medium | 8.0 | 11.0 | 2 | 2 | 10 |
| | Medium | 11.0 | 16.0 | 2 | 2 | 12 |
| | Coarse | 16.0 | 22.6 | 4 | 4 | 16 |
| | Coarse | 22.6 | 32 | 10 | 10 | 26 |
| | Very Coarse | 32 | 45 | 10 | 10 | 36 |
| | Very Coarse | 45 | 64 | 10 | 10 | 46 |
| COBBLE | Small | 64 | 90 | 14 | 14 | 60 |
| | Small | 90 | 128 | 14 | 14 | 74 |
| | Large | 128 | 180 | 8 | 8 | 82 |
| | Large | 180 | 256 | 8 | 8 | 90 |
| BOULDER | Small | 256 | 362 | 4 | 4 | 94 |
| | Small | 362 | 512 | 4 | 4 | 98 |
| | Medium | 512 | 1024 | 2 | 2 | 100 |
| | Large/Very Large | 1024 | 2048 | | | 100 |
| BEDROCK | Bedrock | 2048 | >2048 | | | 100 |
| Total | | | | 100 | 100 | 100 |

| Cross Section 7 | |
|------------------------|--------|
| Channel materials (mm) | |
| D ₁₆ = | 22.60 |
| D ₃₅ = | 43.49 |
| D ₅₀ = | 70.5 |
| D ₈₄ = | 196.6 |
| D ₉₅ = | 394.8 |
| D ₁₀₀ = | 1024.0 |



Reachwide and Cross Section Pebble Count Plots

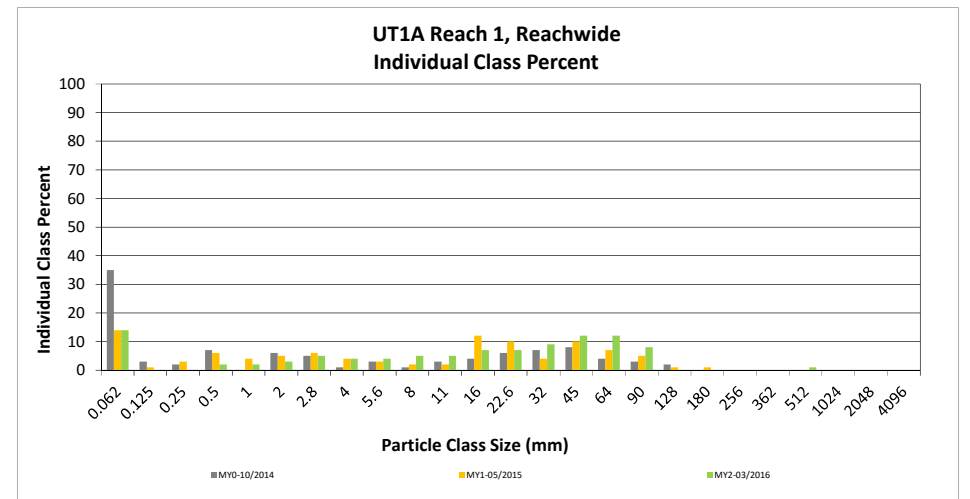
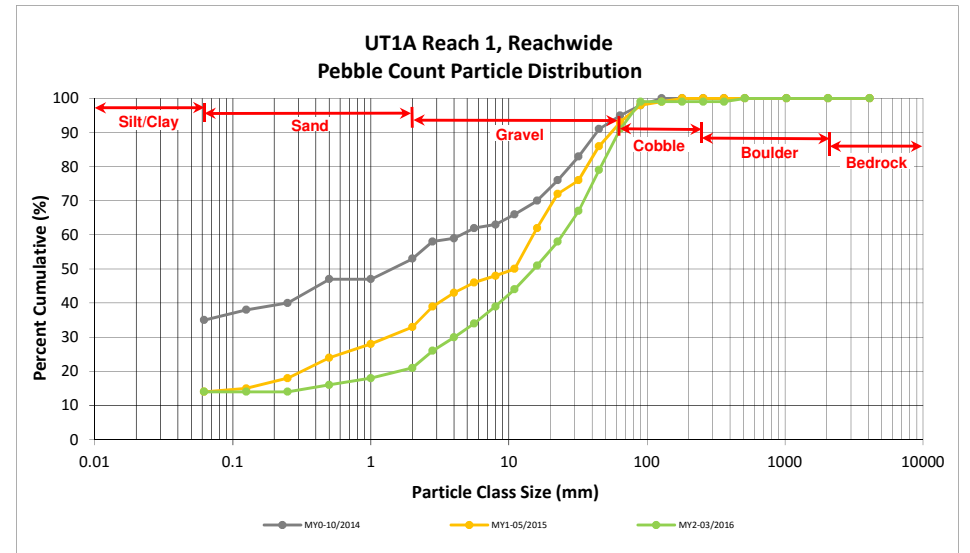
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1A Reach 1, 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 | 2 | 12 | 14 | 14 | 14 |
| SAND | Very fine | 0.062 | 0.125 | | | | | 14 |
| | Fine | 0.125 | 0.250 | | | | | 14 |
| | Medium | 0.25 | 0.50 | | 2 | 2 | 2 | 16 |
| | Coarse | 0.5 | 1.0 | | 2 | 2 | 2 | 18 |
| | Very Coarse | 1.0 | 2.0 | | 3 | 3 | 3 | 21 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 1 | 4 | 5 | 5 | 26 |
| | Very Fine | 2.8 | 4.0 | 1 | 3 | 4 | 4 | 30 |
| | Fine | 4.0 | 5.6 | 1 | 3 | 4 | 4 | 34 |
| | Fine | 5.6 | 8.0 | 1 | 4 | 5 | 5 | 39 |
| | Medium | 8.0 | 11.0 | 3 | 2 | 5 | 5 | 44 |
| | Medium | 11.0 | 16.0 | 5 | 2 | 7 | 7 | 51 |
| | Coarse | 16.0 | 22.6 | 5 | 2 | 7 | 7 | 58 |
| | Coarse | 22.6 | 32 | 9 | | 9 | 9 | 67 |
| | Very Coarse | 32 | 45 | 12 | | 12 | 12 | 79 |
| | Very Coarse | 45 | 64 | 11 | 1 | 12 | 12 | 91 |
| COBBLE | Small | 64 | 90 | 8 | | 8 | 8 | 99 |
| | Small | 90 | 128 | | | | | 99 |
| | Large | 128 | 180 | | | | | 99 |
| | Large | 180 | 256 | | | | | 99 |
| BOULDER | Small | 256 | 362 | | | | | 99 |
| | Small | 362 | 512 | 1 | | 1 | 1 | 100 |
| | Medium | 512 | 1024 | | | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | | | 100 |
| BEDROCK | Bedrock | 2048 | >2048 | | | | | 100 |
| Total | | | | 60 | 40 | 100 | 100 | 100 |

| Reachwide Channel materials (mm) | |
|----------------------------------|-------|
| D ₁₆ = | 0.50 |
| D ₃₅ = | 6.01 |
| D ₅₀ = | 15.2 |
| D ₈₄ = | 52.1 |
| D ₉₅ = | 75.9 |
| D ₁₀₀ = | 512.0 |



Reachwide and Cross Section Pebble Count Plots

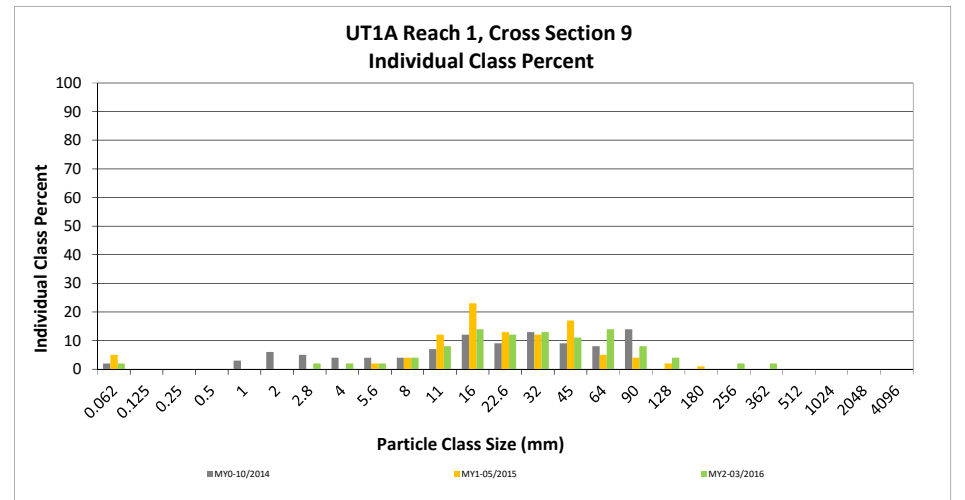
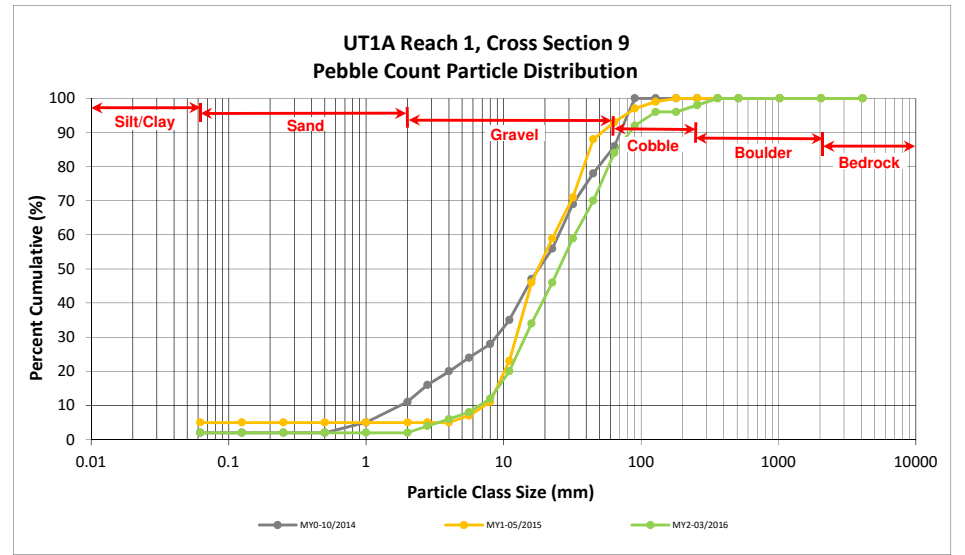
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1A Reach 1, Cross Section 9

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|------------------|------------------|---------------|-------|------------------|------------------|--------------------|
| | | min | max | | Class Percentage | Percent Cumulative |
| <i>SILT/CLAY</i> | Silt/Clay | 0.000 | 0.062 | 2 | 2 | 2 |
| SAND | Very fine | 0.062 | 0.125 | | | 2 |
| | Fine | 0.125 | 0.250 | | | 2 |
| | Medium | 0.25 | 0.50 | | | 2 |
| | Coarse | 0.5 | 1.0 | | | 2 |
| | Very Coarse | 1.0 | 2.0 | | | 2 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 2 | 2 | 4 |
| | Very Fine | 2.8 | 4.0 | 2 | 2 | 6 |
| | Fine | 4.0 | 5.6 | 2 | 2 | 8 |
| | Fine | 5.6 | 8.0 | 4 | 4 | 12 |
| | Medium | 8.0 | 11.0 | 8 | 8 | 20 |
| | Medium | 11.0 | 16.0 | 14 | 14 | 34 |
| | Coarse | 16.0 | 22.6 | 12 | 12 | 46 |
| | Coarse | 22.6 | 32 | 13 | 13 | 59 |
| | Very Coarse | 32 | 45 | 11 | 11 | 70 |
| | Very Coarse | 45 | 64 | 14 | 14 | 84 |
| COBBLE | Small | 64 | 90 | 8 | 8 | 92 |
| | Small | 90 | 128 | 4 | 4 | 96 |
| | Large | 128 | 180 | | | 96 |
| | Large | 180 | 256 | 2 | 2 | 98 |
| BOULDER | Small | 256 | 362 | 2 | 2 | 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 9 | |
|------------------------|-------|
| Channel materials (mm) | |
| D ₁₆ = | 9.38 |
| D ₃₅ = | 16.47 |
| D ₅₀ = | 25.2 |
| D ₈₄ = | 64.0 |
| D ₉₅ = | 117.2 |
| D ₁₀₀ = | 362.0 |



Reachwide and Cross Section Pebble Count Plots

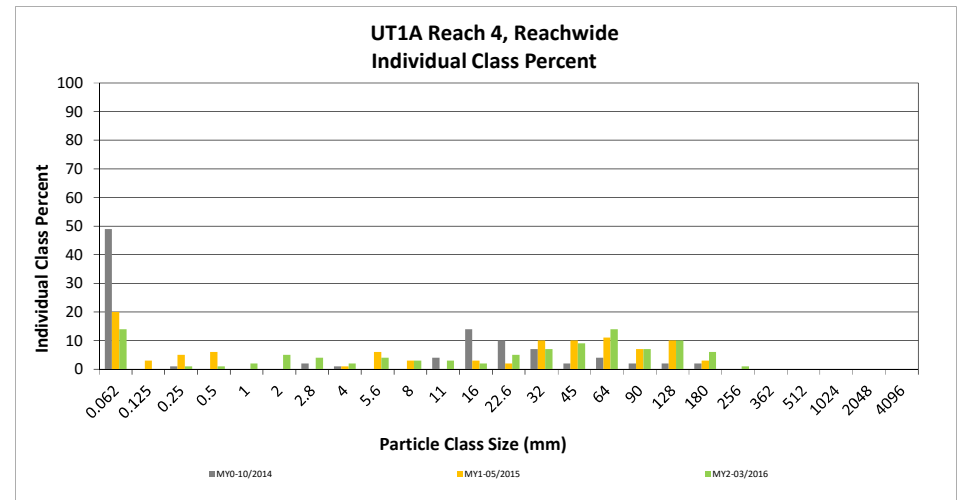
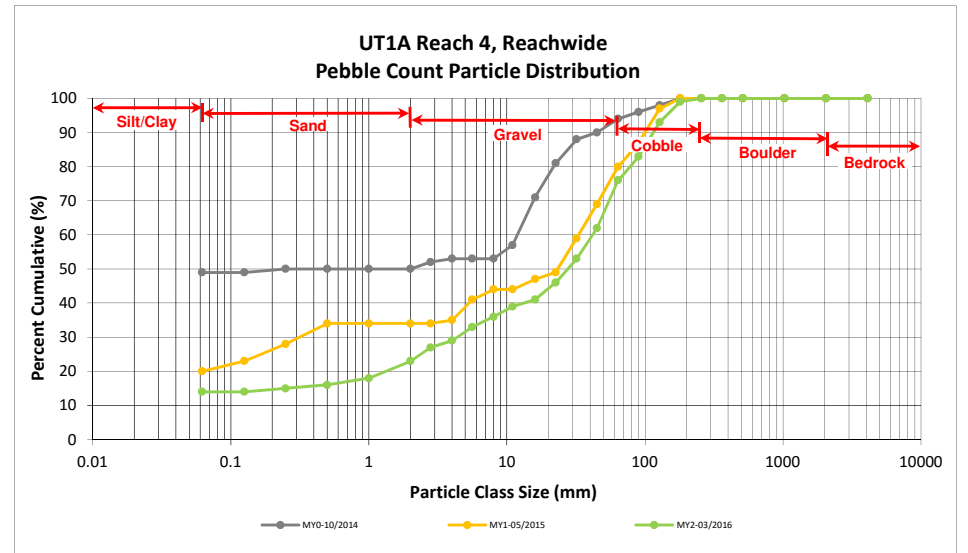
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1A Reach 4, 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 | | 14 | 14 | 14 | 14 |
| SAND | Very fine | 0.062 | 0.125 | | | | | 14 |
| | Fine | 0.125 | 0.250 | | 1 | 1 | 1 | 15 |
| | Medium | 0.25 | 0.50 | | 1 | 1 | 1 | 16 |
| | Coarse | 0.5 | 1.0 | | 2 | 2 | 2 | 18 |
| | Very Coarse | 1.0 | 2.0 | 1 | 4 | 5 | 5 | 23 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 1 | 3 | 4 | 4 | 27 |
| | Very Fine | 2.8 | 4.0 | | 2 | 2 | 2 | 29 |
| | Fine | 4.0 | 5.6 | | 4 | 4 | 4 | 33 |
| | Fine | 5.6 | 8.0 | | 3 | 3 | 3 | 36 |
| | Medium | 8.0 | 11.0 | 1 | 2 | 3 | 3 | 39 |
| | Medium | 11.0 | 16.0 | 2 | | 2 | 2 | 41 |
| | Coarse | 16.0 | 22.6 | 4 | 1 | 5 | 5 | 46 |
| | Coarse | 22.6 | 32 | 7 | | 7 | 7 | 53 |
| | Very Coarse | 32 | 45 | 8 | 1 | 9 | 9 | 62 |
| | Very Coarse | 45 | 64 | 13 | 1 | 14 | 14 | 76 |
| COBBLE | Small | 64 | 90 | 7 | | 7 | 7 | 83 |
| | Small | 90 | 128 | 9 | 1 | 10 | 10 | 93 |
| | Large | 128 | 180 | 6 | | 6 | 6 | 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 | | | | 60 | 40 | 100 | 100 | 100 |

| Reachwide Channel materials (mm) | |
|----------------------------------|-------|
| D ₁₆ = | 0.50 |
| D ₃₅ = | 7.10 |
| D ₅₀ = | 27.57 |
| D ₈₄ = | 93.2 |
| D ₉₅ = | 143.4 |
| D ₁₀₀ = | 256.0 |



Reachwide and Cross Section Pebble Count Plots

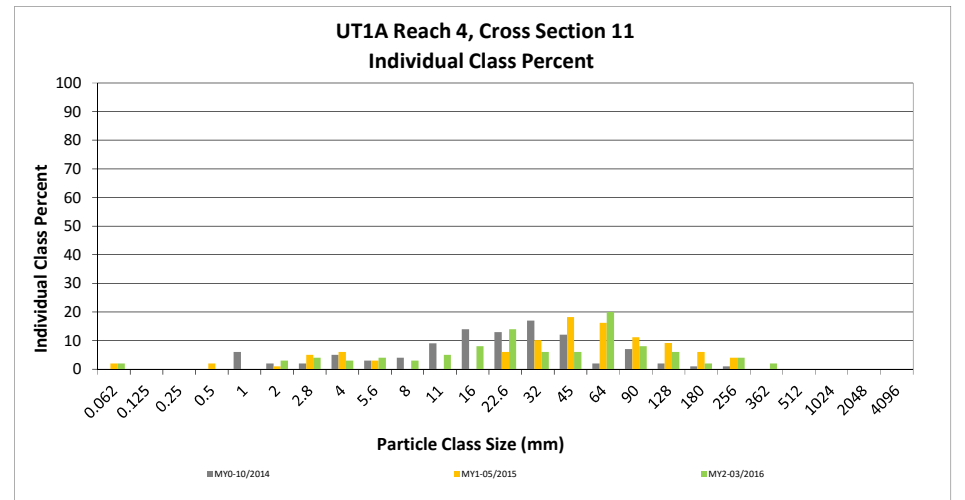
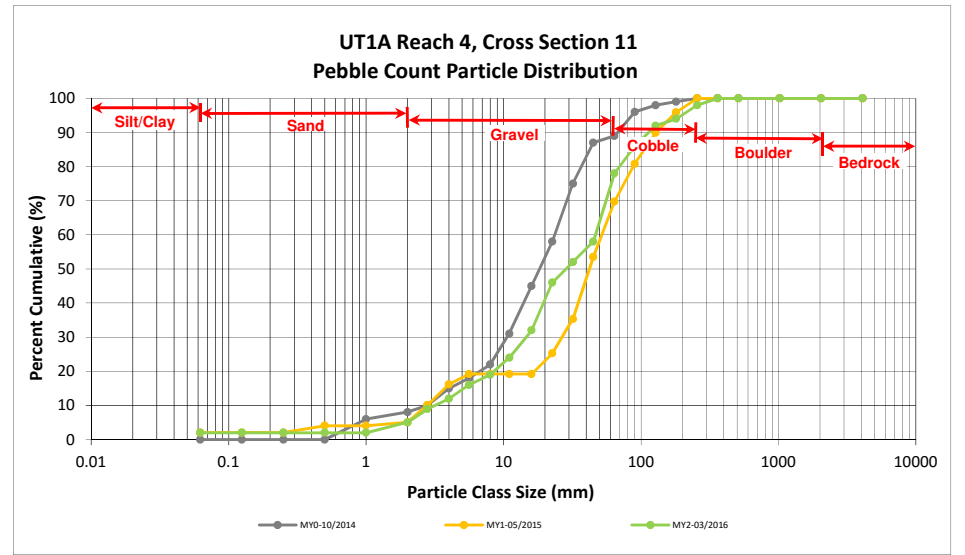
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1A Reach 4, Cross Section 11

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|------------------|------------------|---------------|-------|------------------|------------------|--------------------|
| | | min | max | | Class Percentage | Percent Cumulative |
| <i>SILT/CLAY</i> | Silt/Clay | 0.000 | 0.062 | 2 | 2 | 2 |
| SAND | Very fine | 0.062 | 0.125 | | | 2 |
| | Fine | 0.125 | 0.250 | | | 2 |
| | Medium | 0.25 | 0.50 | | | 2 |
| | Coarse | 0.5 | 1.0 | | | 2 |
| | Very Coarse | 1.0 | 2.0 | 3 | 3 | 5 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 4 | 4 | 9 |
| | Very Fine | 2.8 | 4.0 | 3 | 3 | 12 |
| | Fine | 4.0 | 5.6 | 4 | 4 | 16 |
| | Fine | 5.6 | 8.0 | 3 | 3 | 19 |
| | Medium | 8.0 | 11.0 | 5 | 5 | 24 |
| | Medium | 11.0 | 16.0 | 8 | 8 | 32 |
| | Coarse | 16.0 | 22.6 | 14 | 14 | 46 |
| | Coarse | 22.6 | 32 | 6 | 6 | 52 |
| | Very Coarse | 32 | 45 | 6 | 6 | 58 |
| | Very Coarse | 45 | 64 | 20 | 20 | 78 |
| COBBLE | Small | 64 | 90 | 8 | 8 | 86 |
| | Small | 90 | 128 | 6 | 6 | 92 |
| | Large | 128 | 180 | 2 | 2 | 94 |
| | Large | 180 | 256 | 4 | 4 | 98 |
| BOULDER | Small | 256 | 362 | 2 | 2 | 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 11 | |
|------------------------|-------|
| Channel materials (mm) | |
| D ₁₆ = | 5.60 |
| D ₃₅ = | 17.23 |
| D ₅₀ = | 28.5 |
| D ₈₄ = | 82.6 |
| D ₉₅ = | 196.6 |
| D ₁₀₀ = | 362.0 |



Reachwide and Cross Section Pebble Count Plots

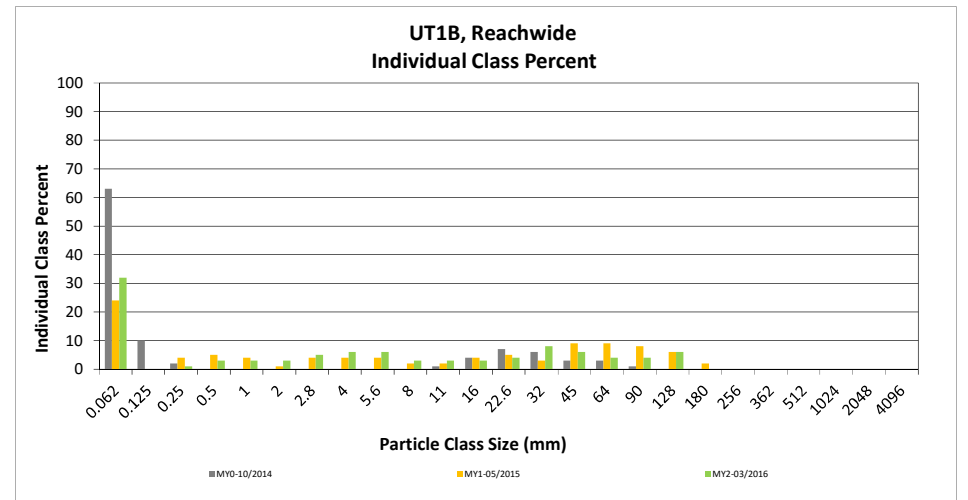
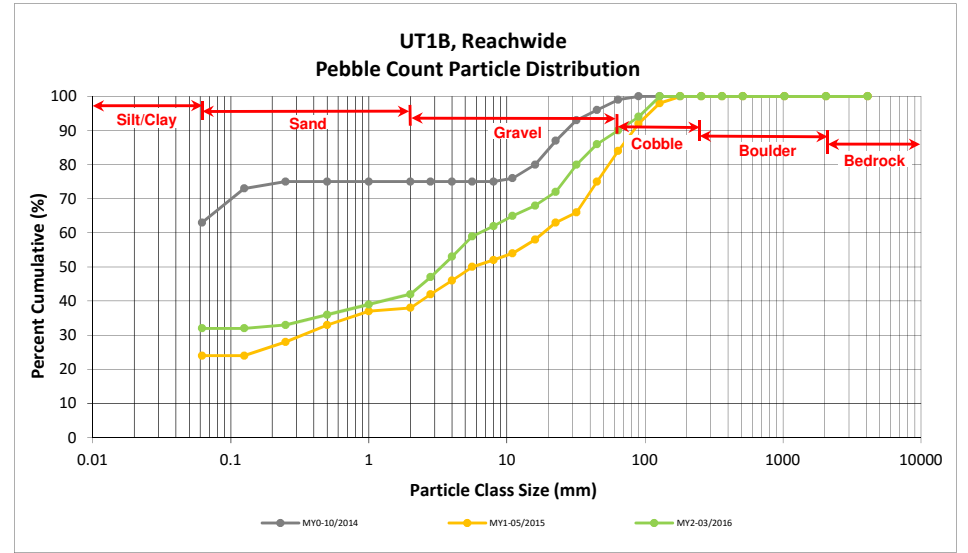
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1B, 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 | 10 | 22 | 32 | 32 | 32 |
| SAND | Very fine | 0.062 | 0.125 | | | | | 32 |
| | Fine | 0.125 | 0.250 | | 1 | 1 | 1 | 33 |
| | Medium | 0.25 | 0.50 | 2 | 1 | 3 | 3 | 36 |
| | Coarse | 0.5 | 1.0 | 1 | 2 | 3 | 3 | 39 |
| | Very Coarse | 1.0 | 2.0 | | 3 | 3 | 3 | 42 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 1 | 4 | 5 | 5 | 47 |
| | Very Fine | 2.8 | 4.0 | 3 | 3 | 6 | 6 | 53 |
| | Fine | 4.0 | 5.6 | 3 | 3 | 6 | 6 | 59 |
| | Fine | 5.6 | 8.0 | 2 | 1 | 3 | 3 | 62 |
| | Medium | 8.0 | 11.0 | 3 | | 3 | 3 | 65 |
| | Medium | 11.0 | 16.0 | 3 | | 3 | 3 | 68 |
| | Coarse | 16.0 | 22.6 | 4 | | 4 | 4 | 72 |
| | Coarse | 22.6 | 32 | 8 | | 8 | 8 | 80 |
| | Very Coarse | 32 | 45 | 6 | | 6 | 6 | 86 |
| | Very Coarse | 45 | 64 | 4 | | 4 | 4 | 90 |
| COBBLE | Small | 64 | 90 | 4 | | 4 | 4 | 94 |
| | Small | 90 | 128 | 6 | | 6 | 6 | 100 |
| | Large | 128 | 180 | | | | | 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 | | | | 60 | 40 | 100 | 100 | 100 |

| Reachwide | |
|------------------------|-----------|
| Channel materials (mm) | |
| D ₁₆ = | Silt/Clay |
| D ₃₅ = | 0.40 |
| D ₅₀ = | 3.3 |
| D ₈₄ = | 40.2 |
| D ₉₅ = | 95.4 |
| D ₁₀₀ = | 128.0 |



Reachwide and Cross Section Pebble Count Plots

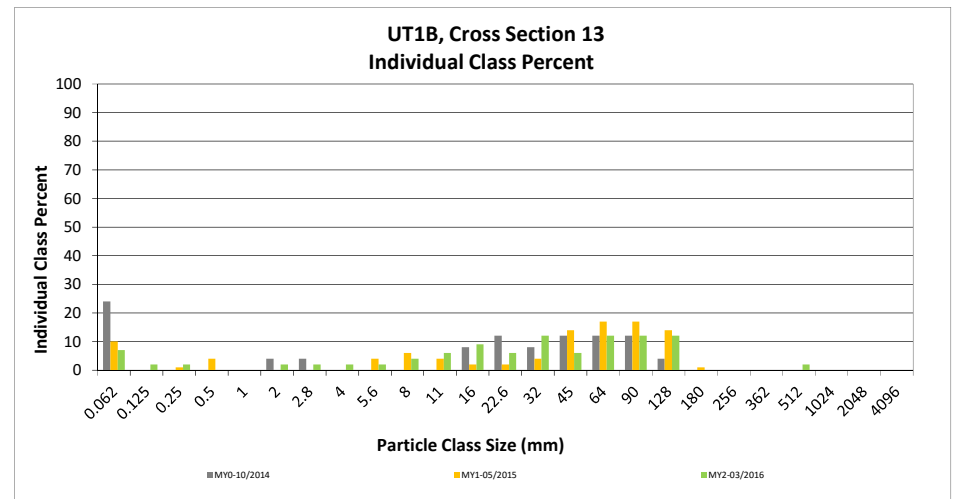
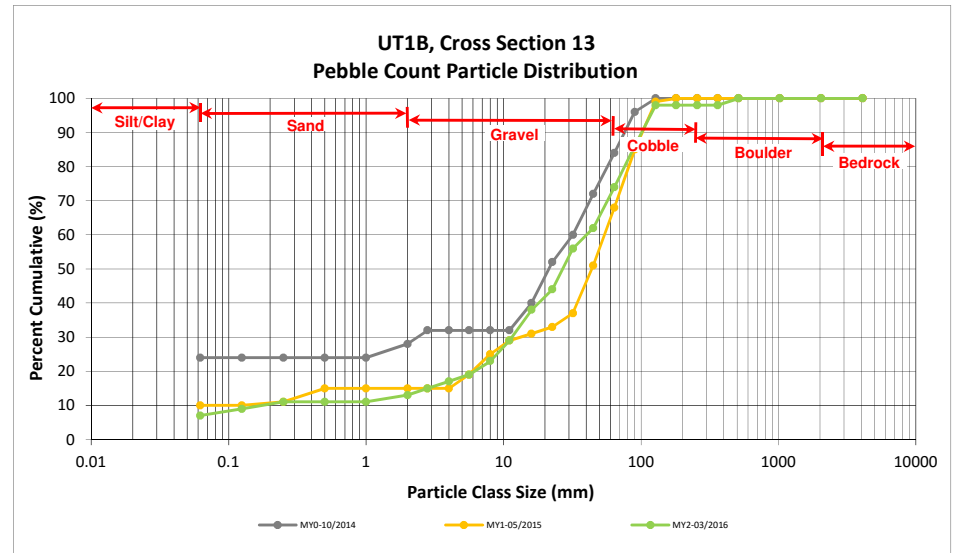
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT1B, Cross Section 13

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|------------------|------------------|---------------|-------|------------------|------------------|--------------------|
| | | min | max | | Class Percentage | Percent Cumulative |
| <i>SILT/CLAY</i> | Silt/Clay | 0.000 | 0.062 | 7 | 7 | 7 |
| SAND | Very fine | 0.062 | 0.125 | 2 | 2 | 9 |
| | Fine | 0.125 | 0.250 | 2 | 2 | 11 |
| | Medium | 0.25 | 0.50 | | | 11 |
| | Coarse | 0.5 | 1.0 | | | 11 |
| | Very Coarse | 1.0 | 2.0 | 2 | 2 | 13 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 2 | 2 | 15 |
| | Very Fine | 2.8 | 4.0 | 2 | 2 | 17 |
| | Fine | 4.0 | 5.6 | 2 | 2 | 19 |
| | Fine | 5.6 | 8.0 | 4 | 4 | 23 |
| | Medium | 8.0 | 11.0 | 6 | 6 | 29 |
| | Medium | 11.0 | 16.0 | 9 | 9 | 38 |
| | Coarse | 16.0 | 22.6 | 6 | 6 | 44 |
| | Coarse | 22.6 | 32 | 12 | 12 | 56 |
| | Very Coarse | 32 | 45 | 6 | 6 | 62 |
| | Very Coarse | 45 | 64 | 12 | 12 | 74 |
| COBBLE | Small | 64 | 90 | 12 | 12 | 86 |
| | Small | 90 | 128 | 12 | 12 | 98 |
| | Large | 128 | 180 | | | 98 |
| | Large | 180 | 256 | | | 98 |
| BOULDER | Small | 256 | 362 | | | 98 |
| | Small | 362 | 512 | 2 | 2 | 100 |
| | Medium | 512 | 1024 | | | 100 |
| | Large/Very Large | 1024 | 2048 | | | 100 |
| BEDROCK | Bedrock | 2048 | >2048 | | | 100 |
| Total | | | | 100 | 100 | 100 |

| Cross Section 13 | |
|------------------------|-------|
| Channel materials (mm) | |
| D ₁₆ = | 3.35 |
| D ₃₅ = | 14.12 |
| D ₅₀ = | 26.9 |
| D ₈₄ = | 85.0 |
| D ₉₅ = | 117.2 |
| D ₁₀₀ = | 512.0 |



Reachwide and Cross Section Pebble Count Plots

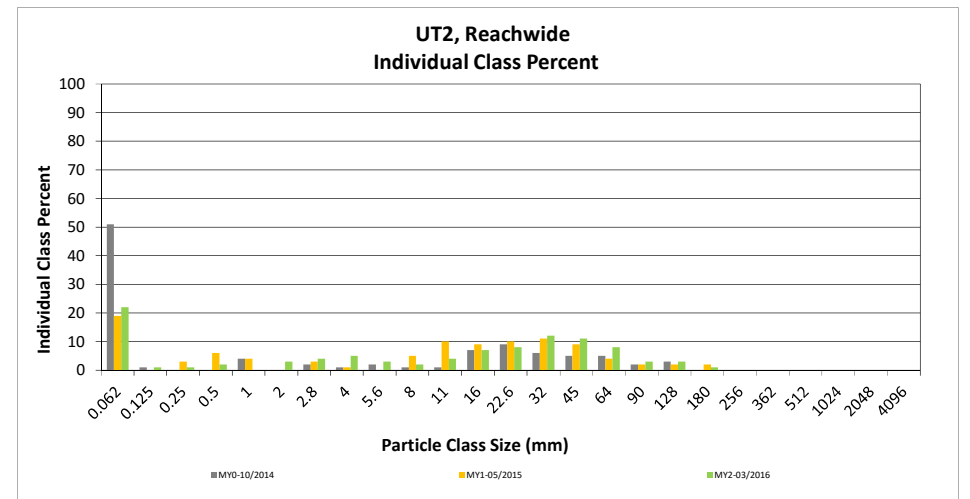
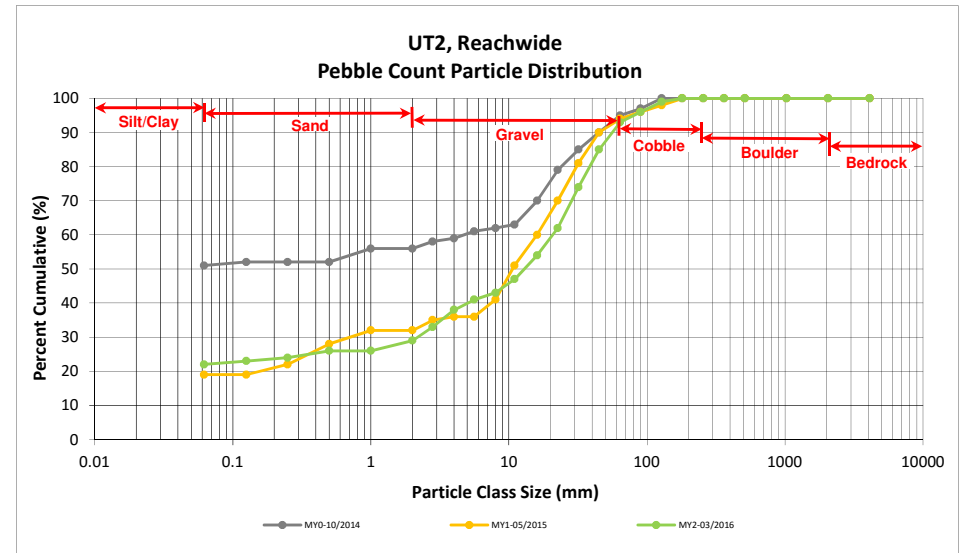
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

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 | 4 | 18 | 22 | 22 | 22 |
| SAND | Very fine | 0.062 | 0.125 | | 1 | 1 | 1 | 23 |
| | Fine | 0.125 | 0.250 | | 1 | 1 | 1 | 24 |
| | Medium | 0.25 | 0.50 | | 2 | 2 | 2 | 26 |
| | Coarse | 0.5 | 1.0 | | | | | 26 |
| | Very Coarse | 1.0 | 2.0 | | | | | 29 |
| GRAVEL | Very Fine | 2.0 | 2.8 | 2 | 2 | 4 | 4 | 33 |
| | Very Fine | 2.8 | 4.0 | 1 | 4 | 5 | 5 | 38 |
| | Fine | 4.0 | 5.6 | 1 | 2 | 3 | 3 | 41 |
| | Fine | 5.6 | 8.0 | 1 | 1 | 2 | 2 | 43 |
| | Medium | 8.0 | 11.0 | 3 | 1 | 4 | 4 | 47 |
| | Medium | 11.0 | 16.0 | 5 | 2 | 7 | 7 | 54 |
| | Coarse | 16.0 | 22.6 | 7 | 1 | 8 | 8 | 62 |
| | Coarse | 22.6 | 32 | 10 | 2 | 12 | 12 | 74 |
| | Very Coarse | 32 | 45 | 10 | 1 | 11 | 11 | 85 |
| | Very Coarse | 45 | 64 | 8 | | 8 | 8 | 93 |
| COBBLE | Small | 64 | 90 | 3 | | 3 | 3 | 96 |
| | Small | 90 | 128 | 2 | 1 | 3 | 3 | 99 |
| | Large | 128 | 180 | 1 | | 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 | | | | 60 | 40 | 100 | 100 | 100 |

| Reachwide Channel materials (mm) | |
|----------------------------------|-----------|
| D ₁₆ = | Silt/Clay |
| D ₃₅ = | 3.23 |
| D ₅₀ = | 12.9 |
| D ₈₄ = | 43.6 |
| D ₉₅ = | 80.3 |
| D ₁₀₀ = | 180.0 |



Reachwide and Cross Section Pebble Count Plots

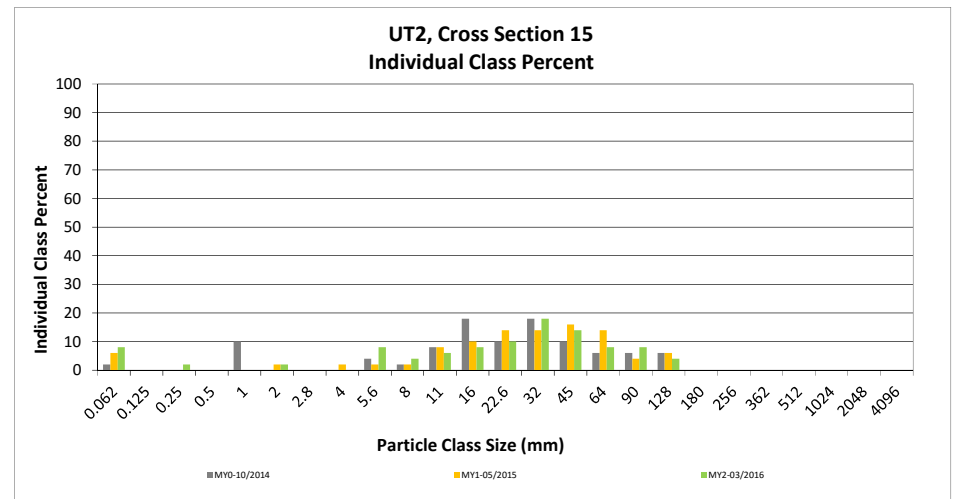
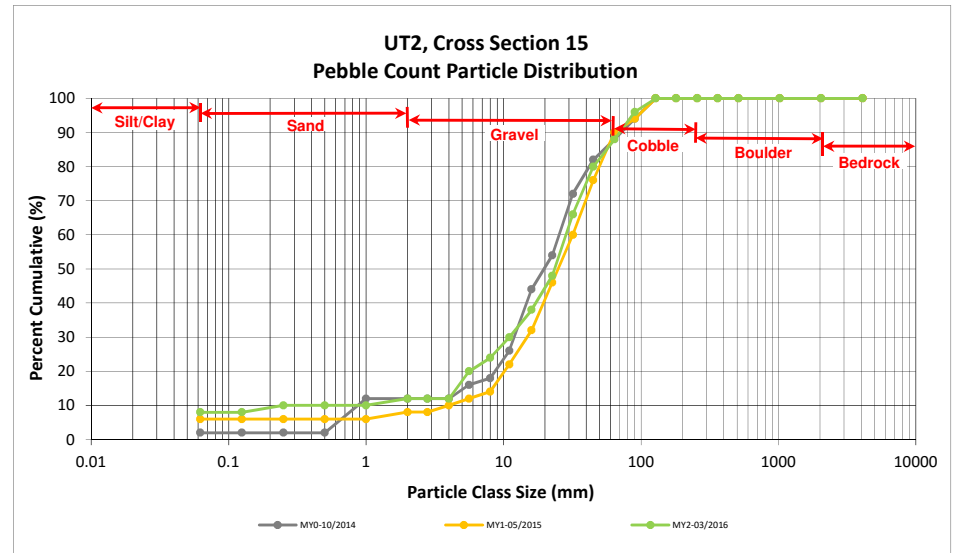
Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

UT2, Cross Section 15

| Particle Class | | Diameter (mm) | | Riffle 100-Count | Summary | |
|------------------|------------------|---------------|-------|------------------|------------------|--------------------|
| | | min | max | | Class Percentage | Percent Cumulative |
| <i>SILT/CLAY</i> | Silt/Clay | 0.000 | 0.062 | 8 | 8 | 8 |
| SAND | Very fine | 0.062 | 0.125 | | | 8 |
| | Fine | 0.125 | 0.250 | 2 | 2 | 10 |
| | Medium | 0.25 | 0.50 | | | 10 |
| | Coarse | 0.5 | 1.0 | | | 10 |
| | Very Coarse | 1.0 | 2.0 | 2 | 2 | 12 |
| GRAVEL | Very Fine | 2.0 | 2.8 | | | 12 |
| | Very Fine | 2.8 | 4.0 | | | 12 |
| | Fine | 4.0 | 5.6 | 8 | 8 | 20 |
| | Fine | 5.6 | 8.0 | 4 | 4 | 24 |
| | Medium | 8.0 | 11.0 | 6 | 6 | 30 |
| | Medium | 11.0 | 16.0 | 8 | 8 | 38 |
| | Coarse | 16.0 | 22.6 | 10 | 10 | 48 |
| | Coarse | 22.6 | 32 | 18 | 18 | 66 |
| | Very Coarse | 32 | 45 | 14 | 14 | 80 |
| | Very Coarse | 45 | 64 | 8 | 8 | 88 |
| COBBLE | Small | 64 | 90 | 8 | 8 | 96 |
| | Small | 90 | 128 | 4 | 4 | 100 |
| | Large | 128 | 180 | | | 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 15 | |
|------------------------|-------|
| Channel materials (mm) | |
| D ₁₆ = | 4.73 |
| D ₃₅ = | 13.90 |
| D ₅₀ = | 23.5 |
| D ₈₄ = | 53.7 |
| D ₉₅ = | 86.2 |
| D ₁₀₀ = | 128.0 |



APPENDIX 5. Hydrology Summary Data and Plots

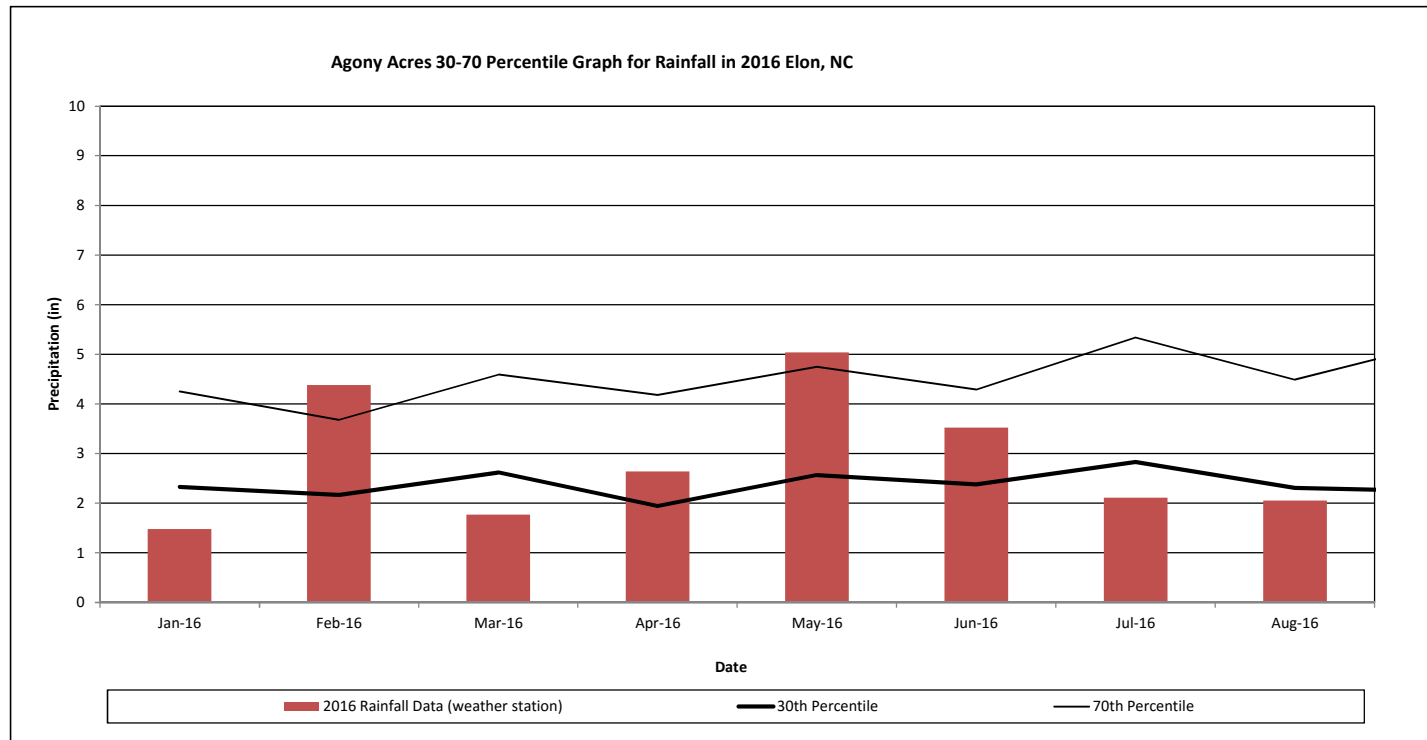
Table 13. Verification of Bankfull Events

Agony Acres Mitigation Site (DMS Project No.95716)
Monitoring Year 2 - 2016

| Reach | Date of Data Collection | Date of Occurrence | Method |
|-------|-------------------------|--------------------|---------------------------------------|
| UT1 | 3/14/2016 | 2/16/2016 | Crest Gage/ Pressure Transducer |
| UT1A | 3/14/2016 | 2/16/2016 | |
| UT1B | 3/14/2016 | 2/16/2016 | |
| | 8/30/2016 | 5/3/2016 | |
| UT2 | 3/14/2016 | 2/16/2016 | |
| | 8/30/2016 | 5/3/2016 | |

Monthly Rainfall Data

Agony Acres Mitigation Site (DMS Project No.95716)
Monitoring Year 2 - 2016



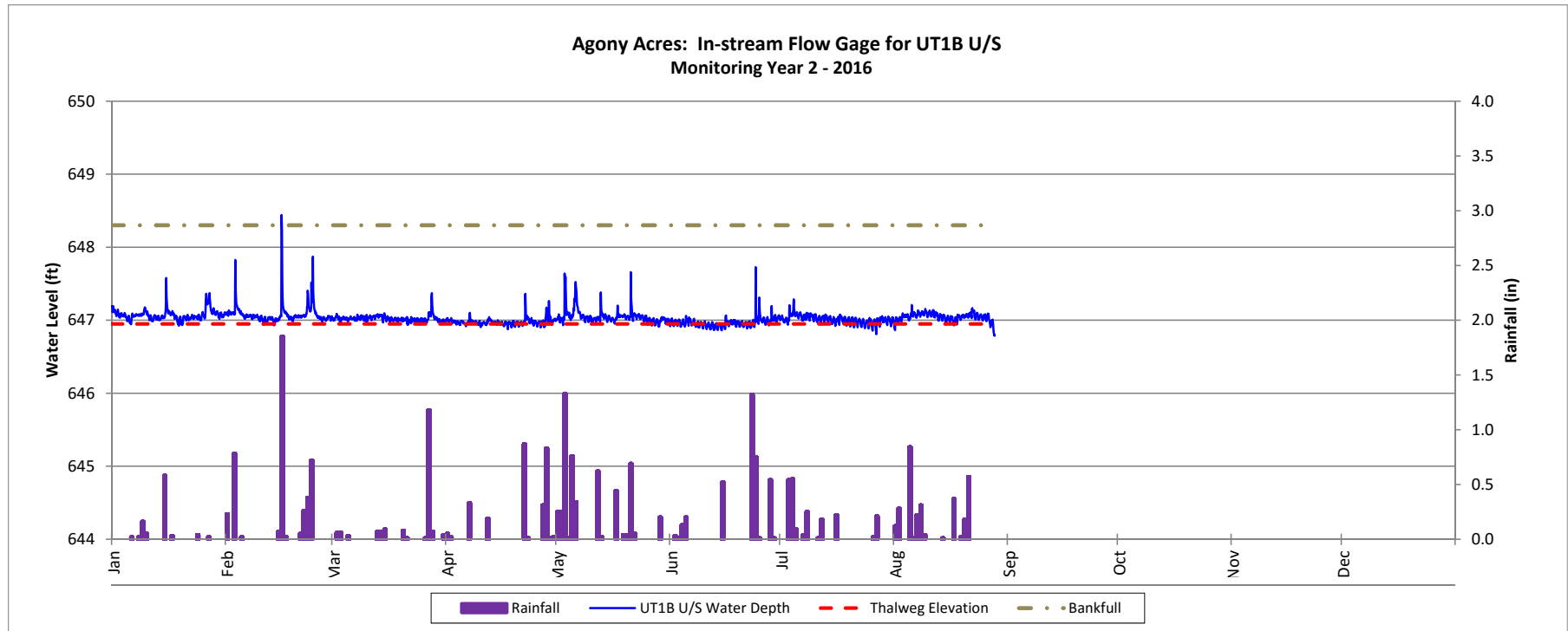
¹ 2016 monthly rainfall collected by onsite rain gage and Weather Underground Station KNCELON5 (Elon, NC).

² 30th and 70th percentile rainfall data collected from weather station NC723, at Piedmont Triad Intl AP, NC (USDA, 2002).

Stream Flow Gage Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016



Stream Flow Gage Plots

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 2 - 2016

