As-Built Baseline Monitoring Report
Russell Gap Mitigation Project

DMS Project ID No. 100003, DEQ Contract No. 6980

USACE Action ID No. SAW-2017-00826, DWR# 20150416

Alexander County, North Carolina, Catawba River Basin: 03050101-120010

Baseline Data Collection Period: Jan. 2020 to June. 2020

Submitted to/Prepared for:

NC Department of Environmental Quality
Division of Mitigation Services (DMS)
1652 Mail Service Center
Raleigh, North Carolina 27699-1652

Michael Baker
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Submission Date: September 2020

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September 11, 2020

Matthew Reid, Project Manager
NCDEQ, Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

Subject: Response to DMS Comments for DRAFT As-Built Monitoring Report
Russell Gap Mitigation Project, Alexander County
DMS Project # 100003, DEQ Contract #6980, Catawba River Basin

Mr. Reid:

Please find enclosed our responses to the NC Division of Mitigation Services (DMS) review comments dated August 28, 2020 in reference to the Russell Gap Mitigation Project - DRAFT As-Built Monitoring Report. We have revised the draft document in response to the review comments as outlined below.

Report Comments/Questions:

- Title Page: The current DWR# shown is actually the RFP#. The correct DWR# is 20150416.
  Response: Revisions made as requested.

- 1.1 Project Description: The official project assets for Russell Gap are 9,166.949 SMUs, and 7.053 WMUs. Please update text accordingly. These are the totals that will be used on future debit ledgers.
  Response: Revisions made as requested.

- Mitigation Component Summary: Please add a brief discussion of the Wetlands Groups in this summary section.
  Response: Additional discussion of the Wetland Groups have been added to the summary section as requested.

- 1.5 Project Timeline: Section indicates only 3 crest gauges were installed. There were a total of 4 installed. Please update.
  Response: Revision made as requested.

- 1.5 Project Timeline: Shumard Oak was added to the approved list of species in the Mitigation Plan due to flooding of the tree nursery field. Were there species not included from the list because of the flooding? Please add a "red line" markup to the table on Sheet 1A indicating the addition of the Shumard Oak and any other changes to the planting list as well as updating the percent planted per species based on the new addition.
  Response: Shumard Oak was added to the approved list of species due to the nursery flooding and not able to gather the appropriate amount of Black Walnut (*Juglans nigra*). However, the contractor found a different source and planted the Black Walnut at the appropriate density and planted the Shumard Oak as an additional planting because they were already purchased.

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- Table 1: Several reaches (R7b, R10a and R10b) have incorrect footage shown under the "Mitigation Plan Designed Footage" column. For example, R7b shows 1,202.12, but it should be 1,202.370. Please update accordingly and check other reaches for accuracy.

  Response: Revisions made as requested.

- Table 1: Wetland Groups have incorrect amounts shown under the "Mitigation Plan Designed Footage" column. These should have three decimal places shown. For Example, Wetland Group 1 shows 5.29, but it should be 5.285. Please update all Wetland Groups and verify with the approved Mitigation Plan asset table acreage amounts.

  Response: Revisions made as requested.

- Table 1: Overall credits should sum to 9166.949 SMUs and 7.053 WMUs.

  Response: Table 1 has been revised to show three decimal places and summed to show accurate overall credits.

- Figure 2: There are two bold green lines shown on R9 floodplain. Based on figures in the Mitigation Plan, this appears to be jurisdictional wetlands. Recommend turning layer off for this Figure.

  Response: Revision made as requested.

- Figure 2: Please revise the overall credit table at the top of the figure to show credits discussed in previous comment.

  Response: Revision made as requested.

- Table 2: Please remove "anticipated" and the expected dates shown for monitoring years not yet completed. Please use a dash in their place.

  Response: Revision made as requested.

- Figure 3: Please add location of Random Vegetation Plot to CCPV.

  Response: Revisions made as requested.

- Figure 3B: Label XS8

  Response: Revision made as requested.

- Figure 3C: Label XS8, XS10

  Response: Revisions made as requested.

- Figure 3D: Label XS21, XS22

  Response: Revisions made as requested.

- Stream Station Photo Points: Photo resolution is very poor in the draft report. Please update for final.

  Response: All stream photos have been redownloaded and updated into the final report as requested.

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- Table 5: Please update table to show scientific name and common name of stems planted with Unknown being the last on the list.

  Response: Revisions made as requested.

- Table 5: Please add note indicating stems will be identified in MY1.

  Response: Revision made as requested.

- Table 5: The approved Mitigation Plan states that there will be 9 random plots conducted each year. Only 1 random plot was included in the MY0 report. Please include the IRT

  Response: All 9 random plots have been added to Table 5 as requested.

- Table 7: Please turn grid lines on for final submittal.

  Response: Revision made as requested.

- Profiles: Reaches 7A, 8, 18, 19, 22, 22A only have TWG shots shown. Some Reaches only show TWG and LTB. Other Reaches show TWG, WSF and LTB. Please update profiles to contain all surveyed data (TWG, WSF and LTB).

  Response: Revisions have been made as requested. Areas where the channel elevation was not altered have been removed.

- Reach 1 Profile excludes X3 and X4 in legend.

  Response: Revision made as requested.

- There are several instances shown on the Asbuilt sheets where the fence crosses the easement. Please verify that there are no other areas where the fence is encroaching. These encroachments will need to be corrected before the MY1 invoice is submitted.
  - Sheet 5: Bottom of page near Note 1.
  - Sheet 15: Corner near end of R3.

  Response: We are working with the contractor to have the fence moved where necessary.

- The following stream features have feature lengths that do not match the reported creditable footage in Table 1. These discrepancies are outlined below as reported length vs. feature length. Please provide updated stream features that accurately represent reported assets.
  - R1: 1910.90 vs. 1902.87
  - R4a: 300.00 vs. 307.61
  - R5: 193.00 vs. 210.10
  - R19: 352.96 vs. 366.42
  - R22a: 68.42 vs. 128.42
  - R25 & R25 Pipe Removal: 374.52+28.00 vs. 430.05
  - R26 472.96 vs. 481.86

  Response: Shapefiles have been updated to accurately represent the reported assets.

- Please include a shape for the MY0 random veg plot.

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Response: Revision made as requested.

- Please update Table 5 so that it has the scientific and common names of the planted stems, and resubmit the supporting .xlsx file.

  Response: Revision made as requested.

As requested, Michael Baker has provided one (1) hardcopy of the FINAL report, and the updated e-submission digital files will be sent via secure ftp link. Please do not hesitate to contact me (Andrew.Powers@mbakerintl.com 919-481-5732) should you have any questions regarding our response submittal.

Sincerely,

Andrew Powers
Environmental Associate

Enclosure: Final As-Built Baseline Monitoring Report Russell Gap Mitigation Project

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APPENDICES

1.0 PROJECT SUMMARY

1.1 Project Description

Michael Baker Engineering, Inc. (Michael Baker) restored approximately 4,209 linear feet of existing stream, enhanced 8,857 linear feet of stream along Unnamed Tributaries (UTs) to Davis Creek, the East Prong Lower Little River, and UTs to the East Prong Lower Little River. Michael Baker also restore and/or enhance approximately 7.3 acres of riparian wetland in the Catawba River Watershed. The project is located in the Catawba River Basin, within the Hydrologic Unit Code (HUC) 03050101-120010, which is identified as a Targeted Local Watershed (TLW) in the NC Division of Mitigation Services'(DMS) 2009 *Upper Catawba River Basin Restoration Priorities* (RBRP) report.

The Russell Gap Stream Mitigation project is located on an active cattle farm in Alexander County, North Carolina, 10 miles northwest of the Town of Taylorsville as shown on the Project Vicinity Map (Figure 1). Historic agriculture uses on the project site include cattle production, row crops, and apple orchards. These activities had negatively impacted both water quality and streambank stability along the project streams and their tributaries (Table 4). The project is being conducted as part of the NCDMS Full Delivery In-Lieu Fee Program and is anticipated to generate at close-out a total of 9,166.949 stream mitigation credits (contracted for 9,400) and up to 7.053 riparian wetland mitigation units (contracted for 4.0) (Table 1) and is protected by a 35.97-acre permanent conservation easement.

1.2 Goals and Objectives

The goals of this project are identified below:

- Establishment of geomorphically stable conditions along all project reaches,
- Improvement of water quality by reducing nutrient and sediment inputs,
- Restoration of natural stream and floodplain interactions,
- Restoration and enhancement of riparian wetland functions,
- Restoration and protection of riparian buffer functions and corridor habitat,
- Improvement of in-stream aquatic habitat, and
- Establishment of a permanent conservation easement on the entire project.

To accomplish these goals, the following objectives were identified:

- To restore appropriate bankfull dimensions, remove spoil berms, and/or raise channel beds, by utilizing either a Priority I Restoration approach or an Enhancement Level I approach.
- To construct streams of appropriate dimensions, pattern, and profile in restored reaches, slope stream banks and provide bankfull benches on enhanced streams and utilize bio-engineering to provide long-term stability.
- Construct a correct channel morphology to all streams increasing the number and depths of pools, with structures including geo-lifts with brush toe, log vanes/weirs, root wads, and/or J-hooks.
- Raise ground water levels in delineated hydric soils areas through the implementation of Priority I restoration and the filling of ditches. Wetland vegetation will also be planted.
- Establish riparian buffers at a 50-foot minimum width along all stream reaches, planted with native tree and shrub species.
- Establish a permanent conservation easement restricting land use in perpetuity. This will prevent site disturbance and allow the project to mature and stabilize.

1.3 Project Success Criteria

The success criteria and performance standards for the project will follow the NCDMS's templates *As-Built Baseline Monitoring Report Format, Data Requirements, and Content Guidance* (February 2014), and the *Annual Monitoring Report Format, Data Requirements, and Content Guidance* (April 2015). and as described in Section 7 of the approved Mitigation Plan. All specific monitoring activities will follow those outlined in detail in Section 8 of the approved Mitigation Plan and will be conducted for a period of 7 years unless otherwise noted.

1.4 Mitigation Component Summary

The project involved the restoration or enhancement of 26 reaches. Reach 1 had been historically impacted and altered through the removal of riparian vegetation and agricultural activities. As a result, it was an incised C4/E4 stream type with steep or vertical eroding banks found throughout its length. A Priority Level I Restoration approach was selected for this reach. The restored channel was raised and relocated towards the center of the valley and designed as a C4 stream type. The abandoned channel was filled and plugged.

Reach R2 was improved using a Restoration approach. R2 is a continuation of Davis Creek. This short reach flows south starting at the outlet of a culvert under Mount Olive Church Road until its confluence with the Lower Little River. It has been historically impacted and altered through channelization, the removal of riparian vegetation and agricultural activities. As a result, it is an incised C4/E4 stream type with steep or vertical eroding banks found throughout its length. Design parameters focused on cross sectional geometry. Bank sloping and bankfull benching restored this reach.

Reach R3 was improved using a Restoration approach. The reach had also been subject to dredging as apparent from the spoil piles adjacent to the stream in several locations and had noted lack of pool features and in-stream structure. As such, restoration activities consist of bank sloping, excavation of bankfull benches, installation of in-stream structures to encourage pool scour and protect stream banks, and planting a riparian buffer along both banks. The design used focused on adjusting the bankfull cross sectional geometry as needed.

Reach R4 was improved using an Enhancement Level I approach. R4 was deeply incised and had very likely been channelized. R4 was most appropriately classified as an incised E4 stream type but the entrenchment ratio was more like a B4. Most of Reach R4 has remained in its current alignment. Channel dimensions were modified in specific areas utilizing bank sloping and excavation of bankfull benches. The profile was modified though the use of in-stream structures to promote bedform diversity and to protect stream banks. The channel now is classified as a B4c stream type.

Reach R4a is an upstream portion of Reach R4. This reach is in stable condition but lacked a riparian buffer. Therefore, Enhancement Level II approach was used in planting a buffer and repairing a small area of bank erosion near the downstream bridge.

Reach R5 was improved using an Enhancement Level II approach. Reach R5 had a failing culvert that was removed and turned into a step pool channel to connect the stream to the upstream elevation in a stable manner. A small area of bank sloping was also performed. This short reach had some woody riparian vegetation; however, it was not of adequate width, so additional woody vegetation was established and invasive species controlled.

Reach R6 had been heavily impacted through channelization and been relocated to the edge of the valley. This reach had also been impacted from livestock and the removal of riparian vegetation. As a result, it was a G4 stream type with vertical eroding banks found throughout its length. This reach was relocated to the low point of the valley and put back into the remnant channel using a Priority Level I Restoration approach. Constructed riffles, log and rock step pools, and geolifts provide grade control, bank protection, and bedform improvement. A short area of bank grading and two in-stream structures were installed along this section where the stream is in the historic channel. The downstream end of R6 had minor adjustments

in pattern to make a stable connection to R7A and to improve channel stability. The abandoned channel has been filled and plugged.

Reach R7a was improved using an Enhancement Level II approach. This reach has been planted with native woody vegetation and invasive species treated. Additionally, fencing was established outside the conservation easement to prevent livestock access.

Reach R7b was improved using an Enhancement Level I approach. R7b was classified as an incised E4 stream type. Most of Reach R7b has remained in its current alignment. Channel dimensions were modified in specific areas utilizing bank sloping and excavation of bankfull benches. The profile was modified though the use of in-stream structures to promote bedform diversity and to protect stream banks. The channel now is classified as a B4 stream type.

Reach R8 was improved using an Enhancement Level II approach. A full 50-foot buffer has been established with the exclusion of cattle to the stream. Invasive species have been controlled as well.

Reach R9 has been historically impacted and altered through the removal of riparian vegetation, channelization, ditching of surrounding wetlands, and agricultural activities. As a result, it was an incised E4b stream type with steep or vertical eroding banks found throughout its length. Through Priority Level I Restoration approach for this reach, the restored channel has been raised designed as a B4 stream type along with installing in-stream structures. This approach has allowed the restoration of a stable channel form with a diverse bedform, as well as improved channel function.

Reach R10a was improved using an Enhancement Level II approach. Work along this reach consisted of stabilizing headcuts, installing a series of steps to get the channel down to the R1 floodplain, riparian buffer planting, and livestock exclusion.

Reach R10b has been improved using Restoration by building a new channel to tie to the new alignment of R1. Constructed riffles and steps were installed to promote pool habitat and ensure bed stability. Additionally, riparian buffer planting, and livestock exclusion fencing was installed.

Reach R11 was improved using an Enhancement Level I approach. R11 begins at the badly degraded outfall of a perched culvert and flows down valley. The existing culvert was kept in place to provide the landowner access. The degraded outfall was repaired utilizing a step-pool channel to drop the stream flow down to the existing bed elevation. Headcuts have also been repaired using boulder step structures and constructed riffles.

Reach R12 had been historically impacted and altered through the removal of riparian vegetation, channelization, ditching of surrounding wetlands, and agricultural activities. Spoil piles existed along its banks. It was likely channelized to try and encourage drainage of adjacent wetlands. As a result, it was an incised E4b stream type with steep or vertical eroding banks found throughout its length. A Priority Level I Restoration approach was performed for this reach. The restored channel has a low sinuosity C4 stream type with grade control structures installed. The abandoned channel has been filled and plugged. While the conservation easement stops at an existing power line right of way, work continues up to the culvert to ensure a stable channel.

Reach R13 was improved using an Enhancement Level I approach. Work along R13 includes bank grading and the installation of a step pool structure to repair the headcut. Livestock has been excluded from the stream and invasive species have been treated.

Reach R14 was severely incised and had livestock impacts. Due to the very steep valley and level of incision the channel classified as an A4 stream type. The Priority Level I restoration along the upper section of this reach primarily focus on providing grade control and sloping and stabilizing banks. In-stream structures such as constructed riffles and boulder steps were installed to improve habitat and provide grade control and energy dissipation. This reach now classifies as a B4a stream type. Transitioning to a C4 stream type downstream once the reach flattens into the floodplain of Reach 1.

Reach R15, R17, and R18 are small headwater streams that were improved using an Enhancement Level II approach. Work along these reaches included installing a series of steps for grade control to meet existing bed elevation at the confluences. These reaches have been fully buffered and excluded from cattle access.

Reach R19 was improved using an Enhancement Level I approach. Reach R19 has remained in its current alignment. Channel dimensions were modified in specific areas utilizing bank sloping. The profile has also been modified though the use of in-stream structures to promote bedform diversity and to protect stream banks. The channel is classified as a B4a stream type.

Reach R20 had Restoration along this reach that focused on providing grade control and stabilizing headcuts. In-stream structures such as constructed riffles and boulder steps were installed to improve habitat, provide grade control, and energy dissipation. This reach was constructed as an A4a+ stream type. Though a large amount of work was required to stabilize and restore this reach, no significant modifications in channel geometry were needed.

Reach R21, R22, and R22a was improved using an Enhancement Level II approach. These were small streams that lacked a riparian buffer and cattle exclusion. These issues have been addressed along with minor bank areas that were scouring.

Reach R25 was improved using an Enhancement Level I Approach. Which resulted in a stable channel with diverse bedform, as well as improved channel function through improved aquatic habitat, restoration of riparian and terrestrial habitats, exclusion of livestock and associated pollutants, and decreased erosion and sediment loss from streambank erosion. The existed culvert was removed along with numerous headcuts.

Reach R26 and R27 are small headwater tributaries to R4. An Enhancement Level II approach was used to add a 50-foot buffer and exclude livestock from the stream. Both streams had in stream structures installed at the confluence to ensure long term stability.

Wetland Groups 1 and 2 were restored using a Restoration-by-Reestablishment approach. These were areas of confirmed hydric soils but due to channel incision, agricultural impacts, and ditching, no longer had suitable wetland hydrology nor woody vegetation and were not considered jurisdictional wetlands. This approach involved the restoration of an appropriate wetland hydrology, the establishment of an appropriate vegetative community, the removal of ditches, and the exclusion of cattle.

Wetland Groups 3, 4, 5, and 6 were improved using a Wetland Enhancement approach. These are all areas of existing jurisdictional wetlands that lacked any significant woody wetland vegetation that would typically be found in this wetland type. This approach involved the reestablishment of an appropriate vegetative community for these areas along with the exclusion of cattle.

Additionally, a full 50-foot buffer was established around all project streams, resulting in the ultimate re-establishment of 29.67 acres of forested riparian buffer that had previously been in hay production or pasture. The entire project area will be preserved in perpetuity in a 35.97-acre permanent conservation easement. A full summary of the project components and mitigation credits is presented in Table 1, while the complete project assets are shown in Figure 2.

1.5 Project Timeline

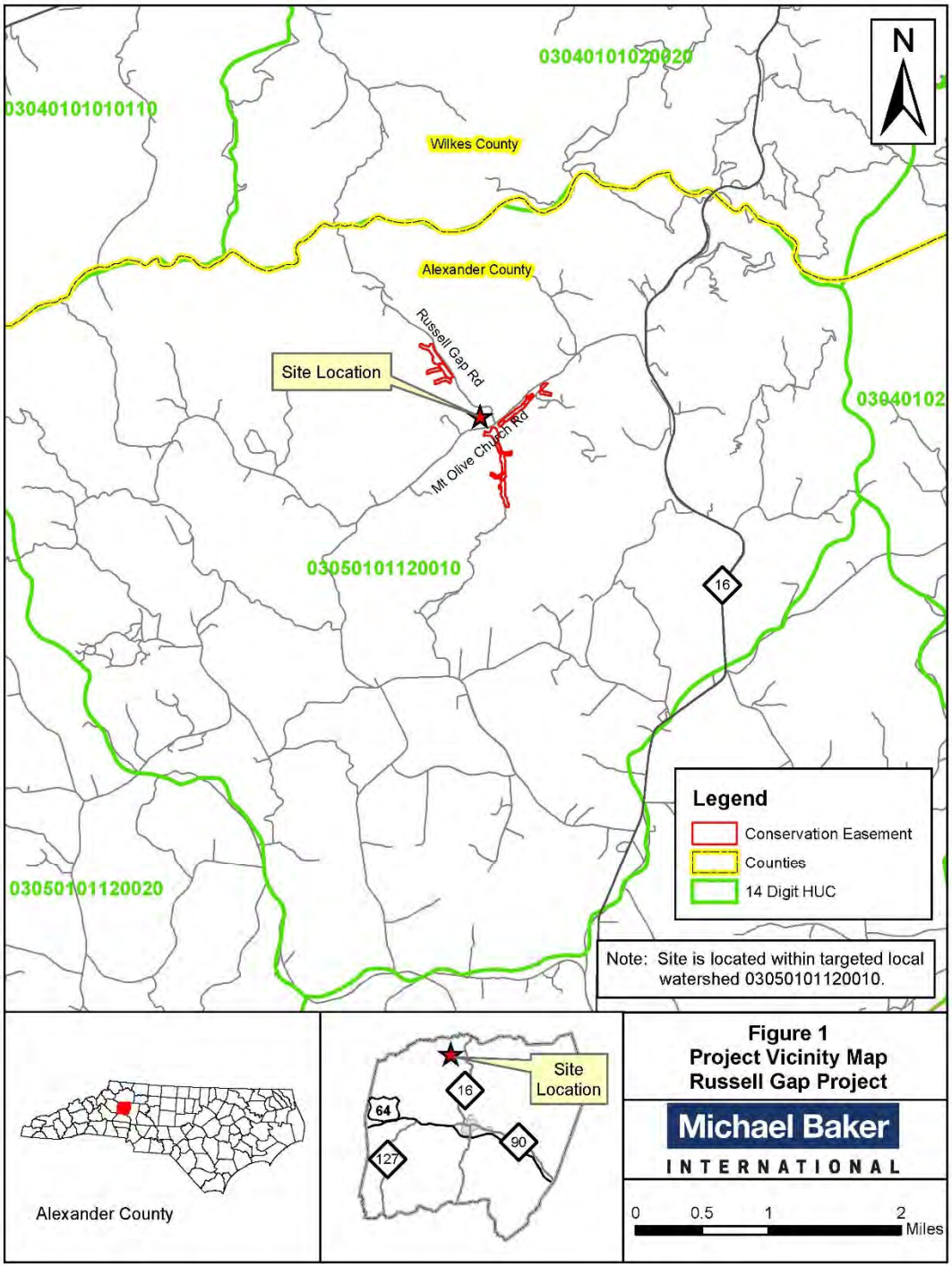
Project construction was initiated in August 2019 and completed in March 2020. Livestakes and bareroot stems were planted in March 2020. The As-Built survey was completed in May of 2020. All 26 cross-sections, 4 crest gauges, 12 groundwater monitoring wells, 20 vegetation plots, and 9 random vegetation plots were installed in March of 2020. The crest gauges located at R1, R4, R6, and R9 are manual cork-and-dowel type gauges. Construction delays occurred due to substantial seasonal rainfall in January and February 2020. Repair work was necessary following those events (mostly riffle and bank repairs in

enhancement reaches with some floodplain reseeding) which delayed project completion until March 2020. However, the site was fully planted in the late winter to early spring of 2020 as anticipated, and Monitoring Year 1 is on schedule for 2020 as shown in Table 2. Due to flooding of the tree nursey supplier's fields used for planting material, an additional tree specie was added to the approved species list found in the Mitigation Plan's Table 6.7. The additional specie is Shumard Oak (*Quercus shumardii*).

1.6 Design Change Deviations

During project construction, there were a few, relatively minor deviations from the original design plans as marked in red in the as-built plans (Appendix E). Primarily these were the length substitutions made in the field due to the presence of riffle pool formations, such as along Reach R1 where constructed riffles were shorted and geolifts were shorted. Also constructed riffles added at the top various structures on Reach R4 to add channel stability, along with a rock vane towards the bottom of the reach. Due to the steepness and grade of reaches R26, R7A, R7B, and R11 additional constructed riffles were installed to further stabilize the stream bed and back. Also, boulder step structures were installed on reaches R11, R13, R27, R19, and R15 to replace rock step pools. This is a minor change in design that should not negatively affect the performance of the stream. Additional fencing and gates were added as well to help with accessibility to the conservation easement. The remaining reaches have slight changes to the location of where structures and riffles were installed, but none of these minor changes should negatively affect stream performance, function, or credit. As a whole, the project was built as designed and no alignment revisions were made.

1.7 Vicinity Map



1.8 Technical and Methodological Descriptions and References

Stream survey data was collected to a minimum of Class C Vertical and Class A Horizontal Accuracy using a Leica TS06 Total Station and was georeferenced to the NAD83 State Plane Coordinate System, FIPS3200 in US Survey Feet, which was derived from the As-built Survey. The survey data from the permanent project cross-sections were collected and classified using the Rosgen Stream Classification System to confirm design stream type (Rosgen 1994).

The twenty vegetation-monitoring quadrants (plots) were installed across the site in accordance with the CVS-DMS Protocol for Recording Vegetation, Version 4.1 (Lee 2007) and the data collected from each was input into the CVS-DMS Data Entry Tool v. 2.3.1 (CVS 2012).

Three automated groundwater monitoring wells were installed in the floodplain following USACE protocols (USACE 2005). The gauges themselves, both flow and groundwater gauges, are all Van Essen brand Baro-Diver data loggers.

References:

Carolina Vegetation Survey (CVS) and NC Division of Mitigation Services (DMS). CVS-DMS Data Entry Tool v. 2.3.1. University of North Carolina, Raleigh, NC. 2012.

Lee, M., Peet R., Roberts, S., Wentworth, T. 2007. CVS-DMS Protocol for Recording Vegetation, Version 4.1.

North Carolina Division of Mitigation Services. 2010. Neuse River Basin Restoration Priorities. NC Department of Environmental Quality. Raleigh, NC.

North Carolina Division of Mitigation Services. 2016. Neuse River Basin Restoration Priorities: Neuse-01 Catalog Unit *Update*. NC Department of Environmental Quality. Raleigh, NC.

North Carolina Interagency Review Team (NCIRT). 2016. Guidance document "*Wilmington District Stream and Wetland Compensatory Mitigation Update"*. October 24, 2016

Rosgen, D.L. 1994. A Classification of Natural Rivers. Catena 22:169-199.

Rosgen, D.L. 1996. Applied River Morphology. Wildlands Hydrology. Pagosa Springs, CO.

United States Army Corps of Engineers (USACE). 2005. "Technical Standard for Water-Table Monitoring of Potential Wetland Sites," WRAP Technical Notes Collection (ERDC TN-WRAP-05-2), U.S. Army Engineer Research and Development Center. Vicksburg, MS.

APPENDIX A

Background Tables and Figures

Table 1. Project Components and Mitigation Credits
Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Project Component (reach ID, etc.)	Wetland Position and HydroType	Existing Footage or Acreage	Stationing	As-Built CL Restored Footage, or SF [1]	As-Built CL w/o Xing Footage, or SF [2]	Mitigation Plan Designed Footage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Plan Credits [3]
Reach R1		2,142	10+00 - 29+45.90	1,946	1,910.90	1,841.60	R	PI	1.0	1,841.60
Reach R2		288	10+00 - 11+65.62	166	165.62	174.21	R	P2	1.0	174.21
Reach R3		388	32+28.36 - 36+34.66	406	406.30	388.74	R	P2	1.0	388.74
Reach R4a		299	10+00 - 13+00.00	300	300.00	300.00	EII	-	2.5	120.00
Reach R4		2,245	10+00 - 32+28.36	2,228	2,038.36	2,063.32	EI	-	1.5	1,375.55
Reach R5		256	10+00 - 12+10.00 w/o pipe	193	193.00	193.00	EII	-	2.5	77.20
Reach R5 Pipe Removal		17	10+32 - 10+49 pipe	17	17.00	17.00	R	P1	1.0	17.00
Reach R6		631	12+10.00 - 19+57.36	747	747.36	741.05	R	P1	1.0	741.05
Reach R7a		155	19+57.36- 20+61.17	104	103.81	110.12	EII	-	2.5	44.05
Reach R7b		1,170	20+61.17 - 33+51.48	1,290	1,216.31	1,202.37	EI	-	1.5	801.58
Reach R8		463	33+75.40 - 38+28.55	453	453.15	455.79	EII	-	2.5	182.32
Reach R9		439	38+65.34 - 43+10.91	446	445.57	445.52	R	P1	1.0	445.52
Reach R10a		371	10+08.40 - 13+74.94	367	366.54	376.11	EII		2.0	188.06
Reach R10b		0	13+74.94 - 14+79.77	105	104.83	112.65	R	P1	1.0	112.65
Reach R11		481	10+00 - 17+31.85	732	711.85	725.83	EI	-	1.5	483.89
Reach R12		86	10+00 - 11+01.78	102	101.78	120.02	R	P1	1.0	120.02
Reach R13		124	10+00 - 11+45.00	145	145.00	145.00	EI	-	1.5	96.67
Reach R14		528	11+45.00 - 17+14.80	570	569.80	572.27	R	P1/2	1.0	572.27
Reach R15		226	10+00 - 13+02.77	303	283.77	281.80	EII	-	2.5	112.72
Reach R17		130	10+00 - 11+06.64	107	106.64	104.44	EII	-	2.5	41.78
Reach R18		185	10+00 - 12+03.31	203	176.31	179.01	EII	-	2.5	71.60
Reach R19		481	9+86.00 - 13+75.96	390	352.96	359.49	EI	-	1.5	239.66
Reach R20		206	10+00 - 12+52.61	253	252.61	252.68	R	P1	1.0	252.68
Reach R21		67	10+00 - 10+91.76	92	91.76	89.11	EII	-	2.5	35.64
Reach R22		161	10+00 - 11+19.46	119	119.46	136.87	EII	-	2.5	54.75
Reach R22a		68	10+60 - 11+28.42	68	68.42	68.42	EII	-	2.5	27.37
Reach R25		422	10+00 - 14+30.52 (w/o pipe)	403	402.52	399.05	EI	-	1.5	266.03
Reach R25 Pipe Removal		28	12+62 - 12+90 pipe	28	28.00	28.00	R	P1	1.0	28.00
Reach R26		548	10+00 - 14+72.96	473	472.96	472.13	EII	-	2.5	188.85
Reach R27		165	10+00 - 11+63.76	164	163.76	163.76	EII	-	2.5	65.50
Wetland Group 1	RR	0		5.285		5.285	Restoration		1.0	5.285
Wetland Group 2	RR	0		1.488		1.488	Restoration		1.0	1.488
Wetland Group 3	RR	0.261		0.261		0.261	Enhancement		2.0	0.131
Wetland Group 4	RR	0.156		0.156		0.156	Enhancement		2.0	0.078
Wetland Group 5	RR	0.034		0.034		0.034	Enhancement		2.0	0.017
Wetland Group 6	RR	0.108		0.108		0.108	Enhancement		2.0	0.054

1 All stream stationing and restored footage numbers reported here, discussed in the report text, and shown in the as-built plan sheets use survey values.

2 The stream footage reported here uses the as-built stream *centerline* survey values and have all easement breaks removed from their totals. Buffer group values reported here are the creditable areas as allowed for each group as described in detail in the mitigation plan.

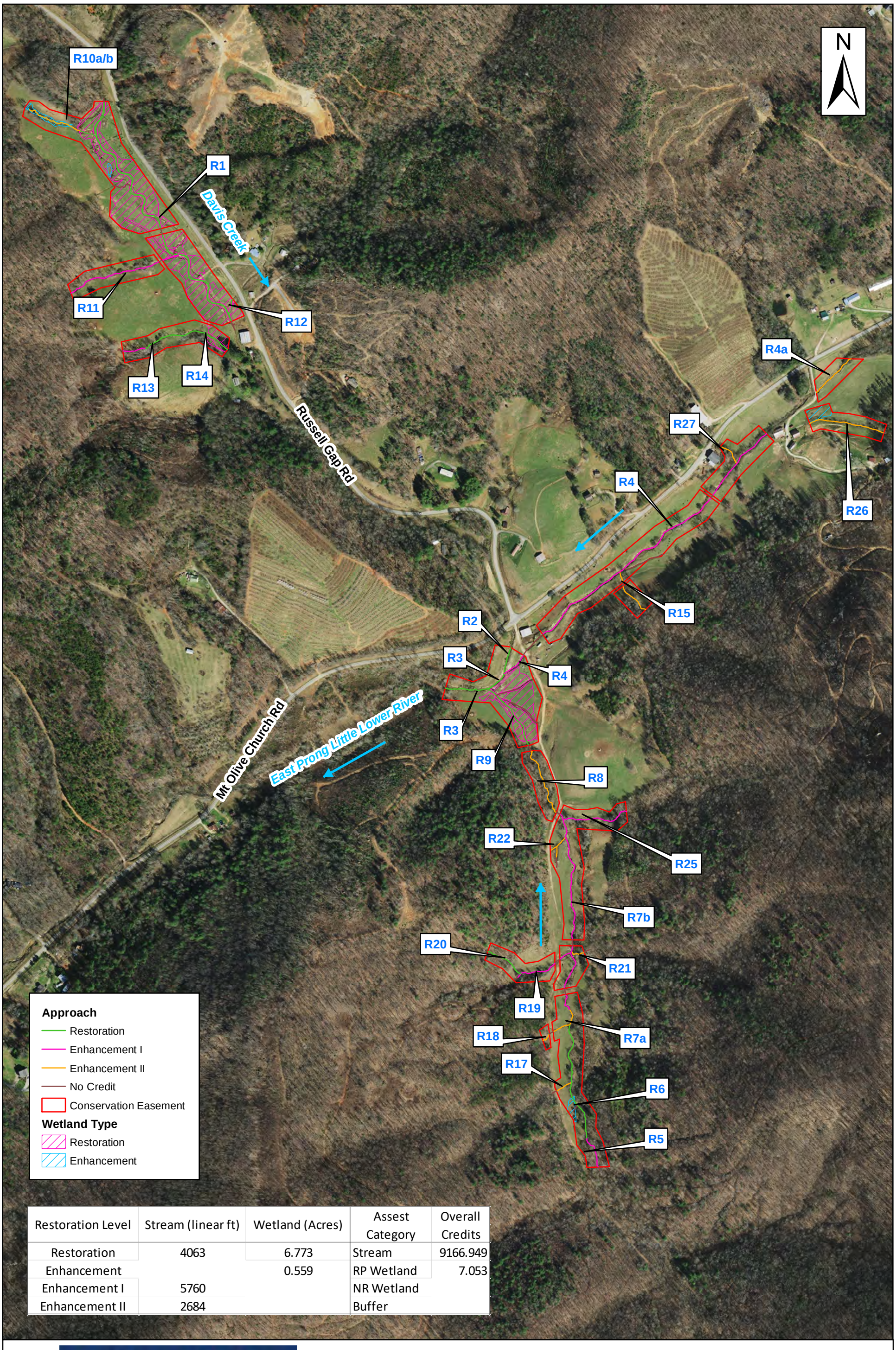
3 Credits reported here are taken directly from the approved mitigation plan Table 11.1

Table 1.1
As-Built Centerline Length and Area Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Credited Buffer (square feet)
		Riverine	Non-Riverine		
Restoration	4,063	6.773			
Enhancement		0.559			
Enhancement I	5,760				
Enhancement II	2,684				
Creation					
Preservation					
High Quality Pres					

Table 1.2
Overall Assets Summary

Asset Category	Overall Credits
Stream	**9,166.949**
RP Wetland	**7.053**
NR Wetland	
Buffer	



Restoration Level	Stream (linear ft)	Wetland (Acres)	Assest Category	Overall Credits
Restoration	4063	6.773	Stream	9166.949
Enhancement		0.559	RP Wetland	7.053
Enhancement I	5760		NR Wetland	
Enhancement II	2684		Buffer	

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0 500 1,000 Feet

Figure 2
Project Asset Map
Russell Gap Project

rev: 5Dec2016

Table 2. Project Activity and Reporting History
Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Elapsed Time Since grading complete:	**6 months**
Elapsed Time Since planting complete:	**5 months**
Number of Reporting Years[1]:	**0**

Activity or Deliverable	Data Collection Complete	Completion or Delivery
404 permit date	N/A	Mar-18
Mitigation Plan	N/A	Jan-18
Final Design – Construction Plans	N/A	Nov-19
Construction Grading Completed	N/A	Feb-20
As-Built Survey	May-20	May-20
Livestake and Bareroot Planting Completed	N/A	Mar-20
As-Built Baseline Monitoring Report (MY0)	Mar-20	Sep-20
Year 1 Monitoring	-------	-------
Year 2 Monitoring	-------	-------
Year 3 Monitoring	-------	-------
Year 4 Monitoring	-------	-------
Year 5 Monitoring	-------	-------
Year 6 Monitoring	-------	-------
Year 7 Monitoring	-------	-------

[1] = The number of monitoring reports excluding the as-built/baseline report

Table 3. Project Contacts
Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Designer	8000 Regency Parkway, Suite 600
Michael Baker Engineering, Inc.	Cary, NC 27518 Contact: Katie McKeithan, Tel. 919-481-5703
Construction Contractor	5616 Coble Church Rd
KBS Earthworks, Inc.	Julian, NC 27283 Contact: Kory Strader, Tel. 336-362-0289
Survey Contractor	P.O. Box 148
Turner Land Surveying	Swannanoa, NC 28778 Contact: David Turner, Tel. 919-827-0745
Planting Contractor	5616 Coble Church Rd
KBS Earthworks, Inc.	Julian, NC 27283 Contact: Kory Strader, Tel. 336-362-0289
Seeding Contractor	5616 Coble Church Rd
KBS Earthworks, Inc.	Julian, NC 27283 Contact: Kory Strader, Tel. 336-362-0289
Seed Mix Sources	
Green Resources	Telephone: 336-855-6363
Nursery Stock Suppliers	
Mellow Marsh Farm	Telephone: 919-742-1200
ArborGen	Telephone: 843-528-3204
Monitoring Performers	
Michael Baker Engineering, Inc.	8000 Regency Parkway, Suite 600 Cary, NC 27518
Stream Monitoring POC	Katie McKeithan, Tel. 919-481-5703
Vegetation Monitoring POC	Katie McKeithan, Tel. 919-481-5703

Table 4. Project Attributes
Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Project Name	Russell Gap Stream Mitigation Project		
County	Alexander County		
Project Area (acres)	35.97		
Project Coordinates (latitude and longitude)	36.0091 N, -81.2139 W		
Planted Acreage (Acres of Woody Stems Planted)	29.67		
Project Watershed Summary Information			
Physiographic Province	Peidmont		
River Basin	Catawba		
USGS Hydrologic Unit 8-digit	3050101	USGS Hydrologic Unit 14-digit	03050101-120010
DWR Sub-basin	03-08-32		
Project Drainage Area (Acres and Square Miles)	2,227 acres / 3.48 square miles (at downstream end of R3)		
Project Drainage Area Percentage of Impervious Area	0.13% impervious area		
CGIA Land Use Classification	82.6% forested, 14.5% agriculture, 1.5% rural residential, 1.4% roadway		
Existing Reach Summary Information			
Parameters	**Reach R1**	**Reach R2**	**Reach R3**	**Reach R4**
Length of reach (linear feet)	2,142	288	388	2,245
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Unconfined	Unconfined	Unconfined
Drainage area (Acres)	960	1,056	2227	806
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C	C	C	C
Stream Classification (existing)	E4 (incised)	E4 (incised)	E4	E4
Stream Classification (proposed)	C4	C4	C4	B4c
Evolutionary trend (Simon)	IV - Degradation and Widening	III - Degradation	III - Degradation	IV - Degradation and Widening
FEMA classification	Zone X	Zone X	Zone X	Zone X
Existing Reach Summary Information				
Parameters	**Reach R4a**	**Reach R5**	**Reach R6**	**Reach R7a**
Length of reach (linear feet)	299	256	631	155
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Unconfined	Unconfined	Unconfined
Drainage area (Acres)	716	150	154	210
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C	C	C	C
Stream Classification (existing)	E4	C4b	G4	E4b
Stream Classification (proposed)	B4c	C4b	B4	E4b
Evolutionary trend (Simon)	I - Stable System	I - Stable System	IV - Degradation and Widening	I - Stable System
FEMA classification	Zone X	Zone X	Zone X	Zone X

Table 4. Continued

Existing Reach Summary Information				
Parameters	**Reach R7b**	**Reach R8**	**Reach R9**	**Reach R10(A/B)**
Length of reach (linear feet)	1,170	463	439	371
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Unconfined	Unconfined	Unconfined
Drainage area (Acres)	288	333	358	17
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C	C	C	C
Stream Classification (existing)	E4b	C4	E4b	E4b
Stream Classification (proposed)	E4b	C4	B4	E4b-C4
Evolutionary trend (Simon)	III - Degradation	I - Stable System	IV - Degradation and Widening	II - Disturbance
FEMA classification	Zone X	Zone X	Zone X	Zone X

Existing Reach Summary Information				
Parameters	**Reach R11**	**Reach R12**	**Reach R13**	**Reach R14**
Length of reach (linear feet)	481	86	124	528
Valley confinement (Confined, moderately confined, unconfined)	Confined	Unconfined	Moderately Confined	Confined (Upper) Unconfined (Lower)
Drainage area (Acres)	17	115	21	22
Perennial, Intermittent, Ephemeral	Intermittent	Perennial	Intermittent	Perennial
NCDWR Water Quality Classification	C	C	C	C
Stream Classification (existing)	B4a	Eb	C4	A4
Stream Classification (proposed)	B4a	C4b	C4	E4
Evolutionary trend (Simon)	III - Degradation	IV - Degradation and Widening	II - Disurbance	IV - Degradation and Widening
FEMA classification	Zone X	Zone X	Zone X	Zone X

Existing Reach Summary Information				
Parameters	**Reach R15**	**Reach R17**	**Reach R18**	**Reach R19**
Length of reach (linear feet)	226	130	185	481
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Unconfined	Unconfined	Moderately Confined
Drainage area (Acres)	19	26	24	22
Perennial, Intermittent, Ephemeral	Intermittent	Intermittent	Intermittent	Perennial
NCDWR Water Quality Classification	C	C	C	C
Stream Classification (existing)	E4b	E4b	E4b	B4a
Stream Classification (proposed)	E4b	E4b	E4b	B4a
Evolutionary trend (Simon)	I - Stable System	I - Stable System	I - Stable System	IV - Degradation and Widening
FEMA classification	Zone X	Zone X	Zone X	Zone X

Table 4. Continued

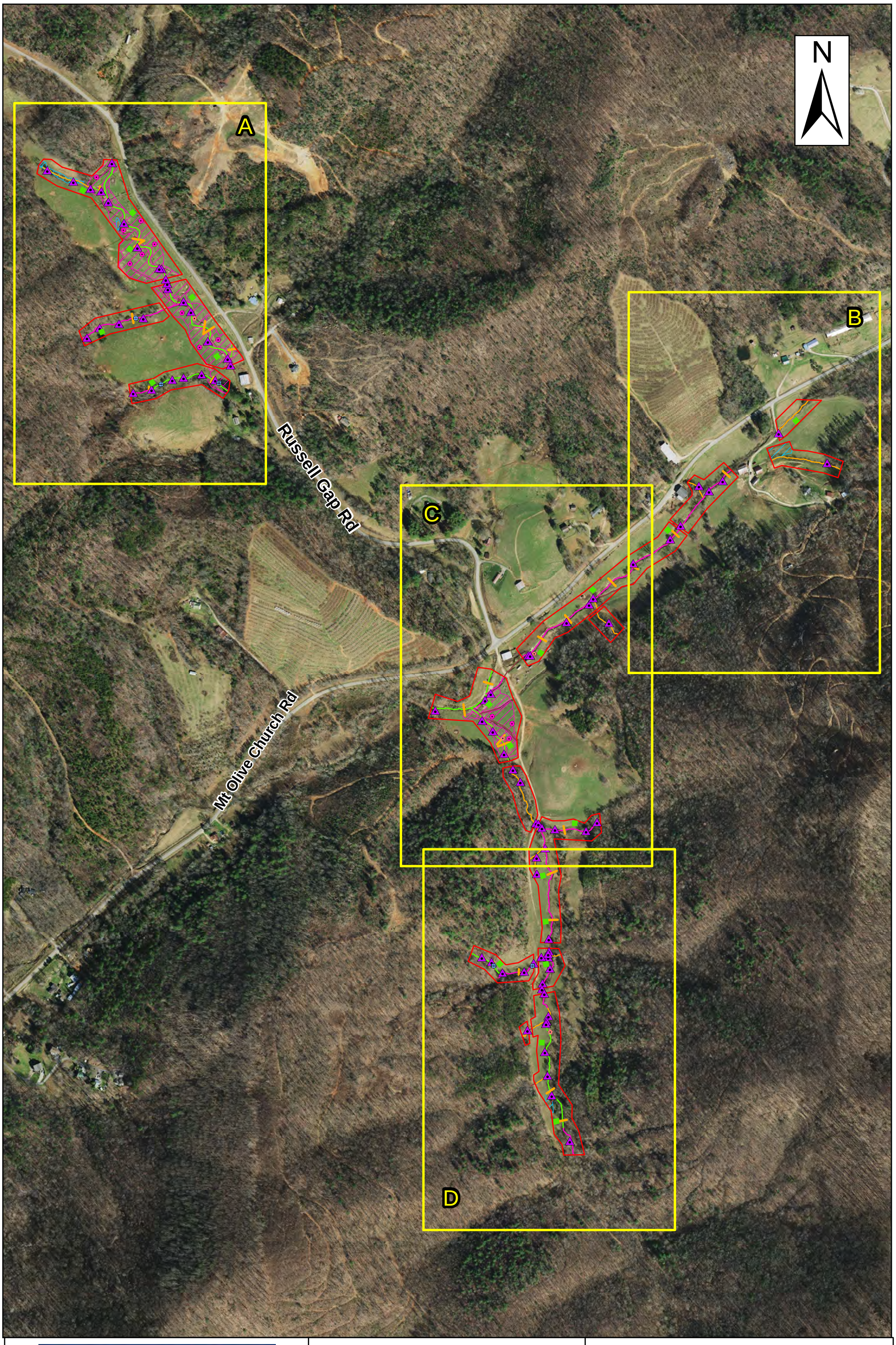
Existing Reach Summary Information				
Parameters	**Reach R20**	**Reach R21**	**Reach R22**	**Reach R22a**
Length of reach (linear feet)	206	67	161	68
Valley confinement (Confined, moderately confined, unconfined)	Confined	Unconfined	Moderately Confined	Moderately Confined
Drainage area (Acres and Square Miles)	9	33	3	3
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C	C	C	C
Stream Classification (existing)	A4a+	B4	B4	B4
Stream Classification (proposed)	A4a+	B4	B4	B4
Evolutionary trend (Simon)	III - Degrading	I - Stable System	II - Channelized	II - Channelized
FEMA classification	Zone X	Zone X	Zone X	Zone X

Existing Reach Summary Information			
Parameters	**Reach R25**	**Reach R26**	**Reach R27**
Length of reach (linear feet)	422	548	165
Valley confinement (Confined, moderately confined, unconfined)	Moderately Confined	Unconfined	Moderately Confined
Drainage area (Acres and Square Miles)	33	32	19
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C	C	C
Stream Classification (existing)	B4a	E4b	E4b
Stream Classification (proposed)	B4a	E4b	E4b
Evolutionary trend (Simon)	III - Degrading	I - Stable System	I - Stable System
FEMA classification	Zone X	Zone X	Zone X

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	PCN
Water of the United States - Section 401	Yes	Yes	PCN
Endangered Species Act	Yes	Yes	Categorical Exclusion
Historic Preservation Act	Yes	Yes	Categorical Exclusion
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

APPENDIX B

Visual Assessment Data



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0 500 1,000 Feet

Figure 3 Overview
Current Conditions Plan View
Russell Gap Project

N

R10A
R10B
R11
R12
R13
R14
R1

VP 16
18 stems
VP 1
20 stems
VP 2
22 stems
VP 3
28 stems
VP 17
22 stems
VP 4
19 stems
VP 18
17 stems

MW1
MW2
MW3
MW4
MW5
MW6
MW7
MW8
MW9

RVP 1
RVP 2
RVP 3

CG 1
FG1
FG2
FG3

XS 1
XS 2
XS 3
XS 4
XS 18
XS 19
XS 20
XS 24
XS 25

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Monitoring Wells
Monitoring Flow Gauges
Monitoring Crest Gauges
Photo Points
Vegetation Plots
Random Vegetation Plots
Conservation Easement
Cross Sections

Approach
Restoration
Enhancement I
Enhancement II
No Credit

Wetland Type
Restoration
Enhancement

Michael Baker INTERNATIONAL

0 150 300 Feet

Figure 3A
Current Conditions Plan View
Russell Gap Project

N

R4A

VP 6
16 stems

65

R26

66

R27

XS 6

67

69

68

R4

RVP 4

70

VP 7
21 stems

XS 7

71

72

XS 8

XS 9

R15

73

Monitoring Wells
Monitoring Flow Gauges
Monitoring Crest Gauges
Photo Points
Vegetation Plots
Random Vegetation Plots
Cross Sections
Conservation Easement

Approach

Restoration
Enhancement I
Enhancement II
No Credit

Wetland Type

Restoration
Enhancement

Michael Baker
INTERNATIONAL

0 150 300
Feet

Figure 3B
Current Conditions Plan View
Russell Gap Project

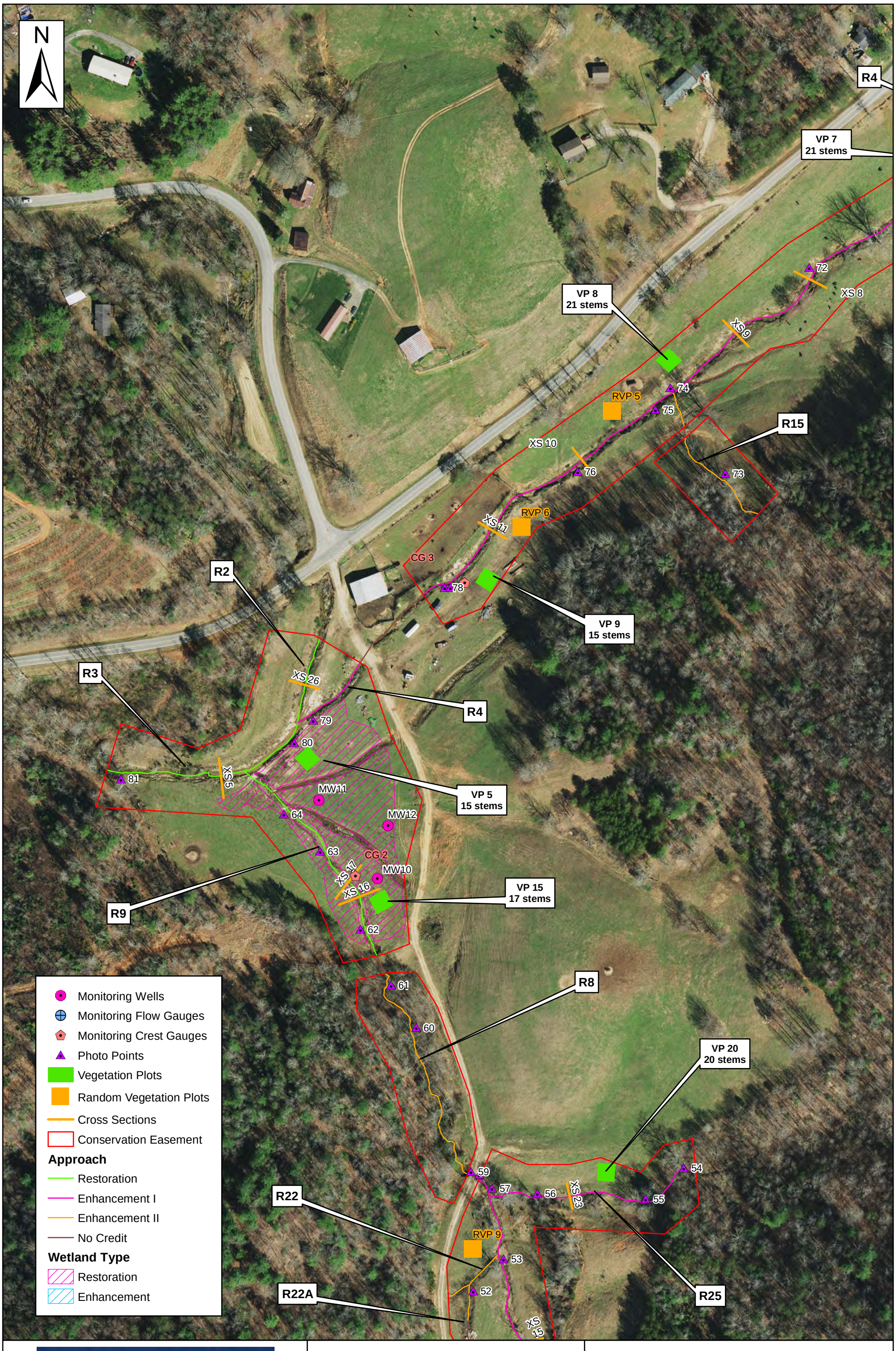

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Figure 3C
Current Conditions Plan View
Russell Gap Project

N

R22
R22A
R25
VP 14
24 stems
R7B
VP 13
19 stems
VP 19
18 stems
R21
R20
R19
R18
R7A
VP 12
21 stems
VP 11
19 stems
R17
R6
VP 10
16 stems
R5

59 57 56 XS 23 55 54
RVP 9
53
52
51 XS 15
50
49 47 46 48
41 42 FG5 XS 22 43 XS 21 44 FG4 45 40
RVP 8
39 38 37
36 34 33 35 CG 4
32
RVP 7
31
XS 13
30
XS 12
29

- Monitoring Wells
- Monitoring Flow Gauges
- Monitoring Crest Gauges
- Photo Points
- Vegetation Plots
- Random Vegetation Plots
- Cross Sections
- Conservation Easement

Approach

- Restoration
- Enhancement I
- Enhancement II
- No Credit

Wetland Type

- Restoration
- Enhancement

Michael Baker INTERNATIONAL

0 150 300 Feet

Figure 3D
Current Conditions Plan View
Russell Gap Project

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-1: Reach 13, view upstream Station 10+20

PP-2: Reach 14, view upstream toward Reach 13, at Station 11+45

PP-3: Reach 14, view upstream Station 13+00

PP-4: Reach 14, view upstream Station 13+75

PP-5: Reach 14, view upstream, Station 15+00

PP-6: Reach 14, end of reach, Station 16+00

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-7: Reach 1, view upstream, at Station 10+20

PP-8: Reach 1, view upstream Reach 1 at Station 13+00

PP-9: Reach 1, view upstream at Station 15+00

PP-10: Reach 1, view upstream at Station 17+25

PP-11: Reach 1, view upstream at Station 20+00

PP-12: Reach 1, view downstream at Station 20+00

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-13: Reach 1, view upstream at Station 20+75

PP-14: Reach 1, view downstream at Station 20+75

PP-15: Reach 1, view upstream at Station 21+50

PP-16: Reach 1, confluence of Reach 1 and Reach 11 at Station 22+75

PP-17: Reach 1, view upstream at Station 24+20

PP-18: Reach 1, view of upstream at Station 27+00

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-19: Reach 1, view upstream Reach 12 at Station 29+10

PP-20: Reach 1, view upstream at Station 29+20

PP-21: Reach 11, view upstream at Station 10+20

PP-22: Reach 11, view upstream at Station 11+50

PP-23: Reach 11, view upstream at Station 12+75

PP-24: Reach 11, view upstream at Station 14+50

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-25: Reach 10A, view upstream at Station 10+50

PP-26: Reach 10A, view upstream at Station 12+50

PP-27: Reach 10A, view upstream at Station 13+75

PP-28: Reach 10B, view upstream at Station 14+50

PP-29: Reach 5, view upstream at Station 11+00

PP-30: Reach 6, view upstream at Station 14+50

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-31: Reach 17, view upstream at Station 11+00

PP-32: Reach 6, view upstream at Station 17+50

PP-33: Reach 6, view upstream at Station 19+50

PP-34: Reach 18, view upstream at Station 12+00

PP-35: Reach 18, view upstream at Station 10+60

PP-36: Reach 7A, view upstream at Station 20+00

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-37: Reach 7B, view upstream at Station 21+75

PP-38: Reach7B, view downstream at Station 22+00

PP-39: Reach 7B, view upstream at Station 22+25

PP-40: Reach 7B, view upstream at Station 23+50

PP-41: Reach 20, view upstream at Station 10+80

PP-42: Reach 20, view upstream at Station 11+50

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-43: Reach 19, view upstream at Station 10+15

PP-44: Reach 19, view upstream at Station 11+85

PP-45: Reach 19, view upstream at Station 12+80

PP-46: Reach 19, view upstream at Station 13+20

PP-47: Reach 19, view upstream at Station013+80

PP-48: Reach 7B, view upstream at Station 24+10

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-49: Reach 7B, view downstream at Station 24+60

PP-50: Reach 7B, view upstream at Station 25+25

PP-51: Reach 22A, view upstream at Station 10+00

PP-52: Reach 22A, view of upstream at Station 11+15

PP-53: Reach 7B, view upstream at Station 32+00

PP-54: Reach 25, view upstream at Station 10+10

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-55: Reach 25, view upstream at Station 11+20

PP-56: Reach 25, view upstream at Station 13+40

PP-57: Reach 7B, view downstream at Station 33+00

PP-58: Reach 7B, view upstream at Station 33+20

PP-59: Reach 8, view downstream at Station 34+00

PP-60: Reach 8, view upstream at Station 37+00

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-61: Reach 8, view upstream at Station 38+00

PP-62: Reach 9, view upstream at Station 39+20

PP-63: Reach 9, view upstream at Station 41+00

PP-64: Reach 9, view upstream at Station 42+00

PP-65: Reach 4A, view upstream at Station 13+00

PP-66: Reach 26, view upstream at Station 11+00

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-67: Reach 4, view upstream at Station 11+10

PP-68: Reach 4, view upstream at Station 12+00

PP-69: Reach 27, view upstream at Station 11+60

PP-70: Reach 4, view upstream at Station 15+00

PP-71: Reach 4, view upstream at Station 16+10

PP-72: Reach 4, view upstream at Station 19+00

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-73: Reach 15, view upstream at Station 11+00

PP-74: Reach 15, view upstream at Station 13+00

PP-75: Reach 4, view upstream at Station 23+20

PP-76: Reach 4, view upstream at Station 25+00

PP-77: Reach 4, view upstream at Station 28+30

PP-78: Reach 4, view downstream at Station 28+00

Photos taken March 17, 2020 unless noted differently.

Russell Gap: MY0 As-Built Stream Station Photo-Points

PP-79: Reach 4, view upstream at Station 32+00

PP-80: Reach 3, view upstream at Station 33+00

PP-81: Reach 3, view upstream at Station 36+40

Photos taken March 17, 2020 unless noted differently.

Vegetation Plot Photo Log
Russell Gap Stream Mitigation Project – NCDMS Project No. 100003
Photographs taken March 17, 2020 unless noted differently.

Vegetation Plot 1 – Reach 1

Vegetation Plot 2 – Reach 1

Vegetation Plot 3 – Reach 1

Vegetation Plot 4 – Reach 1

Vegetation Plot 5 – Reach 2

Vegetation Plot 6 – Reach 4A

Vegetation Plot Photo Log
Russell Gap Stream Mitigation Project – NCDMS Project No. 100003
Photographs taken March 17, 2020 unless noted differently.

Vegetation Plot 7 – Reach 4

Vegetation Plot 8 (Picture taken 9-2-2020)– Reach 4

Vegetation Plot 9 – Reach 4

Vegetation Plot 10 – Reach 6

Vegetation Plot 11 – Reach 6

Vegetation Plot 12 – Reach 7B

Vegetation Plot Photo Log
Russell Gap Stream Mitigation Project – NCDMS Project No. 100003
Photographs taken March 17, 2020 unless noted differently.

Vegetation Plot 13 – Reach 7B

Vegetation Plot 14 – Reach 7B

Vegetation Plot 15(Picture taken 9-2-2020) – Reach 9

Vegetation Plot 16 - Reach 10B

Vegetation Plot 17 – Reach 11

Vegetation Plot 18 – Reach 14

Vegetation Plot Photo Log
Russell Gap Stream Mitigation Project – NCDMS Project No. 100003
Photographs taken March 17, 2020 unless noted differently.

Vegetation Plot 19 – Reach 7B

Vegetation Plot 20 – Reach 7B

All Random Veg. Plot photos taken 9-2-2020. Data Collected March 2020.

Random Vegetation Plot 1 - Reach 1

Random Vegetation Plot 2 – Reach 1

Random Vegetation Plot 3 – Reach 1

Random Vegetation Plot 4 – Reach 4

Vegetation Plot Photo Log
Russell Gap Stream Mitigation Project – NCDMS Project No. 100003
Photographs taken March 17, 2020 unless noted differently.

Random Vegetation Plot 5 – Reach 4

Random Vegetation Plot 6 – Reach 4

Random Vegetation Plot 7 – Reach 6

Random Vegetation Plot 8 – Reach 7b

Random Vegetation Plot 9 – Reach 22

Russell Gap: MY0 As-Built Gauges and Groundwater Well Photographs

Crest Gauge #1, Reach 1, Station 24+50

Crest Gauge #2, Reach 9, Station 40+10

Crest Gauge #3, Reach 4, Station 28+00

Crest Gauge #4, Reach 6, Station 18+75

Flow Gauge#1, Reach 11, Station 14+00

Flow Gauge#2, Reach 14, Station 12+15

Photographs taken June, 1, 2020 unless noted differently

Russell Gap: MY0 As-Built Gauges and Groundwater Well Photographs

Flow Gauge#3, Reach 14, Station 16+40

Flow Gauge#4, Reach 19, Station 12+50

Flow Gauge#5, Reach 20, Station 11+55

Groundwater Well #1, Reach 1, Station 11+50

Groundwater Well #2, Reach 1, Station 16+00

Groundwater Well #3, Reach 1, Station 15+50

Photographs taken June, 1, 2020 unless noted differently

Russell Gap: MY0 As-Built Gauges and Groundwater Well Photographs

Groundwater Well #4, Reach 1, Station 18+10

Groundwater Well #5, Reach 1, Station 18+10

Groundwater Well #6, Reach 1, Station 18+10

Groundwater Well #7, Reach 1, Station 23+50

Groundwater Well #8, Reach 1, Station 27+50

Groundwater Well #9, Reach 1, Station 27+00

Photographs taken June, 1, 2020 unless noted differently

Russell Gap: MY0 As-Built Gauges and Groundwater Well Photographs

Groundwater Well #10, Reach 9, Station 40+00

Groundwater Well #11, Reach 9, Station 42+00

Groundwater Well #12, Reach 9, Station 40+50

Photographs taken June, 1, 2020 unless noted differently

APPENDIX C

Vegetation Plot Data

Table 5. Planted Stem Counts by Plot and Species
Russell Gap Stream Mitigation Project - NCDMS Project No. 100003

Scientific Name	Common Name	Russell Gap Vegetation Plots (MY0 2020)										
		1	2	3	4	5	6	7	8	9	10	11
Betula nigra	River Birch											
Juglans nigra	Black Walnut											
Platanus occidentalis	Sycamore											
Lirodendron tulipifera	Tulip Poplar											
Fraxinus pennsylvanica	Green ash											
Quercus phellos	Willow oak											
Diospyros virginiana	Persimmon											
Alnus serrulata	Tag Alder											
Lindera benzion	Spicebush											
Cercis canadensis	Redbud											
Sambucus canadensis	Elderberry											
Cornus amomum	Silky Dogwood											
Nyssa sylvatica	Black Gum											
Quercus falcata	Southern Red oak											
Quercus alba	White oak											
Fagus grandifolia	American Beech											
Acer rubrum	Red Maple											
Cornus florida	Flowering Dogwood											
Viburnum prunifolium	Blackhaw Viburnum											
Carpinus caroliniana	Ironwood											
Corylus americana	Hazelnut											
Quercus shumardii	Shumard oak											
Unknown	Unknown	20	22	28	19	15	16	21	21	15	16	19
	Stems/Plot	20	22	28	19	15	16	21	21	15	16	19
	Plots (ares)	1	1	1	1	1	1	1	1	1	1	1
	Plot Size (Acres)	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
	Stems/Acre	809	890	1133	769	607	647	850	850	607	647	769

Table 5. Planted Stem Counts by Plot and Species (Continued)

Scientific Name	Common Name	Russell Gap Vegetation Plots (MY0 2020)										
		12	13	14	15	16	17	18	19	20	Random 1	Random 2
Betula nigra	River Birch											
Juglans nigra	Black Walnut											
Platanus occidentalis	Sycamore											
Lirodendron tulipifera	Tulip Poplar											
Fraxinus pennsylvanica	Green ash											
Quercus phellos	Willow oak											
Diospyros virginiana	Persimmon											
Alnus serrulata	Tag Alder											
Lindera benzion	Spicebush											
Cercis canadensis	Redbud											
Sambucus canadensis	Elderberry											
Cornus amomum	Silky Dogwood											
Nyssa sylvatica	Black Gum											
Quercus falcata	Southern Red oak											
Quercus alba	White oak											
Fagus grandifolia	American Beech											
Acer rubrum	Red Maple											
Cornus florida	Flowering Dogwood											
Viburnum prunifolium	Blackhaw Viburnum											
Carpinus caroliniana	Ironwood											
Corylus americana	Hazelnut											
Quercus shumardii	Shumard oak											
Unknown	Unknown	21	19	24	17	18	22	17	18	20	14	10
	Stems/Plot	21	19	24	17	18	22	17	18	20	14	10
	Plots (ares)	1	1	1	1	1	1	1	1	1	1	1
	Plot Size (Acres)	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
	Stems/Acre	850	769	971	688	728	890	688	728	809	560	400

Table 5. Planted Stem Counts by Plot and Species (Continued)

Scientific Name	Common Name	Russell Gap Vegetation Plots (MY0 2020)							
		Random 3	Random 4	Random 5	Random 6	Random 7	Random 8	Random 9	MY0 2020
Betula nigra	River Birch								
Juglans nigra	Black Walnut								
Platanus occidentalis	Sycamore								
Lirodendron tulipifera	Tulip Poplar								
Fraxinus pennsylvanica	Green ash								
Quercus phellos	Willow oak								
Diospyros virginiana	Persimmon								
Alnus serrulata	Tag Alder								
Lindera benzion	Spicebush								
Cercis canadensis	Redbud								
Sambucus canadensis	Elderberry								
Cornus amomum	Silky Dogwood								
Nyssa sylvatica	Black Gum								
Quercus falcata	Southern Red oak								
Quercus alba	White oak								
Fagus grandifolia	American Beech								
Acer rubrum	Red Maple								
Cornus florida	Flowering Dogwood								
Viburnum prunifolium	Blackhaw Viburnum								
Carpinus caroliniana	Ironwood								
Corylus americana	Hazelnut								
Quercus shumardii	Shumard oak								
Unknown	Unknown	16	18	19	20	16	17	15	533
	Stems/Plot	16	18	19	20	16	17	15	533
	Plots (ares)	1	1	1	1	1	1	1	1
	Plot Size (Acres)	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.717
	Stems/Acre	647	728	769	809	647	688	607	744

Exceeds requirements by 10%

[1] Plot MY0 2020 is all the plots averaged to get the average stem density of the planted area.

[2] Stems will be identified in MY1

APPENDIX D

Stream Measurement and

Geomorphology Data

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach R1 - (Restoration XS 1-4)																
Parameter	**Pre-Existing Condition**				**Reference Reach(es) Data**				**Design**				**As-built**			
					Composite											
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	15.52	16.59	-----	17.65	-----	-----	-----	-----	-----	16.90	-----	-----	16.10	16.15	16.15	16.20
Floodprone Width (ft)	71.92	74.43	-----	76.94	-----	-----	-----	-----	75.00	137.50	-----	200.00	75.30	78.85	78.85	82.40
BF Mean Depth (ft)	1.05	1.25	-----	1.44	-----	-----	-----	-----	-----	1.3	-----	-----	1.20	1.25	1.25	1.30
BF Max Depth (ft)	2.64	2.97	-----	3.30	-----	-----	-----	-----	-----	1.60	-----	-----	1.60	1.70	1.70	1.80
BF Cross-sectional Area (ft²)	22.35	23.43	-----	24.5	-----	-----	-----	-----	-----	22.0	-----	-----	18.80	19.70	19.70	20.60
Width/Depth Ratio	10.78	13.80	-----	16.81	-----	-----	-----	-----	-----	-----	-----	-----	12.50	13.20	13.20	13.90
Entrenchment Ratio	4.36	4.50	-----	4.64	-----	-----	-----	-----	4.40	8.10	-----	11.80	4.70	4.90	4.90	5.10
Bank Height Ratio	1.20	1.33	-----	1.46	1.00	1.05	-----	1.10	-----	1.00	-----	-----	1.00	1.00	1.00	1.00
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
Channel Beltwidth (ft)	33.00	73.50	-----	114.00	-----	-----	-----	-----	60.00	97.50	-----	135.00	53.11	73.15	72.84	89.22
Radius of Curvature (ft)	21.00	39.50	-----	58.00	-----	-----	-----	-----	34.00	41.50	-----	49.00	19.00	41.88	39.50	78.00
Rc/Bankfull width (ft/ft)	17.65	10.70	-----	3.74	2.00	2.50	-----	3.00	2.00	2.45	-----	2.90	1.18	2.59	2.45	4.81
Meander Wavelength (ft)	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	142.35	192.15	163.81	303.38
Meander Width Ratio	1.87	4.61	-----	7.35	3.50	5.75	-----	8.00	3.60	5.80	-----	8.00	3.30	4.53	4.51	5.51
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	33.61	50.90	49.22	64.82
Riffle Slope (ft/ft)	0.0120	0.04	-----	0.0600	-----	-----	-----	-----	0.0110	0.0118	-----	0.0125	0.0029	0.0111	0.0098	0.0168
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	16.67	26.35	29.91	43.15
Pool to Pool Spacing (ft)	23.00	123.50	-----	224.00	60.00	89.50	-----	119.00	-----	-----	-----	-----	84.80	101.00	98.09	111.38
Pool Max Depth (ft)	1.60	2.30	-----	3.00	-----	-----	-----	-----	-----	3.50	-----	-----	1.16	1.77	1.85	2.54
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	1.50	-----	-----	-----	-----	-----	-----	-----	1.50	-----	-----	----	1.50	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	C4/E4	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	----	C4	----	----
BF Velocity (fps)	3.67	3.85	-----	4.03	3.50	4.25	-----	5.00	-----	4.10	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	90.0	-----	-----	-----	-----	-----	-----	-----	90.00	-----	-----	----	----	----	----
Valley Length	-----	1,756	-----	-----	-----	-----	-----	-----	-----	1,535	-----	-----	----	1,593	----	----
Channel Length (ft)	-----	2,142	-----	-----	-----	-----	-----	-----	-----	1,842	-----	-----	----	1,911	----	----
Sinuosity	-----	1.22	-----	-----	1.20	1.30	-----	1.40	-----	1.20	-----	-----	----	1.20	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach R2 - (Restoration XS-26)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	15.00	-----	-----	-----	-----	-----	-----	-----	18.00	-----	-----	----	18.50	----	----
Floodprone Width (ft)	22.00	26.00	-----	30.00	-----	-----	-----	-----	-----	42.00	-----	-----	----	38.00	----	----
BF Mean Depth (ft)	-----	1.60	-----	-----	-----	-----	-----	-----	-----	1.4	-----	-----	----	1.80	----	----
BF Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	2.90	----	----
BF Cross-sectional Area (ft^2)	-----	25.00	-----	-----	-----	-----	-----	-----	-----	25.0	-----	-----	----	33.60	----	----
Width/Depth Ratio	-----	9.40	-----	-----	10.00	12.50	-----	15.00	-----	13.00	-----	-----	----	10.20	----	----
Entrenchment Ratio	1.50	1.75	-----	2.00	-----	-----	-----	-----	-----	2.30	-----	-----	----	2.10	----	----
Bank Height Ratio	-----	2.30	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	----	1.00	----	----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	24.78	----	----
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	2.00	2.50	-----	3.00	-----	N/A	-----	-----	----	N/A	----	----
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Meander Width Ratio	-----	N/A	-----	-----	3.50	5.75	-----	8.00	-----	N/A	-----	-----	----	N/A	----	----
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	32.58	48.51	48.51	64.43
Riffle Slope (ft/ft)	-----	0.0179	-----	-----	-----	-----	-----	-----	-----	0.0179	-----	-----	0.0058	0.0113	0.0113	0.0167
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	13.55	18.57	20.90	28.24
Pool to Pool Spacing (ft)	20.00	47.50	-----	75.00	-----	-----	-----	-----	65.00	95.00	-----	125.00	32.00	53.25	53.26	74.51
Pool Max Depth (ft)	-----	2.50	-----	-----	-----	-----	-----	-----	-----	3.50	-----	-----	0.43	0.95	1.05	1.66
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	1.65	-----	-----	-----	-----	-----	-----	-----	1.65	-----	-----	----	1.65	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	E4	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	----	C4	----	----
BF Velocity (fps)	-----	4.00	-----	-----	3.50	-----	-----	5.00	-----	4.00	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	100.0	-----	-----	-----	-----	-----	-----	-----	100.00	-----	-----	----	----	----	----
Valley Length	-----	288	-----	-----	-----	-----	-----	-----	-----	174	-----	-----	----	166	----	----
Channel Length (ft)	-----	288	-----	-----	-----	-----	-----	-----	-----	174	-----	-----	----	166	----	----
Sinuosity	-----	1.00	-----	-----	1.20	1.30	-----	1.40	-----	1.00	-----	-----	----	1.00	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach R3 - (Restoration XS-5)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	21.00	-----	-----	-----	-----	-----	-----	-----	23.70	-----	-----	----	23.80	----	----
Floodprone Width (ft)	-----	71.00	-----	-----	-----	-----	-----	-----	-----	71.00	-----	-----	----	46.50	----	----
BF Mean Depth (ft)	-----	2.23	-----	-----	-----	-----	-----	-----	-----	2.0	-----	-----	----	1.70	----	----
BF Max Depth (ft)	-----	3.40	-----	-----	-----	-----	-----	-----	-----	2.50	-----	-----	----	2.70	----	----
BF Cross-sectional Area (ft^2)	-----	46.87	-----	-----	-----	-----	-----	-----	-----	47.0	-----	-----	----	40.90	----	----
Width/Depth Ratio	-----	9.42	-----	-----	10.00	12.50	-----	15.00	-----	11.90	-----	-----	----	13.80	----	----
Entrenchment Ratio	-----	3.38	-----	-----	-----	-----	-----	-----	-----	3.00	-----	-----	----	2.00	----	----
Bank Height Ratio	-----	1.20	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	----	1.00	----	----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	22.67	----	----
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	2.00	2.50	-----	3.00	-----	N/A	-----	-----	----	N/A	----	----
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Meander Width Ratio	-----	N/A	-----	-----	3.50	5.75	-----	8.00	-----	N/A	-----	-----	----	N/A	----	----
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	29.93	47.57	51.32	72.70
Riffle Slope (ft/ft)	-----	0.0075	-----	-----	-----	-----	-----	-----	-----	0.0075	-----	-----	0.0044	0.0158	0.0138	0.0233
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.28	26.01	29.94	55.59
Pool to Pool Spacing (ft)	18.00	26.00	-----	34.00	-----	-----	-----	-----	85.00	100.00	-----	115.00	47.04	86.95	85.53	124.01
Pool Max Depth (ft)	3.60	3.70	-----	3.80	-----	-----	-----	-----	-----	4.00	-----	-----	0.57	1.27	1.24	1.90
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	3.48	-----	-----	-----	-----	-----	-----	-----	3.48	-----	-----	----	3.48	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	E4 (Incised)	-----	-----	-----	-----	-----	-----	-----	C4	-----	-----	----	C4	----	----
BF Velocity (fps)	-----	5.00	-----	-----	3.50	4.25	-----	5.00	-----	5.00	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	235.0	-----	-----	-----	-----	-----	-----	-----	235.00	-----	-----	----	----	----	----
Valley Length	-----	350	-----	-----	-----	-----	-----	-----	-----	350	-----	-----	----	366	----	----
Channel Length (ft)	-----	388	-----	-----	-----	-----	-----	-----	-----	389	-----	-----	----	406	----	----
Sinuosity	-----	1.11	-----	-----	1.20	1.30	-----	1.40	-----	1.11	-----	-----	----	1.11	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach R4 - (Enhancement I XS 6-11)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	16.00	-----	-----	-----	-----	-----	-----	-----	16.90	-----	-----	13.30	15.84	14.30	22.60
Floodprone Width (ft)	-----	22.82	-----	-----	-----	-----	-----	-----	-----	37.00	-----	-----	24.00	29.58	31.70	34.30
BF Mean Depth (ft)	-----	1.54	-----	-----	-----	-----	-----	-----	-----	1.3	-----	-----	0.90	1.38	1.50	1.70
BF Max Depth (ft)	-----	2.72	-----	-----	-----	-----	-----	-----	-----	1.60	-----	-----	2.00	2.46	2.30	3.00
BF Cross-sectional Area (ft^2)	-----	24.5	-----	-----	-----	-----	-----	-----	-----	22.0	-----	-----	15.50	20.64	22.10	23.10
Width/Depth Ratio	-----	10.36	-----	-----	12.00	15.00	-----	18.00	-----	13.00	-----	-----	8.40	13.04	10.30	26.10
Entrenchment Ratio	-----	1.62	-----	-----	-----	-----	-----	-----	-----	2.20	-----	-----	1.40	1.90	1.90	2.30
Bank Height Ratio	-----	2.32	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	1.00	1.00	1.00	1.00
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	----	-----	-----	-----	N/A	-----	-----	----	----	----	----
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	----	-----	-----	-----	N/A	-----	-----	----	----	----	----
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	----	-----	-----	-----	N/A	-----	-----	----	----	----	----
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	----	-----	-----	-----	N/A	-----	-----	----	----	----	----
Meander Width Ratio	-----	N/A	-----	-----	-----	----	-----	-----	-----	N/A	-----	-----	----	----	----	----
Profile	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	33.46	58.40	68.03	102.60
Riffle Slope (ft/ft)	0.0150	0.0250	-----	0.0350	-----	-----	-----	-----	0.0110	0.0140	-----	0.0170	0.0102	0.0178	0.0195	0.0289
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.23	14.40	20.08	37.92
Pool to Pool Spacing (ft)	55.00	167.50	-----	280.00	-----	-----	-----	-----	85.00	100.00	-----	115.00	33.46	103.56	113.76	194.05
Pool Max Depth (ft)	1.10	-----	-----	2.40	-----	-----	-----	-----	-----	3.00	-----	-----	1.09	1.66	1.71	2.32
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	1.26	-----	-----	-----	-----	-----	-----	-----	1.26	-----	-----	----	----	1.26	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	E4 (Incised)	-----	-----	-----	B4c	-----	-----	-----	B4c	-----	-----	----	----	B4c	----
BF Velocity (fps)	-----	4.01	-----	-----	4.00	5.00	-----	6.00	-----	4.00	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	87.0	-----	-----	-----	-----	-----	-----	-----	87.00	-----	-----	----	----	----	----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Channel Length (ft)	-----	2,245	-----	-----	-----	-----	-----	-----	-----	2,063	-----	-----	----	2,038	----	----
Sinuosity	-----	1.06	-----	-----	1.10	1.20	-----	1.30	-----	1.06	-----	-----	----	1.06	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach R6,R7b - (Restoration, Enhancement I XS 12-15)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	8.44	-----	-----	-----	-----	-----	-----	-----	10.20	-----	-----	11.00	12.40	12.40	13.80
Floodprone Width (ft)	-----	17.64	-----	-----	-----	-----	-----	-----	-----	22.00	-----	-----	45.00	45.45	45.00	45.90
BF Mean Depth (ft)	-----	0.94	-----	-----	-----	-----	-----	-----	-----	0.8	-----	-----	0.80	1.05	1.05	1.30
BF Max Depth (ft)	-----	1.27	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	1.30	1.65	1.65	2.00
BF Cross-sectional Area (ft^2)	-----	7.9	-----	-----	-----	-----	-----	-----	-----	8.0	-----	-----	7.20	10.80	10.80	14.40
Width/Depth Ratio	-----	8.98	-----	-----	12.00	15.00	-----	18.00	-----	12.80	-----	-----	8.40	9.65	9.65	10.90
Entrenchment Ratio	-----	2.09	-----	-----	-----	-----	-----	-----	-----	2.20	-----	-----	4.20	4.65	4.65	5.10
Bank Height Ratio	-----	3.10	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	1.00	1.00	1.00	1.00
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	13.95	40.15	33.06	58.59
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	20.00	46.82	43.00	86.00
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	1.82	3.78	3.47	6.23
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	58.19	108.11	113.28	170.29
Meander Width Ratio	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	1.27	3.24	2.67	4.25
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	34.21	91.23	89.80	145.39
Riffle Slope (ft/ft)	0.0260	0.0430	-----	0.0600	-----	-----	-----	-----	0.0310	0.0375	-----	0.0440	0.0202	0.0384	0.0435	0.0667
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	17.11	20.53	21.39	25.66
Pool to Pool Spacing (ft)	53.00	159.00	-----	265.00	-----	-----	-----	-----	25.00	37.50	-----	50.00	31.36	90.16	138.27	245.18
Pool Max Depth (ft)	1.50	2.05	-----	2.60	-----	-----	-----	-----	-----	1.80	-----	-----	2.28	2.58	2.66	3.04
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.29	-----	-----	-----	-----	-----	-----	-----	0.29	-----	-----	----	0.2900	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	E4	-----	-----	-----	B4	-----	-----	-----	B4	-----	-----	----	B4	----	----
BF Velocity (fps)	-----	4.41	-----	-----	4.00	-----	-----	6.00	-----	4.40	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	35.0	-----	-----	-----	-----	-----	-----	-----	35.00	-----	-----	----	----	----	----
Valley Length	-----	1,783	-----	-----	-----	-----	-----	-----	-----	1,816	-----	-----	----	1,793	----	----
Channel Length (ft)	-----	1,801	-----	-----	-----	-----	-----	-----	-----	1,943	-----	-----	----	1,919	----	----
Sinuosity	-----	1.01	-----	-----	1.10	1.15	-----	1.20	-----	1.07	-----	-----	----	1.07	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach 9 - (Restoration XS 16-17)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	10.40	-----	-----	-----	-----	-----	-----	-----	12.70	-----	-----	----	12.10	----	----
Floodprone Width (ft)	-----	45.00	-----	-----	-----	-----	-----	-----	-----	60.00	-----	-----	----	18.70	----	----
BF Mean Depth (ft)	-----	1.15	-----	-----	-----	-----	-----	-----	-----	0.9	-----	-----	----	1.00	----	----
BF Max Depth (ft)	-----	2.25	-----	-----	-----	-----	-----	-----	-----	1.20	-----	-----	----	1.40	----	----
BF Cross-sectional Area (ft^2)	-----	12.0	-----	-----	-----	-----	-----	-----	-----	12.0	-----	-----	----	11.90	----	----
Width/Depth Ratio	-----	9.04	-----	-----	12.00	15.00	-----	18.00	-----	13.50	-----	-----	----	12.20	----	----
Entrenchment Ratio	-----	4.33	-----	-----	-----	-----	-----	-----	-----	4.70	-----	-----	----	1.60	----	----
Bank Height Ratio	-----	1.19	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	----	1.00	----	----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	20.86	24.81	22.89	30.60
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	41.00	73.83	56.00	176.00
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	3.39	6.10	4.63	2.53
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	105.77	121.47	117.31	146.34
Meander Width Ratio	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	1.72	2.05	1.89	2.53
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	31.00	41.69	42.23	53.45
Riffle Slope (ft/ft)	0.0410	0.0480	-----	0.0550	-----	-----	-----	-----	0.2600	0.1505	-----	0.0410	0.0065	0.0218	0.0199	0.0332
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	10.49	19.56	20.03	29.57
Pool to Pool Spacing (ft)	29.00	47.50	-----	66.00	-----	-----	-----	-----	15.00	38.50	-----	62.00	45.71	62.03	62.51	79.31
Pool Max Depth (ft)	2.30	2.70	-----	3.10	-----	-----	-----	-----	-----	2.50	-----	-----	0.52	1.62	1.55	2.58
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.56	-----	-----	-----	-----	-----	-----	-----	0.56	-----	-----	----	0.5600	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	E4b	-----	-----	-----	-----	-----	-----	-----	B4	-----	-----	----	B4	----	----
BF Velocity (fps)	-----	4.00	-----	-----	4.00	5.00	-----	6.00	-----	4.00	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	48.0	-----	-----	-----	B4	-----	-----	-----	48.00	-----	-----	----	----	----	----
Valley Length	-----	422	-----	-----	-----	-----	-----	-----	-----	429	-----	-----	----	429	----	----
Channel Length (ft)	-----	439	-----	-----	-----	-----	-----	-----	-----	446	-----	-----	----	446	----	----
Sinuosity	-----	1.04	-----	-----	1.10	1.15	-----	1.20	-----	1.04	-----	-----	----	1.04	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach 10b - (Restoration XS-24)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	4.90	-----	-----	----	6.20	----	----
Floodprone Width (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	115.00	-----	-----	----	32.00	----	----
BF Mean Depth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	0.4	-----	-----	----	0.50	----	----
BF Max Depth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	0.50	-----	-----	----	1.00	----	----
BF Cross-sectional Area (ft^2)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	2.0	-----	-----	----	3.50	----	----
Width/Depth Ratio	-----	N/A	-----	-----	10.00	12.50	-----	15.00	-----	12.30	-----	-----	----	11.00	----	----
Entrenchment Ratio	-----	N/A	-----	-----	-----	-----	-----	-----	-----	23.50	-----	-----	----	8.70	----	----
Bank Height Ratio	-----	N/A	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	----	1.00	----	----
d50 (mm)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	10.37	13.70	11.86	18.87
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	34.00	66.67	82.00	84.00
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	2.00	2.50	-----	3.00	-----	N/A	-----	-----	5.48	10.75	1.91	13.55
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	29.79	49.56	59.44	59.44
Meander Width Ratio	-----	N/A	-----	-----	3.50	5.75	-----	8.00	-----	N/A	-----	-----	1.67	2.21	1.91	3.04
Profile																
Riffle Length (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	107.07	----	----
Riffle Slope (ft/ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	0.0142	-----	-----	----	0.0196	----	----
Pool Length (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pool to Pool Spacing (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	38.00	-----	-----	----	----	----	----
Pool Max Depth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	1.00	-----	-----	----	----	----	----
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.26	-----	-----	-----	-----	-----	-----	-----	0.26	-----	-----	----	0.2600	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	-----	-----	C4	-----	-----	----	C4	----	----
BF Velocity (fps)	-----	-----	-----	-----	3.50	4.25	-----	5.00	-----	3.50	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	7.00	-----	-----	----	----	----	----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Channel Length (ft)	-----	0	-----	-----	-----	-----	-----	-----	-----	113	-----	-----	----	105	----	----
Sinuosity	-----	-----	-----	-----	1.20	1.30	-----	1.40	-----	-----	-----	-----	----	----	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach 12 - (Restoration XS-25)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	7.97	-----	-----	-----	-----	-----	-----	-----	8.80	-----	-----	----	9.10	----	----
Floodprone Width (ft)	-----	41.00	-----	-----	-----	-----	-----	-----	-----	20.00	-----	-----	----	38.20	----	----
BF Mean Depth (ft)	-----	0.91	-----	-----	-----	-----	-----	-----	-----	0.7	-----	-----	----	0.60	----	----
BF Max Depth (ft)	-----	1.84	-----	-----	-----	-----	-----	-----	-----	0.80	-----	-----	----	1.00	----	----
BF Cross-sectional Area (ft^2)	-----	7.3	-----	-----	-----	-----	-----	-----	-----	6.0	-----	-----	----	5.20	----	----
Width/Depth Ratio	-----	8.75	-----	-----	12.00	13.50	-----	15.00	-----	12.60	-----	-----	----	16.20	----	----
Entrenchment Ratio	-----	5.14	-----	-----	-----	-----	-----	-----	-----	2.30	-----	-----	----	4.20	----	----
Bank Height Ratio	-----	1.63	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	----	1.00	----	----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
*Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	14.22	18.28	18.28	22.33
*Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	40.00	40.00	40.00	40.00
*Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	4.40	4.40	4.40	4.40
*Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	61.50	68.17	68.17	74.84
*Meander Width Ratio	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	1.56	2.01	2.01	2.45
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	16.04	25.93	25.93	35.81
Riffle Slope (ft/ft)	0.0350	0.0365	-----	0.0380	-----	-----	-----	-----	0.0150	0.0160	-----	0.0170	0.0123	0.1365	0.1123	0.2123
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.88	7.24	7.24	8.59
Pool to Pool Spacing (ft)	24.00	32.00	-----	40.00	-----	-----	-----	-----	35.00	40.00	-----	45.00	10.16	49.98	49.98	89.80
Pool Max Depth (ft)	1.80	2.00	-----	2.20	-----	-----	-----	-----	-----	1.50	-----	-----	0.61	0.78	0.82	1.03
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / B%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.18	-----	-----	-----	-----	-----	-----	-----	0.18	-----	-----	----	0.1800	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
*Rosgen Classification	-----	E4	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	----	C4	----	----
BF Velocity (fps)	-----	4.13	-----	-----	3.50	-----	-----	5.00	-----	5.00	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	30.0	-----	-----	-----	-----	-----	-----	-----	30.00	-----	-----	----	----	----	----
Valley Length	-----	83	-----	-----	-----	-----	-----	-----	-----	115	-----	-----	----	98	----	----
Channel Length (ft)	-----	86	-----	-----	-----	-----	-----	-----	-----	120	-----	-----	----	102	----	----
Sinuosity	-----	1.03	-----	-----	-----	-----	-----	-----	-----	1.04	-----	-----	----	1.04	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach 14 - (Restoration XS 19-20)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design Values Upper				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	3.85	-----	-----	-----	-----	-----	-----	-----	5.10	-----	-----	3.70	4.10	4.10	4.50
Floodprone Width (ft)	-----	5.82	-----	-----	-----	-----	-----	-----	-----	10.00	-----	-----	11.10	21.55	21.55	32.00
BF Mean Depth (ft)	-----	0.51	-----	-----	-----	-----	-----	-----	-----	0.4	-----	-----	0.50	0.50	0.50	0.50
BF Max Depth (ft)	-----	0.70	-----	-----	-----	-----	-----	-----	-----	0.50	-----	-----	0.80	0.90	0.90	1.00
BF Cross-sectional Area (ft^2)	-----	2.0	-----	-----	-----	-----	-----	-----	-----	2.0	-----	-----	2.00	2.10	2.10	2.20
Width/Depth Ratio	-----	7.55	-----	-----	12.00	15.00	-----	18.00	-----	12.80	-----	-----	6.80	7.95	7.95	9.10
Entrenchment Ratio	-----	1.51	-----	-----	-----	-----	-----	-----	-----	2.00	-----	-----	2.50	5.60	5.60	8.70
Bank Height Ratio	-----	9.60	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	1.00	1.00	1.00	1.00
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
*Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	24.51	40.15	33.06	58.59
*Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	21.00	72.88	56.00	178.00
*Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	5.68	17.78	13.66	39.56
*Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	62.14	95.04	83.77	56.00
*Meander Width Ratio	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	6.62	9.79	8.06	13.02
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.19	15.81	25.68	47.17
Riffle Slope (ft/ft)	0.1000	0.1400	-----	0.1800	-----	-----	-----	-----	0.0850	0.1075	-----	0.1300	0.0108	0.0398	0.0518	0.0928
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.17	2.00	1.87	2.57
Pool to Pool Spacing (ft)	24.00	37.00	-----	50.00	-----	-----	-----	-----	5.00	12.50	-----	20.00	5.84	14.71	14.13	22.41
Pool Max Depth (ft)	0.50	0.65	-----	0.80	-----	-----	-----	-----	-----	0.70	-----	-----	0.69	1.10	1.15	1.60
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / B%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.02	-----	-----	-----	-----	-----	-----	-----	0.02	-----	-----	----	0.0180	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
*Rosgen Classification	-----	A4	-----	-----	-----	B4a	-----	-----	-----	B4a	-----	-----	----	B4a	----	----
BF Velocity (fps)	-----	4.10	-----	-----	4.00	-----	-----	6.00	-----	4.00	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	8.0	-----	-----	-----	-----	-----	-----	-----	8.00	-----	-----	----	----	----	----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Channel Length (ft)	-----	528	-----	-----	-----	-----	-----	-----	-----	572	-----	-----	----	570	----	----
Sinuosity	-----	N/A	-----	-----	1.10	-----	-----	1.20	-----	N/A	-----	-----	----	N/A	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach 19 - (Enhancement I XS-21)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	4.31	-----	-----	-----	-----	-----	-----	-----	5.40	-----	-----	----	8.80	----	----
Floodprone Width (ft)	-----	8.84	-----	-----	-----	-----	-----	-----	-----	10.00	-----	-----	----	26.30	----	----
BF Mean Depth (ft)	-----	0.45	-----	-----	-----	-----	-----	-----	-----	0.4	-----	-----	----	0.90	----	----
BF Max Depth (ft)	-----	0.91	-----	-----	-----	-----	-----	-----	-----	0.50	-----	-----	----	1.50	----	----
BF Cross-sectional Area (ft^2)	-----	1.9	-----	-----	-----	-----	-----	-----	-----	2.0	-----	-----	----	7.60	----	----
Width/Depth Ratio	-----	9.58	-----	-----	12.00	15.00	-----	18.00	-----	13.50	-----	-----	----	10.20	----	----
Entrenchment Ratio	-----	2.05	-----	-----	-----	-----	-----	-----	-----	1.90	-----	-----	----	3.00	----	----
Bank Height Ratio	-----	1.10	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	----	1.00	----	----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
*Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
*Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
*Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
*Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
*Meander Width Ratio	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.14	19.69	40.27	78.40
Riffle Slope (ft/ft)	0.0800	0.0950	-----	0.1100	-----	-----	-----	-----	0.0800	0.0950	-----	0.1100	0.0260	0.0561	0.0515	0.0771
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.27	2.01	2.06	2.85
Pool to Pool Spacing (ft)	7.00	31.50	-----	56.00	-----	-----	-----	-----	4.00	12.00	-----	20.00	6.35	9.34	9.34	12.33
Pool Max Depth (ft)	-----	0.95	-----	-----	-----	-----	-----	-----	-----	1.00	-----	-----	0.89	1.24	1.28	1.66
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / B%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.03	-----	-----	-----	-----	-----	-----	-----	0.03	-----	-----	----	0.0300	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
*Rosgen Classification	-----	B4a	-----	-----	-----	B4	-----	-----	-----	B4a	-----	-----	----	B4a	----	----
BF Velocity (fps)	-----	4.12	-----	-----	4.00	-----	-----	6.00	-----	4.00	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	8.0	-----	-----	-----	-----	-----	-----	-----	8.00	-----	-----	----	----	----	----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Channel Length (ft)	-----	481	-----	-----	-----	-----	-----	-----	-----	359	-----	-----	----	352	----	----
Sinuosity	-----	1.08	-----	-----	1.10	-----	-----	1.20	-----	1.08	-----	-----	----	1.08	----	----

Table 6. Baseline Stream Data Summary

Russell Gap Stream Mitigation Project: DMS Project No ID. 100003

Reach 25 - (Enhancement I XS-23)

Parameter	Pre-Existing Condition				Reference Reach(es) Data Composite				Design				As-built			
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	5.00	-----	-----	-----	-----	-----	-----	-----	5.40	-----	-----	----	5.10	----	----
Floodprone Width (ft)	-----	12.00	-----	-----	-----	-----	-----	-----	-----	12.00	-----	-----	----	11.10	----	----
BF Mean Depth (ft)	-----	0.40	-----	-----	-----	-----	-----	-----	-----	0.4	-----	-----	----	0.50	----	----
BF Max Depth (ft)	-----	0.50	-----	-----	-----	-----	-----	-----	-----	0.50	-----	-----	----	0.80	----	----
BF Cross-sectional Area (ft^2)	-----	1.9	-----	-----	-----	-----	-----	-----	-----	2.0	-----	-----	----	2.20	----	----
Width/Depth Ratio	-----	12.50	-----	-----	12.00	15.00	-----	18.00	-----	13.50	-----	-----	----	9.10	----	----
Entrenchment Ratio	-----	2.40	-----	-----	-----	-----	-----	-----	-----	2.20	-----	-----	----	2.50	----	----
Bank Height Ratio	-----	2.00	-----	-----	1.00	1.05	-----	1.10	-----	1.00	-----	-----	----	1.00	----	----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
*Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
*Radius of Curvature (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
*Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
*Meander Wavelength (ft)	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
*Meander Width Ratio	-----	N/A	-----	-----	-----	-----	-----	-----	-----	N/A	-----	-----	----	----	----	----
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.68	17.65	18.60	30.52
Riffle Slope (ft/ft)	0.0800	0.0950	-----	0.1100	1.1000	1.4500	-----	1.8000	0.0950	0.1025	-----	0.1100	0.0165	0.0591	0.0564	0.0962
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.23	5.21	5.41	8.59
Pool to Pool Spacing (ft)	7.00	31.50	-----	56.00	-----	-----	-----	-----	7.00	13.50	-----	20.00	7.63	16.24	23.05	38.47
Pool Max Depth (ft)	-----	1.20	-----	-----	-----	-----	-----	-----	-----	1.20	-----	-----	1.16	1.75	1.68	2.19
Substrate and Transport Parameters	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
SC% / Sa% / G% / C% / B%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.30	-----	-----	-----	-----	-----	-----	-----	0.30	-----	-----	----	0.3000	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
*Rosgen Classification	-----	B4a	-----	-----	-----	B4	-----	-----	-----	B4a	-----	-----	----	B4a	----	----
BF Velocity (fps)	-----	4.64	-----	-----	4.00	-----	-----	6.00	-----	4.50	-----	-----	----	----	----	----
BF Discharge (cfs)	-----	9.0	-----	-----	-----	-----	-----	-----	-----	9.00	-----	-----	----	----	----	----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Channel Length (ft)	-----	422	-----	-----	-----	-----	-----	-----	-----	427	-----	-----	----	431	----	----
Sinuosity	-----	1.09	-----	-----	1.10	-----	-----	1.20	-----	1.08	-----	-----	----	1.08	----	----

Table 7. Cross-Section Morphology Data Summary
Russell Gap Restoration Project: DMS Project No ID. 100003

Stream Reach	Reach 1																												
	Cross-section X-1 (Riffle)							Cross-section X-2 (Pool)							Cross-section X-3 (Riffle)							Cross-section X-4 (Pool)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																													
BF Width (ft)	16.2							24.6							16.1							22.9						
BF Mean Depth (ft)	1.2							1.0							1.3							1.2						
Width/Depth Ratio	13.9							24.1							12.5							18.9						
BF Cross-sectional Area (ft²)	18.8							25.1							20.6							27.7						
BF Max Depth (ft)	1.6							1.7							1.8							2.4						
Width of Floodprone Area (ft)	75.3							75.3							82.4							82.2						
Entrenchment Ratio	4.7							3.1							5.1							3.6						
Bank Height Ratio	1.0							0.9							1.0							1.1						
Wetted Perimeter (ft)	16.7							25.3							16.8							23.5						
Hydraulic Radius (ft)	1.1							1.0							1.2							1.2						
d50 (mm)																													
Stream Reach	**Reach 3**														**Reach 4**														
	Cross-section X-5 (Riffle)							Cross-section X-6 (Riffle)							Cross-section X-7 (Riffle)							Cross-section X-8 (Riffle)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																													
BF Width (ft)	23.8							13.9							14.3							15.1						
BF Mean Depth (ft)	1.7							1.7							1.6							1.5						
Width/Depth Ratio	13.8							8.4							9.0							10.3						
BF Cross-sectional Area (ft²)	40.9							23.1							22.9							22.1						
BF Max Depth (ft)	2.7							2.8							2.3							3.0						
Width of Floodprone Area (ft)	46.5							24.0							31.7							34.3						
Entrenchment Ratio	2.0							1.7							2.2							2.3						
Bank Height Ratio	1.0							1.0							1.0							1.0						
Wetted Perimeter (ft)	25.1							15.5							15.7							16.4						
Hydraulic Radius (ft)	1.6							1.5							1.5							1.4						
d50 (mm)																													
Stream Reach	**Reach 4**																					**Reach 6**						
	Cross-section X-9 (Pool)							Cross-section X-10 (Riffle)							Cross-section X-11 (Riffle)							Cross-section X-12 (Pool)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																													
BF Width (ft)	16.2							22.6							13.3							13.8						
BF Mean Depth (ft)	1.7							0.9							1.2							0.8						
Width/Depth Ratio	9.7							26.1							11.4							16.3						
BF Cross-sectional Area (ft²)	27.2							19.6							15.5							11.6						
BF Max Depth (ft)	2.7							2.2							2.0							1.8						
Width of Floodprone Area (ft)	38.0							32.0							25.9							56.8						
Entrenchment Ratio	2.3							1.4							1.9							5.7						
Bank Height Ratio	1.0							1.0							1.0							1.0						
Wetted Perimeter (ft)	17.4							23.7							14.3							10.8						
Hydraulic Radius (ft)	1.6							0.8							1.1							1.1						
d50 (mm)																													

Table 7. Cross-Section Morphology Data Summary
Russell Gap Restoration Project: DMS Project No ID. 100003

Stream Reach	Reach 6							Reach 7b													Reach 9						
	Cross-section X-13 (Riffle)							Cross-section X-14 (Riffle)							Cross-section X-15 (Pool)							Cross-section X-16 (Pool)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	13.8							11.0							14.0							12.9						
BF Mean Depth (ft)	0.8							1.3							1.0							1.0						
Width/Depth Ratio	10.9							8.4							14.4							12.4						
BF Cross-sectional Area (ft²)	7.2							14.4							13.6							13.5						
BF Max Depth (ft)	1.3							2.0							1.6							1.9						
Width of Floodprone Area (ft)	45.0							45.9							27.3							80.4						
Entrenchment Ratio	5.1							4.2							1.9							6.2						
Bank Height Ratio	1.0							1.0							2.4							1.0						
Wetted Perimeter (ft)	9.4							12.0							14.5							13.8						
Hydraulic Radius (ft)	0.8							1.2							0.9							1.0						
d50 (mm)																												

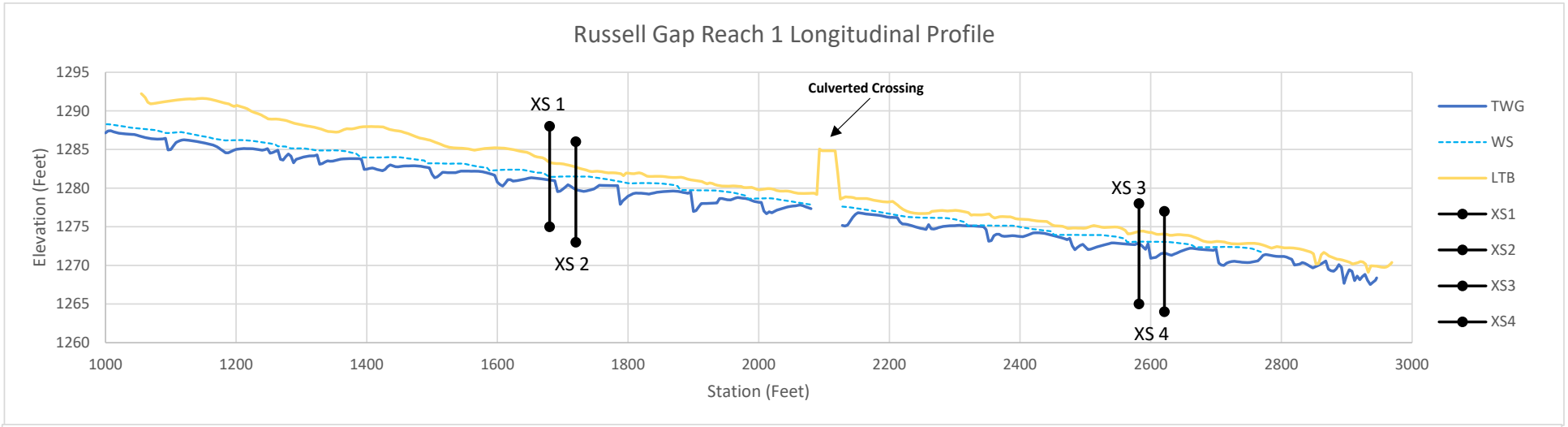
Stream Reach	Reach 9							Reach 11							R14													
	Cross-section X-17 (Riffle)							Cross-section X-18 (Riffle)							Cross-section X-19 (Riffle)							Cross-section X-20 (Riffle)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	12.1							8.9							4.5							3.7						
BF Mean Depth (ft)	1.0							1.1							0.5							0.5						
Width/Depth Ratio	12.2							8.4							9.1							6.8						
BF Cross-sectional Area (ft²)	11.9							9.5							2.2							2.0						
BF Max Depth (ft)	1.4							1.9							0.8							1.0						
Width of Floodprone Area (ft)	18.7							18.6							11.1							32.0						
Entrenchment Ratio	1.6							2.1							2.5							8.7						
Bank Height Ratio	1.0							2.9							1.0							1.0						
Wetted Perimeter (ft)	12.6							9.8							4.8							4.2						
Hydraulic Radius (ft)	0.9							1.0							0.5							0.5						
d50 (mm)																												

Stream Reach	Reach 19							Reach 20							Reach 25							Reach 10b						
	Cross-section X-21 (Riffle)							Cross-section X-22 (Riffle)							Cross-section X-23 (Riffle)							Cross-section X-24 (Riffle)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	8.8							3.8							5.1							6.2						
BF Mean Depth (ft)	0.9							0.5							0.6							0.6						
Width/Depth Ratio	10.2							7.0							8.1							11.0						
BF Cross-sectional Area (ft²)	7.6							2.0							3.2							3.5						
BF Max Depth (ft)	1.5							0.8							1.0							1.0						
Width of Floodprone Area (ft)	26.3							12.4							8.1							45.5						
Entrenchment Ratio	3.0							3.3							1.6							7.3						
Bank Height Ratio	1.0							1.0							1.0							1.0						
Wetted Perimeter (ft)	9.4							4.3							5.7							6.6						
Hydraulic Radius (ft)	0.8							0.5							0.6							0.5						
d50 (mm)																												

Table 7. Cross-Section Morphology Data Summary
Russell Gap Restoration Project: DMS Project No ID. 100003

Stream Reach	Reach 12							Reach 2						
	Cross-section X-25 (Riffle)							Cross-section X-26 (Riffle)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation														
BF Width (ft)	9.1							18.5						
BF Mean Depth (ft)	0.6							1.8						
Width/Depth Ratio	16.2							10.2						
BF Cross-sectional Area (ft²)	5.2							33.6						
BF Max Depth (ft)	1.0							2.9						
Width of Floodprone Area (ft)	38.2							38.0						
Entrenchment Ratio	4.2							2.1						
Bank Height Ratio	1.0							1.0						
Wetted Perimeter (ft)	9.4							19.4						
Hydraulic Radius (ft)	0.5							1.7						
d50 (mm)														

FIGURE 3. LONGITUDINAL PROFILES



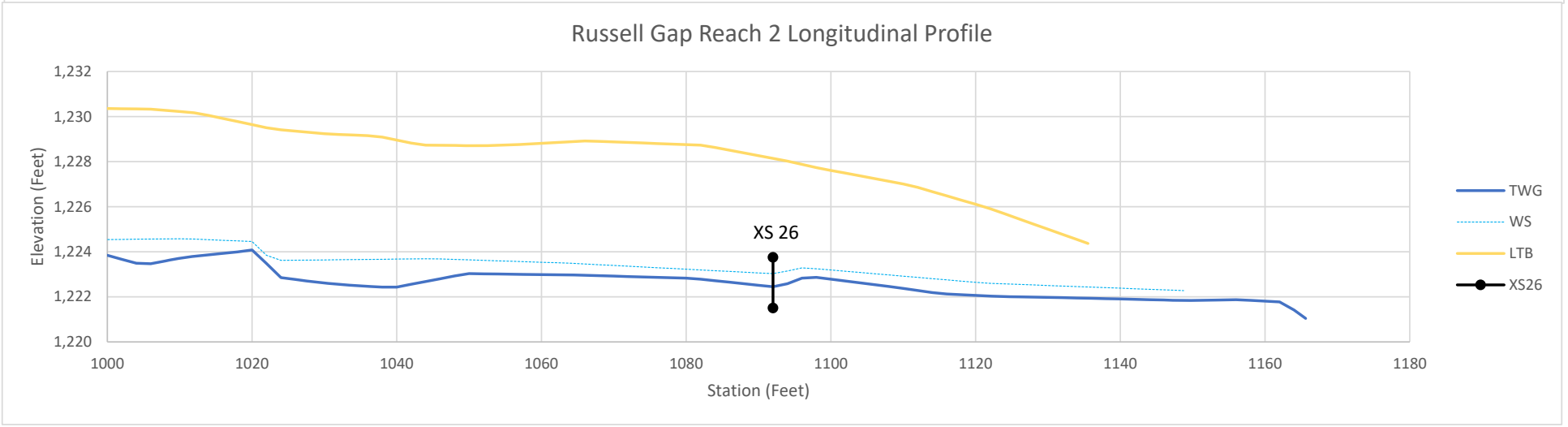
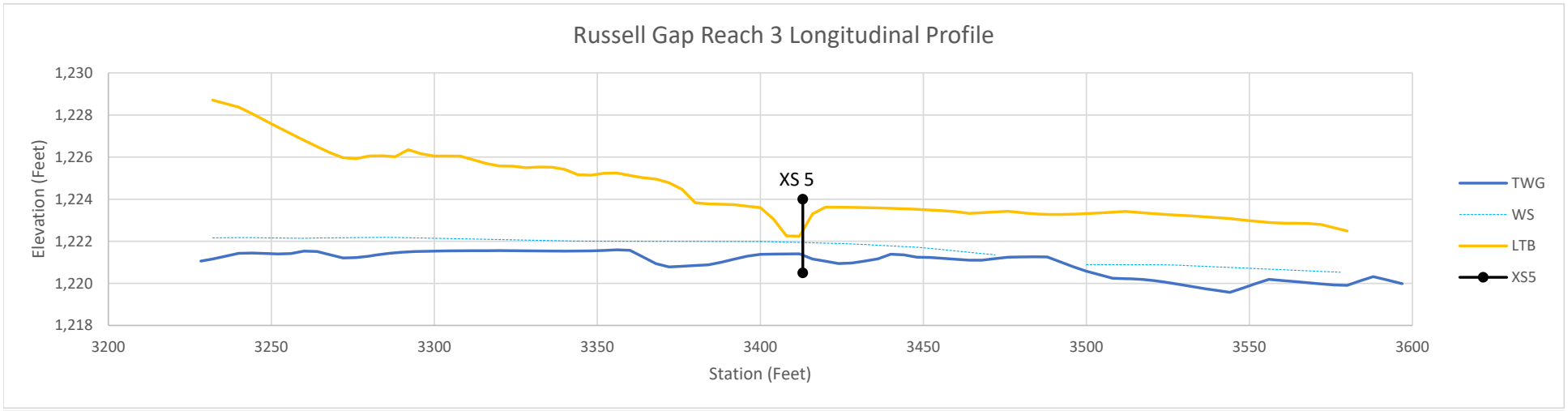


FIGURE 3. LONGITUDINAL PROFILES



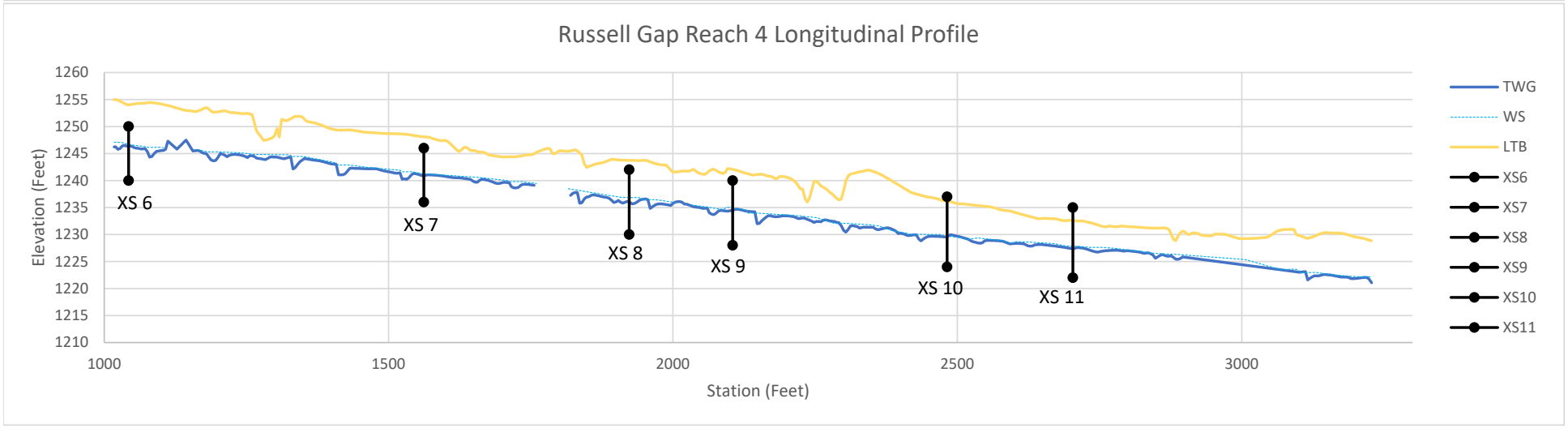
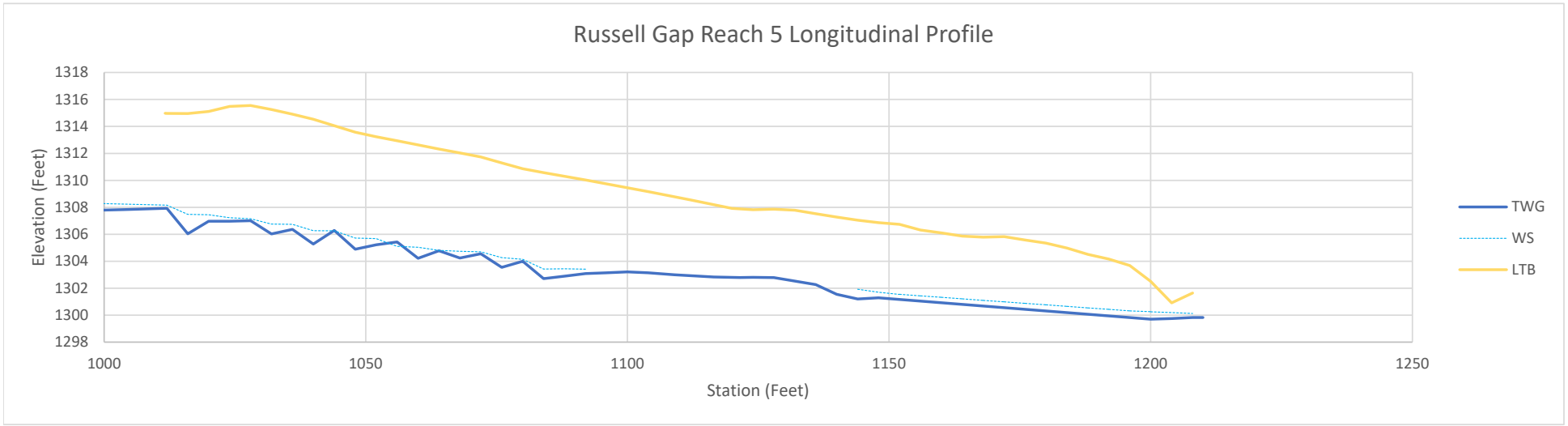


FIGURE 3. LONGITUDINAL PROFILES



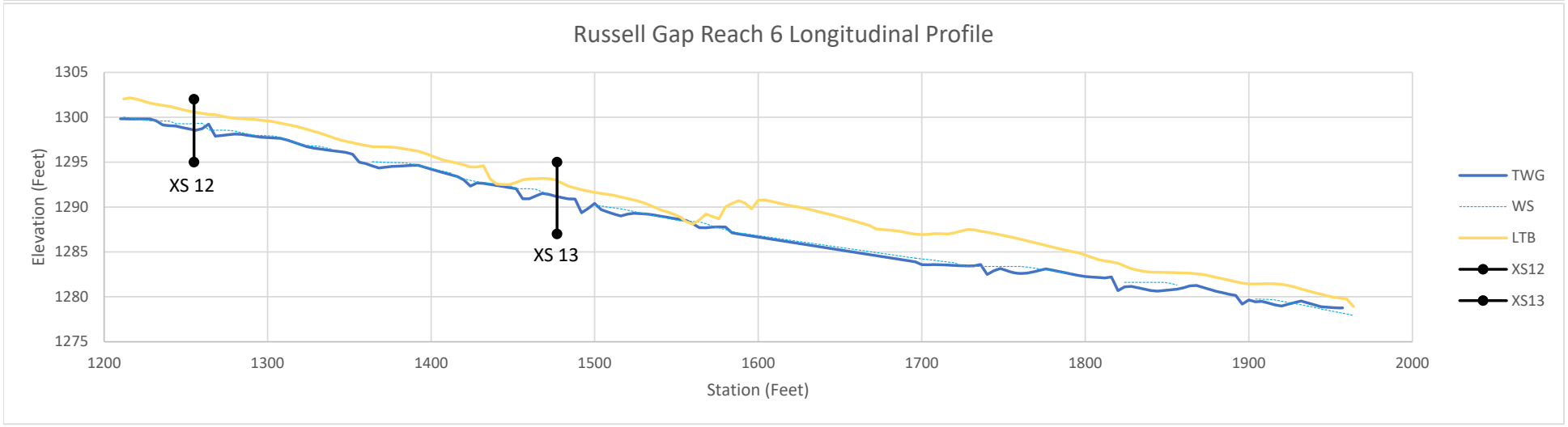
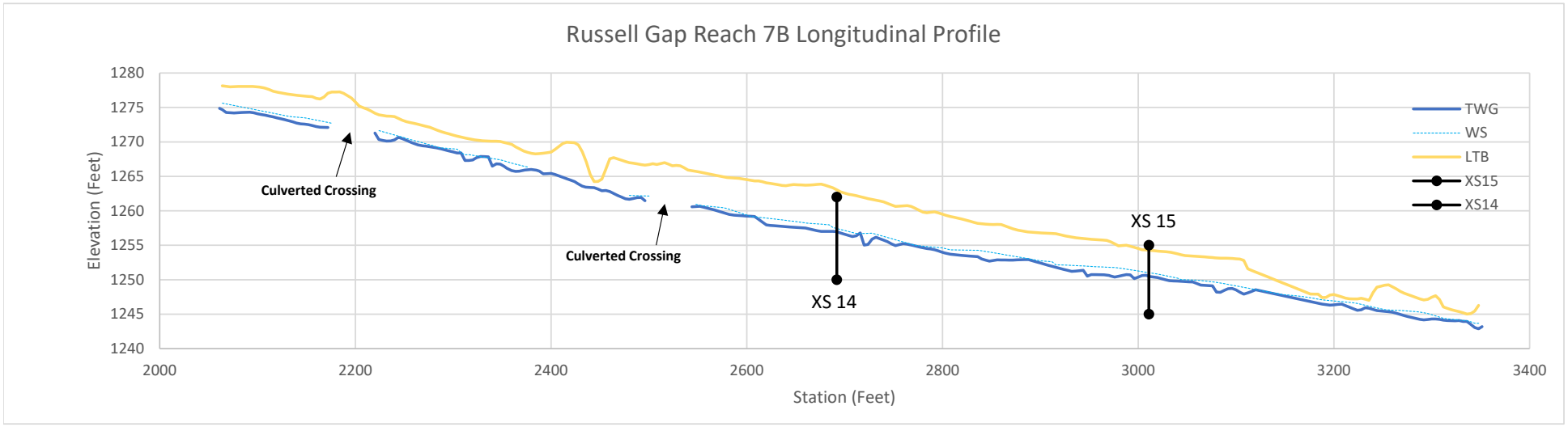


FIGURE 3. LONGITUDINAL PROFILES



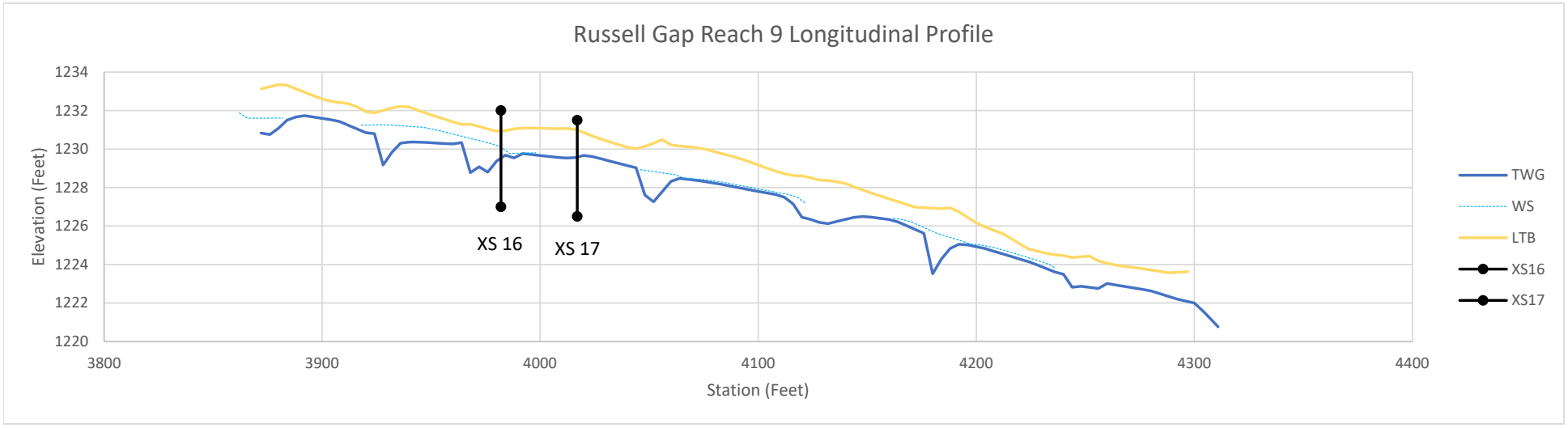


FIGURE 3. LONGITUDINAL PROFILES

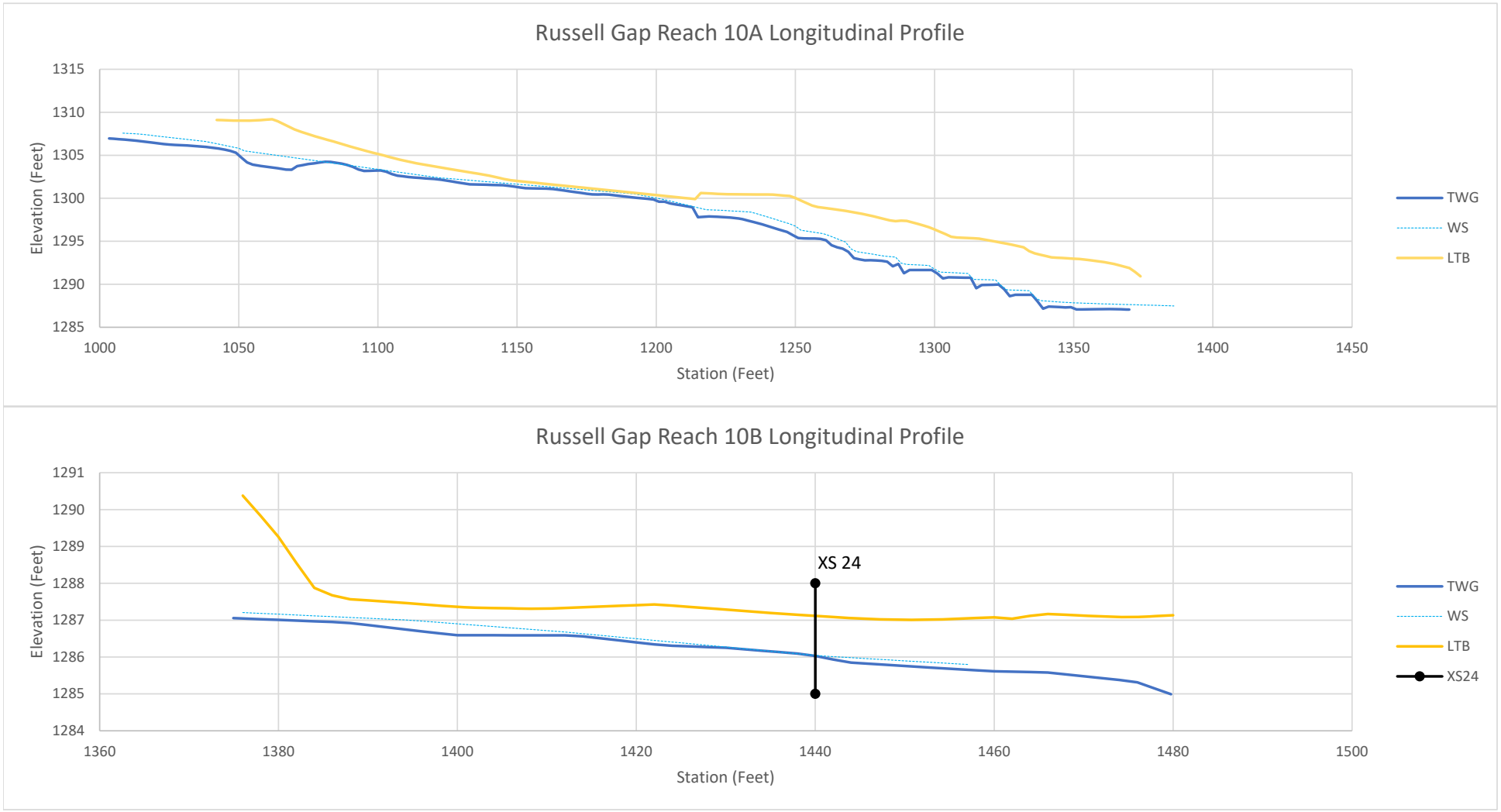
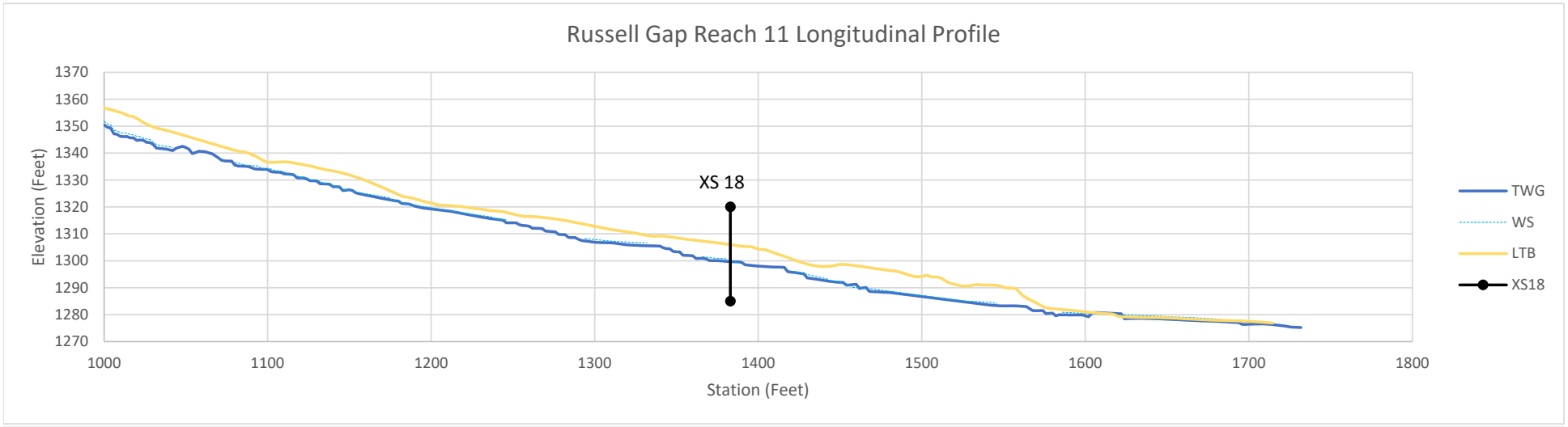


FIGURE 3. LONGITUDINAL PROFILES



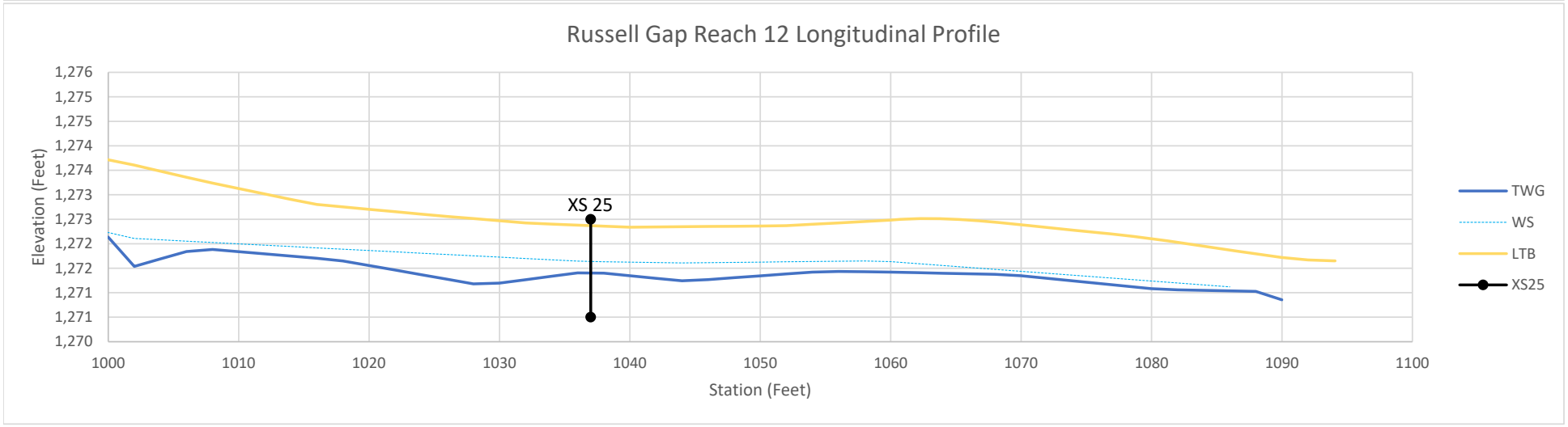
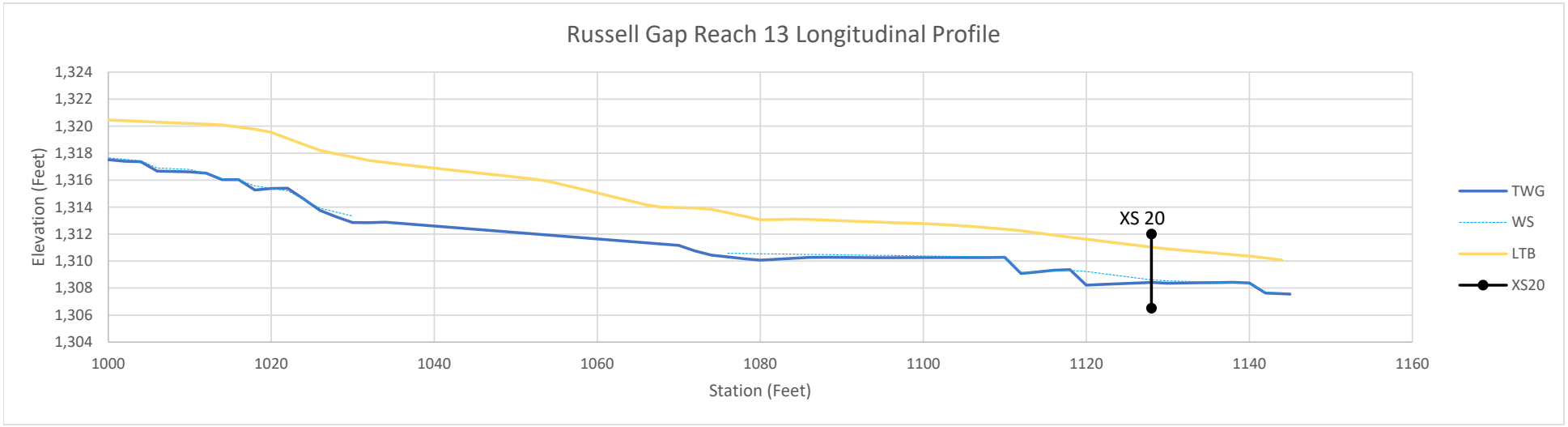


FIGURE 3. LONGITUDINAL PROFILES



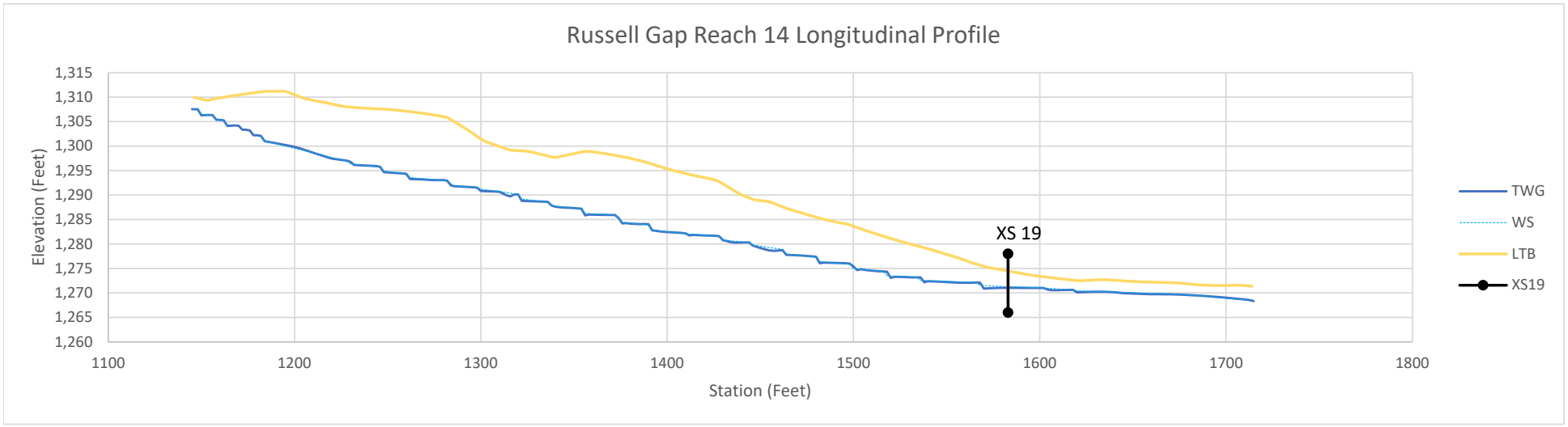
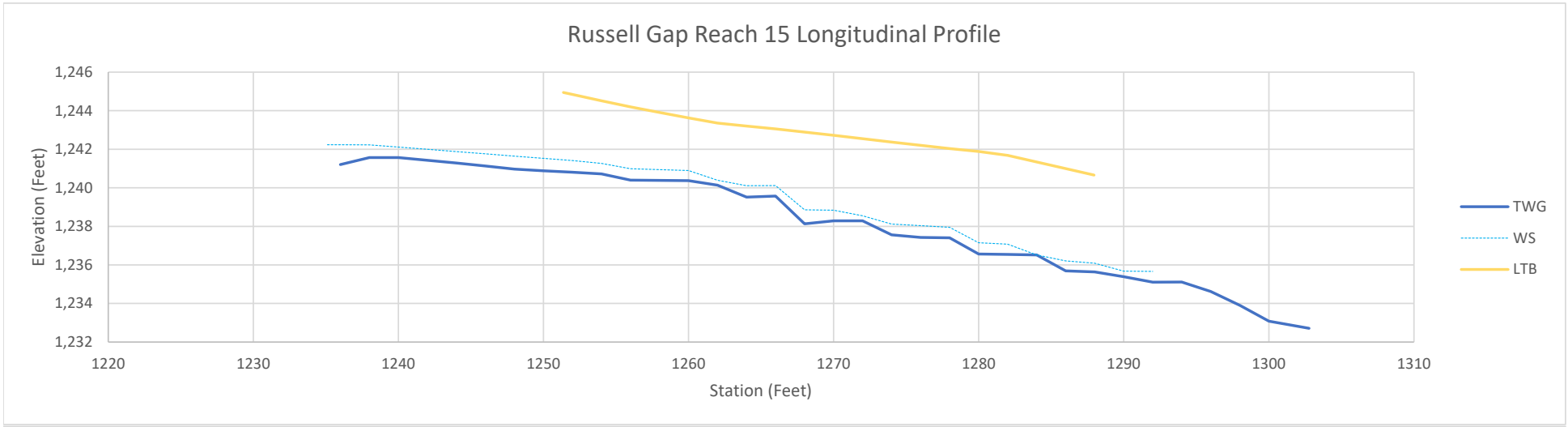


FIGURE 3. LONGITUDINAL PROFILES



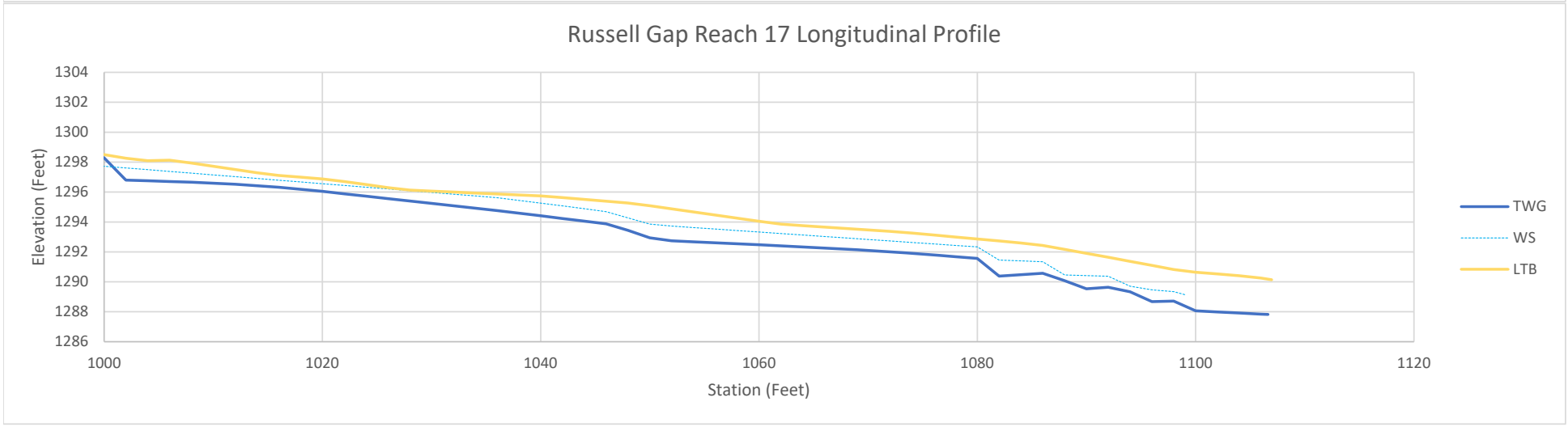
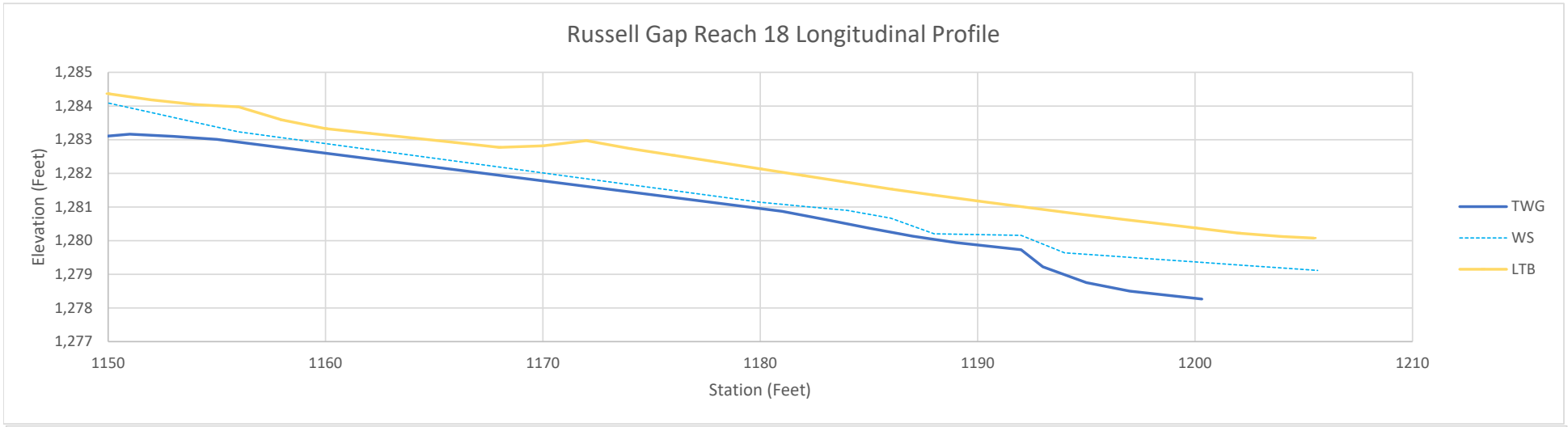


FIGURE 3. LONGITUDINAL PROFILES



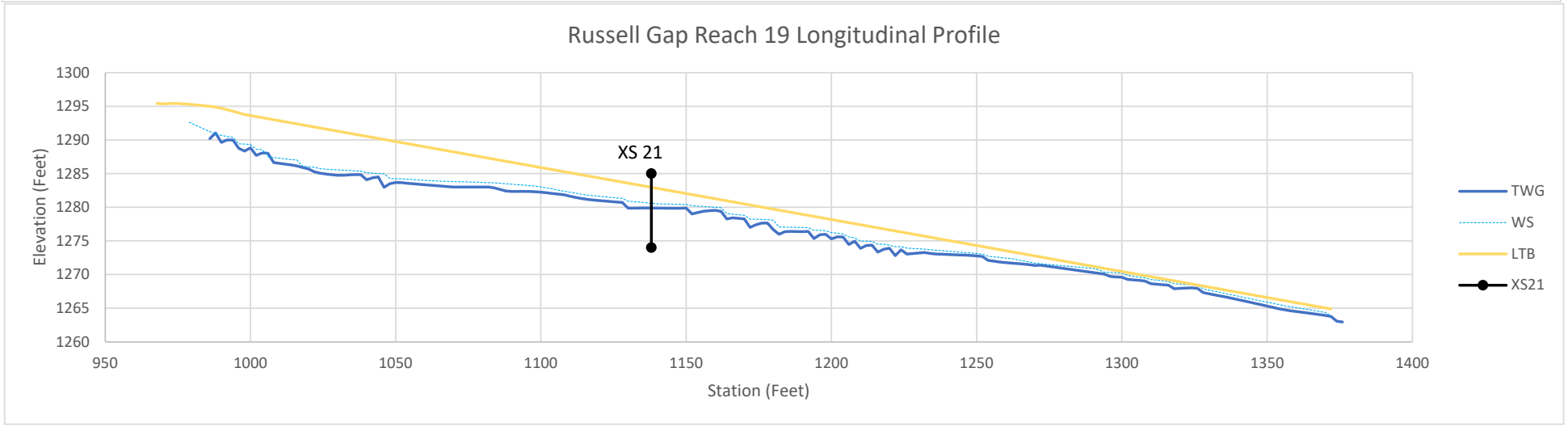


FIGURE 3. LONGITUDINAL PROFILES

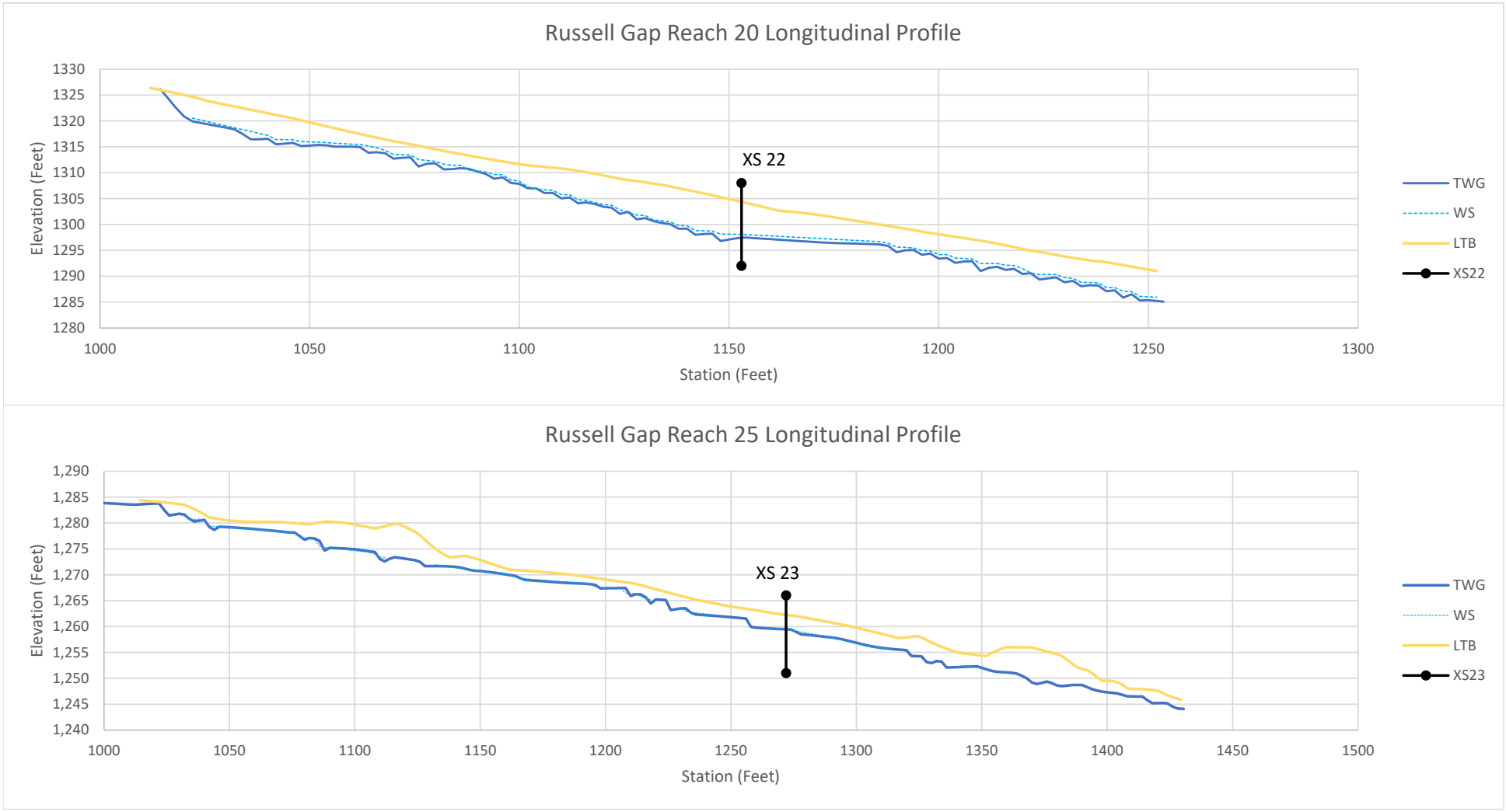
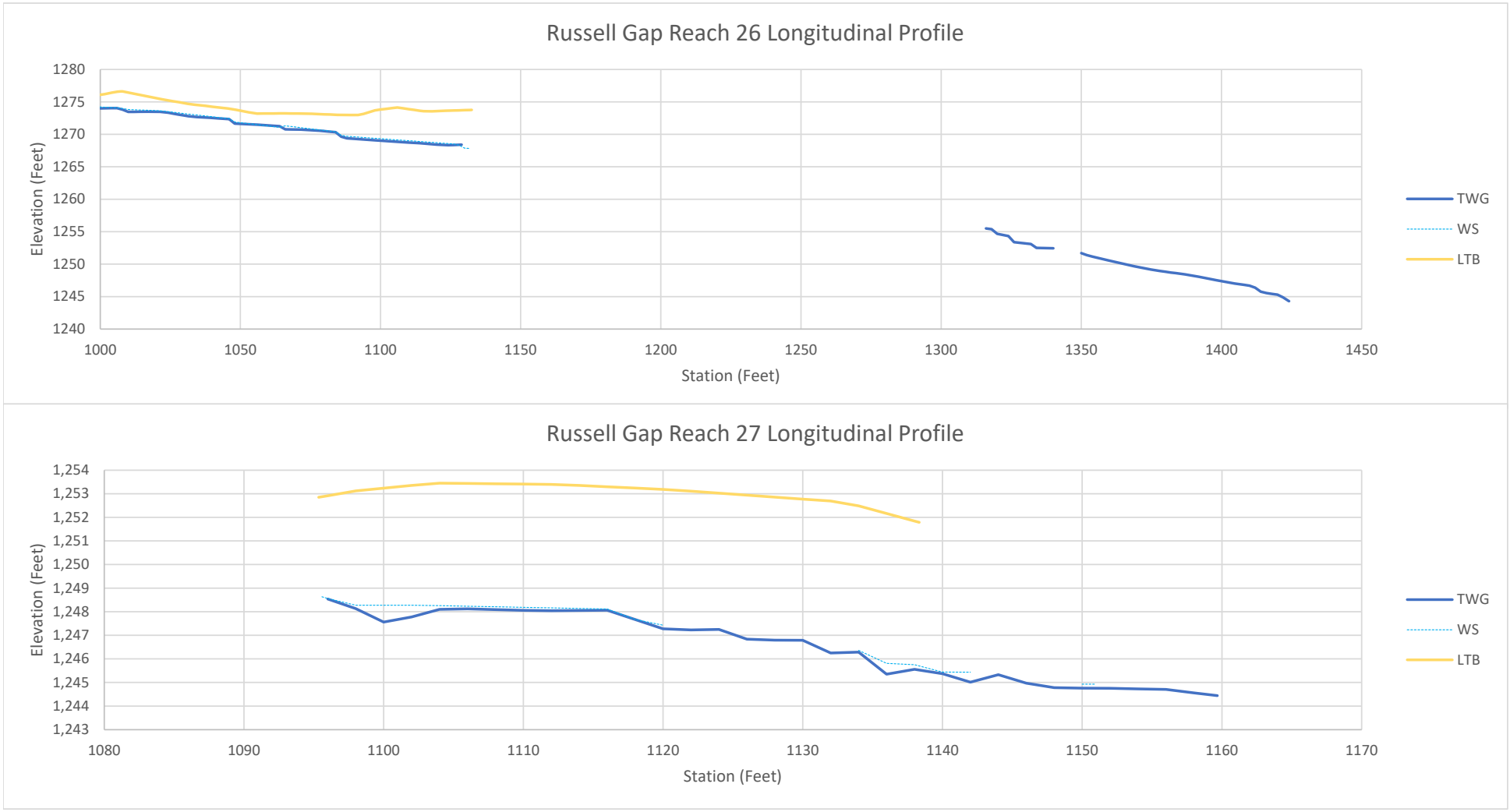


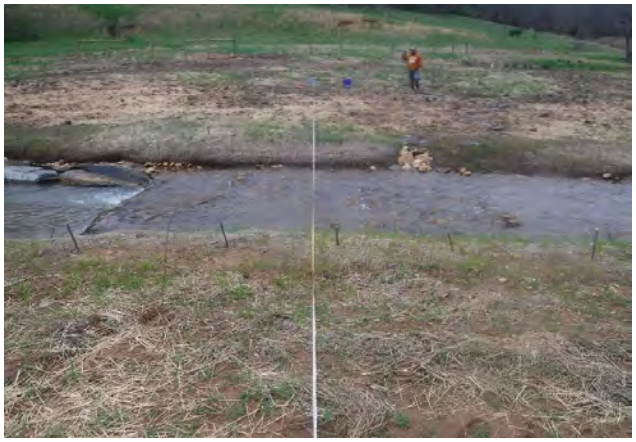
FIGURE 3. LONGITUDINAL PROFILES



Permanent Cross-Section 1

(As-built Survey Data Collected: March 2020)

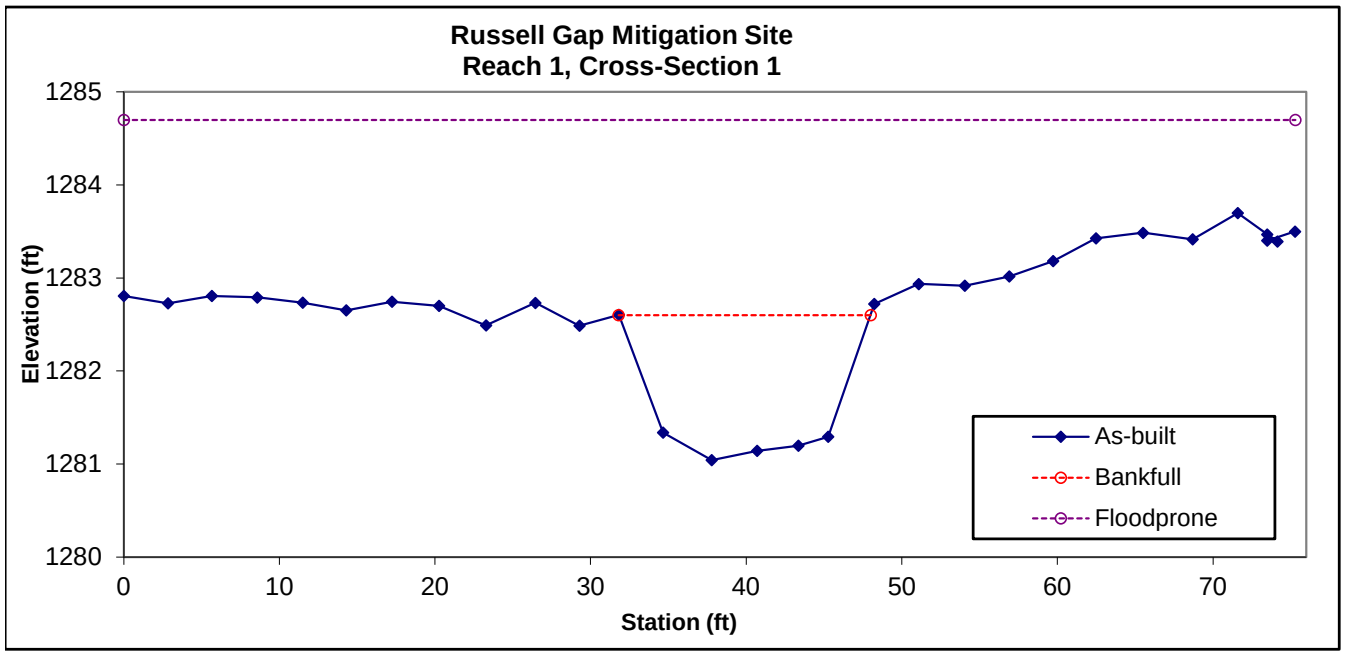
Restoration



Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	18.8	16.2	1.2	1.6	13.9	1.0	4.7	1282.6	1282.6



Permanent Cross-Section 2

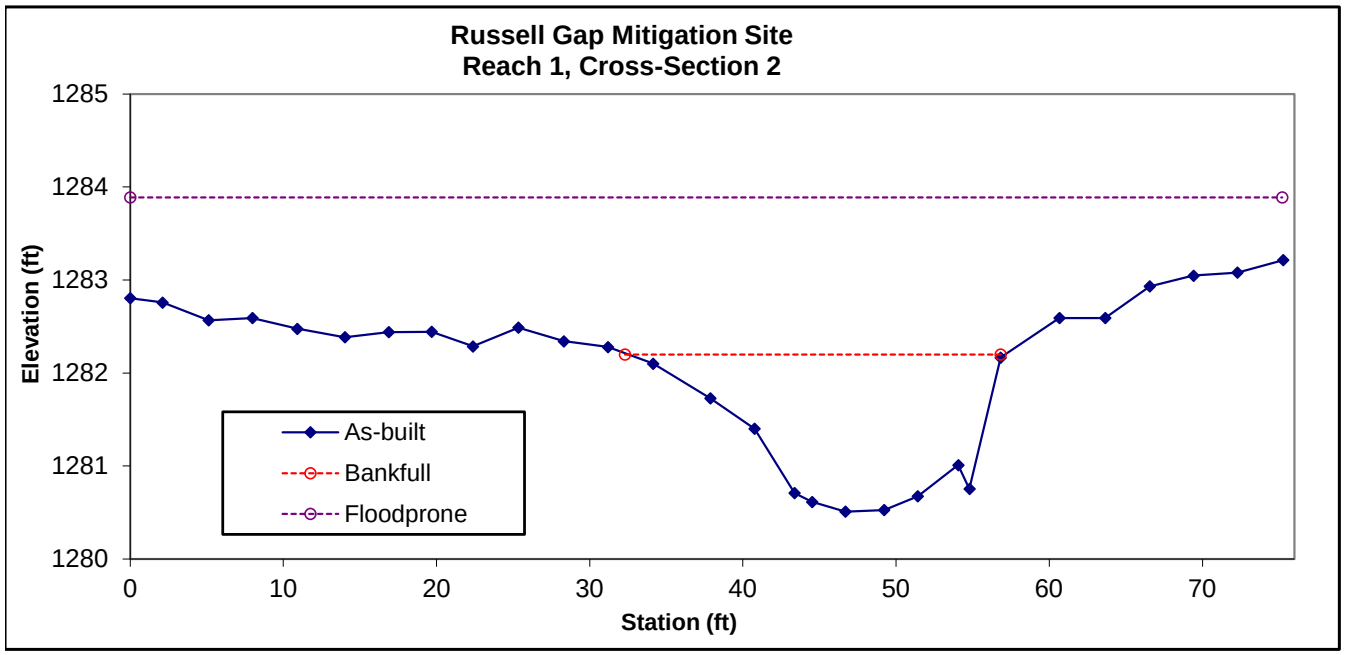
(As-built Survey Data Collected: March 2020)

Restoration

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	25.1	24.6	1	1.7	24.1	--	--	1282.2	1282.2



Permanent Cross-Section 3

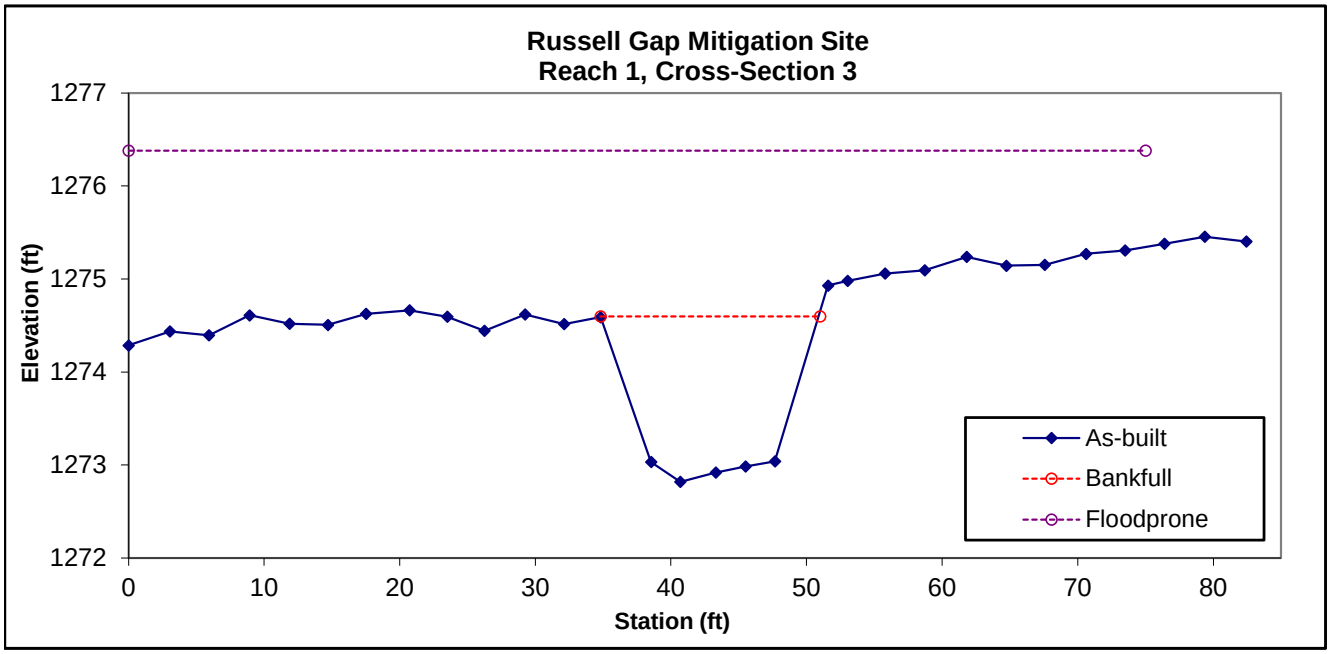
(As-built Survey Data Collected: March 2020)

Restoration

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	20.6	16.1	1.3	1.8	12.5	1.0	5.1	1274.6	1274.6

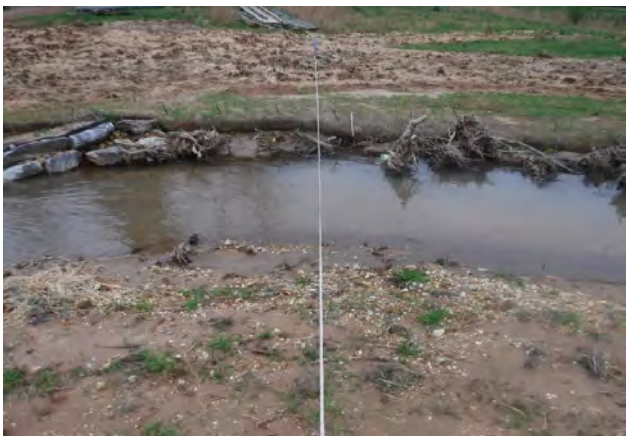


Permanent Cross-Section 4

(As-built Survey Data Collected: March 2020)

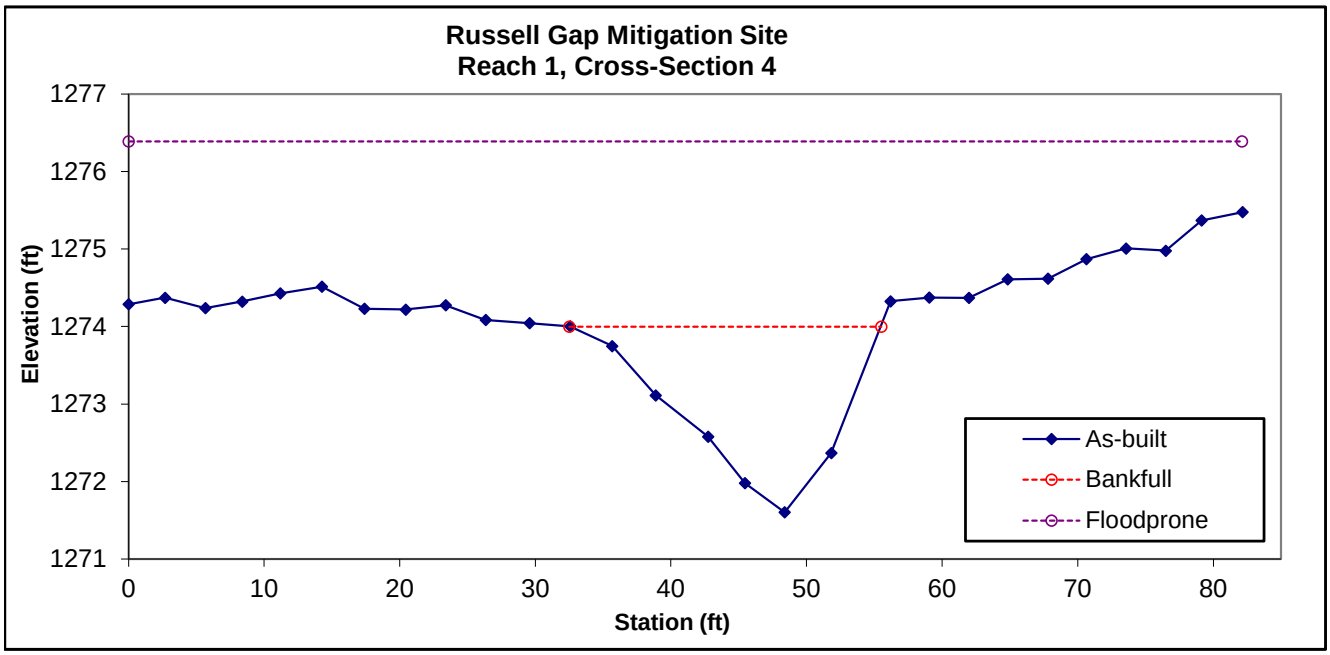
Restoration

Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	27.7	22.9	1.2	2.4	18.9	-	-	1274	1274



Permanent Cross-Section 5

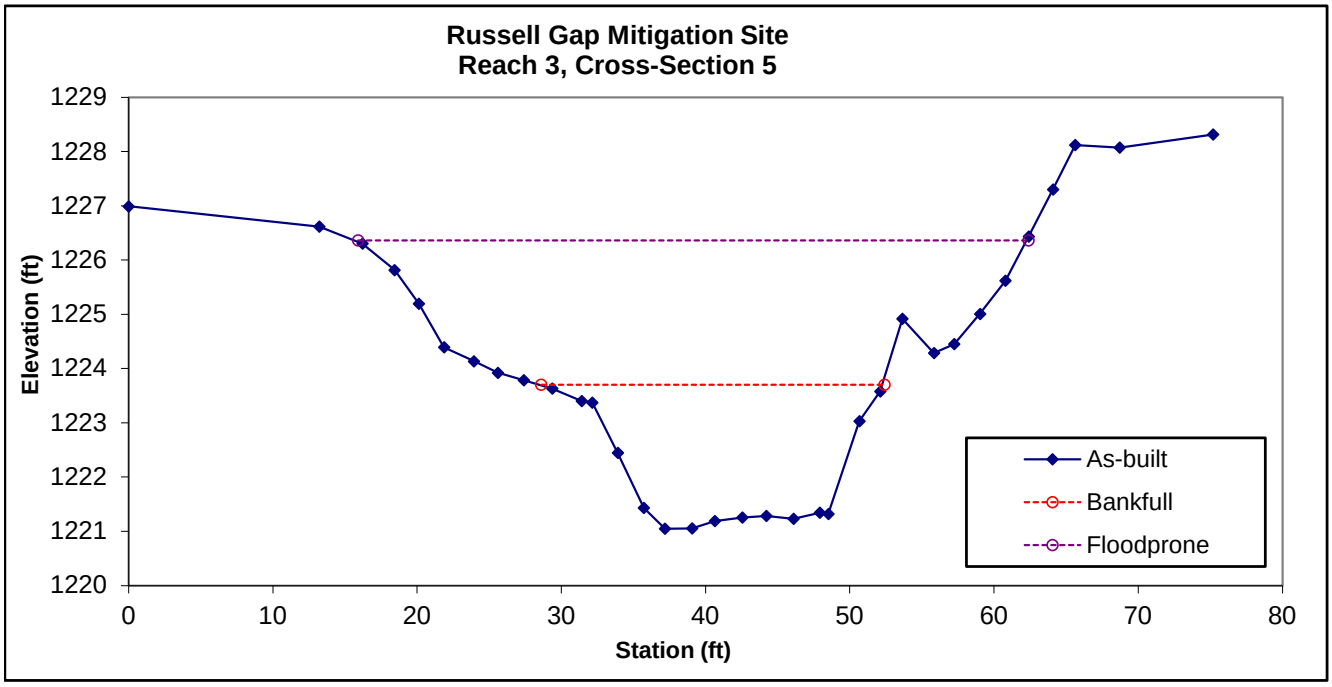
(As-built Survey Data Collected: March 2020)

Restoration

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	40.9	23.8	1.7	2.7	13.8	1.0	2	1223.70	1223.70

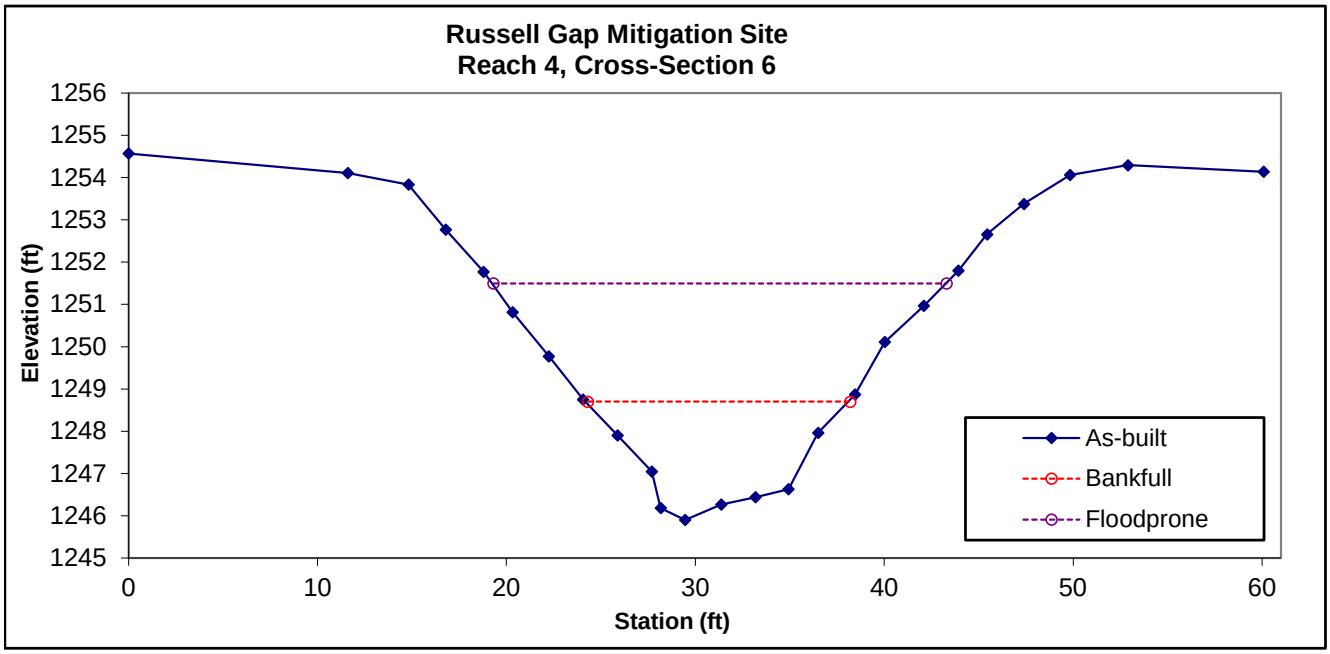


Permanent Cross-Section 6
(As-built Survey Data Collected: March 2020)
Enhancement 1

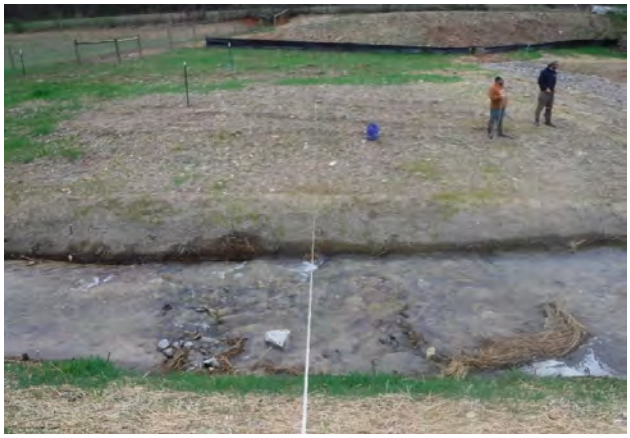
Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	23.1	13.9	1.7	2.8	8.4	1.0	1.7	1248.7	1248.75



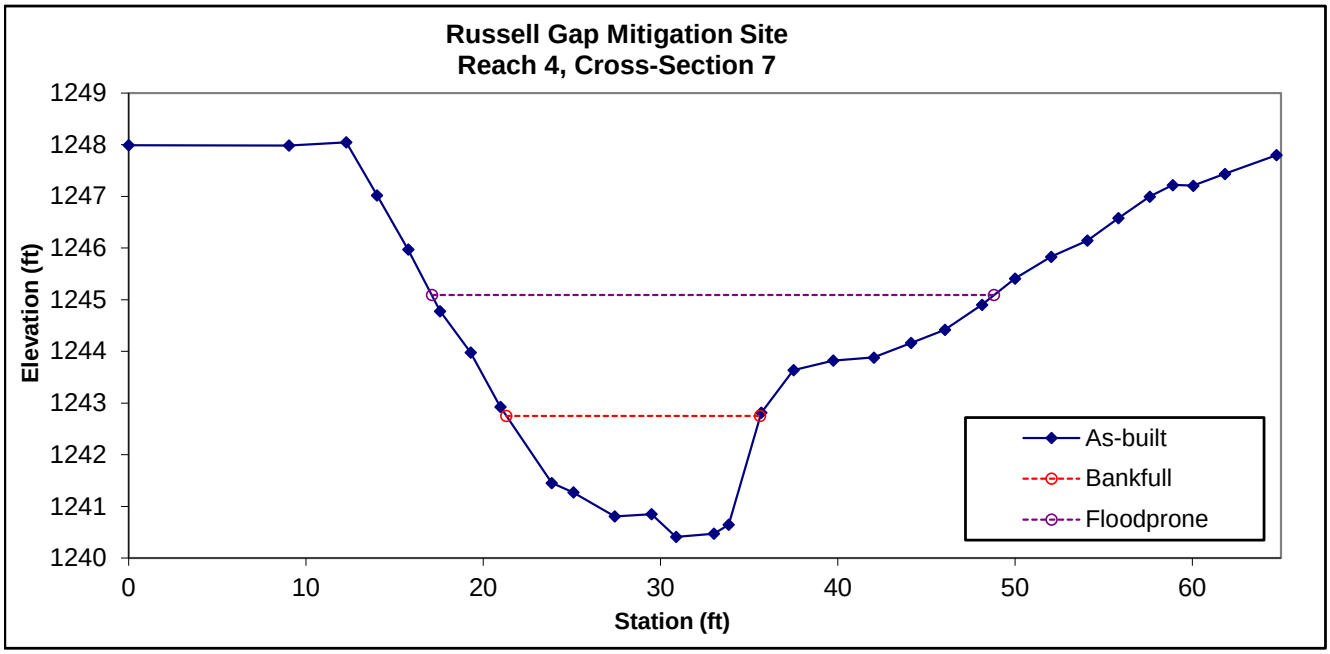
Permanent Cross-Section 7
(As-built Survey Data Collected: March 2020)
Enhancement 1



Looking at the Left Bank

Looking at the Right Bank

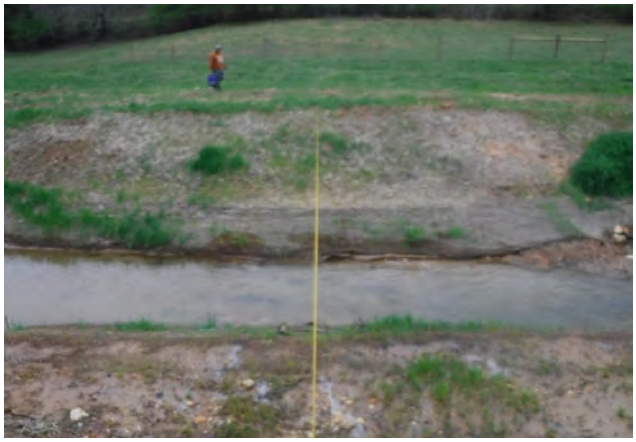
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	22.9	14.3	1.6	2.3	9	1.0	2.2	1242.75	1242.82



Permanent Cross-Section 8

(As-built Survey Data Collected: March 2020)

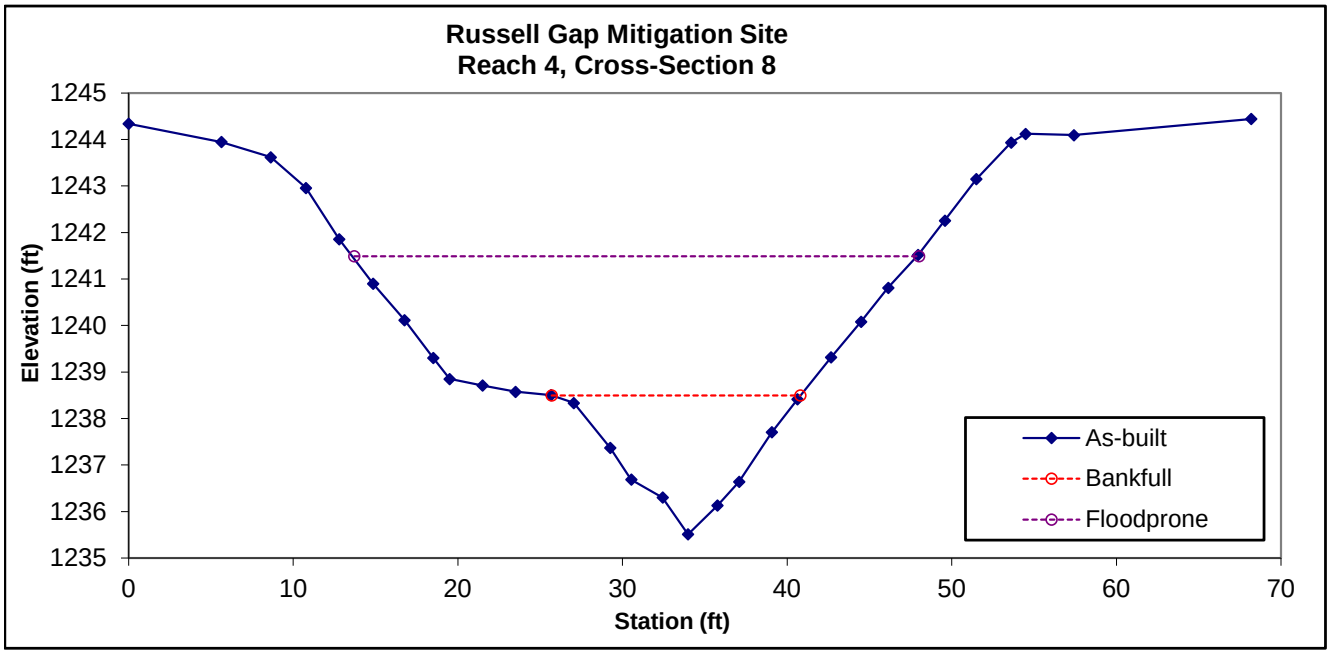
Enhancement 1



Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	22.1	15.1	1.5	3	10.3	1.0	2.3	1238.5	1238.4



Permanent Cross-Section 9

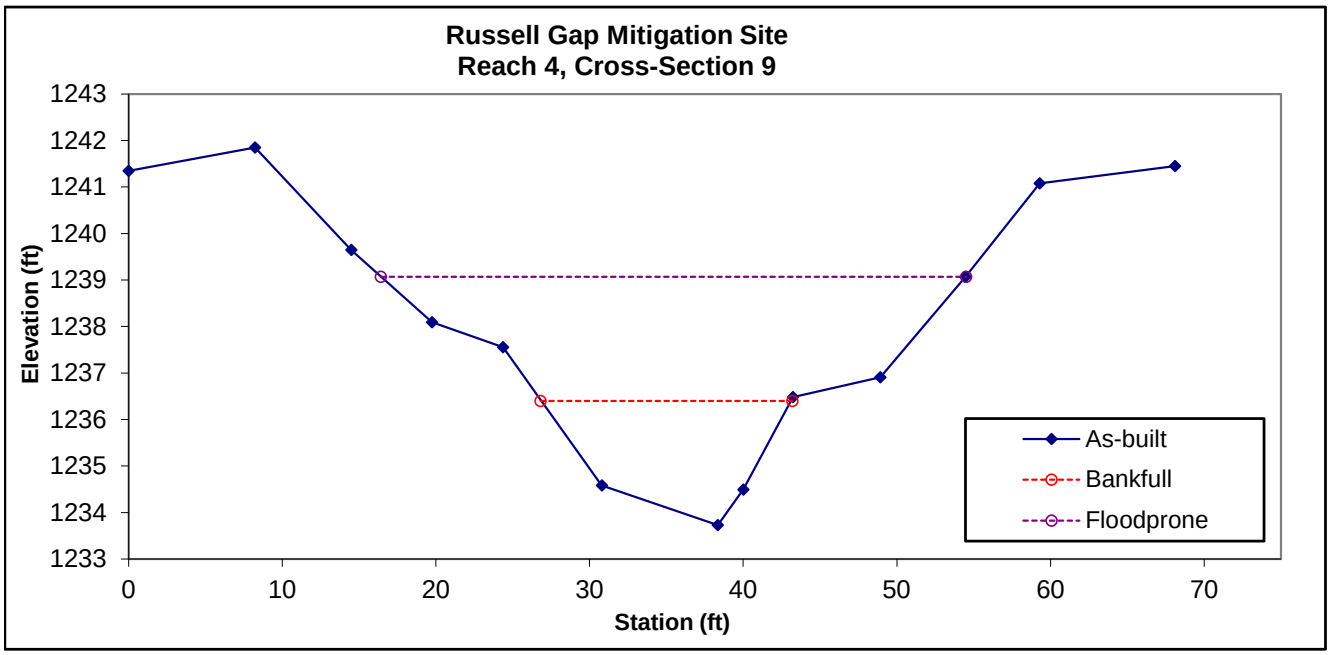
(As-built Survey Data Collected: March 2020)

Enhancement 1

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	27.2	16.2	1.7	2.7	9.7	1.0	2.3	1236.4	1236.5

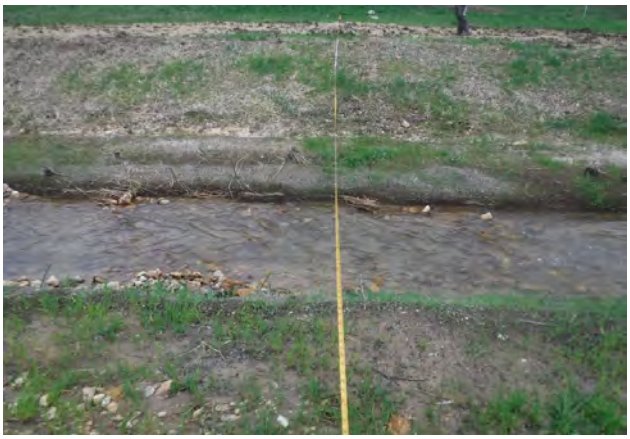


Permanent Cross-Section 10

(As-built Survey Data Collected: March 2020)

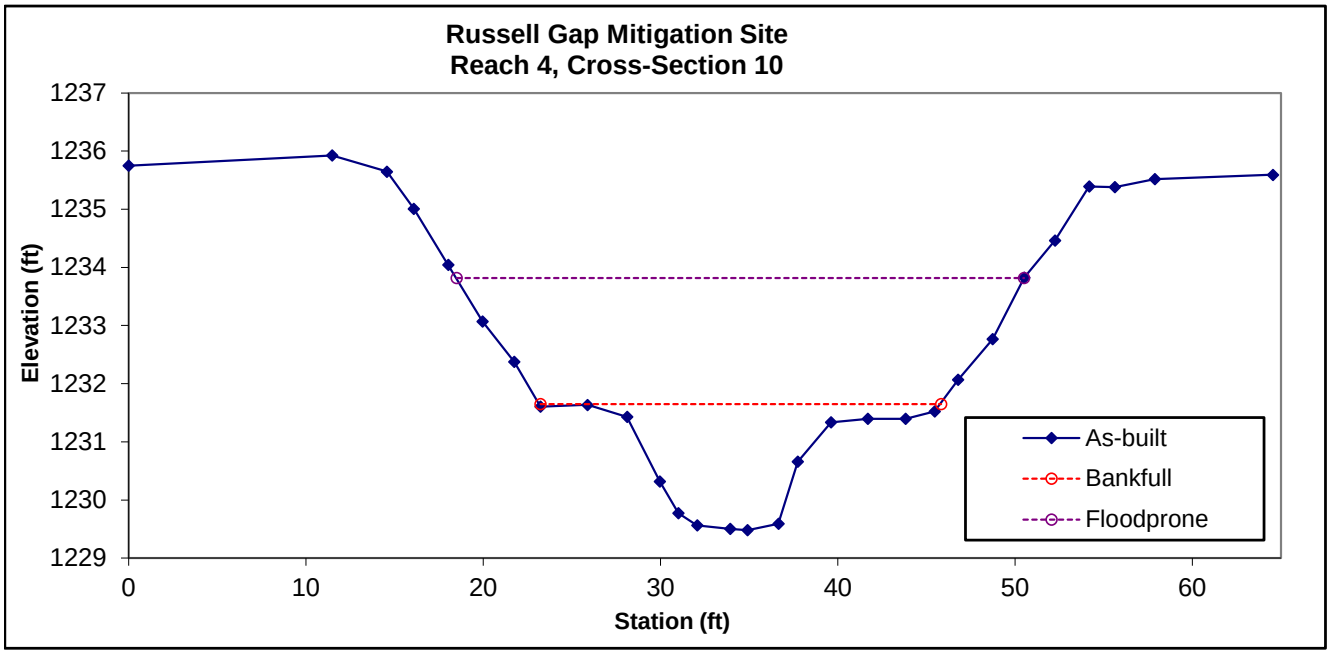
Enhancement 1

Looking at the Left Bank



Looking at the Right Bank

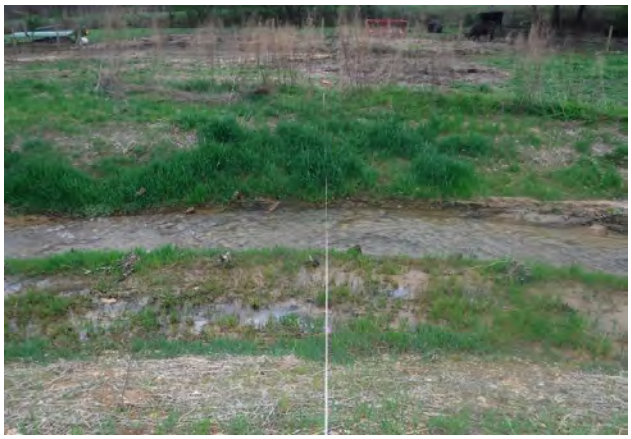
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	19.6	22.6	0.9	2.2	26.1	1.0	1.4	1231.65	1261.65



Permanent Cross-Section 11

(As-built Survey Data Collected: March 2020)

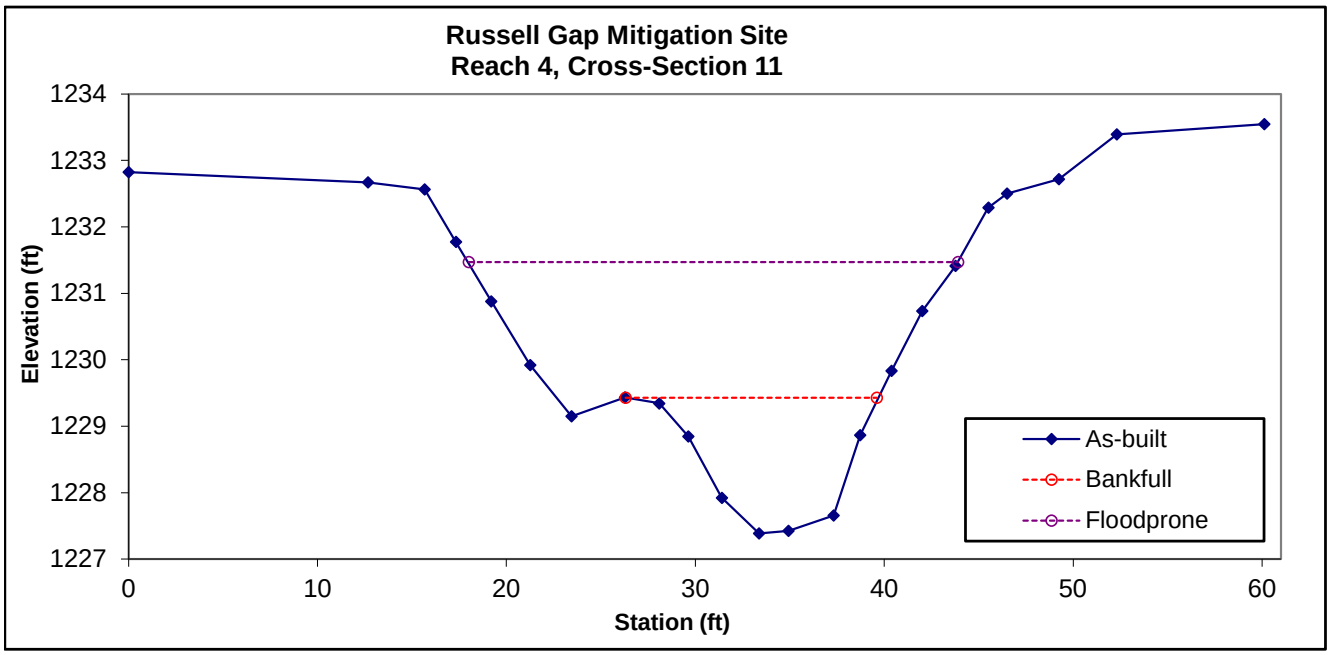
Enhancement 1



Looking at the Left Bank

Looking at the Right Bank

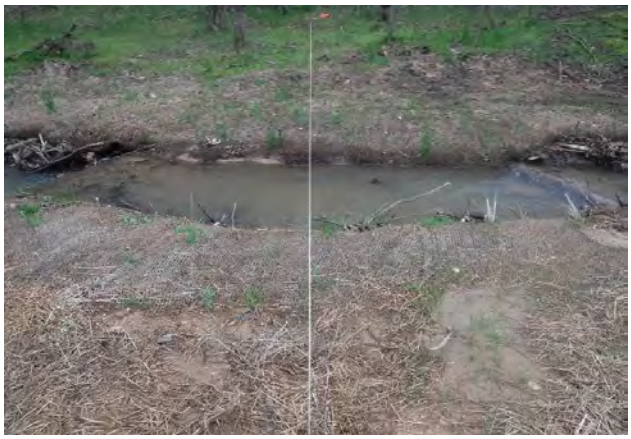
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	15.5	13.3	1.2	2	11.4	1.0	1.9	1229.43	1229.43



Permanent Cross-Section 12

(As-built Survey Data Collected: March 2020)

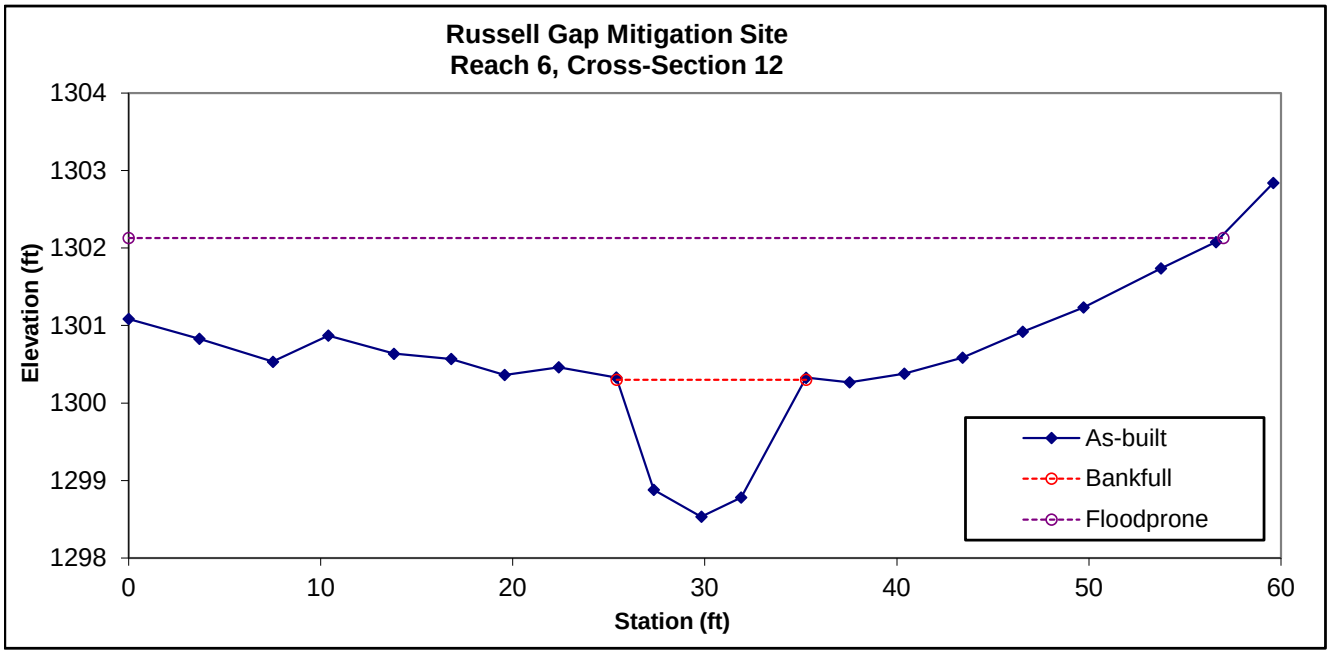
Restoration



Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	11.5	9.9	1.2	1.8	8.5	--	--	1300.3	1300.3



Permanent Cross-Section 13

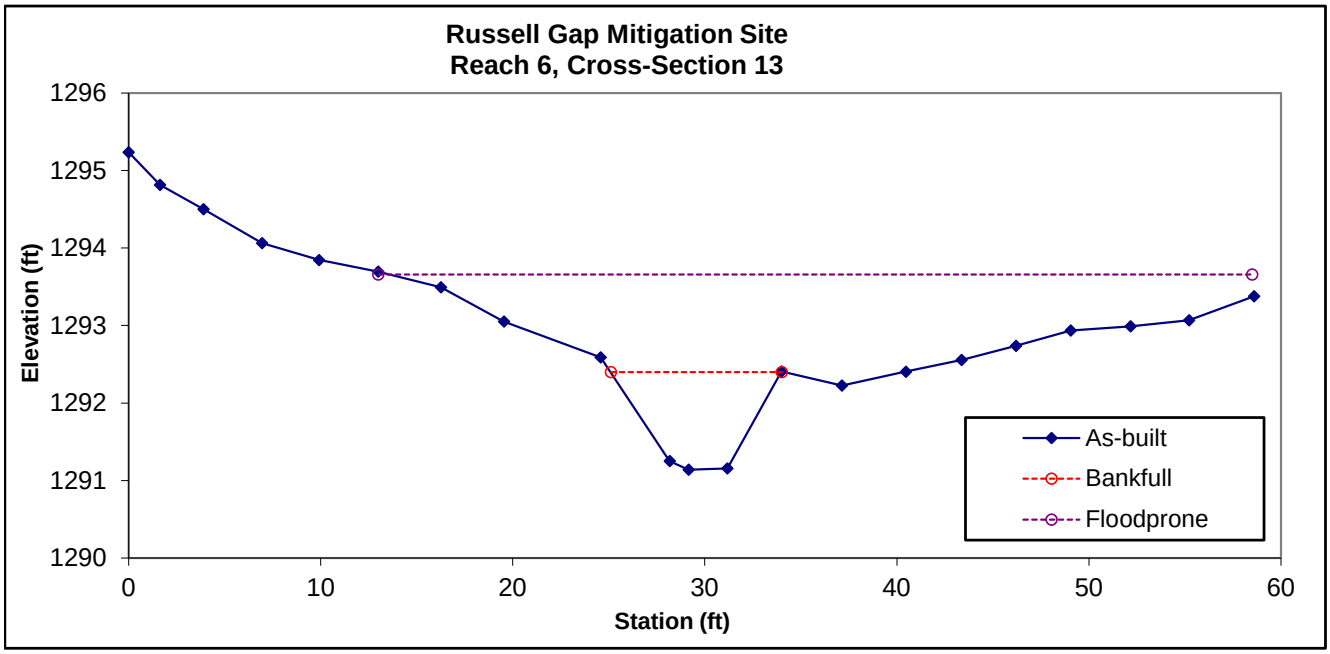
(As-built Survey Data Collected: March 2020)

Restoration

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	7.2	8.9	0.8	1.3	10.9	1.0	5.1	1292.4	1292.4

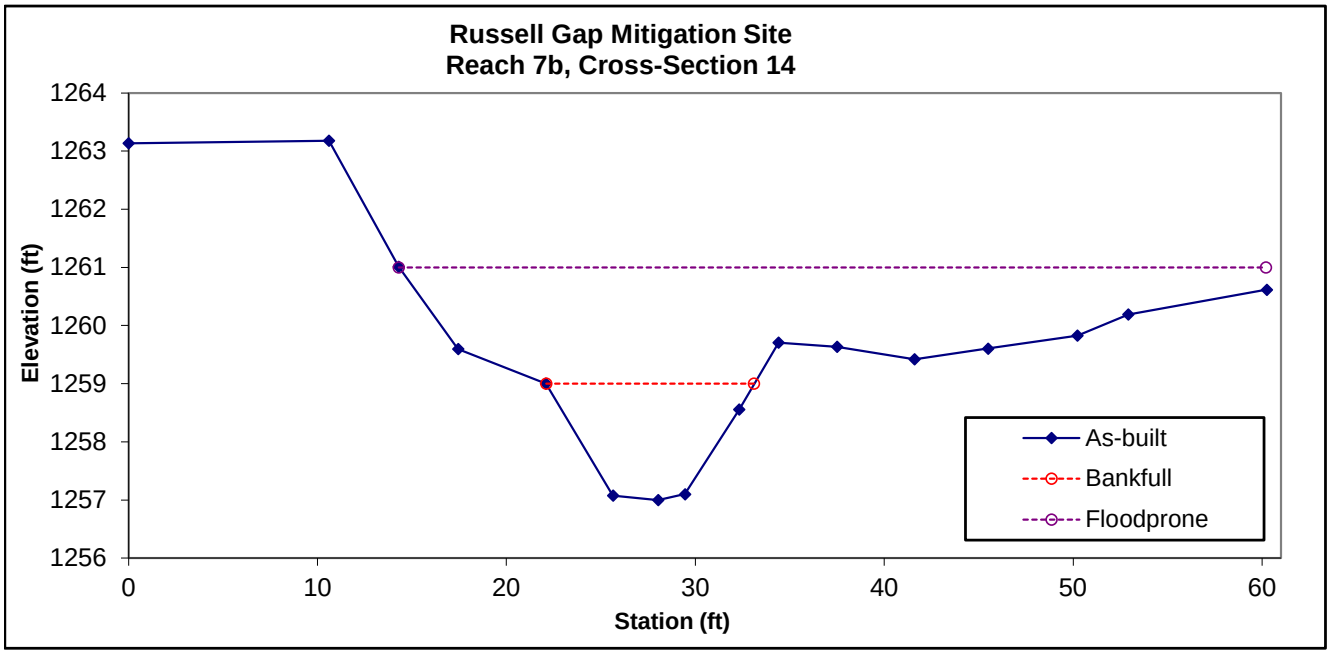


Permanent Cross-Section 14
(As-built Survey Data Collected: March 2020)
Enhancement 1

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	14.4	11	1.3	2	8.4	1.0	3.7	1259	1259



Permanent Cross-Section 15

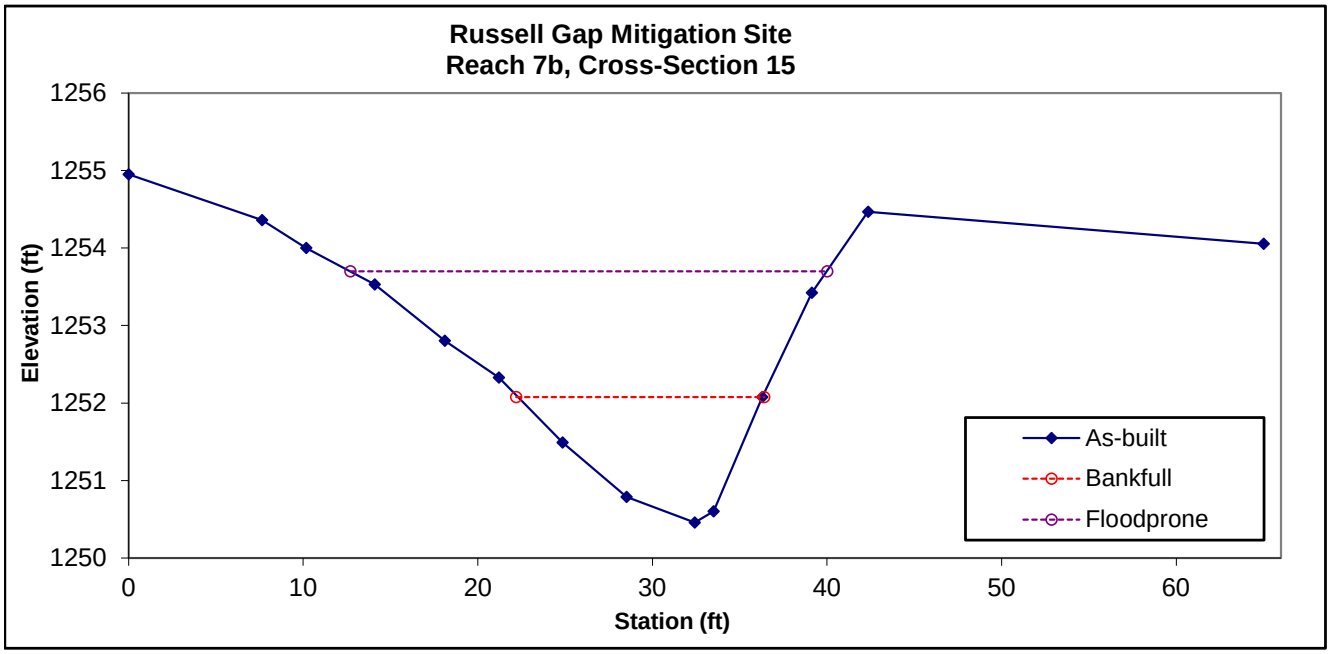
(As-built Survey Data Collected: March 2020)

Enhancement 1

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	13.6	14	1.0	1.6	14.4	--	--	1252.08	1254.4



Permanent Cross-Section 16

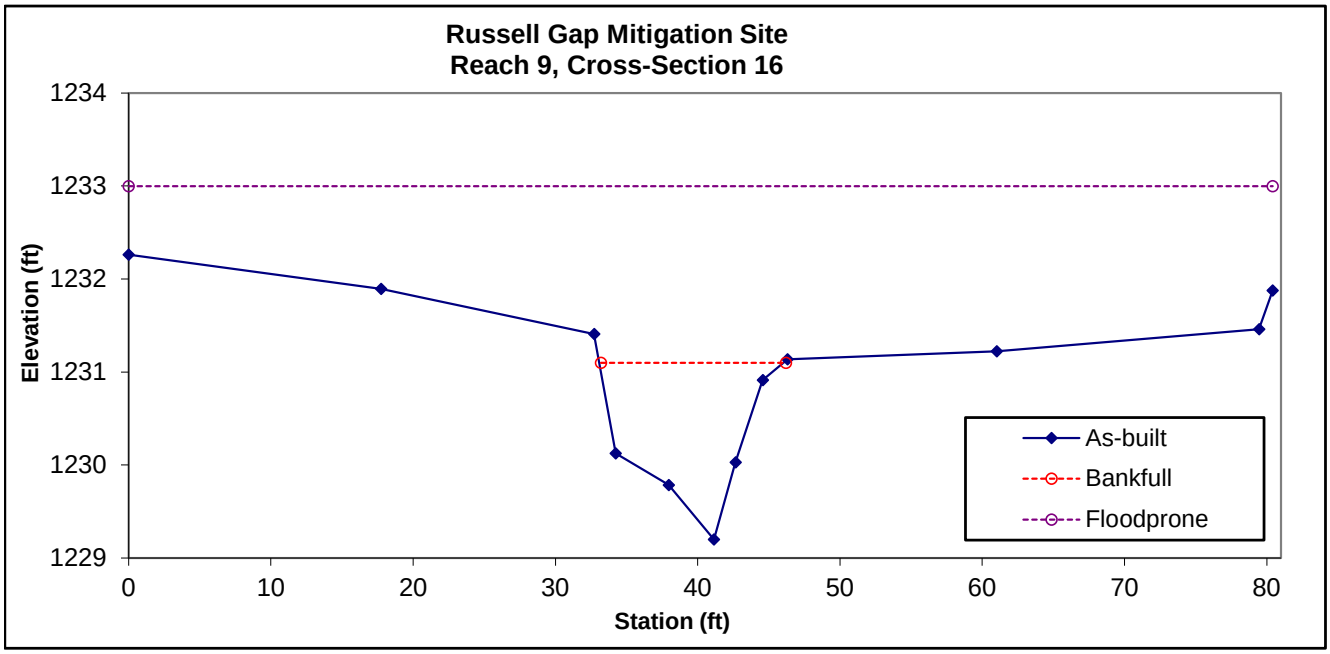
(As-built Survey Data Collected: March 2020)

Restoration

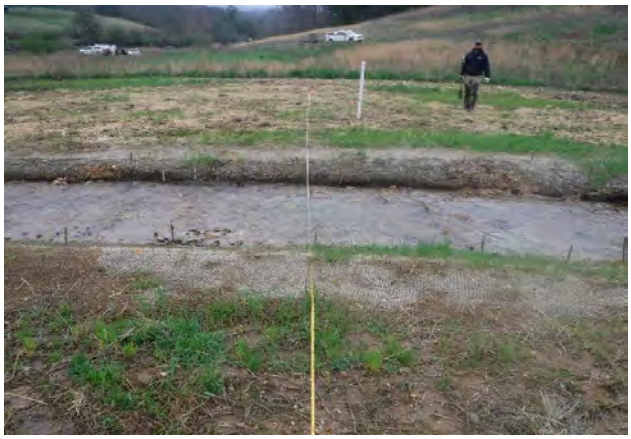
Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	--	13.5	12.9	1.0	1.9	12.4	--	--	1231.1	1231.1



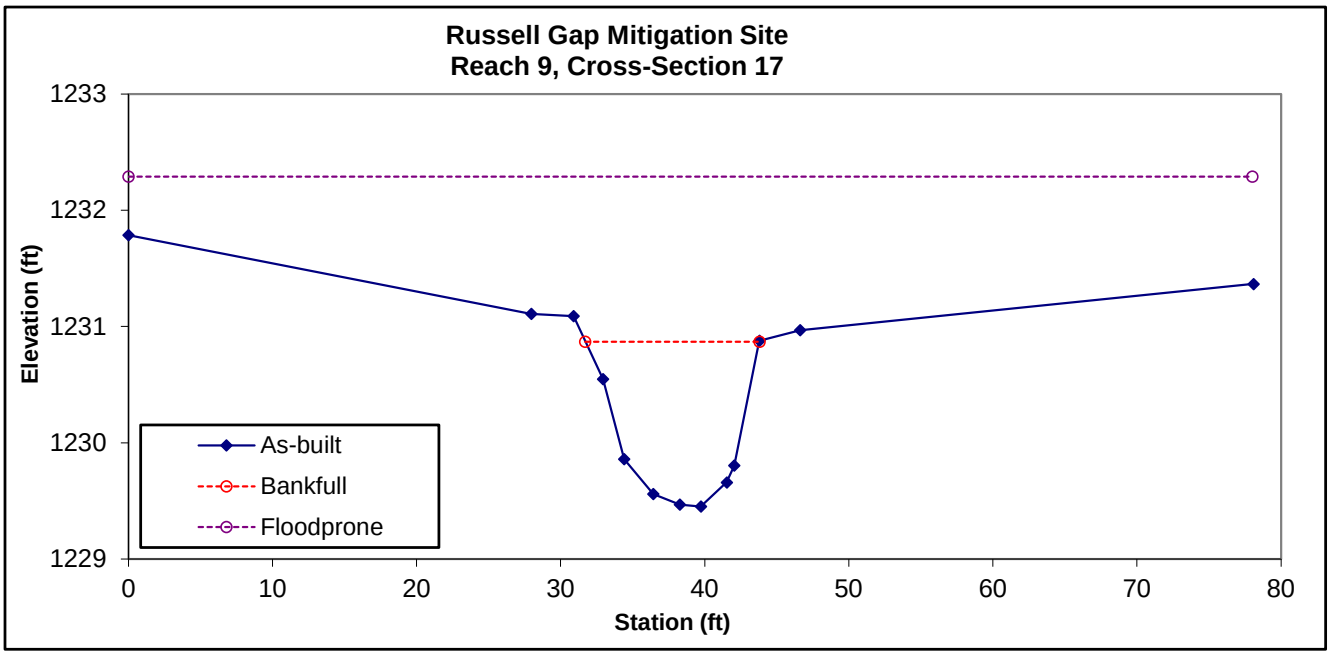
Permanent Cross-Section 17
(As-built Survey Data Collected: March 2020)
Restoration



Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	11.9	12.1	1.0	1.4	12.2	1.0	1.6	1230.87	1230.87



Permanent Cross-Section 18

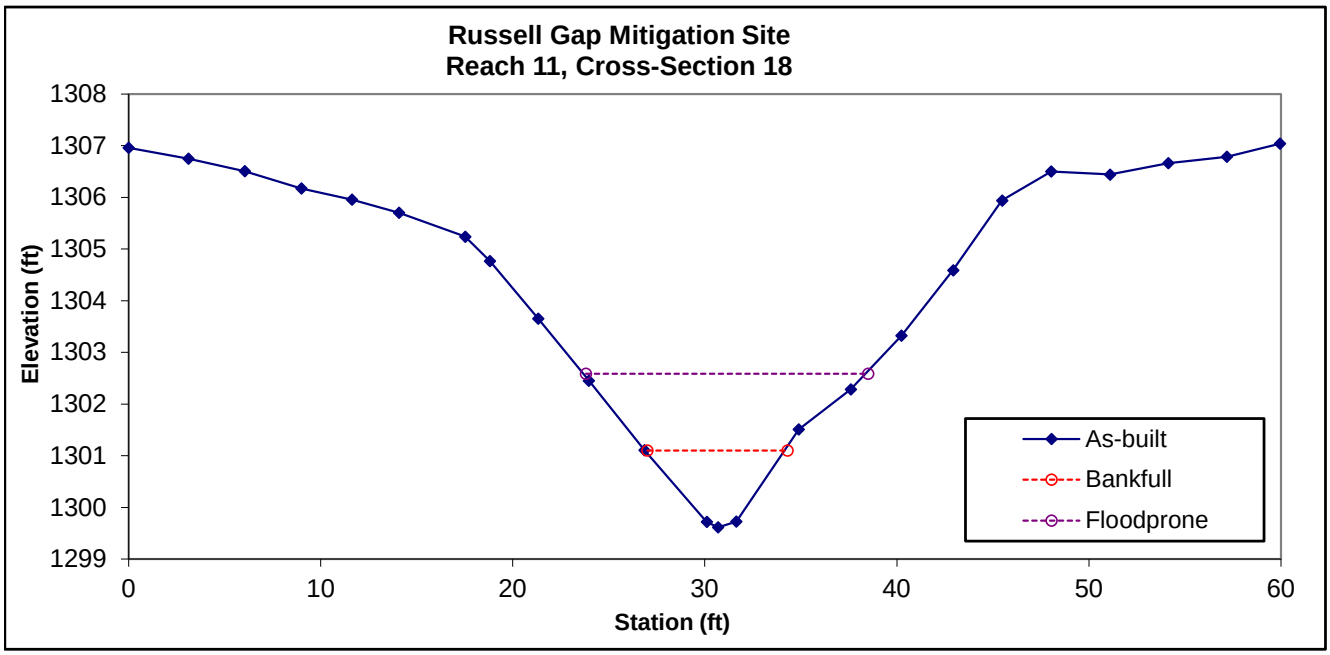
(As-built Survey Data Collected: March 2020)

Enhancement 1

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	6.1	7.3	0.8	1.5	8.6	1.3	2	1301.1	1301.5



Permanent Cross-Section 19

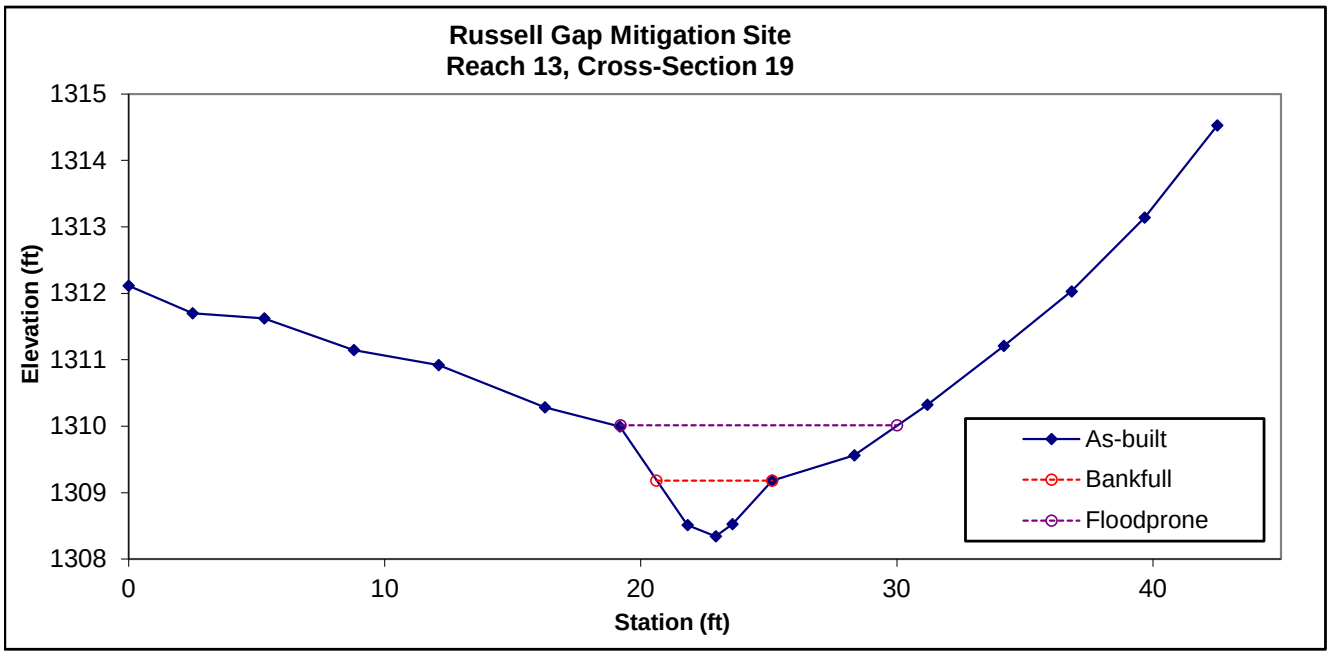
(As-built Survey Data Collected: March 2020)

Enhancement 1

Looking at the Left Bank

Looking at the Right Bank

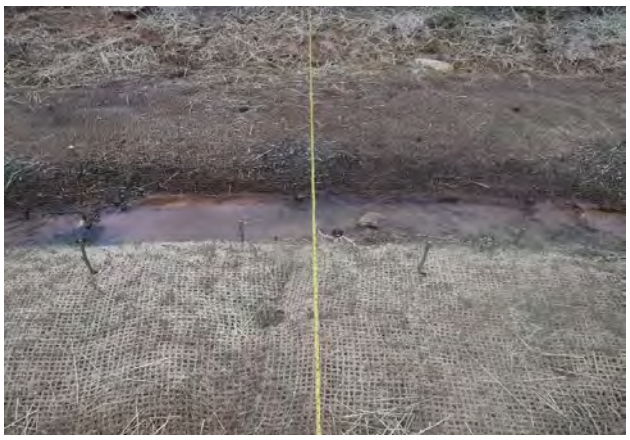
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	2.2	4.5	0.5	0.8	9.1	1.0	2.5	1309.18	1309.2



Permanent Cross-Section 20

(As-built Survey Data Collected: March 2020)

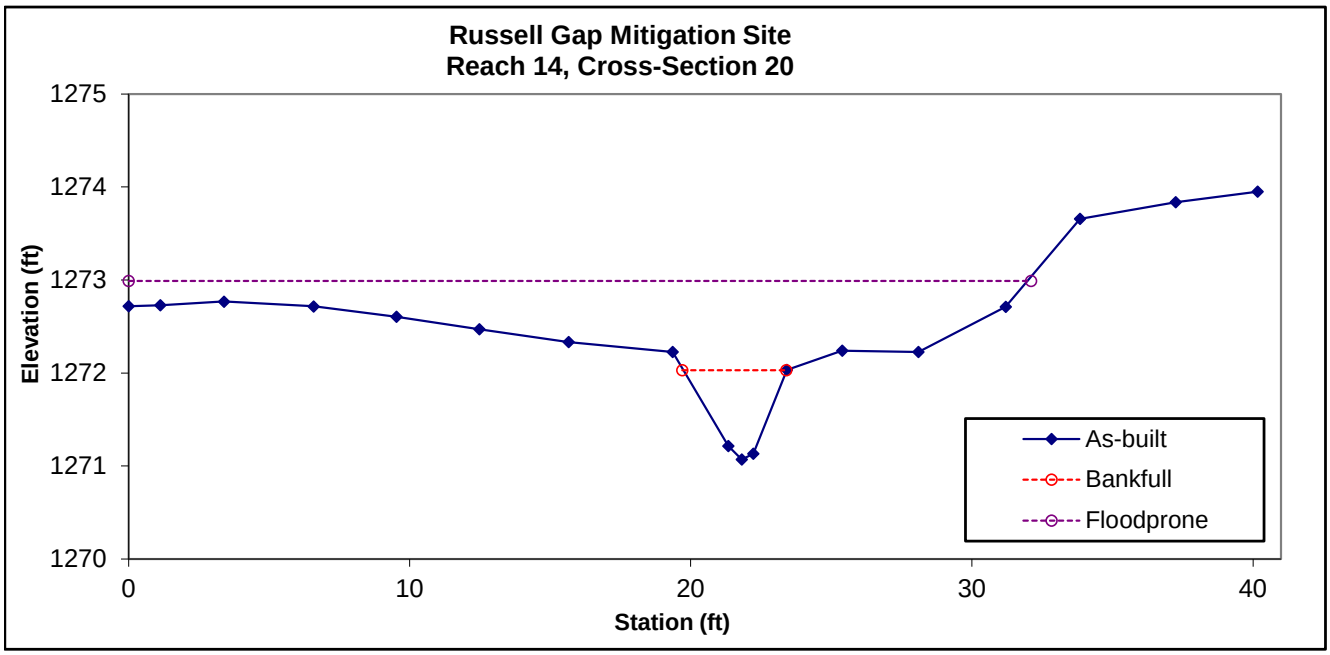
Restoration



Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	2	3.7	0.5	1	6.8	1.0	8.7	1272.03	1272



Permanent Cross-Section 21

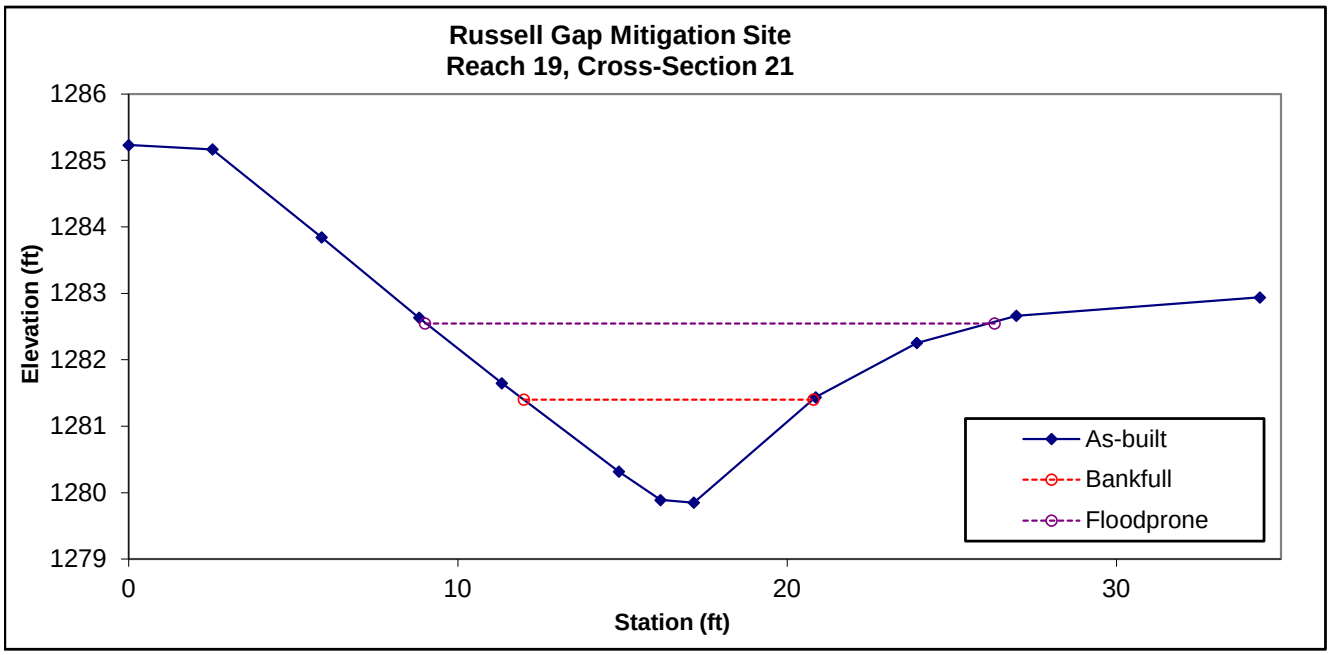
(As-built Survey Data Collected: March 2020)

Enhancement 1

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	7.6	8.8	0.9	1.5	10.2	1.0	3	1281.4	1281.4



Permanent Cross-Section 22

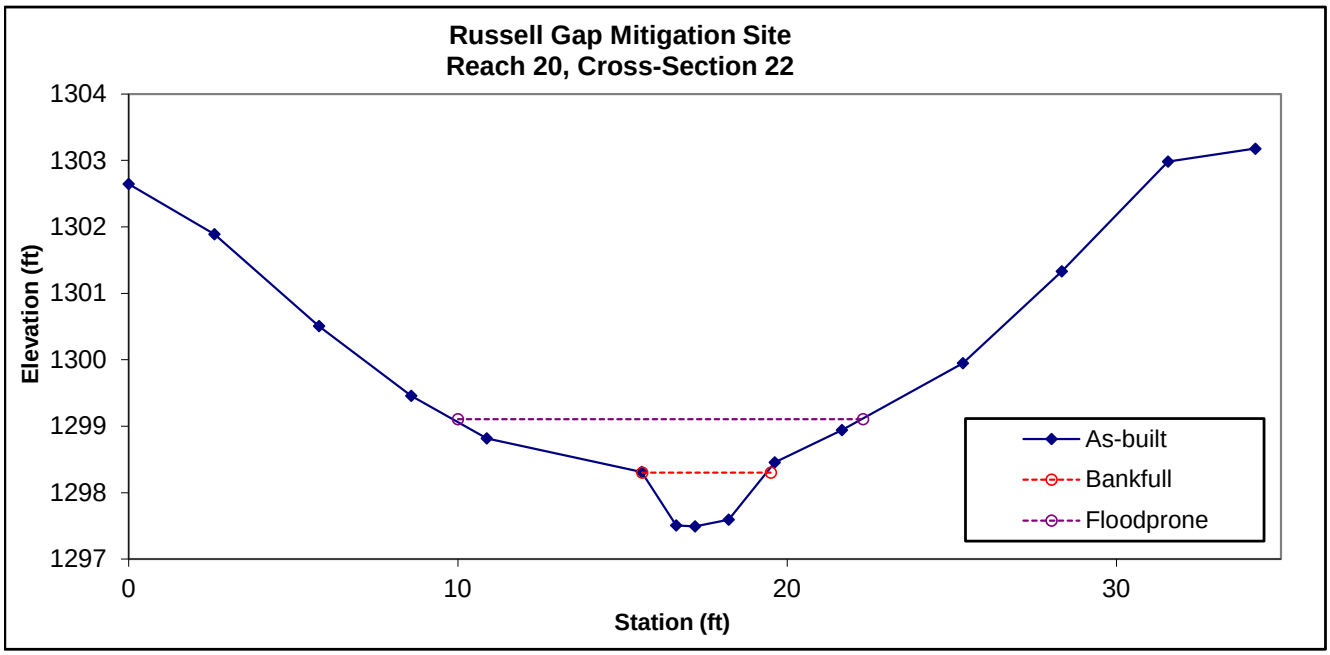
(As-built Survey Data Collected: March 2020)

Restoration

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	E	2	3.8	0.5	0.8	7	1.0	3.3	1298.3	1298.3



Permanent Cross-Section 23

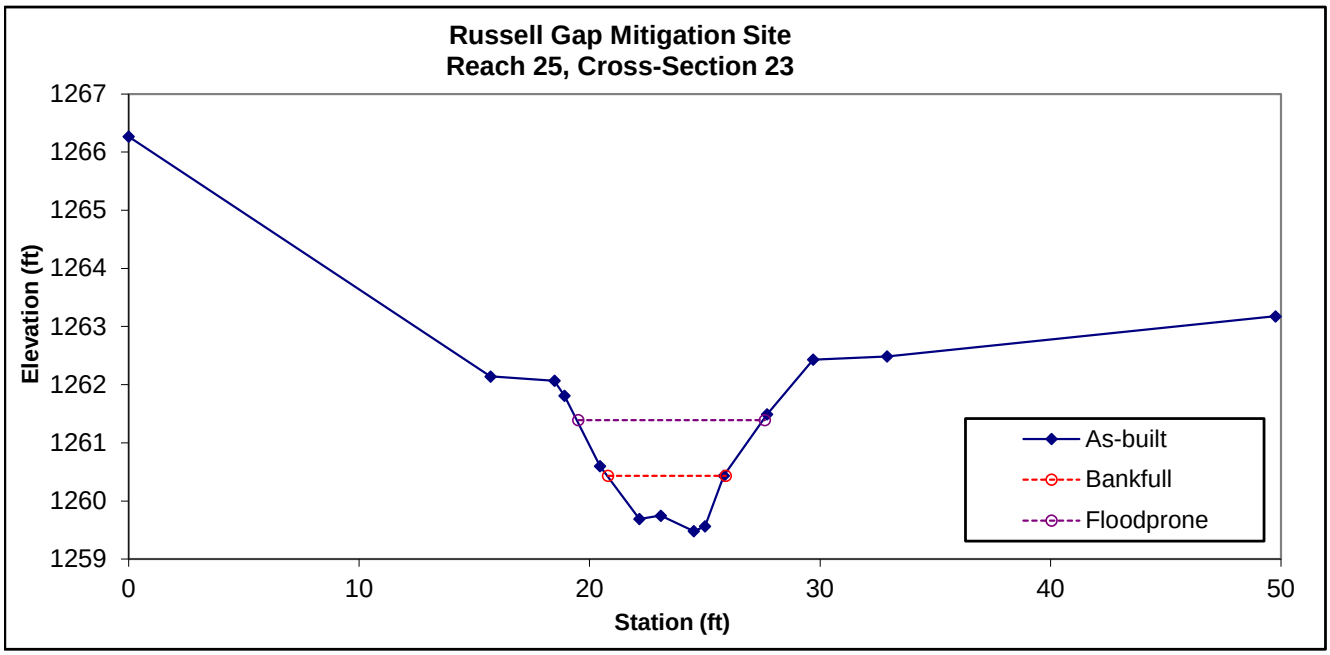
(As-built Survey Data Collected: March 2020)

Enhancement 1

Looking at the Left Bank

Looking at the Right Bank

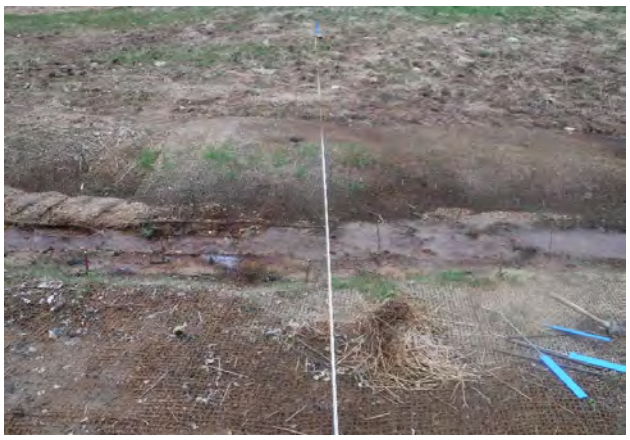
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	3.2	5.1	0.6	1	8.1	1.0	1.6	1260.435	1260.44



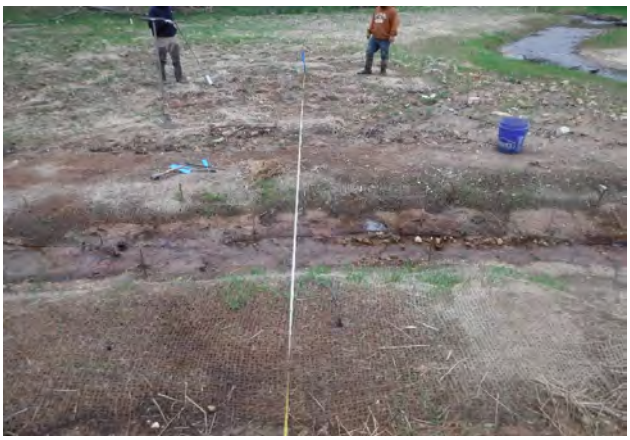
Permanent Cross-Section 24

(As-built Survey Data Collected: March 2020)

Restoration

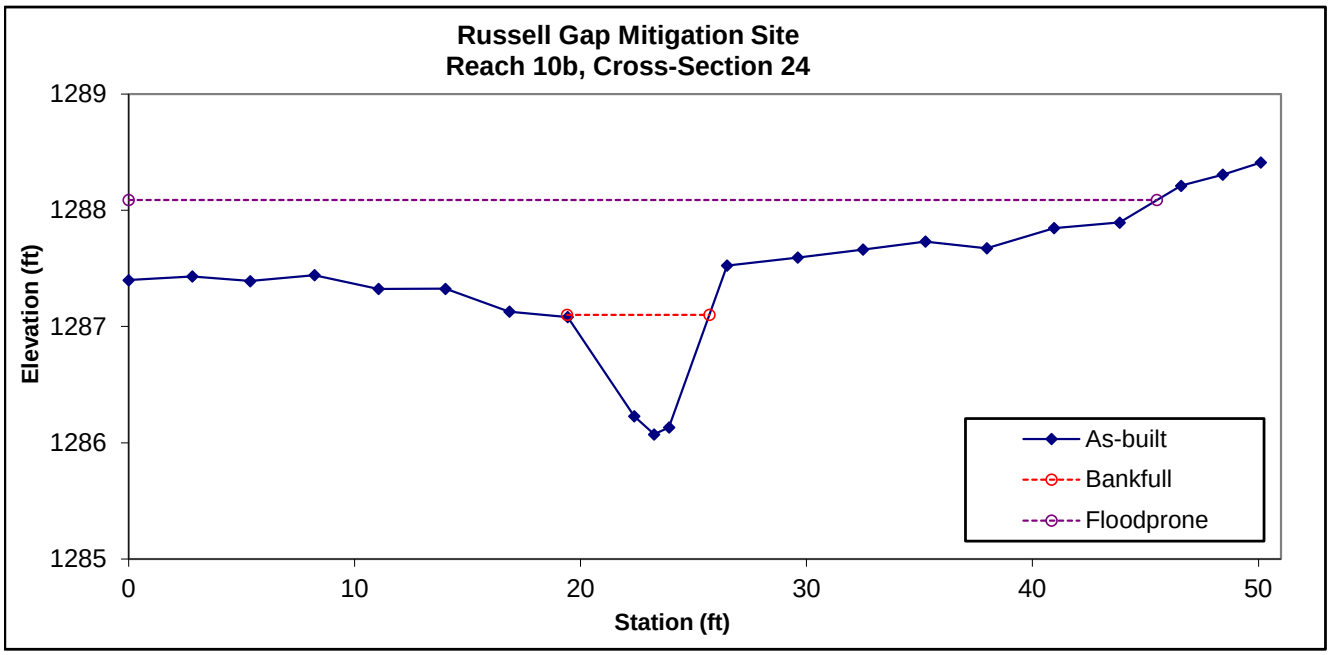


Looking at the Left Bank



Looking at the Right Bank

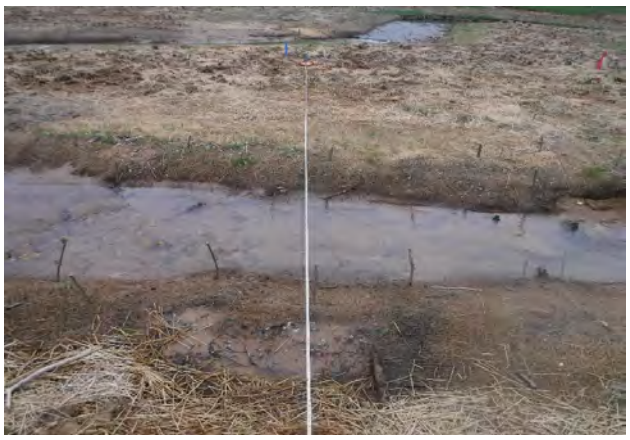
Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	3.5	6.2	0.6	1	11	1.0	7.3	1287.1	1287.1



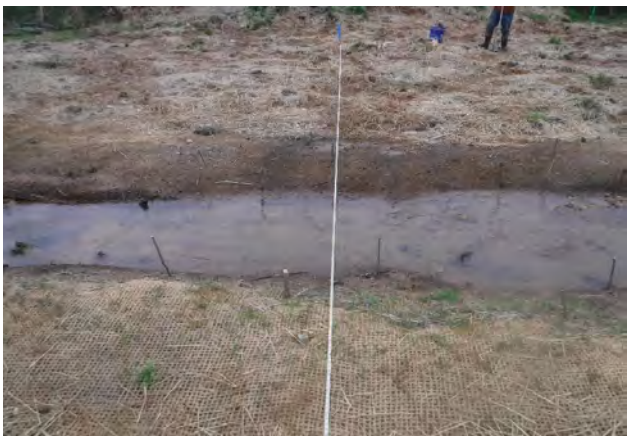
Permanent Cross-Section 25

(As-built Survey Data Collected: March 2020)

Restoration

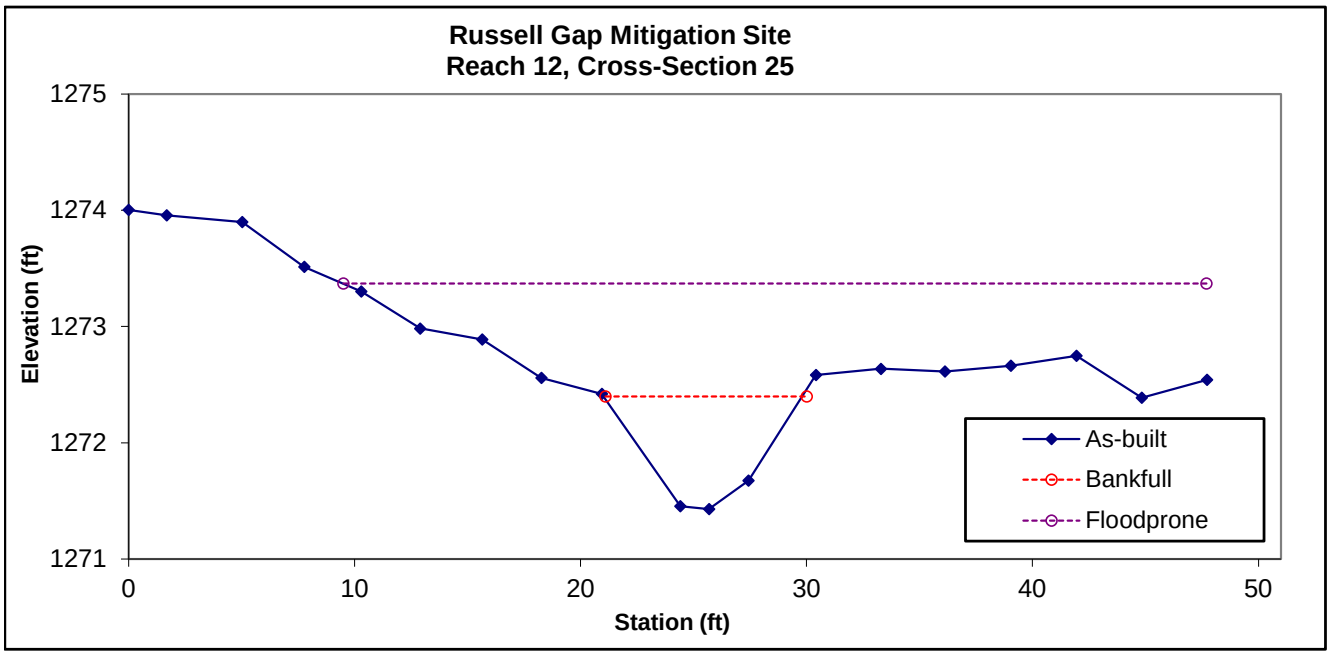


Looking at the Left Bank



Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	5.2	9.1	0.6	1	16.2	1.0	4.2	1272.4	1272.4



Permanent Cross-Section 26

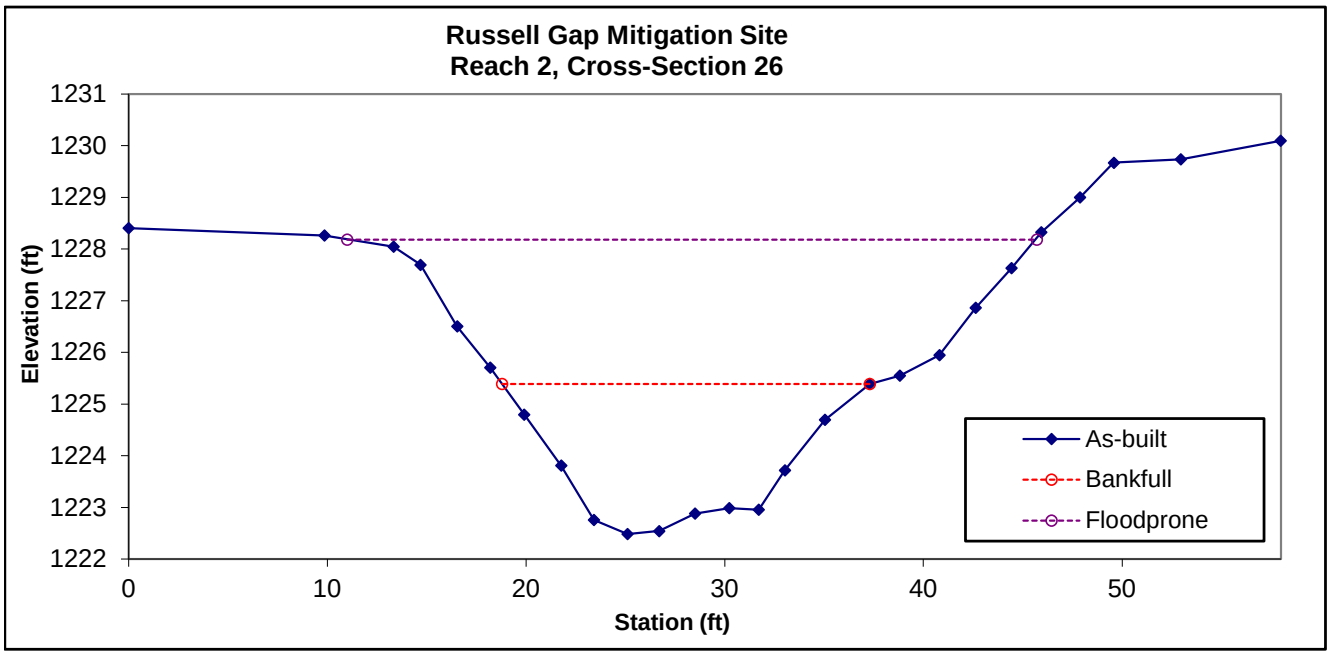
(As-built Survey Data Collected: March 2020)

Restoration

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	33.6	18.5	1.8	2.9	10.2	1.0	2.1	1225.39	1225.39



APPENDIX E

As-Built Plan Sheets

STATE	BAKER PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
NC	157329	1	43

NORTH CAROLINA
DIVISION OF MITIGATION SERVICES

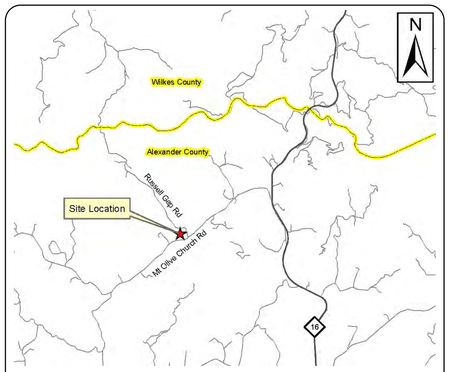
ALEXANDER COUNTY

RUSSELL GAP

PROJECT: 157329

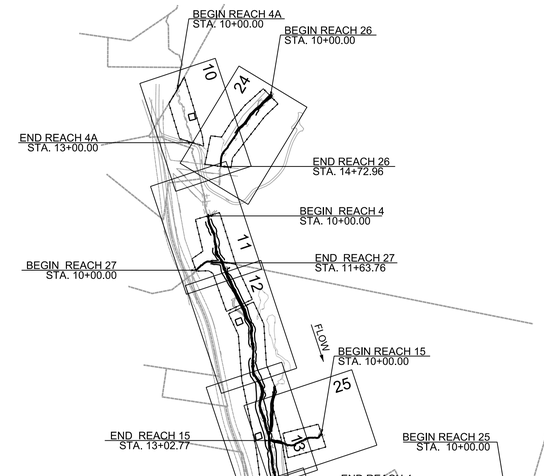
LOCATION: NEAR RUSSELL GAP ROAD AND MOUNT OLIVE CHURCH ROAD

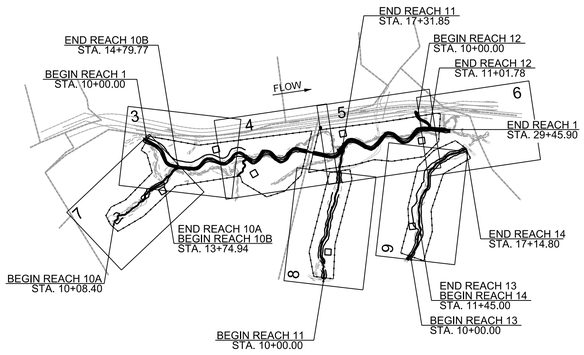
TYPE OF WORK: AS – BUILT PLAN



VICINITY MAP

INDEX OF SHEETS





NAD 83

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS, EXCEPT WHERE OTHERWISE NOTED HERON, WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS DAY OF

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by:
David S. Turner
PROFESSIONAL LAND SURVEYOR L-4551
9/11/2020

Existing survey provided by Kee Mapping and Survey (License # C-3039). Sealed by Nolan R. Carmack, PLS L-5076 on November 6, 2017. Show in gray as background information.

As-Built Survey provided by Turner Land Surveying is sealed by David S. Turner L-4551.

Redlines are sealed by Kathleen M. McKeithan PE028432.

NCDMS ID NO. 100003

GRAPHIC SCALES

PLANS: 20 0 20 40

PROFILE (HORIZONTAL): 20 0 20 40

PROFILE (VERTICAL): 5 0 5 10

MITIGATION SUMMARY

STREAM CREDITS	**9,166.949**
WETLAND CREDITS	7.053

PREPARED FOR THE OFFICE OF:

NCDEQ
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NC 27699–1652

CONTACT: MATTHEW REID
PROJECT MANAGER

Michael Baker INTERNATIONAL

Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

SPRING 2018
LETTING DATE:

KATHLEEN M. McKEITHAN, PE
PROJECT ENGINEER

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028432 ENGINEER KATHLEEN M. McKEITHAN

9/11/2020

DocuSigned by:
Kathleen Marie McKeithan
P.E.
SIGNATURE:

2/26/03

STREAM CONVENTIONAL SYMBOLS

SUPERCEDES SHEET 1-B

- ROCK J-HOOK
- ROCK VANE
- OUTLET PROTECTION
- ROCK CROSS VANE
- DOUBLE DROP ROCK CROSS VANE
- SINGLE WING DEFLECTOR
- DOUBLE WING DEFLECTOR
- TEMPORARY SILT CHECK
- ROOT WAD
- GRADE CONTROL LOG J-HOOK
- LOG VANE
- LOG WEIR
- LOG CROSS VANE
- LOG ROLLER
- GRADE CONTROL LOG JAM
- CONSTRUCTED RIFFLE
- BOULDER CLUSTER
- ROCK STEP POOL
- SAFETY FENCE
- TF — TAPE FENCE
- FP — 100 YEAR FLOOD PLAIN
- CE — CONSERVATION EASEMENT
- 435 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- LIMITS OF DISTURBANCE
- PROPERTY LINE
- FOOT BRIDGE
- TEMPORARY STREAM CROSSING
- PERMANENT STREAM CROSSING
- TRANSPLANTED VEGETATION
- TREE REMOVAL
- TREE PROTECTION
- CHANNEL PLUG
- CHANNEL FILL
- SLOPE, SEED, MULCH, MAT, AND LIVE STAKE
- GEOLIFT WITH BRUSH TOE
- PROPOSED WETLAND RESTORATION
- WLB — PROPOSED WETLAND ENHANCEMENT
- WLB — JURISDICTIONAL WETLAND BOUNDARY
- V-NOTCH WEIR

**NOTE: ALL ITEMS ABOVE MAY NOT BE USED ON THIS PROJECT

STANDARD SPECIFICATIONS

NORTH CAROLINA
EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL
MARCH 2009 (REV 2013)

- 6.06 TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- 6.24 RIPARIAN AREA SEEDING
- 6.60 TEMPORARY SEDIMENT TRAP
- 6.62 TEMPORARY SILT FENCE
- 6.63 TEMPORARY ROCK DAM
- 6.70 TEMPORARY STREAM CROSSING

PROJECT REFERENCE NO.	SHEET NO.
157329	1-A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028432 ENGINEER KATHLEEN M MCKEITHAN

DocuSigned by: Kathleen Mode McKeithan 247E84DF4181473

APPROVED BY:

9/11/2020

DATE:

Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

GENERAL NOTES

1. THE CONTRACTOR IS REQUIRED TO INSTALL IN-STREAM STRUCTURES USING A TRACK HOE WITH A HYDRAULIC THUMB OF SUFFICIENT SIZE TO PLACE BOULDERS (3'x2'x2'), LOGS AND ROOTWADS.
2. WORK IS BEING PERFORMED AS AN ENVIRONMENTAL RESTORATION PLAN. THE CONTRACTOR SHOULD MAKE ALL REASONABLE EFFORTS TO REDUCE SEDIMENT LOSS AND MINIMIZE DISTURBANCE OF THE SITE WHILE PERFORMING THE CONSTRUCTION WORK.
3. CONSTRUCTION IS SCHEDULED FOR 2018.
4. CONTRACTOR SHOULD CALL NORTH CAROLINA "ONE-CALL" BEFORE EXCAVATION STARTS. (1-800-632-4949)
5. BOULDER SIZES FOR IN-STREAM STRUCTURES SHALL BE A MINIMUM OF 2'x2'x1' AND CAN BE CHANGED PER STRUCTURE OR THE DIRECTION OF THE ENGINEER.
6. ALL ON-SITE ALLUVIUM SHALL BE HARVESTED AND STOCKPILED PRIOR TO FILLING ABANDONED CHANNELS.
7. TOPSOIL SHALL BE EXCAVATED TO A DEPTH OF 8" AND STOCKPILED SEPARATELY FROM UNDERCUT SOIL. 6" OF TOPSOIL SHALL BE PLACED ON ALL BANKFULL BENCHES AND AS DIRECTED BY THE ENGINEER.
8. ALL DISTURBED EMBANKMENTS SHALL BE MATTED WITH COIR FIBER MATTING OR AS DIRECTED BY THE ENGINEER.
9. ALL STREAM BANKS SHALL BE LIVE STAKED.
10. UNLESS THE ALIGNMENT IS BEING ALTERED, THE EXISTING CHANNEL DIMENSIONS ARE TO REMAIN UNLESS OTHERWISE NOTED.
11. BANKFULL BENCHES SHALL BE A MINIMUM OF 6' IN WIDTH UNLESS OTHERWISE SHOWN ON THE PLANS.
12. CONTRACTOR WILL ENSURE THAT FENCING IS INSTALLED ON OR OUTSIDE THE CONSERVATION EASEMENT AS SHOWN ON THE PLANS BUT NO MORE THAN 1' OUTSIDE.
13. WHERE PROPOSED FENCE CROSSES EXISTING STREAMS, THE CONTRACTOR SHALL UTILIZE A SECTION OF BREAK AWAY FENCE, A FLOOD GATE, OR ELECTRIFIED CHAINS AS DIRECTED BY THE ENGINEER.

VEGETATION SELECTION

Shumard oak, *Quercus shumardii*, added to planting list. Not supplemental but additional planting.

Riparian planting (25.23 ac.)			
Common Name	**Scientific Name**	**Percent Planted by Species**	**Wetness Tolerance**
Trees (75%) Planted 9' X 9' Spacing – 538 Trees/ Acre			
River Birch	*Betula nigra*	15%	FACW
Black Walnut	*Juglans nigra*	10%	FACU
Sycamore	*Platanus occidentalis*	20%	FACW
Tulip Poplar	*Liriodendron tulipifera*	20%	FACU
Green ash	*Fraxinus pennsylvanica*	5%	FACW
Willow oak	Quercus phellos	20%	FAC
Persimmon	*Diospyros virginiana*	10%	FAC
	Tree total	**100%**	
Shrubs (25%) Planted 16' X 16' Spacing - 164 Shrubs/ Acre			
Tag Alder	*Alnus serrulata*	20%	OBL
Spicebush	*Lindera benzoin*	25%	FAC
Redbud	*Cercis canadensis*	20%	FACU
Elderberry	*Sambucus canadensis*	15%	FAC
Silky Dogwood	*Cornus amomum*	20%	FACW
	Shrub Total	**100%**	

Upland planting (4.44 ac.)			
Trees (75%) Planted 9' X 9' Spacing – 538 Trees/ Acre			
Tulip Poplar	*Liriodendron tulipifera*	20%	FACU
Black Walnut	*Juglans nigra*	10%	FACU
Black Gum	*Nyssa sylvatica*	10%	FAC
Persimmon	*Diospyros virginiana*	10%	FAC
Southern red oak	*Quercus falcata*	15%	FACU
White oak	*Quercus alba*	15%	FACU
American Beech	*Fagus grandifolia*	10%	FACW
Red Maple	*Acer rubrum*	10%	FAC
	Total Trees	**100%**	
Shrubs (25%) Planted 16' X 16' Spacing - 164 Shrubs/ Acre			
Spicebush	*Lindera benzoin*	15%	FAC
Redbud	*Cercis canadensis*	20%	FACU
Flowering Dogwood	*Cornus florida*	15%	FACU
Blackhaw Viburnum	Viburnum prunifolium	15%	FACU
Ironwood	*Carpinus caroliniana*	20%	FAC
Hazelnut	*Corylus americana*	15%	FACU
	Shrub total	100%	

Streambank Live Stake Plantings			
Silky Willow	*Salix sericea*	25%	OBL
Elderberry	*Sambucus nigra canadensis*	25%	FAC
Buttonbush	*Cephalanthus occidentalis*	15%	OBL
Silky Dogwood	*Cornus amomum*	25%	FACW
Black Willow	*Salix nigra*	10%	OBL

Note: Final species selection may change due to refinement or availability at the time of planting. If species substitution is required, the planting contractor will submit a revised planting list to Baker for approval prior to the procurement of plant stock.

Permanent seed mixtures for the project site shall be planted throughout the floodplain and riparian buffer areas except the vernal pools. Permanent seed mixtures shall be applied with temporary seed, as defined in the construction specifications.

Common Name	Scientific Name	Percent of Mixture	Seeding Density (lbs/acre)	Wetness Tolerance
Redtop	*Agrostis alba*	10%	1.5	FACW
Virginia Wildrye	*Elymus virginicus*	15%	2.25	FACW
Switchgrass	*Panicum virgatum*	15%	2.25	FAC
Eastern Gamma Grass	*Tripsacum dactyloides*	5%	0.75	FACW
Pennsylvania Smartweed	*Polygonum pennsylvanicum*	5%	0.75	FACW
Little Blue Stem	*Schizachyrium scoparium*	5%	0.75	FACU
Soft Rush	*Juncus effusus*	5%	0.75	FACW
Beggars Tick	*Bidens frondosa (or aristosa)*	5%	0.75	FACW
Lance-Leaved Tick Seed	*Coreopsis lanceolata*	10%	1.5	FACU
Tioga Deer Tongue	*Dichanthelium clandestinum*	15%	2.25	FAC
Big Blue Stem	*Andropogon gerardii*	5%	0.75	FAC
Indian Grass	*Sorghastrum nutans*	5%	0.75	FACU

5/23/2020
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mcrea

PROJECT REFERENCE NO.	SHEET NO.
157329	1-B
NCDMS ID NO. 100003	

2/26/03

*S.U.E = SUBSURFACE UTILITY ENGINEER

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CONVENTIONAL SYMBOLS

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin — EIP
- Property Corner
- Property Monument — ECM
- Parcel/Sequence Number — 123
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary — WLB
- Proposed Wetland Boundary — WLB
- Existing Endangered Animal Boundary — EAB
- Existing Endangered Plant Boundary — EPB

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign — S
- Well — W
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream — JS
- Buffer Zone 1 — BZ 1
- Buffer Zone 2 — BZ 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch — FLOW
- False Sump

RAILROADS:

- Standard Gauge — CSX TRANSPORTATION
- RR Signal Milepost — MILEPOST 35
- Switch — SWITCH
- RR Abandoned
- RR Dismantled

RIGHT OF WAY:

- Baseline Control Point
- Existing Right of Way Marker
- Existing Right of Way Line
- Proposed Right of Way Line — RW
- Proposed Right of Way Line with Iron Pin and Cap Marker — RW
- Proposed Right of Way Line with Concrete or Granite Marker — RW
- Existing Control of Access — CA
- Proposed Control of Access — CA
- Existing Easement Line — E
- Proposed Temporary Construction Easement — E
- Proposed Temporary Drainage Easement — TDE
- Proposed Permanent Drainage Easement — PDE
- Proposed Permanent Utility Easement — PUE
- Proposed Temporary Utility Easement — TUE
- Proposed Permanent Easement with Iron Pin and Cap Marker

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut — C
- Proposed Slope Stakes Fill — F
- Proposed Wheel Chair Ramp — WCR
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard — Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert — CONC
- Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR:

- Head and End Wall — CONC HW
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB — CB
- Paved Ditch Gutter
- Storm Sewer Manhole — S
- Storm Sewer — S

UTILITIES:

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole — P
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole — HH
- H-Frame Pole
- Recorded U/G Power Line — P
- Designated U/G Power Line (S.U.E.*) — P

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole — T
- Telephone Booth
- Telephone Pedestal — T
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole — HH
- Recorded U/G Telephone Cable — T
- Designated U/G Telephone Cable (S.U.E.*) — T
- Recorded U/G Telephone Conduit — TC
- Designated U/G Telephone Conduit (S.U.E.*) — TC
- Recorded U/G Fiber Optics Cable — T FO
- Designated U/G Fiber Optics Cable (S.U.E.*) — T FO

WATER:

- Water Manhole — W
- Water Meter
- Water Valve
- Water Hydrant
- Recorded U/G Water Line — W
- Designated U/G Water Line (S.U.E.*) — W
- Above Ground Water Line — A/G Water

TV:

- TV Satellite Dish
- TV Pedestal — C
- TV Tower
- U/G TV Cable Hand Hole — HH
- Recorded U/G TV Cable — TV
- Designated U/G TV Cable (S.U.E.*) — TV
- Recorded U/G Fiber Optic Cable — TV FO
- Designated U/G Fiber Optic Cable (S.U.E.*) — TV FO

GAS:

- Gas Valve
- Gas Meter
- Recorded U/G Gas Line — G
- Designated U/G Gas Line (S.U.E.*) — G
- Above Ground Gas Line — A/G Gas

SANITARY SEWER:

- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line — SS
- Above Ground Sanitary Sewer — A/G Sanitary Sewer
- Recorded SS Forced Main Line — FSS
- Designated SS Forced Main Line (S.U.E.*) — FSS

MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box — S
- Utility Unknown U/G Line — ?UTL
- U/G Tank; Water, Gas, Oil
- A/G Tank; Water, Gas, Oil
- U/G Test Hole (S.U.E.*)
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.

5/28/2020
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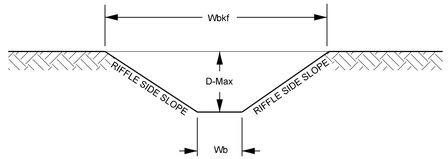
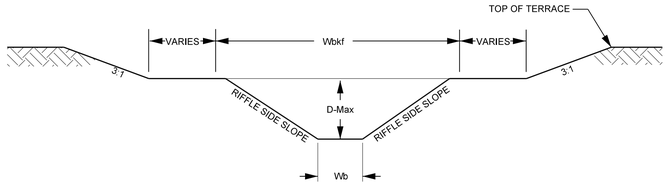
revised 02/02/00

2/26/03

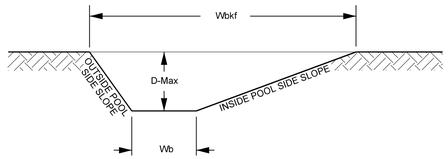
TYPICAL RIFFLE, POOL, AND BANKFULL BENCH CROSS SECTIONS



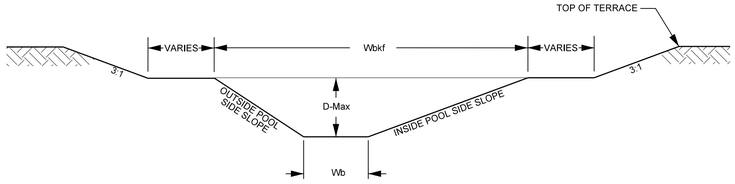
RIFFLE



RIFFLE WITH BANKFULL BENCH



POOL



POOL WITH BANKFULL BENCH

NOTES:

1. TERRACE SLOPES ON RESTORATION BENCHES (R1, R6, R9, R12, R14) SHALL BE 3:1. FILL OTHER TERRACE SLOPES SHALL BE 2:5:1.
2. WHERE POSSIBLE, ON REACHES WITH WETLAND RESTORATION ADJACENT TO THE STREAM, THE BANKFULL ELEVATION SHALL BE CARRIED OUT TO THE PROPOSED WETLAND RESTORATION BOUNDARY. NO MORE THAN 6" OF CUT CAN BE EXCAVATED IN THE WETLAND RESTORATION AREAS IN CONJUNCTION WITH THESE EFFORTS.
3. BANKFULL BENCHES SHALL BE A MINIMUM OF 6' IN WIDTH UNLESS OTHERWISE NOTED ON THE PLANS.

	R1		R2		R3		R4		R5/R6/R7		R9		R10	
	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL
WIDTH OF BANKFULL (Wbkf)	16.9	25.0	18.0	25.0	23.7	35.0	16.9	21.0	10.2	13.0	12.7	17.0	4.9	6.0
MAXIMUM DEPTH (Dmax)	1.6	3.5	1.7	3.5	2.5	4.0	1.6	3.0	1.1	1.8	1.2	2.5	0.5	1.0
W/D (Wbkf/Dbkf)	13.0	12.3	13.0	12.3	12.0	13.3	13.0	12.3	13.0	12.4	13.5	12.2	12.3	9.0
BANKFULL AREA (Abkf)	22.0	50.8	25.0	50.8	47.0	92.0	22.0	36.0	8.0	13.9	12.0	23.8	2.0	4.0
BOTTOM WIDTH (Wb)	10.5	4.0	11.2	4.0	13.7	11.0	10.2	3.0	4.9	2.2	6.5	2.0	2.8	2.0
RIFFLE SIDE SLOPE (X:1)	2.0	N/A	2.0	N/A	2.0	N/A	2.0	N/A	2.5	N/A	2.5	N/A	2.0	N/A
INSIDE POOL SIDE SLOPE	N/A	4.0	N/A	3.0	N/A	4.0	N/A	4.0	N/A	3.0	N/A	3.0	N/A	2.0
OUTSIDE POOL SIDE SLOPE	2.0	N/A	3.0	N/A	2.0	N/A	2.0	N/A	3.0	N/A	3.0	N/A	2.0	N/A

	R11		R12		R14 (Upper)		R14 (Lower)		R19		R20		R25	
	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL	RIFFLE	POOL
WIDTH OF BANKFULL (Wbkf)	3.9	4.0	8.8	11.5	5.1	5.5	5.0	7.0	5.1	6.5	4.2	5.0	5.1	7.0
MAXIMUM DEPTH (Dmax)	0.4	0.6	0.8	1.5	0.5	0.7	0.5	1.0	0.5	1.0	0.4	1.0	0.5	1.2
W/D (Wbkf/Dbkf)	13.0	9.5	13.0	10.4	13.0	12.7	12.5	12.3	13.0	9.4	12.0	8.3	13.0	8.9
BANKFULL AREA (Abkf)	1.2	1.7	6.0	12.8	2.0	2.4	2.0	4.0	2.0	4.5	1.5	3.0	2.0	5.5
BOTTOM WIDTH (Wb)	2.4	1.6	5.5	5.5	2.4	1.3	3.0	1.0	3.2	2.5	2.4	1.0	3.2	2.2
RIFFLE SIDE SLOPE (X:1)	2.0	N/A	2.0	N/A	2.5	N/A	2.0	N/A	2.0	N/A	2.0	N/A	2.0	N/A
INSIDE POOL SIDE SLOPE	N/A	2.0	N/A	2.0	N/A	3.0	N/A	4.0	N/A	2.0	N/A	2.0	N/A	2.0
OUTSIDE POOL SIDE SLOPE	2.0	N/A	2.0	N/A	3.0	N/A	2.0	N/A	2.0	N/A	2.0	N/A	2.0	N/A

PROJECT REFERENCE NO.	SHEET NO.
157329	2

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028432 ENGINEER KATHLEEN M MCKEITHAN

DocuSigned by: Kathleen Mcke McKeithan 247E84DFE4181473

APPROVED BY:

9/11/2020

DATE:

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Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

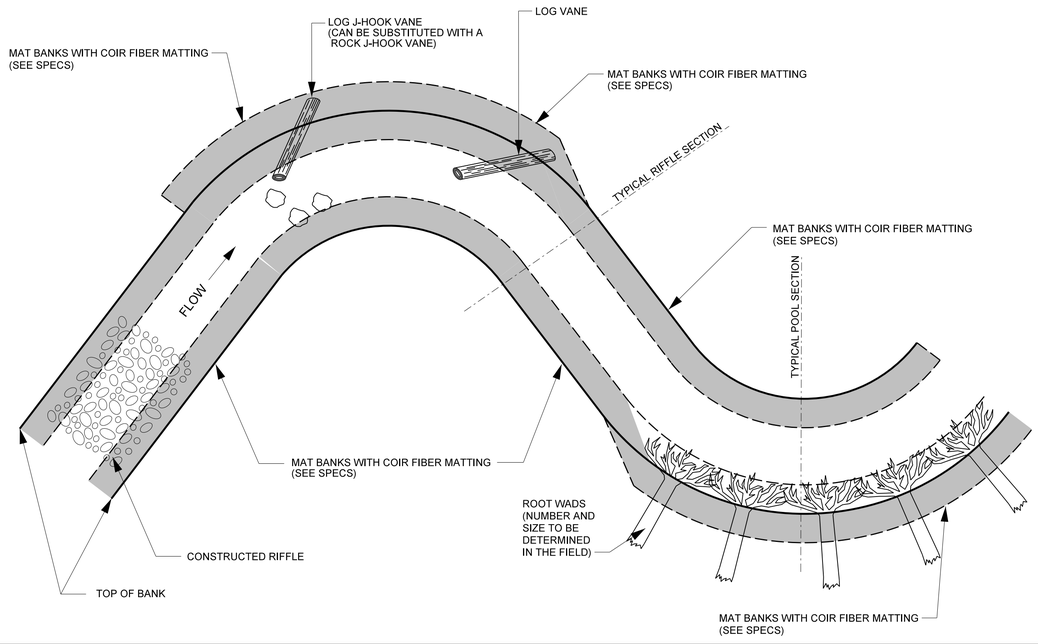
TYPICAL STRUCTURE PLACEMENT

STRUCTURE NOTES:

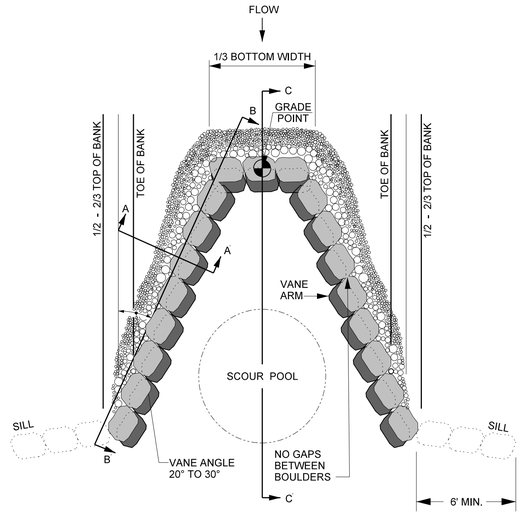
1. GENERALLY LOG AND ROCK J-HOOK VANES, ROOT WADS, LOG VANES AND COIR FIBER MATTING WILL BE INSTALLED IN THE LOCATION AND SEQUENCE AS SHOWN.
2. ADDITIONAL STRUCTURES OR CHANGES TO STRUCTURE LOCATIONS MAY BE MADE BY THE DESIGN ENGINEER DURING CONSTRUCTION.

NOTES:

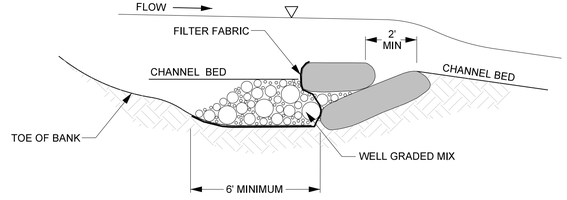
1. COIR FIBER MATTING TO BE INSTALLED ON ALL RESTORED STREAMBANKS.
2. IF ROOT WADS DO NOT COVER ENTIRE SLOPE ON OUTSIDE OF MEANDER BENDS, COIR FIBER MATTING IS NEEDED.



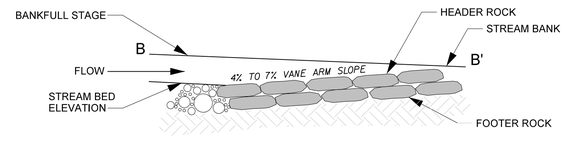
ROCK CROSS VANE



PLAN VIEW



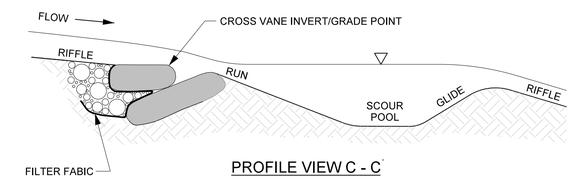
SECTION A - A'



PROFILE VIEW B - B'
VANE ARM

NOTES FOR ALL VANE STRUCTURES:

1. INSTALL FILTER FABRIC FOR DRAINAGE BEGINNING AT THE MIDDLE OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
2. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
3. CONSTRUCT ANGLE AND SLOPE SPECIFICATIONS AS SHOWN.
4. BACKFILL VANE ARMS AND INVERT WITH A WELL GRADED MIX OF CLASS B, A, AND #57 STONE.
5. ON-SITE ALLUVIUM SHALL BE INCORPORATED INTO THE STONE BACKFILL WHERE AVAILABLE.
6. BOULDER SILL MUST BE A MINIMUM OF 6'.



PROFILE VIEW C - C'

5/23/2020
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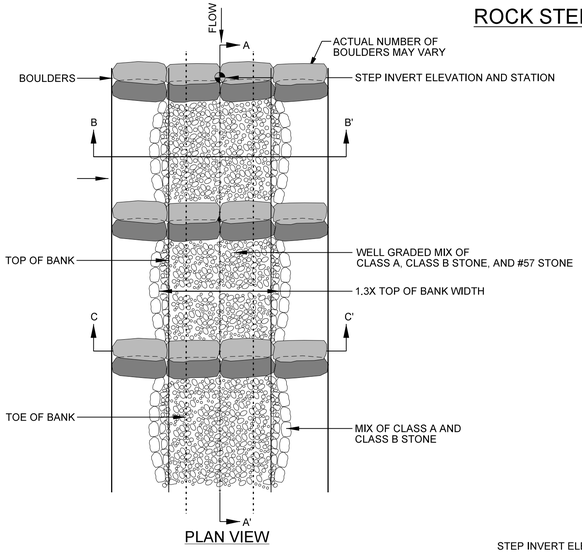
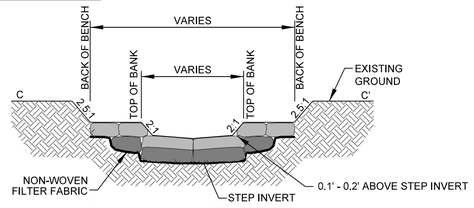
mcrain

2/26/03

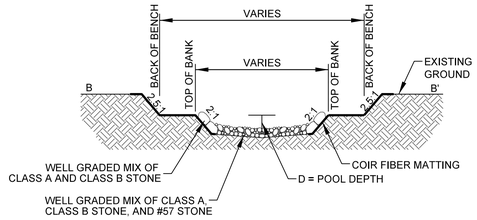
ROCK STEP-POOL CHANNEL



PLAN VIEW



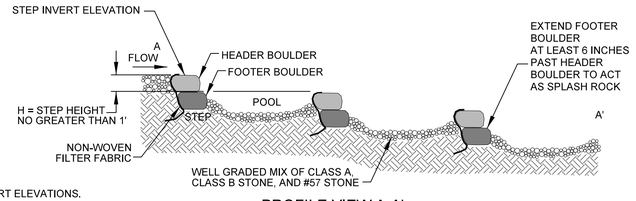
POOL CROSS SECTION C-C'



POOL CROSS SECTION B-B'

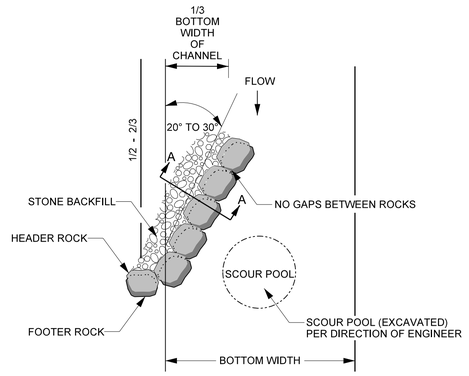
NOTES:

1. HEADER BOULDERS MUST BE 2' X 2' X 1' AND FOOTERS SHALL NOT EXCEED 3' X 2' X 1'.
2. FOOTERS SHALL BE INSTALLED SUCH THAT 1/4 TO 1/3 OF THE LENGTH IS DOWNSTREAM OF THE HEADER.
3. SOIL SHALL BE WELL COMPACTED AROUND BURIED PORTION OF FOOTERS WITH THE BUCKET OF EXCAVATOR.
4. INSTALL NON-WOVEN FILTER FABRIC BELOW FOOTER BOULDERS.
5. UNDERCUT POOL BED ELEVATION 8 INCHES TO ALLOW FOR LAYER OF STONE.
6. INSTALL EROSION CONTROL MATTING ALONG COMPLETED BANKS SUCH THAT THE EROSION CONTROL MATTING AT THE TOE OF THE BANK EXTENDS DOWN TO THE UNDERCUT ELEVATION.
7. INSTALL WELL GRADED MIX OF CLASS A AND CLASS B STONE ALONG SIDE SLOPES.
8. FINAL CHANNEL BED SHAPE SHOULD BE ROUNDED, COMPACTED, AND CONCAVE, WITH THE ELEVATION OF THE BED APPROXIMATELY 0.5 FT DEEPER IN THE CENTER THAN AT THE EDGES.
9. STEP HEIGHT (H) SHALL NOT EXCEED 1.0 FT.
10. MINIMUM POOL DEPTH (D) SHALL BE NO LESS THAN 1.3 FT.
11. AT LEAST 6" OF THE UPSTREAM FOOTER MUST BE BURIED BELOW THE DOWNSTREAM HEADER INVERT ELEVATIONS.
12. ALL STRUCTURES MUST BE FOOTERED.

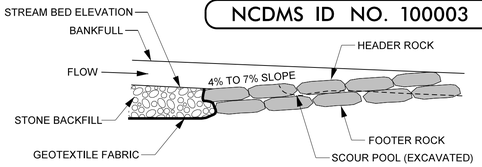


PROFILE VIEW A-A'

ROCK VANE



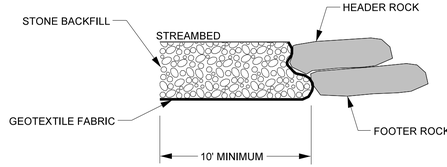
PLAN VIEW



PROFILE VIEW

NOTES FOR ALL VANE STRUCTURES:

1. INSTALL GEOTEXTILE FABRIC BEGINNING AT THE TOP OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF TEN FEET.
2. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
3. START AT BANK AND PLACE FOOTER ROCKS FIRST AND THEN HEADER (TOP) ROCK.
4. CONTINUE WITH STRUCTURE, FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
5. AN EXTRA ROCK CAN BE PLACED IN SCOUR POOL FOR HABITAT IMPROVEMENT.
6. USE HAND PLACED STONE TO FILL GAPS ON UPSTREAM SIDE OF HEADER AND FOOTER ROCKS.
7. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.
8. START SLOPE AT 2/3 TO 3/4 TIMES THE BANKFULL STAGE.



SECTION A - A

PROJECT REFERENCE NO.	SHEET NO.
157329	2A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028432 ENGINEER KATHLEEN M MCKEITHAN

DocuSigned by: Kathleen Mode McKeithan 247E84DF4181473...

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9/11/2020

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License #: F-1084

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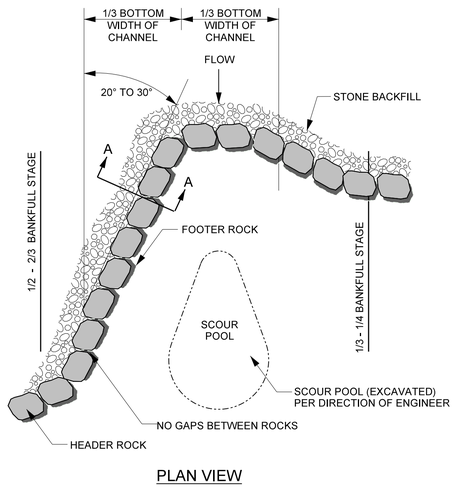
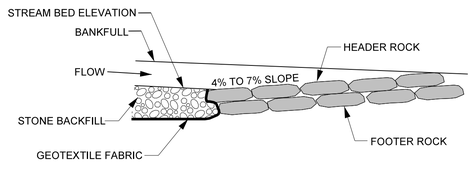
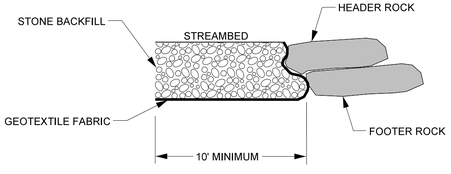
GRADE CONTROL J-HOOK VANE



PLAN VIEW



PROFILE VIEW

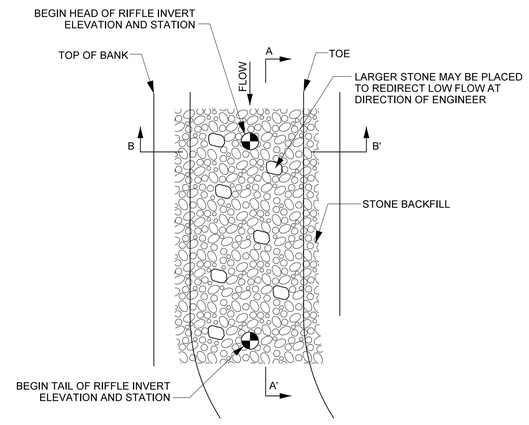


SECTION A - A

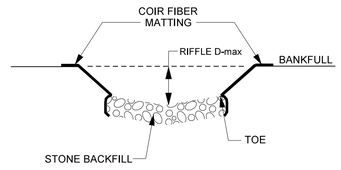
NOTES FOR ALL VANE STRUCTURES:

1. INSTALL FILTER FABRIC FOR DRAINAGE BEGINNING AT THE MIDDLE OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
2. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
3. CONSTRUCT ANGLE AND SLOPE SPECIFICATIONS AS SHOWN.
4. BACKFILL VANE ARMS AND INVERT WITH A WELL GRADED MIX OF CLASS B, A, AND #57 STONE.
5. ON-SITE ALLUVIUM SHALL BE INCORPORATED INTO THE STONE BACKFILL WHERE AVAILABLE.
6. BOULDER SILL MUST BE A MINIMUM OF 6'.

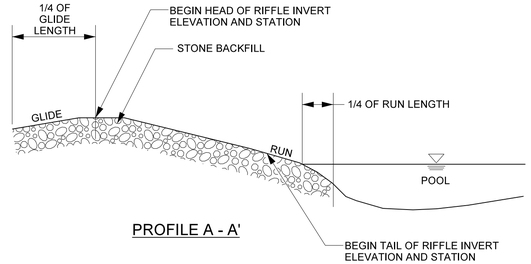
CONSTRUCTED RIFFLE



PLAN VIEW



SECTION B - B'



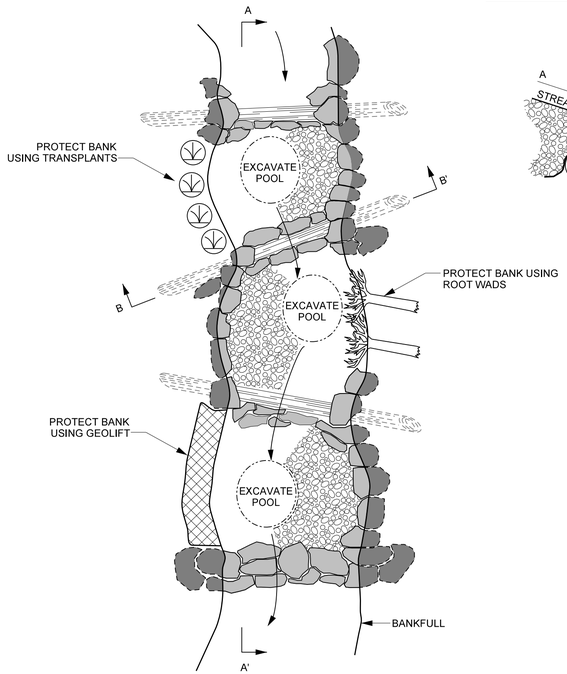
PROFILE A - A'

NOTES:

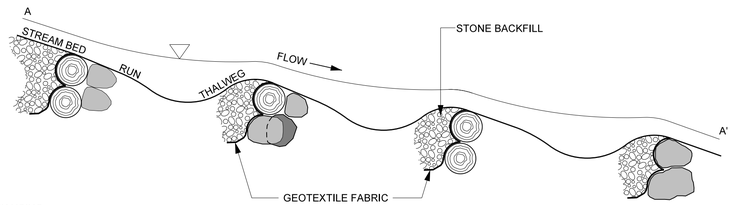
1. UNDERCUT CHANNEL BED ELEVATION AS NEEDED TO ALLOW FOR LAYERS OF STONE TO ACHIEVE FINAL GRADE.
2. INSTALL COIR FIBER MATTING ALONG COMPLETED BANKS SUCH THAT THE EROSION CONTROL MATTING AT THE TOE OF THE BANK EXTENDS DOWN TO THE UNDERCUT ELEVATION.
3. INSTALL STONE BACKFILL, COMPACTED TO GRADE.
4. FINAL CHANNEL BED SHAPE SHOULD BE ROUNDED, SMOOTH, AND CONCAVE, WITH THE ELEVATION OF THE BED 0.2 FT DEEPER IN THE CENTER THAN AT THE EDGES.
5. STONE BACKFILL SHALL CONSIST OF 10% CLASS I, 20% CLASS B, 40% CLASS A, AND 30% ON-SITE ALLUVIUM BY VOLUME. IF ALLUVIUM IS UNAVAILABLE, BACKFILL SHALL BE A WELL GRADED MIX OF 10% CLASS I, 20% CLASS B, 40% CLASS A, AND 30% #57 STONE.
6. CONSTRUCTED RIFFLES SHALL BE 18" THICK ON REACHES R1, R4, & R9. ALL OTHER CONSTRUCTED RIFFLES SHALL BE 12" THICK.

2/26/03

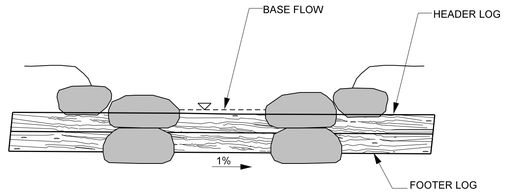
LOG AND ROCK STEP / POOL



PLAN VIEW



SECTION A - A'

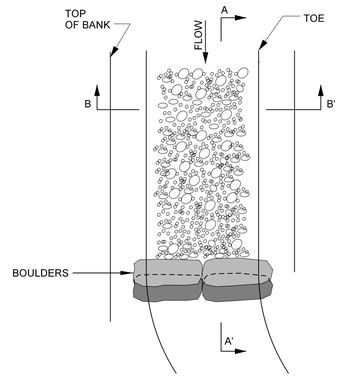


SECTION B - B'

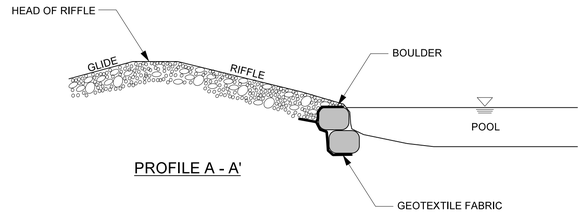
NOTES:

1. LOGS SHOULD BE AT LEAST 10" IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED AND EXTENDING INTO THE BANK 5' ON EACH SIDE.
2. SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOG.
3. GEOTEXTILE FABRIC SHOULD BE NAILED TO THE LOG BELOW THE BACKFILL.
4. BOULDERS SHOULD BE 3' X 2' X 2' AND PLACED ON TOP OF HEADER LOG FOR ANCHORING.
5. TRANSPLANTS CAN BE USED INSTEAD OF BOUDERS, PER DIRECTION OF ENGINEER.
6. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.

BOULDER STEP



PLAN VIEW



PROFILE A - A'

NOTES:

1. HEADER BOULDERS MUST BE 3' X 2' X 2' AND FOOTERS SHALL NOT EXCEED 4' X 3' X 2'.
2. FOOTERS SHALL BE INSTALLED SUCH THAT 1/4 TO 1/3 OF THE LENGTH IS DOWNSTREAM OF THE HEADER.
3. SOIL SHALL BE WELL COMPACTED AROUND BURIED PORTION OF FOOTERS WITH THE BUCKET OF EXCAVATOR.
4. INSTALL NON-WOVEN FILTER FABRIC UNDERNEATH FOOTER BOULDERS.
5. UNDERCUT THE RIFFLE ELEVATION 16 INCHES TO ALLOW FOR A LAYER OF STONE.
6. INSTALL EROSION CONTROL MATTING ALONG COMPLETED BANKS SUCH THAT THE EROSION CONTROL MATTING AT THE TOE OF THE BANK EXTENDS DOWN TO THE UNDERCUT ELEVATION.
7. FILL TRENCH WITH GRADED MIX OF CLASS A, CLASS B, AND #57 STONE TO THE BED ELEVATION OF THE CHANNEL.
8. BOULDER STEPS MUST BE EXTENDED TO A MINIMUM OF 2' INTO THE BANK. USE SILL BOULDERS IF NECESSARY.
9. THALWEG AND STEP INVERT WILL BE CONCAVE AND SHAPED PER DIRECTION OF THE DESIGNER.

PROJECT REFERENCE NO.	SHEET NO.
157329	2B

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028432 ENGINEER KATHLEEN M MCKEITHAN

DocuSigned by: Kathleen Mckeithan 24FE84DF4481473...

APPROVED BY:

9/11/2020

DATE:

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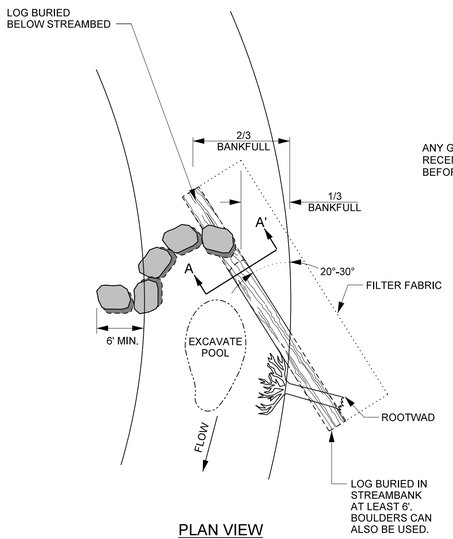
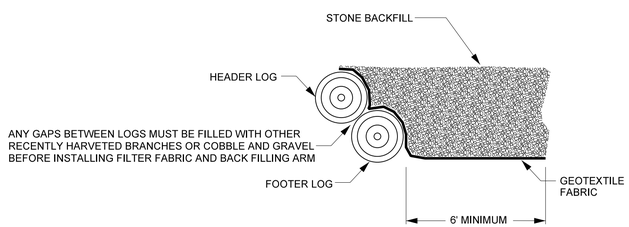
License #: F-1084

NCDMS ID NO. 100003

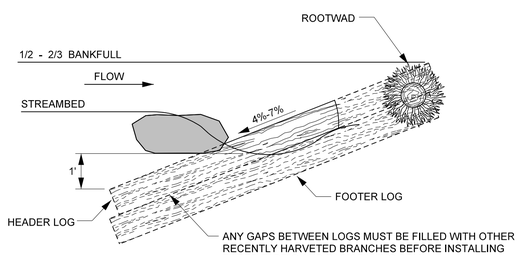
GRADE CONTROL LOG J-HOOK VANE



PLAN VIEW



SECTION A - A'

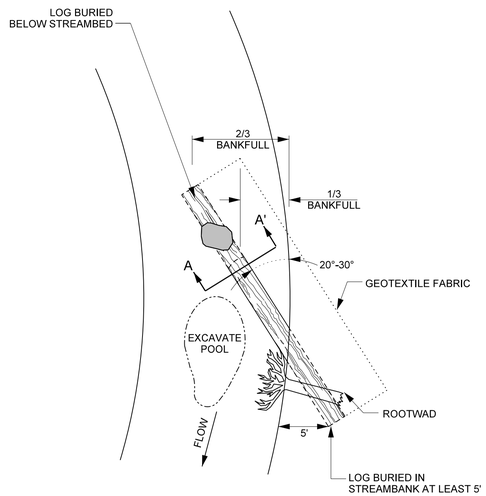


PROFILE VIEW

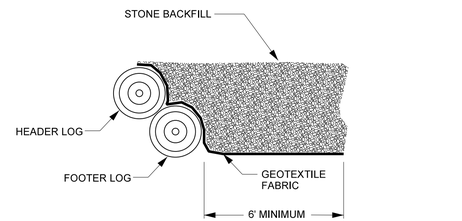
NOTES:

1. LOGS SHOULD BE AT LEAST 10" IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, RECENTLY HARVESTED, AND FOOTERED.
2. BOULDERS MUST BE AT LEAST 2' x 2' x 1'.
3. SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOG.
4. ROOTWADS SHOULD BE PLACED BENEATH THE HEADER LOG AND PLACED SO THAT IT LOCKS THE HEADER LOG INTO THE BANK, SEE ROOTWAD DETAIL.
5. BOULDERS SHOULD BE PLACED ON TOP OF HEADER LOG FOR ACHORING.
6. HEADER BOULDERS TO BE PLACED 0.5 TO 0.75 FEET APART.
7. FILTER FABRIC SHOULD BE NAILED TO THE LOG BELOW THE BACKFILL.
8. TRANSPLANTS OR BOULDERS CAN BE USED INSTEAD OF ROOWADS, PER DIRECTION OF ENGINEER.
9. BOULDER SILL MUST BE A MINIMUM OF 6'.
10. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.

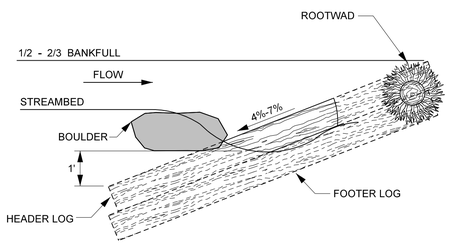
LOG VANE



PLAN VIEW



SECTION A - A'



PROFILE VIEW

NOTES:

1. LOGS SHOULD BE AT LEAST 10" IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED.
2. BOULDERS MUST BE OF SUFFICIENT SIZE TO ANCHOR LOGS.
3. SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOGS.
4. ROOTWADS SHOULD BE PLACED BENEATH THE HEADER LOG AND PLACED SO THAT IT LOCKS THE HEADER LOG INTO THE BANK, SEE ROOTWAD DETAIL.
5. BOULDER SHOULD BE PLACED ON TOP OF HEADER LOG FOR ANCHORING.
6. GEOTEXTILE FABRIC SHOULD BE NAILED TO THE LOG BELOW THE BACKFILL.
7. TRANSPLANTS CAN BE USED INSTEAD OF ROOTWADS, PER DIRECTION OF ENGINEER.
8. AFTER ALL STONE BACKFILL HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH WELL GRADED MIX OF CLASS B, CLASS A, & #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER ROCK. INCORPORATE ON-SITE ALLUVIUM WHERE AVAILABLE.

8/3/2020
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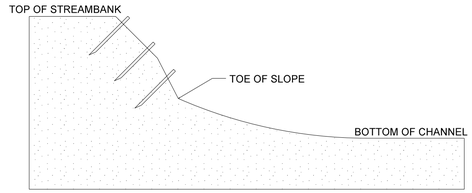
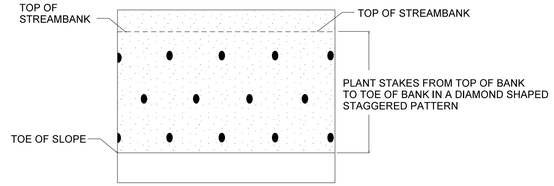
mcarter

2/26/03

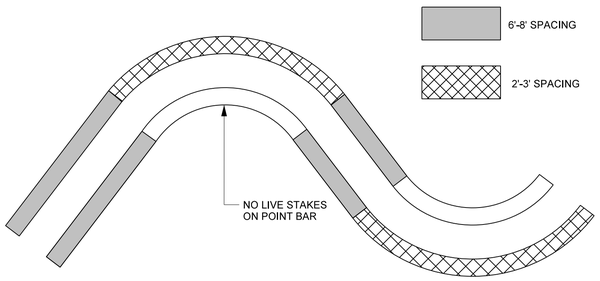
LIVE STAKING



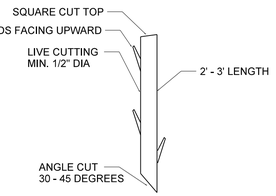
CROSS SECTION VIEW



PLAN VIEW



PLAN VIEW

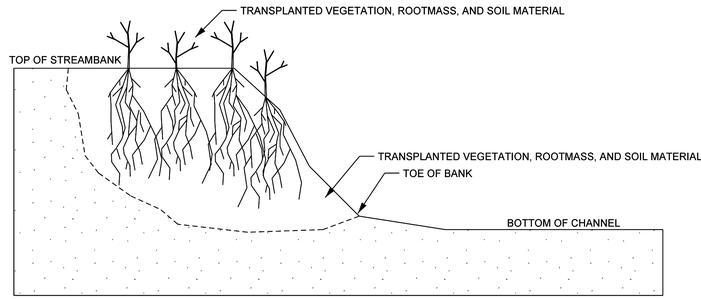


LIVE STAKE DETAIL

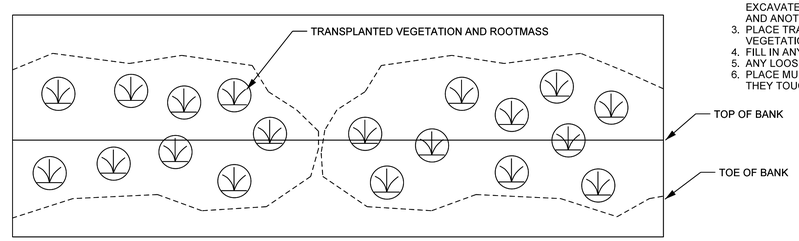
NOTES:

1. STAKES SHOULD BE CUT AND INSTALLED ON THE SAME DAY.
2. DO NOT INSTALL STAKES THAT HAVE BEEN SPLIT.
3. STAKES MUST BE INSTALLED WITH BUDS POINTING UPWARDS.
4. STAKES SHOULD BE INSTALLED PERPENDICULAR TO BANK.
5. STAKES SHOULD BE 1/2 TO 2 INCHES IN DIAMETER AND 2 TO 3 FT LONG.
6. STAKES SHOULD BE INSTALLED LEAVING 1/5 OF STAKE ABOVE GROUND.

TRANSPLANTED VEGETATION



CROSS SECTION VIEW



PLAN VIEW

NOTES:

1. EXCAVATE A HOLE IN THE BANK TO BE STABILIZED THAT WILL ACCOMMODATE THE SIZE OF TRANSPLANT TO BE PLACED. BEGIN EXCAVATION AT THE TOE OF THE BANK.
2. EXCAVATE TRANSPLANT USING A FRONT END LOADER. EXCAVATE THE ENTIRE ROOT MASS AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE. IF ENTIRE ROOT MASS CAN NOT BE EXCAVATE IN ONE BUCKET LOAD, THE TRANSPLANT IS TOO LARGE AND ANOTHER SHOULD BE SELECTED.
3. PLACE TRANSPLANT IN THE BANK TO BE STABILIZED SO THAT VEGETATION IS ORIENTATED VERTICALLY.
4. FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
5. ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
6. PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.

PROJECT REFERENCE NO.	SHEET NO.
157329	2C

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028432 ENGINEER KATHLEEN M MCKEITHAN

DocuSigned by: Kathleen Marie McKeithan 247E840F4181473...

APPROVED BY:

9/11/2020

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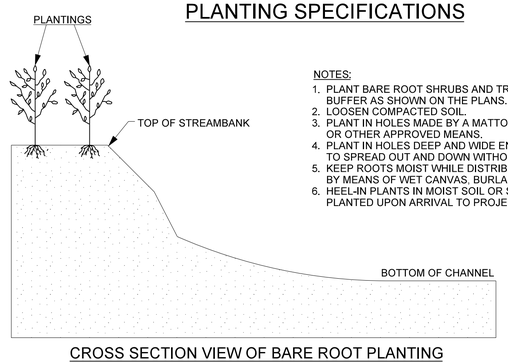
License #: F-1084

NCDMS ID NO. 100003

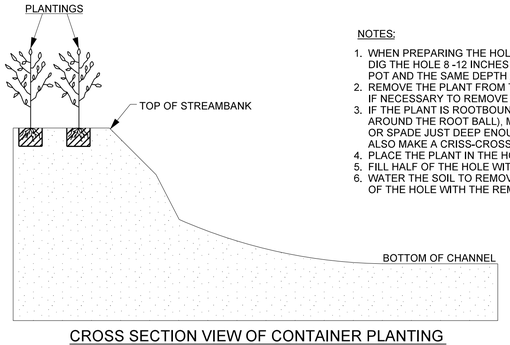
PLANTING SPECIFICATIONS



CROSS SECTION VIEW OF BARE ROOT PLANTING

NOTES:

1. PLANT BARE ROOT SHRUBS AND TREES TO THE WIDTH OF THE BUFFER AS SHOWN ON THE PLANS.
2. LOOSEN COMPACTED SOIL.
3. PLANT IN HOLES MADE BY A MATTOCK, DIBBLE, PLANTING BAR, OR OTHER APPROVED MEANS.
4. PLANT IN HOLES DEEP AND WIDE ENOUGH TO ALLOW THE ROOTS TO SPREAD OUT AND DOWN WITHOUT J-ROOTING.
5. KEEP ROOTS MOIST WHILE DISTRIBUTING OR WAITING TO PLANT BY MEANS OF WET CANVAS, BURLAP, OR STRAW.
6. HEEL-IN PLANTS IN MOIST SOIL OR SAWDUST IF NOT PROMPTLY PLANTED UPON ARRIVAL TO PROJECT SITE.



CROSS SECTION VIEW OF CONTAINER PLANTING

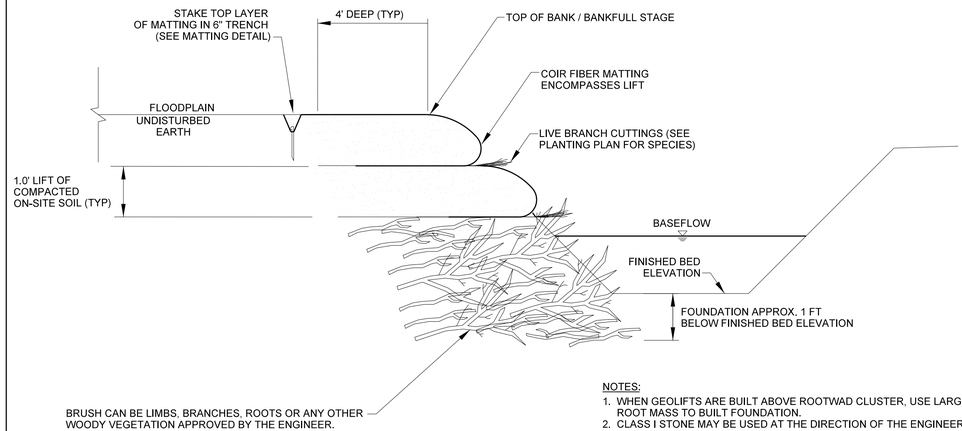
NOTES:

1. WHEN PREPARING THE HOLE FOR A POTTED PLANT OR SHRUB DIG THE HOLE 8 -12 INCHES LARGER THAN THE DIAMETER OF THE POT AND THE SAME DEPTH AS THE POT.
2. REMOVE THE PLANT FROM THE POT. LAY THE PLANT ON ITS SIDE IF NECESSARY TO REMOVE THE POT.
3. IF THE PLANT IS ROOTBOUND (ROOTS GROWING IN A SPIRAL AROUND THE ROOT BALL), MAKE VERTICAL CUTS WITH A KNIFE OR SPADE JUST DEEP ENOUGH TO CUT THE NET OF ROOTS. ALSO MAKE A CRISS-CROSS CUT ACROSS THE BOTTOM OF THE BALL.
4. PLACE THE PLANT IN THE HOLE.
5. FILL HALF OF THE HOLE WITH SOIL (SAME SOIL REMOVED FOR BACKFILL).
6. WATER THE SOIL TO REMOVE AIR POCKETS AND FILL THE REST OF THE HOLE WITH THE REMAINING SOIL.

GEOLIFT WITH BRUSH TOE

NOTES:

1. LIVE BRANCH CUTTINGS SHALL BE THE SAME SPECIES AS THE LIVE STAKES AND SHALL BE INSTALLED DURING VEGETATION DORMANCY.
2. LIVE BRANCH CUTTINGS SHALL BE INSTALLED AT A DENSITY OF 20-30 CUTTINGS PER LINEAR FOOT AND A MAXIMUM DIAMETER OF 2.5 INCHES.
3. NUMBER OF SOIL LIFTS MAY VARY, IN GENERAL LIFTS SHALL EXTEND TO THE TOP OF BANK OR BANKFULL STAGE.



NOTES:

1. WHEN GEOLIFTS ARE BUILT ABOVE ROOTWAD CLUSTER, USE LARGE STONE BACKFILL BEHIND ROOT MASS TO BUILT FOUNDATION.
2. CLASS I STONE MAY BE USED AT THE DIRECTION OF THE ENGINEER TO BUILD THE FOUNDATION IN LIEU OF BRUSH MATERIAL.

5/29/2020
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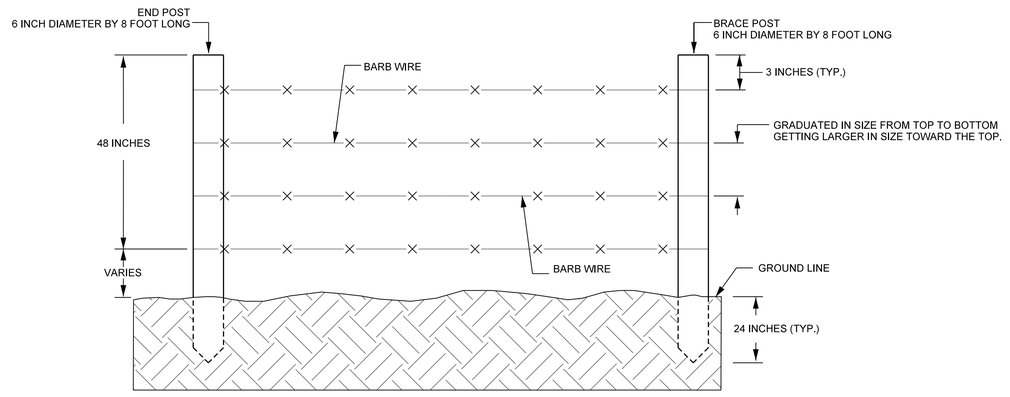
2/26/03

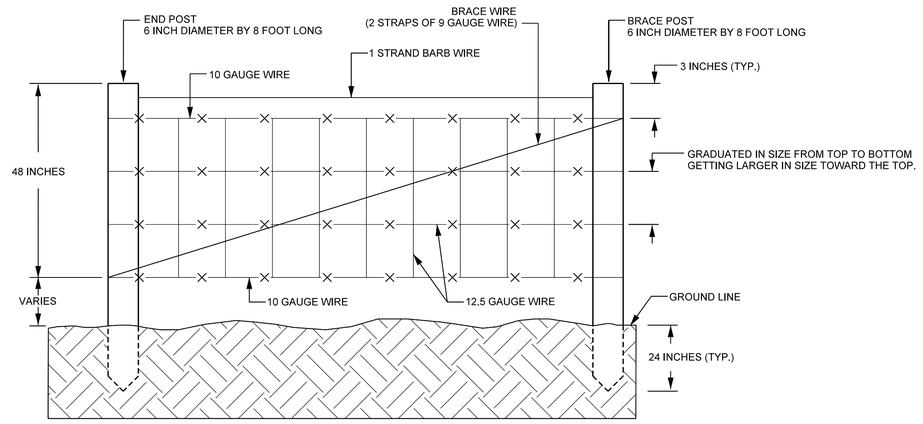
BARB WIRE FIELD FENCE



NOTE:

1. END POSTS SHALL BE INSTALLED AT A SPACING OF 10-15 FEET.

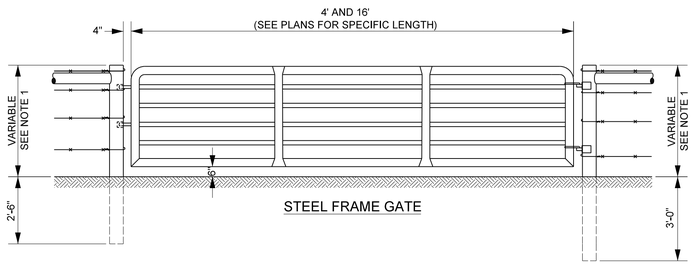
WOVEN WIRE FENCE



NOTE:

1. END POSTS SHALL BE INSTALLED AT A SPACING OF 10-15 FEET.

STEEL GATES

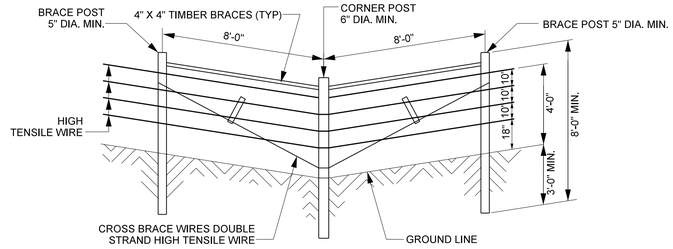


STEEL FRAME GATE

NOTES:

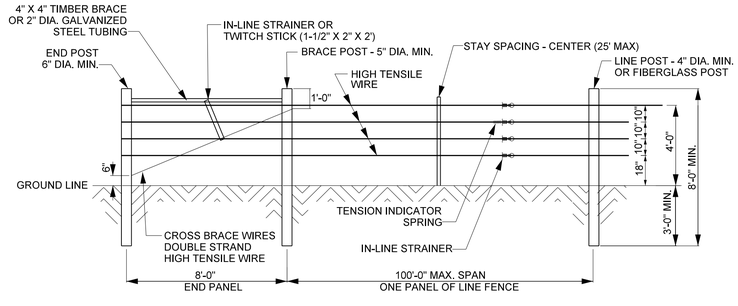
1. POST HEIGHT DIMENSION SHALL BE THE SAME AS REQUIRED FOR THE ADJACENT FENCE.
2. CONSTRUCT AN END OR STRESS PANEL, AS REQUIRED IN THE SPECIFICATION, ON EACH SIDE OF GATE.
3. HINGES AND LOCKS SHALL BE INSTALLED AS SPECIFIED BY GATE MANUFACTURER.

4 STRAND - HIGH TENSILE FENCING

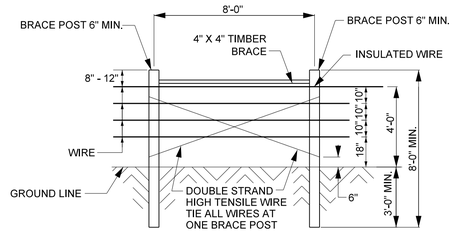


CORNER AND VERICAL CHANGE BRACING

INSTALL AT ALL POINTS WHERE FENCE ALIGNMENT CHANGES 15 DEGREES OR MORE

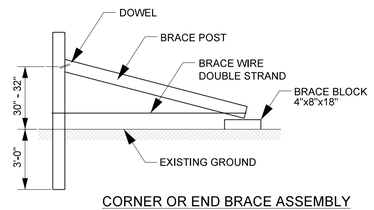


END ASSEMBLY AND LINE FENCE SECTION



PULL POST ASSEMBLY

PLACE IN FENCE LINE SO THAT MAXIMUM DISTANCE BETWEEN BRACED POSTS DOES NOT EXCEED 1320 FEET



CORNER OR END BRACE ASSEMBLY

OPTIONAL FIGURE 4

NOTES:

1. NOTCH POSTS 3/4" FOR 4" X 4" TIMBER BRACES.
2. DOWELS TO BE 1/2" DIA. X 5" PLAIN STEEL RODS. DRIVE DOWELS IN 7/16" DIA. HOLES, 2-1/2" INTO EACH POST AND TIMBER BRACE.
3. STAPLE CROSS-BRACE WIRES TO BRACE AND CORNER POSTS AT QUARTER POINTS OF THE POSTS.
4. HIGH TENSILE WIRE WILL BE NEW AND SMOOTH AND WILL MEET THE FOLLOWING 1) TENSILE STRENGTH - 110,000 PSI 2) GALVANIZING - TYPE III 3) GAGE - 12-1/2.
5. ALL CORNER POSTS, BRACE POSTS, BRACES, AND STAY SPACERS, SHALL BE PRESSURE TREATED. PRESSURE TREATMENT SHALL CONFORM TO FEDERAL SPECIFICATION TT-W-571. (1-1/4" LONG FOR HARD WOODS).
6. AT CORNER POSTS, STAPLE EACH WIRE AT QUARTER POINTS OF POSTS. AT BRACE POSTS, DOUBLE STAPLE EACH WIRE. AT LINE POSTS, SECURE EACH WIRE WITH STANDARD CLAMPS.
7. FIBERGLASS MAY BE USED FOR LINE POSTS. THESE WILL CONSIST OF MARBLE, FIBERGLASS, AND POLYMER RESINS WHICH HAVE BEEN TREATED BY THERMOSETTINGS (HEAT TREATMENT). POSTS MUST BE DRIVEN IN THE SOIL AT LEAST 18 INCHES.
8. 2" DIAMETER PIPE DIAGONAL BRACE MAY BE USED IN PLACE OF HORIZONTAL TIMBER BRACE AND DIAGONAL WIRES.
9. MINIMUM NET RETENTION OF CHROMATED COPPER ARSENATE (CCA) FOR WOOD FENCE POSTS SHALL BE 0.40 POUNDS PER CUBIC FOOT.
10. A SINGLE 12 FOOT LONG, 6 INCH MINIMUM DIAMETER POST MAY BE SUBSTITUTED FOR END PANEL, CORNER AND VERTICAL CHANGE BRACING, AND PULL POST ASSEMBLY. THE 12 FOOT LONG POSTS SHALL EXTEND A MINIMUM OF 7.5 FEET INTO THE GROUND AND BE BACKFILLED WITH GRAVEL.
11. FOR FURTHER DETAILS ON APPROVED METHODS OF FENCE INSTALLATION, SEE NATURAL RESOURCE SERVICE'S CONSERVATION PRACTICE MATERIALS AND CONSTRUCTION SPECIFICATIONS FOR FENCING (CODE 382) BY NRCS NORTH CAROLINA (FEBRUARY 2008).

PROJECT REFERENCE NO.	SHEET NO.
157329	2D

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028432 ENGINEER KATHLEEN M MCKEITHAN

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247E84DF4181473...

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9/11/2020

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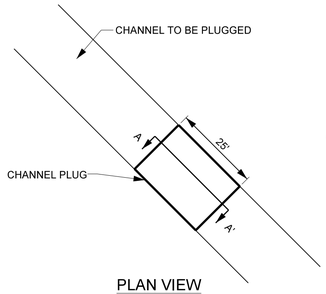
License #: F-1084

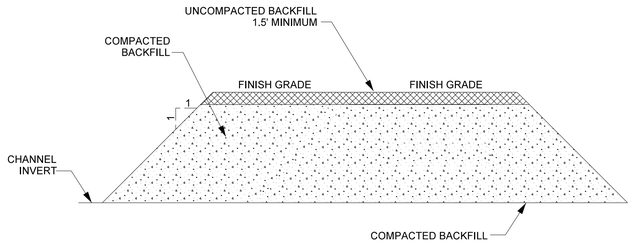
NCDMS ID NO. 100003

2/26/03

CHANNEL PLUG



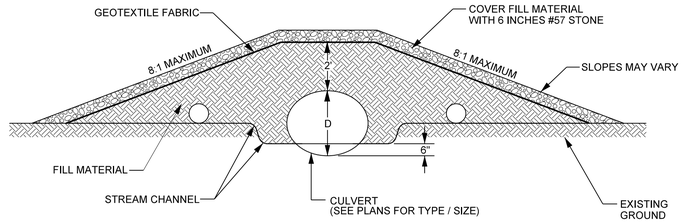
PLAN VIEW



SECTION A - A'

NOTE:
COMPACT BACKFILL USING ON-SITE HEAVY EQUIPMENT
IN 10 INCH LIFTS.

PERMANENT STREAM CROSSING



CROSS SECTION VIEW

NOTES:

1. SIZE DIMENSIONS SHOWN ON PLANS.
2. APPLY SUFFICIENT FILL (18" MIN) OVER CULVERT TO PREVENT COLLAPSE.
3. STABILIZE SIDE SLOPES WITH EROSION CONTROL MATTING AND FILL AROUND CULVERTS WITH CLASS II STONE.
4. INSTALL HEADWALLS AND ENDWALLS AS SHOWN ON THE PLANS.

PROJECT REFERENCE NO.	SHEET NO.
157329	2E

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028432 ENGINEER KATHLEEN M MCKEITHAN

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9/3/2020
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mcoffey

2/26/03

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
2. EXCAVATE STREAMBED MATERIAL BEFORE FILLING IN THE OLD CHANNEL AND USE STREAMBED MATERIAL WITHIN THE NEWLY CONSTRUCTED CHANNEL.
3. CONTRACTOR CAN USE BRUSH MATERIAL TO INCORPORATE WITHIN THE CONSTRUCTED RIFFLES AND BRUSH TOES ALONG MEANDER BENDS.
4. FENCING INSIDE EASEMENT WILL BE REMOVED AND HAULED OFF-SITE BY THE CONTRACTOR.
5. ANY AREA THAT HAS BEEN GRADED MUST HAVE POSITIVE DRAINAGE, UNLESS OTHERWISE DIRECTED BY ENGINEER.
6. AREAS OF BENCHING: CONTRACTOR WILL EXCAVATE THE TOPSOIL, STOCKPILE IT, AND THEN ADD THE TOPSOIL AS TOP LAYER OF BENCH TO A DEPTH OF AT LEAST 8 INCHES.
7. CONTRACTOR WILL CONTROL ANY INVASIVE SPECIES WITHIN EASEMENT.
8. LOCATIONS OF BOULDER STEPS AND GRADE CONTROL STRUCTURES ARE SUBJECT TO CHANGE BASED ON FIELD CONDITIONS AND BY THE DIRECTION OF THE ENGINEER.
9. CONTRACTOR SHALL INCORPORATE SOIL WITHIN THE CONSTRUCTED RIFFLES ALONG ALL STEEP HEADWATER TRIBUTARIES TO REDUCE PERMEABILITY AND KEEP SURFACE FLOW.
10. WHERE DESIGN PROFILE OF STEEP HEADWATER CHANNELS DIVIATES FROM THE EXISTING PROFILE, CONTRACTOR SHALL SLOPE STREAM BANKS AT 2:1 AS NECESSARY TO TIE TO EXISTING GROUND.

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	3

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA09AC644F...

APPROVED BY:

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Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

NAD 83

CONTROL POINT
N: 832400.89
E: 1342937.62
ELEV: 1292.35'

CONTROL POINT
N: 832678.36
E: 1342832.44
ELEV: 1295.46'

BEGIN REACH 1
STA. 10+00.00

RUSSELL GAP ROAD
SR 1335
R/W WIDTH 60' PER DB:208 PG:260

UNITED ENERGY UTILITY EASEMENT

HYDRIC SOILS BOUNDARY

WOVEN WIRE FENCE (TYP.)

ROCK CROSS VANE (TYP.)

AB GATE LOCATION NOT IN ORIGINAL DESIGN

GATE

CONSTRUCTED RIFFLE (TYP.)

AS-BUILT THALWEG (TYP.)

CHRISTINA MOOSE HERMAN & HUSBAND DAVID SHAWN MOOSE
PIN: 3843-12-2016
DB: 542 PG: 2445

AS-BUILT TOE OF BANK (TYP.)

END REACH 10B
STA. 14+79.77

NEW CONST. RIFFLE NOT IN DESIGN PLANS

LOG & ROCK STEP POOL (TYP.)

GEOLIFT WITH BRUSH TOE (TYP.)

ROCK VANE (TYP.)

VEG PLOT 1

MW #1
MW #2
MW #3

W1
W5

AS-BUILT TOP OF BANK (TYP.)

GRADE CONTROL ROCK J- HOOK VANE (TYP.)

MATCH LINE - SEE SHEET 7

MATCH LINE - SEE SHEET 4

FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS–BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

9/3/2020
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mcoffey

2/26/03

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
2. EXCAVATE STREAMBED MATERIAL BEFORE FILLING IN THE OLD CHANNEL AND USE STREAMBED MATERIAL WITHIN THE NEWLY CONSTRUCTED CHANNEL.
3. CONTRACTOR CAN USE BRUSH MATERIAL TO INCORPORATE WITHIN THE CONSTRUCTED RIFFLES AND BRUSH TOES ALONG MEANDER BENDS.
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10. WHERE DESIGN PROFILE OF STEEP HEADWATER CHANNELS DIVIATES FROM THE EXISTING PROFILE, CONTRACTOR SHALL SLOPE STREAM BANKS AT 2:1 AS NECESSARY TO TIE TO EXISTING GROUND.

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	4

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

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APPROVED BY:

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License #: F-1084

NCDMS ID NO. 100003

NAD 83

CONTROL POINT
N: 832400.89
E: 1342937.62
ELEV: 1288.97'

RUSSELL GAP ROAD
SR 1335
R/W WIDTH 60' PER DB:208 PG:260

ENERGY UTILITY EASEMENT

WIRE FENCE

HYDRIC SOILS BOUNDARY

WOVEN WIRE FENCE (TYP.)

OVERHEAD UTILITY

CHRISTINA MOOSE HERMAN & HUSBAND DAVID SHAWN MOOSE
PIN: 3843-12-2016
DB: 542 PG: 2445

AS-BUILT TOE OF BANK (TYP.)

AS-BUILT TOP OF BANK (TYP.)

MW #4

W1

68"X106" ELLIPTICAL CULVERT CALLED FOR IN DESIGN. 96"CMP IS AN EQUILVALENT SIZE. (TYP.)

24" RCP CALLED FOR IN DESIGN (TYP)

24" RCP
INV=1279.11'

96" CMP
INV=1276.92'

24" RCP
INV=1279.23'

CONSTRUCTED RIFFLE (TYP.)

AS-BUILT THALWEG (TYP.)

MATCH LINE - SEE SHEET 3

MATCH LINE - SEE SHEET 5

REBECCA HERMAN DUPUIS & JAMES MICHAEL DUPUIS
PIN: 3843-11-8159
DB: 542 PG: 2450

24" RCP
INV=1278.73'

96"CMP
INV=1276.42'

24" RCP
INV=1278.71'

X-1

X-2

MW #5

MW #6

GEOLIFT WITH BRUSH TOE (TYP.)

GRADE CONTROL ROCK J- HOOK VANE (TYP.)

VEG PLOT 2

GATE

GATE

GATE

AB GATE LOCATION NOT IN ORIGINAL DESIGN

FILL EXISTING CHANNEL

CHANNEL PLUG

16+00 17+00 18+00 19+00 20+00 21+00 22+00

RUSSELL GAP AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/31/2020
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BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	5

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1GBEEEA08AC644F...

APPROVED BY:

9/11/2020

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Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

2/26/03

NAD 83

RUSSELL GAP ROAD
SR 1335
R/W WIDTH 60' PER DB:208 PG:260

OVERHEAD UTILITY

UNITED ENERGY UTILITY EASEMENT

WIRE FENCE

WOVEN WIRE FENCE (TYP.)

CONTROL POINT
N: 831680.72
E: 1343429.92
ELEV: 1280.15'

AB GATE LOCATION NOT IN ORIGINAL DESIGN

GATE

HYDRIC SOILS BOUNDARY

LOG VANE INSTALLED BOULDER STEP CALLED FOR IN DESIGN

HYDRIC SOILS BOUNDARY

DIRT ROAD

VEG PLOT 3

W1

REBECCA HERMAN DUPUIS &
JAMES MICHAEL DUPUIS
PIN: 3843-11-8159
DB: 542 PG: 2450

END REACH 11
STA. 17+31.85

GEOLIFT WITH BRUSH TOE (TYP.)

AS-BUILT THALWEG (TYP.)

BEGIN REACH 12
STA. 10+00.00

ROCK CROSS VANE (TYP.)

X-26

X-4

X-3

MW #8

CREST GAUGE #1

ROCK VANE (TYP.)

CONSTRUCTED RIFFLE (TYP.)

MW #7

22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
10+00
11+00

MATCH LINE - SEE SHEET 4

MATCH LINE - SEE SHEET 8

MATCH LINE - SEE SHEET 6

VEG PLOT 4

END REACH 12
STA. 11+01.78

AS-BUILT TOE OF BANK (TYP.)

AS-BUILT TOP OF BANK (TYP.)

FENCE INSTALLED HERE FOR A STRAIGHT LINE

REBECCA HERMAN DUPUIS &
JAMES MICHAEL DUPUIS
PIN: 3843-11-8159
DB: 542 PG: 2450

GRADE CONTROL ROCK J- HOOK VANE (TYP.)

MW #9

HYDRIC SOILS BOUNDARY

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
2. EXCAVATE STREAMBED MATERIAL BEFORE FILLING IN THE OLD CHANNEL AND USE STREAMBED MATERIAL WITHIN THE NEWLY CONSTRUCTED CHANNEL.
3. CONTRACTOR CAN USE BRUSH MATERIAL TO INCORPORATE WITHIN THE CONSTRUCTED RIFFLES AND BRUSH TOES ALONG MEANDER BENDS.
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10. WHERE DESIGN PROFILE OF STEEP HEADWATER CHANNELS DIVIATES FROM THE EXISTING PROFILE, CONTRACTOR SHALL SLOPE STREAM BANKS AT 2:1 AS NECESSARY TO TIE TO EXISTING GROUND.

FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP AS–BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-05.dgn
mdeal

2/26/03

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	6

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA7BAC844F...

APPROVED BY:

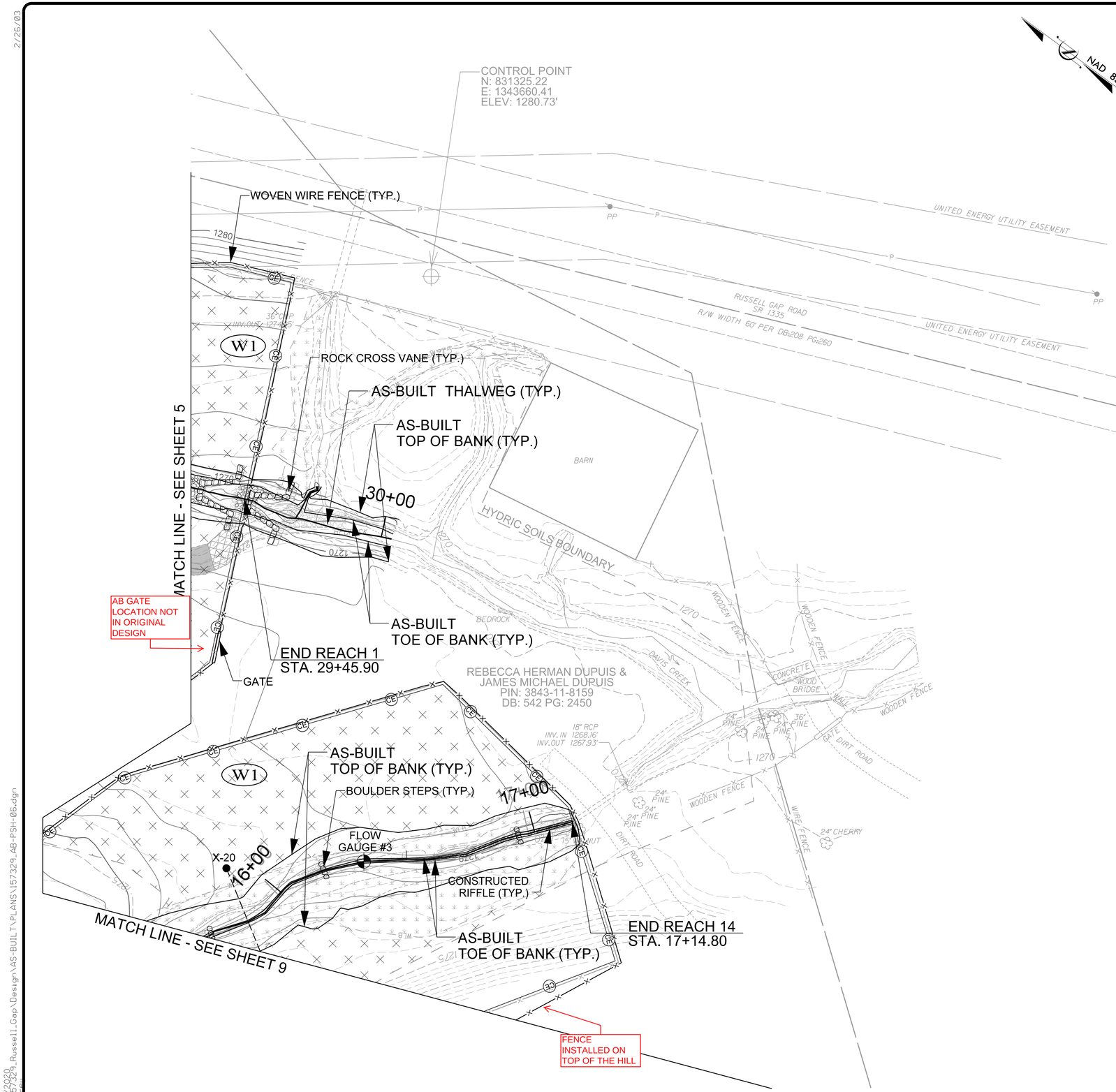
9/11/2020

DATE:

Michael Baker INTERNATIONAL

Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003



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FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

9/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-06.dgn
mpope

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	7

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC844F...

APPROVED BY:

9/11/2020

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Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

2/26/03

NAD 83

CHRISTINA MOOSE HERMAN &
HUSBAND DAVID SHAWN
MOOSE
PIN: 3843-12-2016
DB: 542 PG: 2445

BEGIN REACH 10A
STA. 10+08.40

WOVEN WIRE FENCE (TYP.)

AS-BUILT
TOE OF BANK (TYP.)

AS-BUILT
THALWEG (TYP.)

MATCH LINE - SEE SHEET 3

10+00

11+00

12+00

13+00

W1

W4

BOULDER STEPS (TYP.)

AS-BUILT
TOP OF BANK (TYP.)

VEG
PLOT
16

AB GATE
LOCATION NOT
IN ORIGINAL
DESIGN

GATE

CONTROL POINT
N: 832511.89
E: 1342409.91
ELEV: 1313.69'

CHRISTINA MOOSE HERMAN &
HUSBAND DAVID SHAWN
MOOSE
PIN: 3843-12-2016
DB: 542 PG: 2445

END REACH 10A
BEGIN REACH 10B
STA. 13+74.94

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
2. EXCAVATE STREAMBED MATERIAL BEFORE FILLING IN THE OLD CHANNEL AND USE STREAMBED MATERIAL WITHIN THE NEWLY CONSTRUCTED CHANNEL.
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FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-07.dgn

2/26/03

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	8

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC644F...

APPROVED BY:

9/11/2020

DATE:

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Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

NAD 83

REBECCA HERMAN DUPUIS &
JAMES MICHAEL DUPUIS
PIN: 3843-11-8159
DB: 542 PG: 2450

CONTROL POINT
N: 831707.66
E: 1342889.68
ELEV: 1311.61'

WOVEN WIRE FENCE (TYP.)

BEGIN REACH 11
STA. 10+00.00

CONSTRUCTED RIFFLE (TYP.)

AS-BUILT
TOE OF BANK (TYP.)

ROCK STEP
POOL CHANNEL
CALLED FOR IN
DESIGN

BOULDER STEPS (TYP.)

AS-BUILT
THALWEG (TYP.)

VEG
PLOT
17

FLOW
GAUGE #1

X-18

AS-BUILT
TOP OF BANK (TYP.)

ADDITIONAL RIP
RAP INSTALLED
TO STABILIZE
ROAD

10+00 11+00 12+00 13+00 14+00 15+00

MATCH LINE - SEE SHEET 5

REBECCA HERMAN DUPUIS &
JAMES MICHAEL DUPUIS
PIN: 3843-11-8159
DB: 542 PG: 2450

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FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/3/2020
8:31:25 AM
I:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-08.dgn
mcarr

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	9

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA08AC644F...

APPROVED BY:

9/11/2020

DATE:

Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

2/26/03

NAD 83

REBECCA HERMAN DUPUIS &
JAMES MICHAEL DUPUIS
PIN: 3843-11-8159
DB: 542 PG: 2450

CONTROL POINT
N: 831242.26
E: 1342875.02
ELEV: 1338.94'

BEGIN REACH 13
STA. 10+00.00

FENCE MOVED TO THE TOP OF THE HILL

WOVEN WIRE FENCE (TYP.)

BOULDER STEPS INPLACE OF ROCK STEP POOL CHANNEL CALLED FOR IN DESIGN

AS-BUILT TOE OF BANK (TYP.)

VEG PLOT 18

10+00

11+00

12+00

13+00

14+00

15+00

X-19

FLOW GAUGE #2

BOULDER STEPS (TYP.)

AS-BUILT THALWEG (TYP.)

GATE

CONTROL POINT
N: 831330.54
E: 1343260.56
ELEV: 1292.97'

AS-BUILT TOP OF BANK (TYP.)

END REACH 13
BEGIN REACH 14
STA. 11+45.00

MATCH LINE - SEE SHEET 6

X-20

REBECCA HERMAN DUPUIS &
JAMES MICHAEL DUPUIS
PIN: 3843-11-8159
DB: 542 PG: 2450

FILL EXISTING CHANNEL

CHANNEL PLUG

FENCE INSTALLED AT THE TOP OF THE HILL

NOTES:

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RUSSELL GAP AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-09.dgn
mgreen

2/26/03

NOTES:

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BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	10

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC644F...

APPROVED BY:

9/11/2020

DATE:

Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

NAD 83

RUTH GAIL BUMGARNER
AND LINDA LOWE
PIN: 3843-60-7639
BY WILL
REF:DB: 47 PG: 485

WOVEN WIRE FENCE (TYP.)

AB GATE
LOCATION NOT
IN ORIGINAL
DESIGN

GATE

MATCH LINE – SEE SHEET 24

VEG
PLOT
6

10+00 11+00 12+00 13+00

1260 1260

CE CE CE CE CE CE CE CE CE CE CE CE

WL8 WL8 WL7M

ACCESS ROAD

TLS#46NL

BRIDGE

ACCESS ROAD

UNITED ENERGY UTILITY EASEMENT

UNITED ENERGY UTILITY EASEMENT

GATE

AB GATE
LOCATION NOT
IN ORIGINAL
DESIGN

EXISTING R/W

MT. OLIVE CHURCH ROAD
SR 1334

EXISTING R/W

MATCH LINE – SEE SHEET 11

FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-10.dgn
mcDOT

2/26/03

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NAD 83

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	11

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA08AC644F

APPROVED BY:

9/11/2020

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Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

MATCH LINE – SEE SHEET 24

MATCH LINE – SEE SHEET 10

MATCH LINE – SEE SHEET 12

WOVEN WIRE FENCE (TYP.)

AS-BUILT THALWEG (TYP.)

AS-BUILT TOE OF BANK (TYP.)

CONSTRUCTED RIFFLE (TYP.)

ROCK CROSS VANE (TYP.)

AS-BUILT TOP OF BANK (TYP.)

BEGIN REACH 4
STA. 10+00.00

END REACH 27
STA. 11+59.68

BOULDER STEPS (TYP.)

BOULDER STEPS INSTALLED IN PLACE OF ROCK STEP POOLS

BEGIN REACH 27
STA. 10+00.00

10+00

11+00

12+00

13+00

X-6

TLS#30NL

RUTH GAIL BUMGARNER
AND LINDA LOWE
PIN: 3843-60-7639
BY WILL
REF:DB: 47 PG: 485

RUTH GAIL BUMGARNER
AND LINDA LOWE
PIN: 3843-60-7639
BY WILL
REF:DB: 396 PG: 1279

CONTROL POINT
NGGS MONUMENT (504)
(UNPUBLISHED)
STATE PLANE COORDINATES
N: 830822.79
E: 1346664.50
ELEV: 1271.27'

CONTROL POINT
N: 830684.72
E: 1346562.31
ELEV: 1265.93'

ACCESS ROAD

UNITED ENERGY UTILITY EASEMENT

EAST PRONG LOWER LITTLE RIVER

ELECTRIC FENCE

48" POPLAR

48" CMP
INV IN 1255.21'
INV OUT 1252.78'

EXISTING R/W

MT OLIVE CHURCH ROAD
SR 1334

FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

9/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-11.dgn
PSHeet

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	12

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC644F...

APPROVED BY:

9/11/2020

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Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

2/26/03

NAD 83

AB GATE LOCATION NOT IN ORIGINAL DESIGN

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-69-4491
DB:561 PG: 218 (TRACT VI)
REF: DB: 219 PG: 695
& DB: 52 PG: 388

GATE

WOVEN WIRE FENCE (TYP.)

AS-BUILT THALWEG (TYP.)

ROCK VANE (TYP.)

CONSTRUCTED RIFFLE (TYP.)

X-7

TLS#30NL

TLS#32NL

14+00 15+00 16+00 17+00 18+00 19+00

VEG PLOT 7

AS-BUILT TOP OF BANK (TYP.)

ROCK CROSS VANE (TYP.)

AS-BUILT TOE OF BANK (TYP.)

MATCH LINE – SEE SHEET 11

MATCH LINE – SEE SHEET 13

WOODEN FENCE

EXISTING R/W

MT.OLIVE CHURCH ROAD SR 1334

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FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP AS–BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/13/2020
8:33:02 AM
J:\157329_Russell_Gap\Design\AS-BUILTPLANS\157329_AB-PSH-12.dgn
mgreen

2/26/03

NOTES:

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5. ANY AREA THAT HAS BEEN GRADED MUST HAVE POSITIVE DRAINAGE, UNLESS OTHERWISE DIRECTED BY ENGINEER.
6. AREAS OF BENCHING: CONTRACTOR WILL EXCAVATE THE TOPSOIL, STOCKPILE IT, AND THEN ADD THE TOPSOIL AS TOP LAYER OF BENCH TO A DEPTH OF AT LEAST 8 INCHES.
7. CONTRACTOR WILL CONTROL ANY INVASIVE SPECIES WITHIN EASEMENT.
8. LOCATIONS OF BOULDER STEPS AND GRADE CONTROL STRUCTURES ARE SUBJECT TO CHANGE BASED ON FIELD CONDITIONS AND BY THE DIRECTION OF THE ENGINEER.
9. CONTRACTOR SHALL INCORPORATE SOIL WITHIN THE CONSTRUCTED RIFFLES ALONG ALL STEEP HEADWATER TRIBUTARIES TO REDUCE PERMEABILITY AND KEEP SURFACE FLOW.
10. WHERE DESIGN PROFILE OF STEEP HEADWATER CHANNELS DIVIATES FROM THE EXISTING PROFILE, CONTRACTOR SHALL SLOPE STREAM BANKS AT 2:1 AS NECESSARY TO TIE TO EXISTING GROUND.

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	13

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1C95EEA0BAC944F...

APPROVED BY:

9/11/2020

DATE:

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Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
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Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

NAD 83

WOVEN WIRE FENCE (TYP.)

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-69-4491
DB:561 PG: 218 (TRACT VI)
REF: DB: 219 PG: 695
& DB: 52 PG: 388

GRADE CONTROL ROCK J-HOOK VANE (TYP.)

AS-BUILT TOE OF BANK (TYP.)

AS-BUILT THALWEG (TYP.)

MATCH LINE – SEE SHEET 25

MATCH LINE – SEE SHEET 12

GRADE FARM PATH
INSTALL GEOTEXTILE FABRIC AND 6" OF CRUSH & RUN

BOULDER STEPS (TYP.)

BOULDER STEPS INSTALLED IN PLACE OF ROCK STEP POOLS

CONSTRUCTED RIFFLE (TYP.)

AS-BUILT TOP OF BANK (TYP.)

VEG PLOT 8

ROCK CROSS VANE (TYP.)

END REACH 15
STA. 13+02.77

MATCH LINE – SEE SHEET 14

CONTROL POINT
N: 830123.49
E: 1346022.45
ELEV: 1269.32'

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-69-4491
DB:561 PG: 218 (TRACT VI)
REF: DB: 219 PG: 695
& DB: 52 PG: 388

EXISTING R/W

MT. OLIVE CHURCH ROAD
SR 1334

FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-13.dgn

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	14

SEAL L-4551 NORTH CAROLINA PROFESSIONAL LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC844F...

APPROVED BY:

9/11/2020

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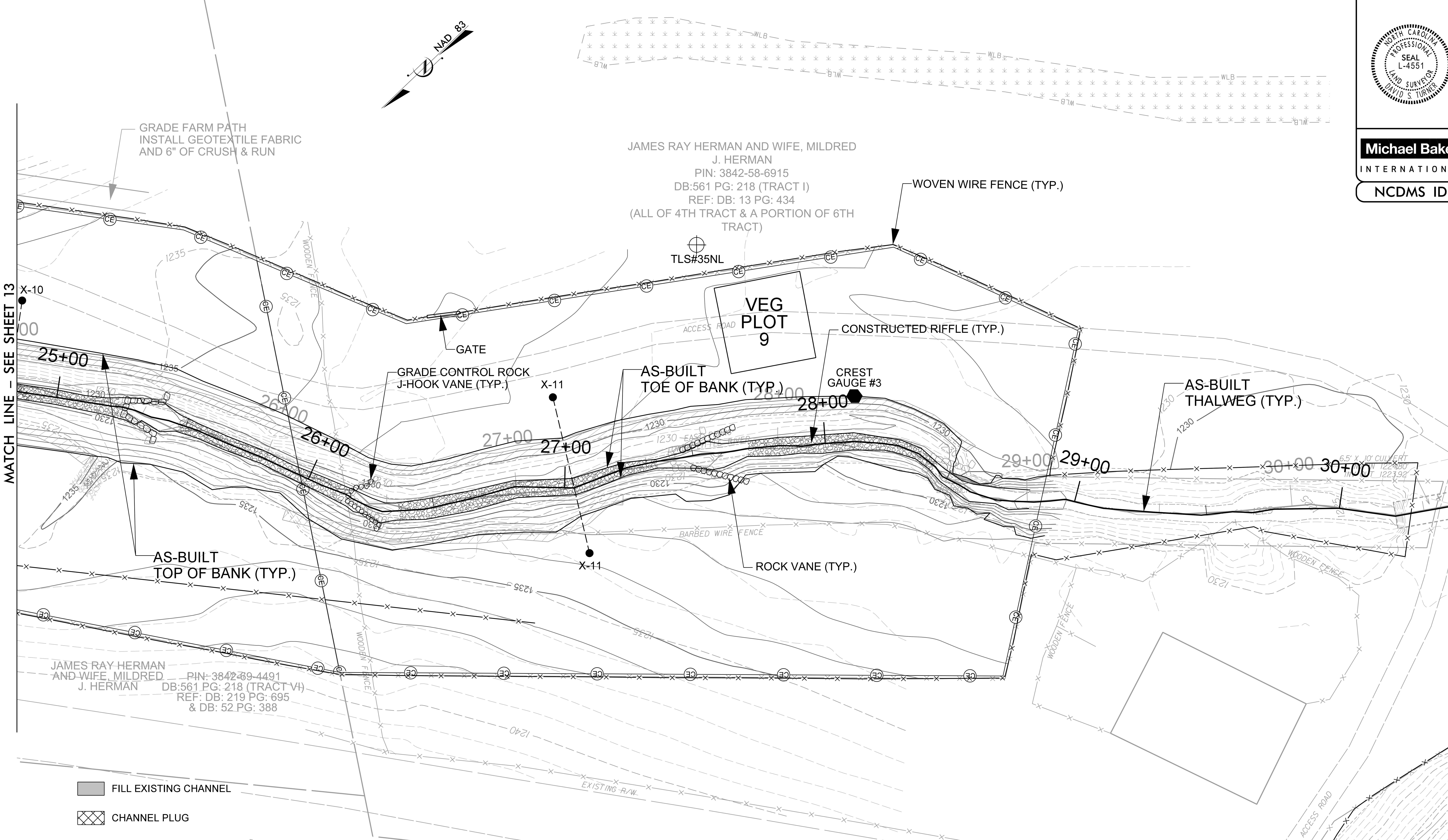
License #: F-1084

NCDMS ID NO. 100003



FILL EXISTING CHANNEL

CHANNEL PLUG

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
2. EXCAVATE STREAMBED MATERIAL BEFORE FILLING IN THE OLD CHANNEL AND USE STREAMBED MATERIAL WITHIN THE NEWLY CONSTRUCTED CHANNEL.
3. CONTRACTOR CAN USE BRUSH MATERIAL TO INCORPORATE WITHIN THE CONSTRUCTED RIFFLES AND BRUSH TOES ALONG MEANDER BENDS.
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10. WHERE DESIGN PROFILE OF STEEP HEADWATER CHANNELS DEVIATES FROM THE EXISTING PROFILE, CONTRACTOR SHALL SLOPE STREAM BANKS AT 2:1 AS NECESSARY TO TIE TO EXISTING GROUND.

CONTROL POINT
NCGS MONUMENT (502)
(UNPUBLISHED)
STATE PLANE COORDINATES
N: 829584.83
E: 1345397.75
ELEV: 1245.48'
CF: .99990545

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

2/26/03

9/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-14.dgn

2/26/03

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	15

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S TURNER

DocuSigned by: David S. Turner 1CB5EEA08AC644F...

APPROVED BY:

9/11/2020

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NCDMS ID NO. 100003

NAD 83

MATCH LINE – SEE SHEET 21

MATCH LINE – SEE SHEET 14

JAMES RAY HERMAN AND
WIFE, MILDRED J. HERMAN
PIN: 3842-58-6915
DB:561 PG: 218 (TRACT I)
REF: DB: 13 PG: 434
(ALL OF 4TH TRACT & A PORTION OF 6TH TRACT)

CONTROL POINT
N: 828996.30
E: 1344995.61
ELEV: 1230.04'

GRADE CONTROL J-HOOK VANE (TYP.)

AS-BUILT
THALWEG (TYP.)

ROCK VANE NOT
INSTALLED DUE
TO BEDROCK

AS-BUILT
TOE OF BANK (TYP.)

HYDRIC SOILS BOUNDARY

AS-BUILT
TOP OF BANK (TYP.)

END REACH 3
STA. 36+34.66

VEG
PLOT
5

W2

ROCK VANE (TYP.)

CONSTURCTED RIFFLE (TYP.)

ROCK CROSS
VANE (TYP.)

ROCK CROSS
VANE INSTALLED
AS DESIGNED

END REACH 9
STA. 43+10.91

END REACH 4
BEGIN REACH 3
STA. 32+28.36
END REACH 2
STA. 11+65.62

BEGIN REACH 2
STA. 10+00.00

X-5
X-26

10+00
11+00
31+00
32+00
33+00
34+00
35+00
36+00
43+00

WOVEN WIRE FENCE (TYP.)

OLD WAGON ROAD

BARBED WIRE FENCE

PROPERTY
OVERLAP
AREA

EXISTING R/W

MT.OLIVE CHURCH ROAD
SR 1334

15" WALNUT
24" SYCAMORE
18" CEDAR
18" POPLAR
15" POPLAR
30" SYCAMORE
36" SYCAMORE
18" POPLAR

3 X 10' CULVERT
INV. IN 1224.80'
INV. OUT 1223.92'

NOTES:

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FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/3/2020
R:\157329_Russell_Gap\Design\AS-BUILTPLANS\157329_AB-PSH-15.dgn
mcgee

2/26/03

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	16

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC944F...

APPROVED BY:

9/11/2020

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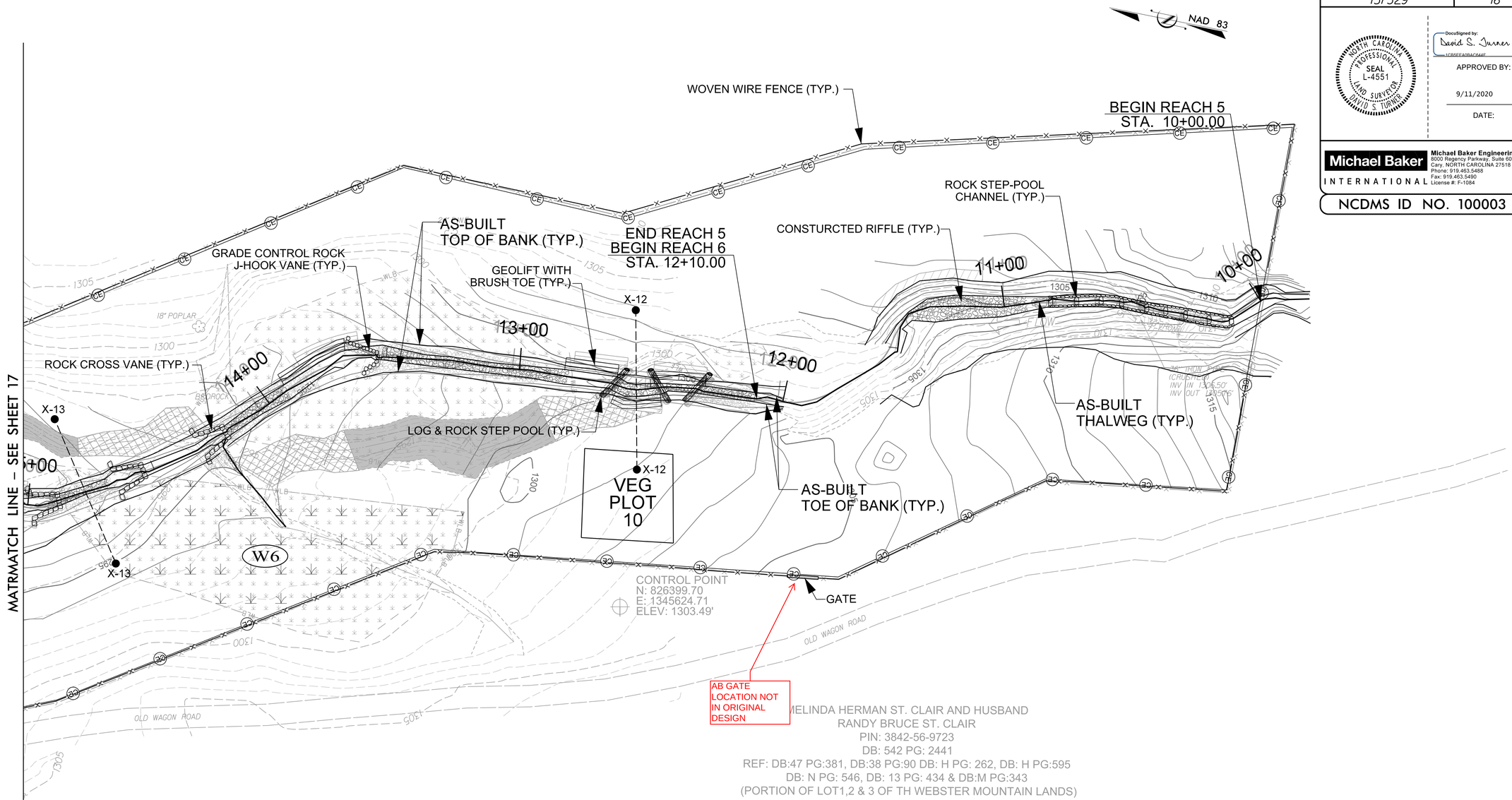
NCDMS ID NO. 100003



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FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS–BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

9/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-16.dgn
mdeal

2/26/03

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	17

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

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9/11/2020

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License #: F-1084

NCDMS ID NO. 100003

NAD 83

WOVEN WIRE FENCE (TYP.)

END REACH 6
BEGIN REACH 7A
STA. 19+57.36
END REACH 18
STA. 12+03.31

GRADE CONTROL ROCK J-HOOK VANE (TYP.)

GEOLIFT WITH BRUSH TOE (TYP.)

CONSTRUCTED RIFFLE ADDED IN AB

AS-BUILT TOE OF BANK (TYP.)

CONSTURCTED RIFFLE (TYP.)

ROCK CROSS VANE (TYP.)

MATCH LINE – SEE SHEET 18

MATCH LINE – SEE SHEET 16

CREST GAUGE #4

BOULDER STEPS (TYP.)

BOULDER STEPS INSTALLED IN PLACE OF ROCK STEP POOLS

VEG PLOT 11
CONTROL POINT
N: 826926.18
E: 1345646.44
ELEV: 1288.41'

AS-BUILT THALWEG (TYP.)

AS-BUILT TOP OF BANK (TYP.)

END REACH 17
STA. 11+06.64

GATE

AB GATE LOCATION NOT IN ORIGINAL DESIGN

GATE

OLD WAGON ROAD

18"CMP
INV IN 1289.84'
INV OUT 1288.26'

15"CMP
INV IN 1297.1
INV OUT 1297.

15" POPLAR

BEGIN REACH 17
STA. 10+00.00

BEGIN REACH 18
STA. 10+00.00

MELINDA HERMAN ST. CLAIR AND HUSBAND
RANDY BRUCE ST. CLAIR
PIN: 3842-56-9723
DB: 542 PG: 2441
REF: DB:47 PG:381, DB:38 PG:90 DB: H PG: 262, DB: H PG:595
DB: N PG: 546, DB: 13 PG: 434 & DB:M PG:343
(PORTION OF LOT1,2 & 3 OF TH WEBSTER MOUNTAIN LANDS)

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
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FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP AS–BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/31/2020
R:\157329_Russell_Gap\Design\AS-BUILT-PLANS\157329_AB-PSH-17.dgn
jmorris

2/26/03

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
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BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	18

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC644F

APPROVED BY:

9/11/2020

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Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

NAD 83

MELINDA HERMAN ST. CLAIR AND HUSBAND
RANDY BRUCE ST. CLAIR
PIN: 3842-56-9723
DB: 542 PG: 2441
REF: DB:47 PG:381, DB:38 PG:90 DB: H PG: 262, DB: H PG:595
DB: N PG: 546, DB: 13 PG: 434 & DB:M PG:343
(PORTION OF LOT1,2 & 3 OF TH WEBSTER MOUNTAIN LANDS)

BEGIN REACH 21
STA. 10+00.00

WOVEN WIRE FENCE (TYP.)

END REACH 21
STA. 10+91.76

END REACH 19
STA. 13+75.96

AS-BUILT
TOE OF BANK (TYP.)

ROCK VANE (TYP.)

END REACH 7A
BEGIN REACH 7B
STA. 20+61.17

AS-BUILT
THALWEG (TYP.)

AS-BUILT
TOP OF BANK (TYP.)

VEG
PLOT
12

ROCK CROSS VANE (TYP.)

CONSTURCTED RIFFLE (TYP.)

GEOLIFT WITH
BRUSH TOE (TYP.)

GATE

GRADE CONTROL ROCK
J-HOOK VANE (TYP.)

BOULDER STEPS (TYP.)

TLS#35NL

AB GATE
LOCATION NOT
IN ORIGINAL
DESIGN

GATE
FLOW
GAUGE #4

CONTROL POINT
N: 827356.84
E: 1345519.00
ELEV: 1276.19'

REALIGN AND GRADE FARM PATH
INSTALL GEOTEXTILE FABRIC
AND 6" OF CRUSH & RUN

BOULDER STEPS
INSTALLED IN
PLACE OF ROCK
STEP POOLS

MATCH LINE – SEE SHEET 19

MATCH LINE – SEE SHEET 22

MATCH LINE – SEE SHEET 17

FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-18.dgn
mcarey

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	19

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA08AC844F...

APPROVED BY:

9/11/2020

DATE:

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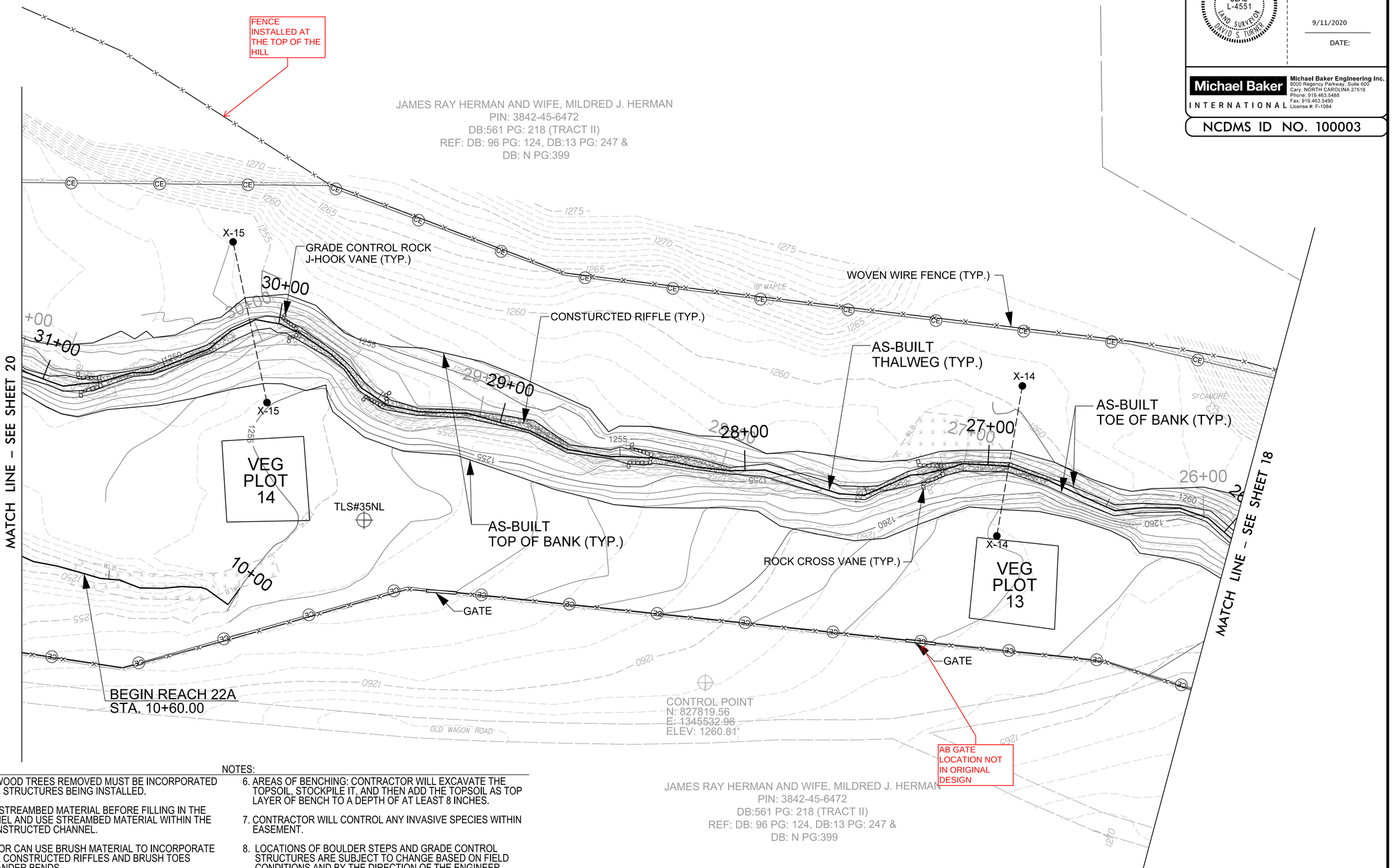

NOTES:

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FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

2/26/03

9/3/2020
8:15:57 AM
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mcdaniel

2/26/03

NOTES:

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NAD 83

MATCH LINE – SEE SHEET 23

CONTROL POINT
N: 828372.48
E: 1345666.61
ELEV: 1267.80'

CONTROL POINT
N: 828633.37
E: 1345541.06
ELEV: 1259.61'

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-58-6915
DB:561 PG: 218 (TRACT I)
REF: DB: 13 PG: 434
(ALL OF 4TH TRACT & A PORTION OF 6TH TRACT)

REALIGN AND GRADE FARM PATH
INSTALL GEOTEXTILE FABRIC
AND 6" OF CRUSH & RUN

TLS#35NL

X-23 X-23

BOULDER STEPS (TYP.)

FENCE INSTALLED ON TOP OF THE HILL

END REACH 25
STA. 14+30.52

CONSTURCTED RIFFLE (TYP.)

GATE

AS-BUILT THALWEG (TYP.)

AS-BUILT TOE OF BANK (TYP.)

ROCK VANE (TYP.)

AS-BUILT TOP OF BANK (TYP.)

END REACH 22
STA. 11+19.46

BEGIN REACH 8
STA. 33+75.40

END REACH 7B
STA. 33+51.48

GATE

AB GATE LOCATION NOT IN ORIGINAL DESIGN

END REACH 22A
STA. 11+28.42

BEGIN REACH 22
STA. 10+00.00

WOVEN WIRE FENCE (TYP.)

FLOW

60" CMP
INV IN 1243.01'
INV OUT 1242.06'

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-45-6472
DB:561 PG: 218 (TRACT XI)
REF: DB: 272 PG: 65 &
DB: 13 PG:434
(REMAINING PORTIONS OF 1ST,2ND,3RD,6TH,7TH,8TH&9TH TRACTS)
(SEE ALSO DB: M PG:343 &NC PATENT BOOK 179 PG:279)

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-45-6472
DB:561 PG: 218 (TRACT II)
REF: DB: 96 PG: 124, DB:13 PG: 247 &
DB: N PG:399

MATCH LINE – SEE SHEET 21

MATCH LINE – SEE SHEET 19

FILL EXISTING CHANNEL

CHANNEL PLUG

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	20

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1C85EEA0BAC044E...

APPROVED BY:

9/11/2020

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Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	21

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC644F...

APPROVED BY:

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NCDMS ID NO. 100003

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-58-6915
DB:561 PG: 218 (TRACT I)
REF: DB: 13 PG: 434
(ALL OF 4TH TRACT & A PORTION OF 6TH TRACT)

NAD 83

AB GATE LOCATION NOT IN ORIGINAL DESIGN

GATE

15" CMP INV IN 1240.23' INV OUT 1239.23'

15" CPP INV IN 1235.53' INV OUT 1229.91'

TLS#32NL

AB GATE LOCATION NOT IN ORIGINAL DESIGN

GATE

60" CMP INV IN 1231.65' INV OUT 1231.53'

W2

MW #12

MW #10

X-16

VEG PLOT 15

AS-BUILT THALWEG (TYP.)

X-17

CREST GAUGE

GEOLIFT WITH BRUSH TOE (TYP.)

ROCK CROSS VANE (TYP.)

ROCK OUTLET INSTALLED

CONSTURCTED RIFFLE (TYP.)

MW #11

BOWL OUTLET LINED WITH CLASS B STONE

AS-BUILT TOP OF BANK (TYP.)

AS-BUILT TOE OF BANK (TYP.)

GRADE CONTROL ROCK J-HOOK VANE (TYP.)

END REACH 8
STA. 38+28.55

BEGIN REACH 9
STA. 38+65.34

WOVEN WIRE FENCE (TYP.)

MATCH LINE – SEE SHEET 15

MATCH LINE – SEE SHEET 20

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-45-6472
DB:561 PG: 218 (TRACT XI)
REF: DB: 272 PG: 65 &
DB: 13 PG:434
(REMAINING PORTIONS OF 1ST,2ND,3RD,6TH,7TH,8TH&9TH TRACTS)
(SEE ALSO DB: M PG:343 &NC PATENT BOOK 179 PG:279)

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-58-6915
DB:561 PG: 218 (TRACT I)
REF: DB: 13 PG: 434
(ALL OF 4TH TRACT & A PORTION OF 6TH TRACT)

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
2. EXCAVATE STREAMBED MATERIAL BEFORE FILLING IN THE OLD CHANNEL AND USE STREAMBED MATERIAL WITHIN THE NEWLY CONSTRUCTED CHANNEL.
3. CONTRACTOR CAN USE BRUSH MATERIAL TO INCORPORATE WITHIN THE CONSTRUCTED RIFFLES AND BRUSH TOES ALONG MEANDER BENDS.
4. FENCING INSIDE EASEMENT WILL BE REMOVED AND HAULED OFF-SITE BY THE CONTRACTOR.
5. ANY AREA THAT HAS BEEN GRADED MUST HAVE POSITIVE DRAINAGE, UNLESS OTHERWISE DIRECTED BY ENGINEER.
6. AREAS OF BENCHING: CONTRACTOR WILL EXCAVATE THE TOPSOIL, STOCKPILE IT, AND THEN ADD THE TOPSOIL AS TOP LAYER OF BENCH TO A DEPTH OF AT LEAST 8 INCHES.
7. CONTRACTOR WILL CONTROL ANY INVASIVE SPECIES WITHIN EASEMENT.
8. LOCATIONS OF BOULDER STEPS AND GRADE CONTROL STRUCTURES ARE SUBJECT TO CHANGE BASED ON FIELD CONDITIONS AND BY THE DIRECTION OF THE ENGINEER.
9. CONTRACTOR SHALL INCORPORATE SOIL WITHIN THE CONSTRUCTED RIFFLES ALONG ALL STEEP HEADWATER TRIBUTARIES TO REDUCE PERMEABILITY AND KEEP SURFACE FLOW.
10. WHERE DESIGN PROFILE OF STEEP HEADWATER CHANNELS DIVIATES FROM THE EXISTING PROFILE, CONTRACTOR SHALL SLOPE STREAM BANKS AT 2:1 AS NECESSARY TO TIE TO EXISTING GROUND.

FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS–BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

9/3/2020
8:31:52 AM
M:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-21.dgn

2/26/03

NOTES:

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NAD 83

BEGIN REACH 20
STA. 10+00.00

10+00

11+00

12+00

BOULDER STEPS INSTALLED IN PLACE OF ROCK STEP POOLS

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-45-6472
DB:561 PG: 218 (TRACT II)
REF: DB: 96 PG: 124, DB:13 PG: 247 &
DB: N PG:399

REMAING PORTION OF
TRACT I DB: 91 PG; 186

X-22

FLOW GAUGE #5
N: 1045297.69
E: 2127429.69
ELEV: 1298.95

VEG PLOT 19

END REACH 20
STA. 12+53.61

AS-BUILT
THALWEG (TYP.)

AS-BUILT
TOE OF BANK (TYP.)

BOULDER STEPS (TYP.)

X-21

TLS#35NL

BEGIN REACH 19
STA. 9+86.00

AS-BUILT
TOP OF BANK (TYP.)

WOVEN WIRE FENCE (TYP.)

MATCH LINE - SEE SHEET 18

MELINDA HERMAN ST. CLAIR AND HUSBAND
RANDY BRUCE ST. CLAIR
PIN: 3842-56-9723
DB: 542 PG: 2441
REF: DB:47 PG:381, DB:38 PG:90 DB: H PG: 262, DB: H PG:595
DB: N PG: 546, DB: 13 PG: 434 & DB:M PG:343
(PORTION OF LOT1,2 & 3 OF TH WEBSTER MOUNTAIN LANDS)

FILL EXISTING CHANNEL

CHANNEL PLUG

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	22

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC644F

APPROVED BY:

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Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

9/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-22.dgn
mdeal

2/26/03

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	23

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA08AC644F

APPROVED BY:

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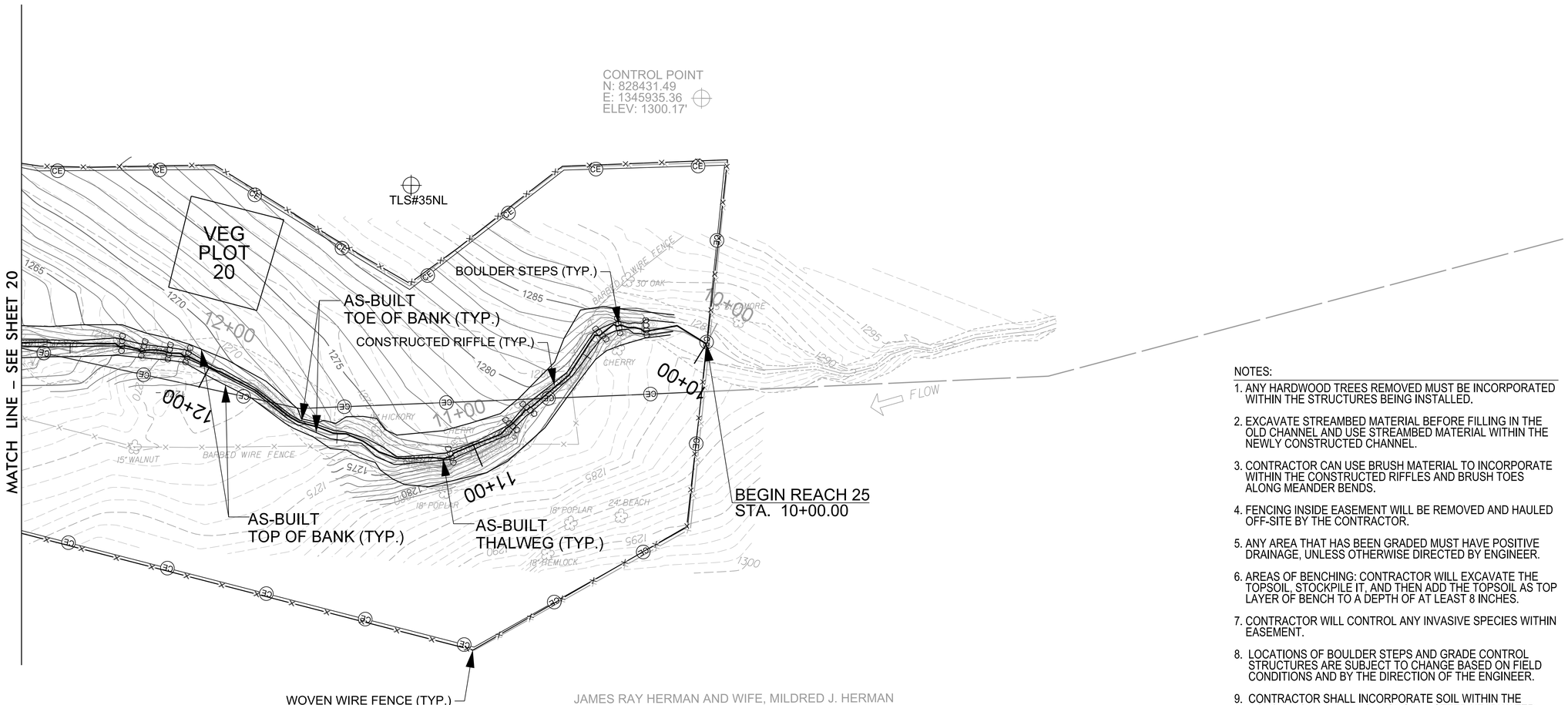
NCDMS ID NO. 100003

NAD 83

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-58-6915
DB:561 PG: 218 (TRACT I)
REF: DB: 13 PG: 434
(ALL OF 4TH TRACT & A PORTION OF 6TH TRACT)

CONTROL POINT
N: 828431.49
E: 1345935.36
ELEV: 1300.17'



JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-45-6472
DB:561 PG: 218 (TRACT II)
REF: DB: 96 PG: 124, DB:13 PG: 247 &
DB: N PG:399

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
2. EXCAVATE STREAMBED MATERIAL BEFORE FILLING IN THE OLD CHANNEL AND USE STREAMBED MATERIAL WITHIN THE NEWLY CONSTRUCTED CHANNEL.
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FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP AS–BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

8/31/2020
8:31:52 AM
J:\157329_Russell_Gap\Design\AS-BUILTS\PLANS\157329_AB-PSH-23.dgn
mcgrew

2/26/03

NOTES:

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BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	24

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA08AC644F...

APPROVED BY:

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NCDMS ID NO. 100003

NAD 83

RUTH GAIL BUMGARNER
AND LINDA LOWE
PIN: 3843-60-7639
BY WILL
REF:DB: 47 PG: 485

WOVEN WIRE FENCE (TYP.)

AS-BUILT TOE OF BANK (TYP.)

BOULDER STEPS (TYP.)

AS-BUILT THALWEG (TYP.)

STRUCTURES NOT INSTALLED DUE TO HEAEY VEGETATION AND STABILE BANKS

BEGIN REACH 26
STA. 10+00.00

END REACH 26
STA. 14+72.96

AS-BUILT TOP OF BANK (TYP.)

TLS#47NL

10+00
11+00
12+00
13+00
14+00

W3

ELECTRIC FENCE

UNITED ENERGY UTILITY EASEMENT

MATCH LINE – SEE SHEET 11

MATCH LINE – SEE SHEET 10

CONTROL POINT
N: 830836.08
E: 1347385.49
ELEV: 1276.95'

FILL EXISTING CHANNEL

CHANNEL PLUG

RUSSELL GAP
AS-BUILT PLAN VIEW

20 0 20 40
SCALE (FT)

9/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-24.dgn
mbaker

2/26/03

NOTES:

1. ANY HARDWOOD TREES REMOVED MUST BE INCORPORATED WITHIN THE STRUCTURES BEING INSTALLED.
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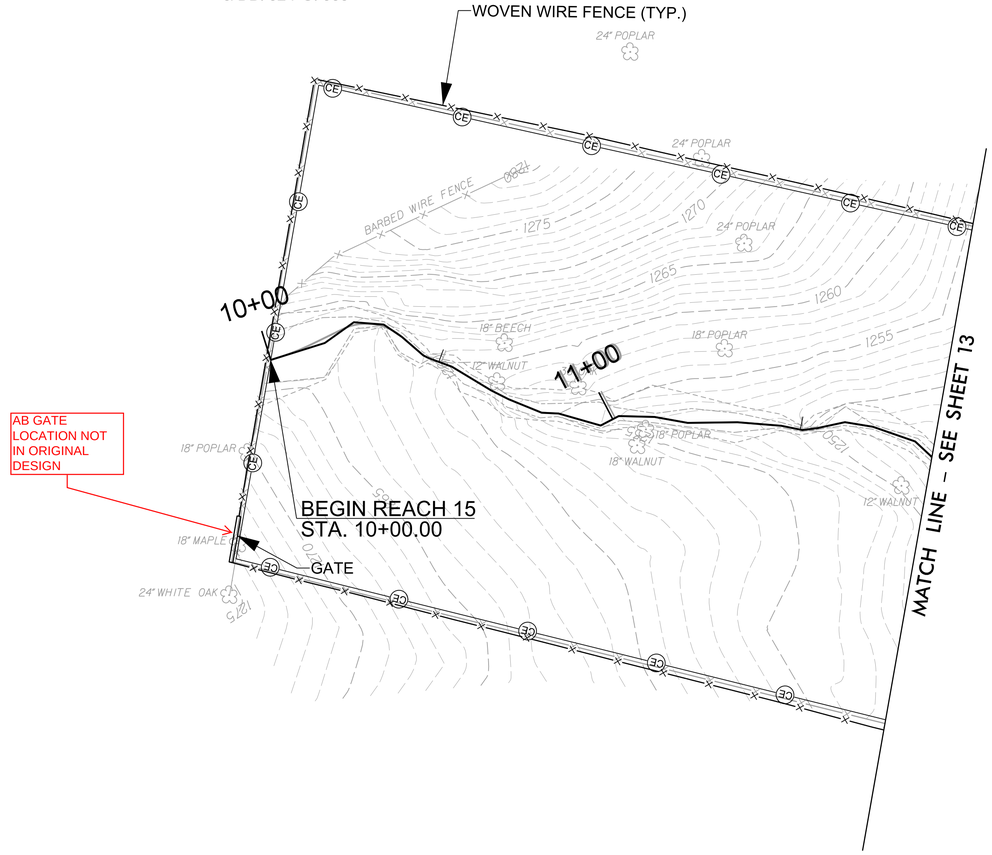
NAD 83

JAMES RAY HERMAN AND WIFE, MILDRED J. HERMAN
PIN: 3842-69-4491
DB:561 PG: 218 (TRACT VI)
REF: DB: 219 PG: 695
& DB: 52 PG: 388



FILL EXISTING CHANNEL

CHANNEL PLUG

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	25

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC644F...

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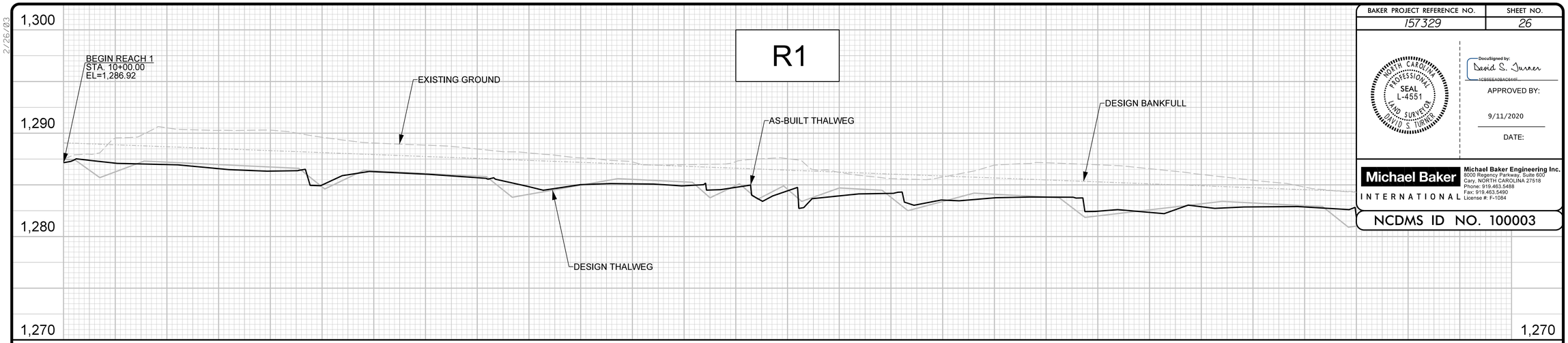
NCDMS ID NO. 100003

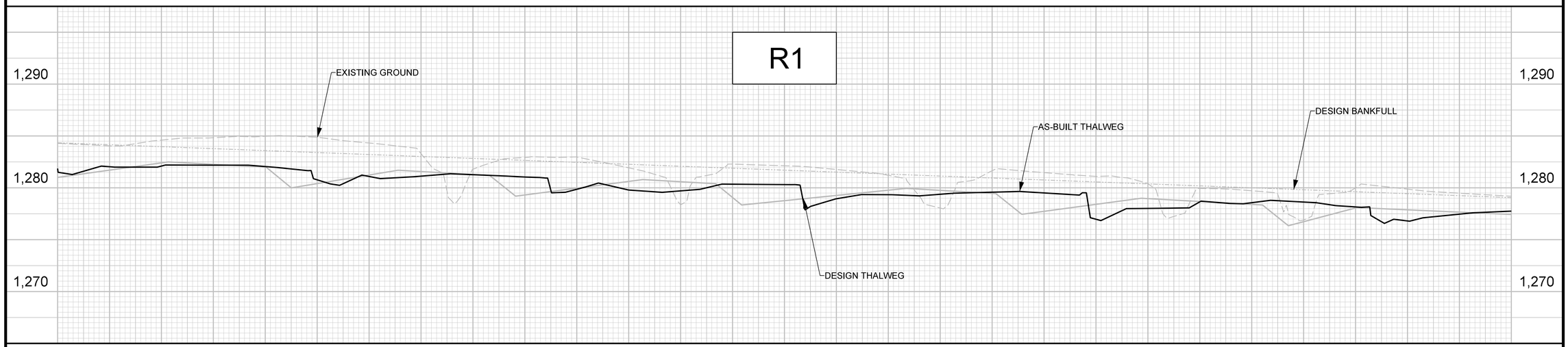
RUSSELL GAP
AS-BUILT PLAN VIEW

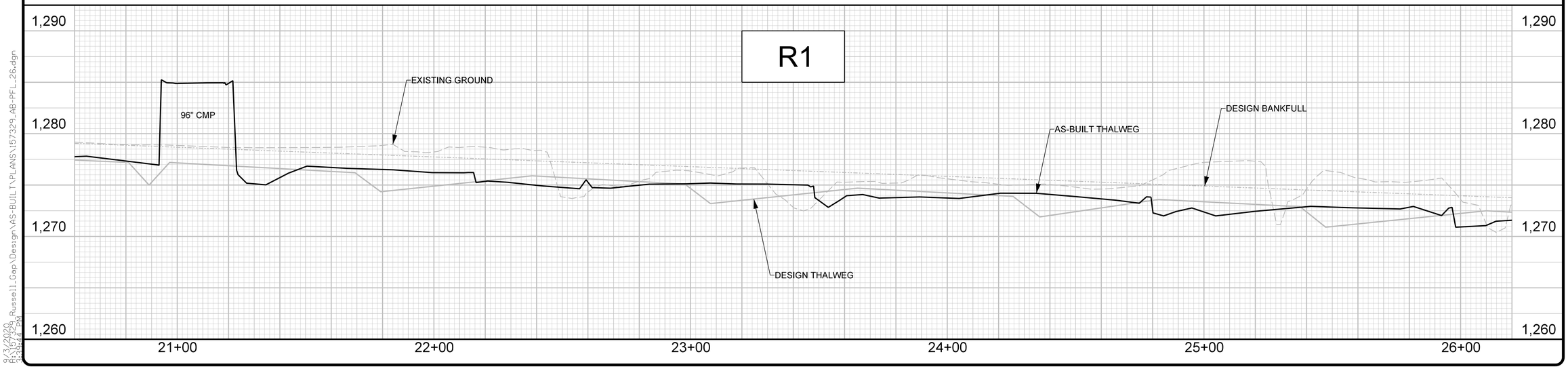
20 0 20 40
SCALE (FT)

9/3/2020
K:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PSH-25.dgn
mcgrew

2/26/03







BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	26

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S TURNER

DocuSigned by: David S. Turner 1CB5EEA08AC644F...

APPROVED BY:

9/11/2020

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NCDMS ID NO. 100003

2/26/03

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	27

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

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APPROVED BY:

9/11/2020

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License #: F-1084

NCDMS ID NO. 100003

R1

1,280 / 1,270 / 1,260

EXISTING GROUND
DESIGN BANKFULL
AS-BUILT THALWEG
DESIGN THALWEG
END REACH 1
STA. 29+45.90
EL=1,268.39

27+00 28+00 29+00

R2

1,240 / 1,230 / 1,220

BEGIN REACH 2
STA. 10+00.00
EL=1,306.96
AS-BUILT THALWEG
DESIGN THALWEG
EXISTING GROUND
END REACH 2
STA. 11+65.62
EL=1,221.04

10+00 11+00

R4

1,260 / 1,250 / 1,240 / 1,230

BEGIN REACH 4
STA. 10+00.00
EL=1,246.57
AS-BUILT THALWEG
DESIGN BANKFULL
DESIGN THALWEG
EXISTING GROUND

10+00 11+00 12+00 13+00 14+00 15+00

R4

1,250 / 1,240 / 1,230

EXISTING GROUND
DESIGN BANKFULL
AS-BUILT THALWEG
DESIGN THALWEG

16+00 17+00 18+00 19+00 20+00 21+00

9/3/2020
R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PFL_27.dgn
3:41:26 PM

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	28

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-4551 DAVID S. TURNER

DocuSigned by: David S. Turner

APPROVED BY:

9/11/2020

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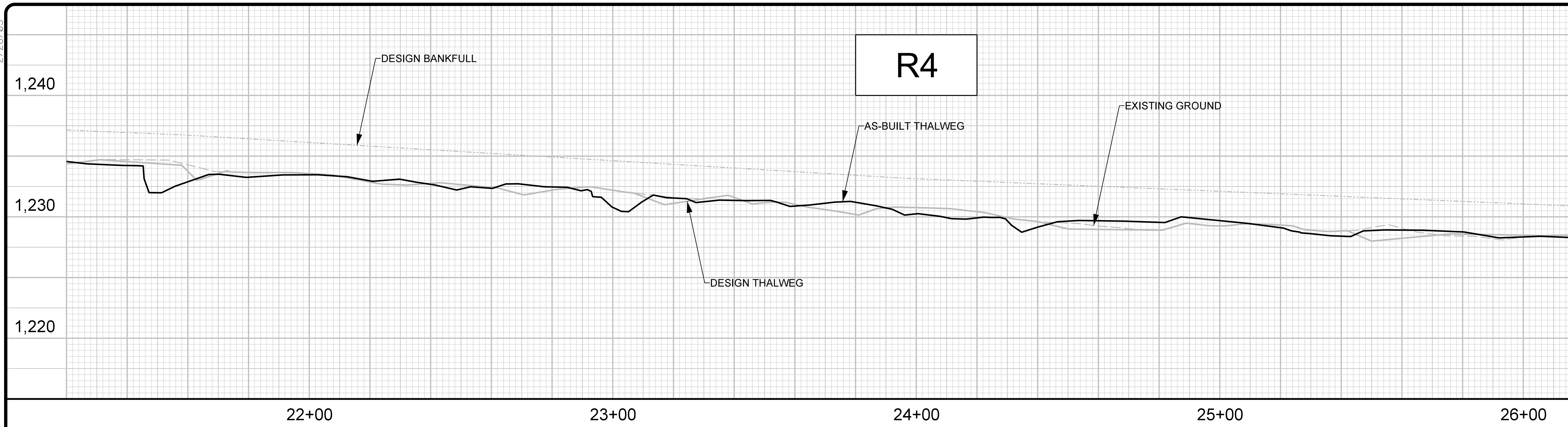
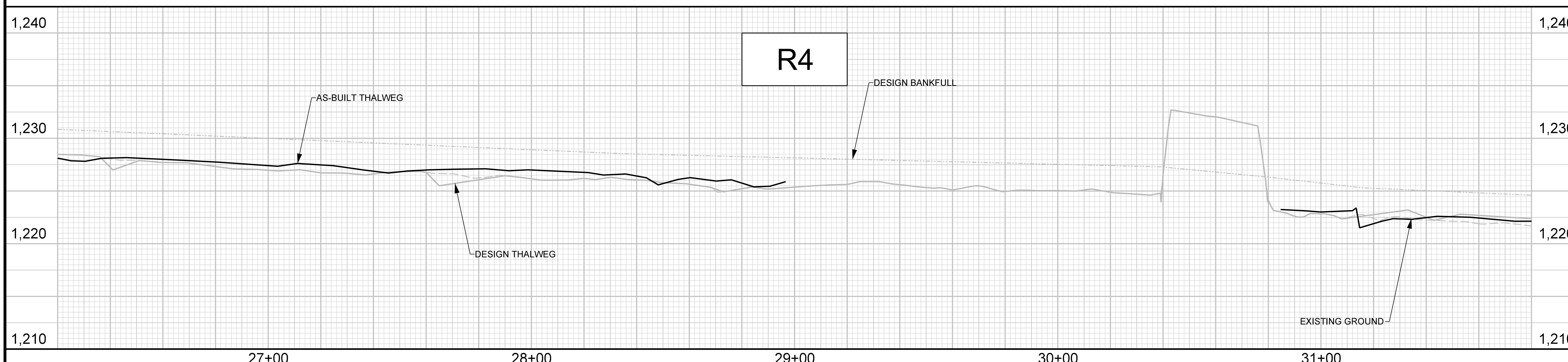
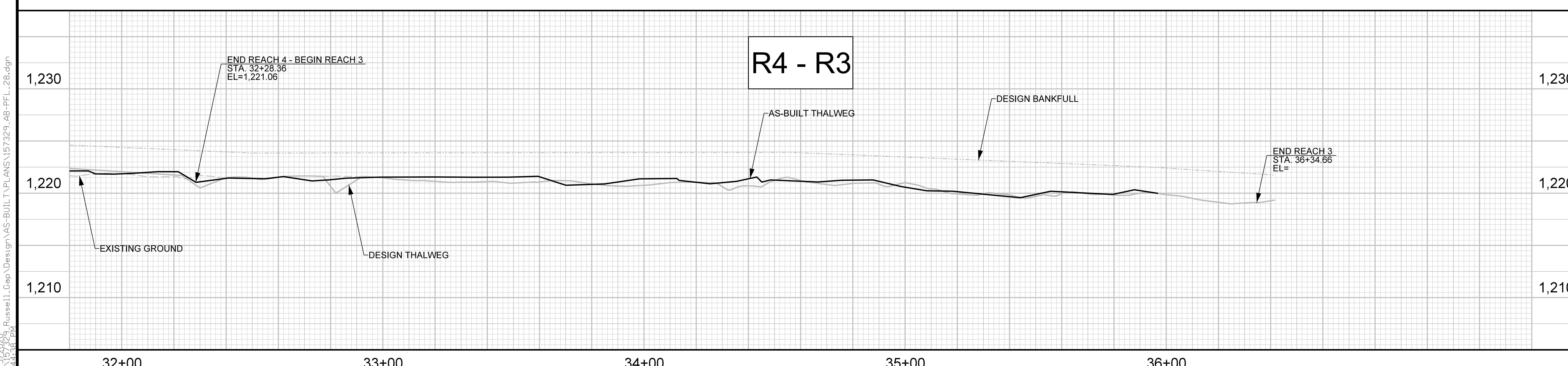
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

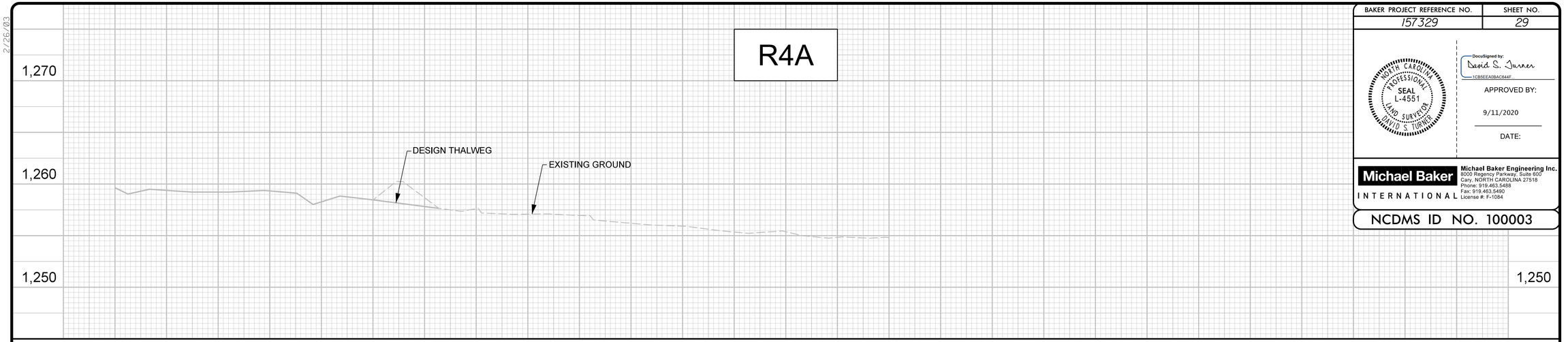




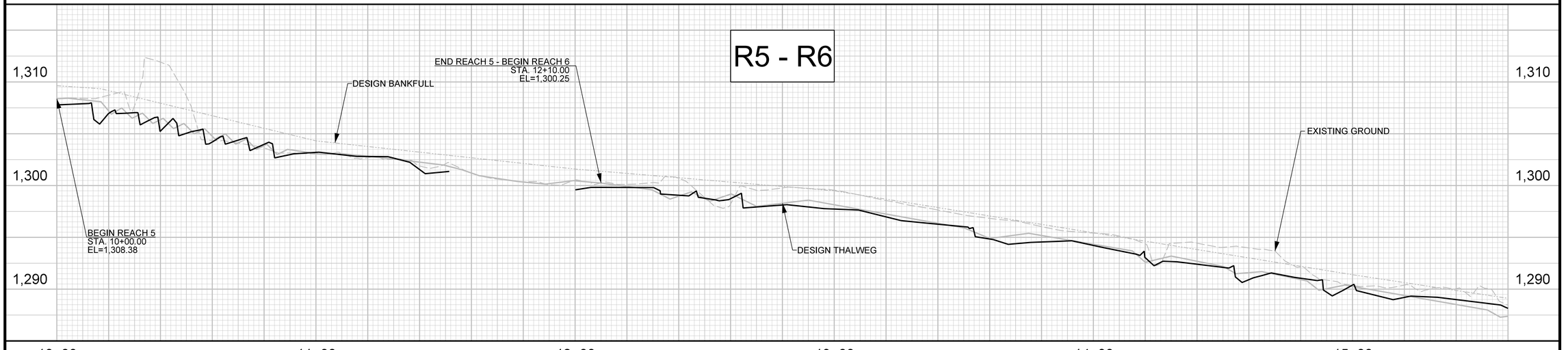


2/26/03

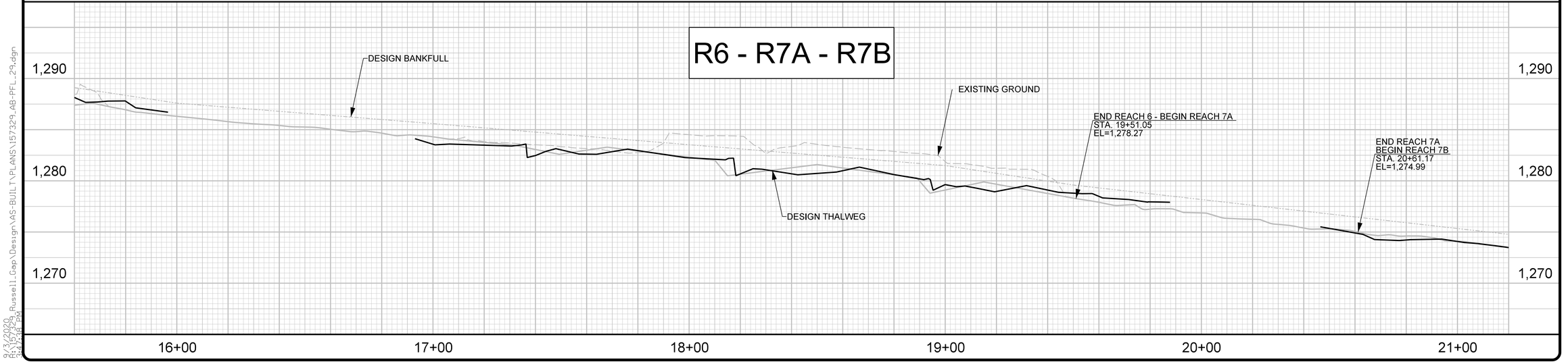
R4A



R5 - R6



R6 - R7A - R7B



BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	29

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC644F...

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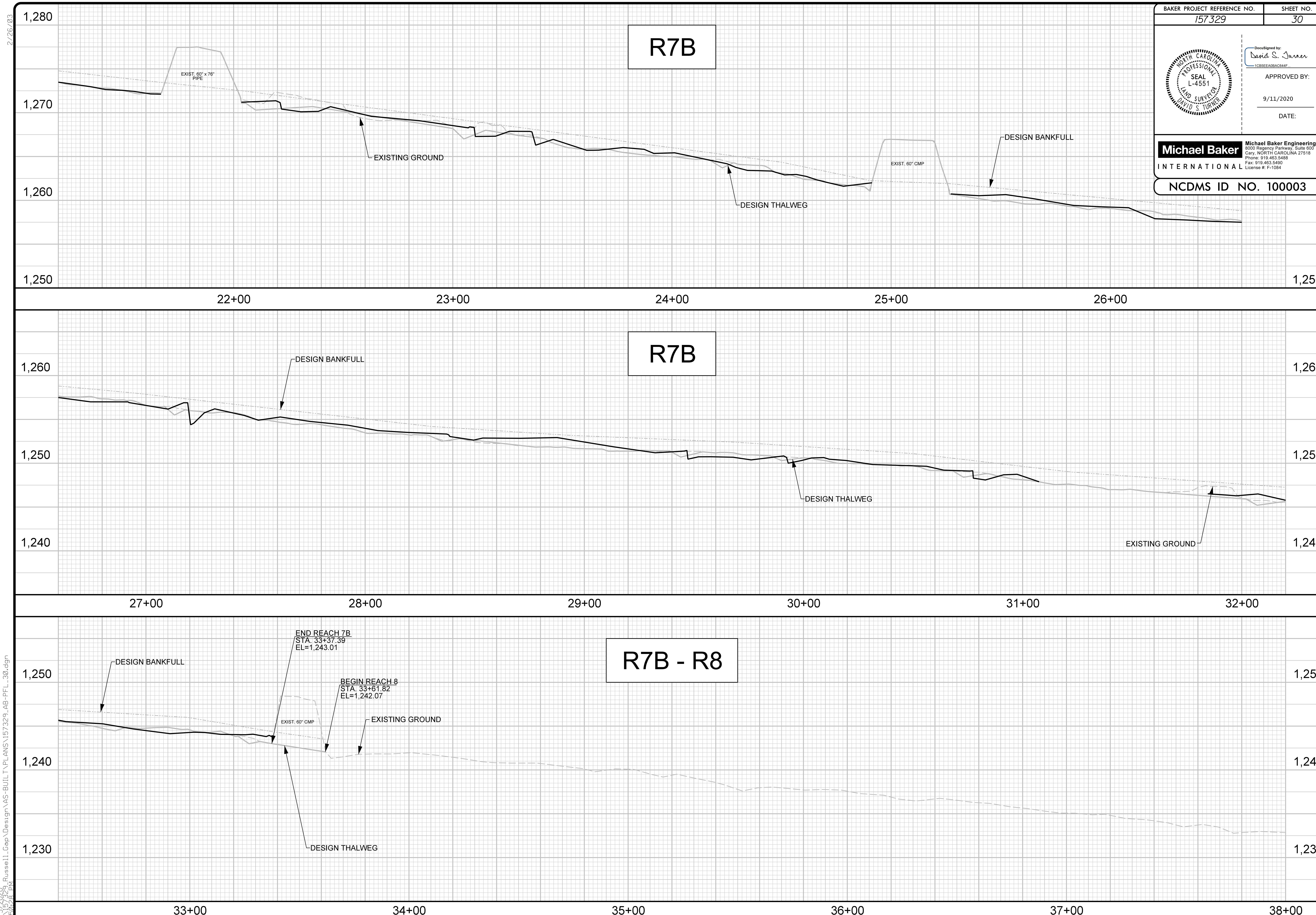

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	30

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner

APPROVED BY:

9/11/2020

DATE:

Michael Baker INTERNATIONAL

Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
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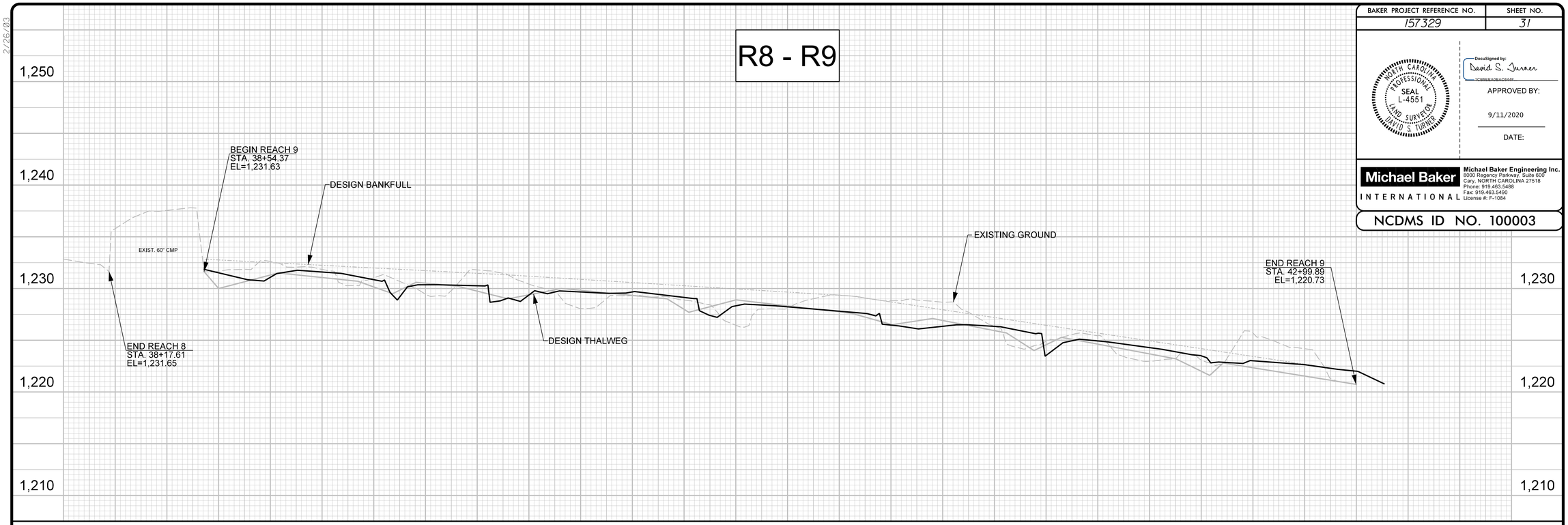
Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NCDMS ID NO. 100003

9/3/2020 R:\157329_Russell_Gap\Design\AS-BUILT\PLANS\157329_AB-PFL_30.dgn

2/26/03

R8 - R9



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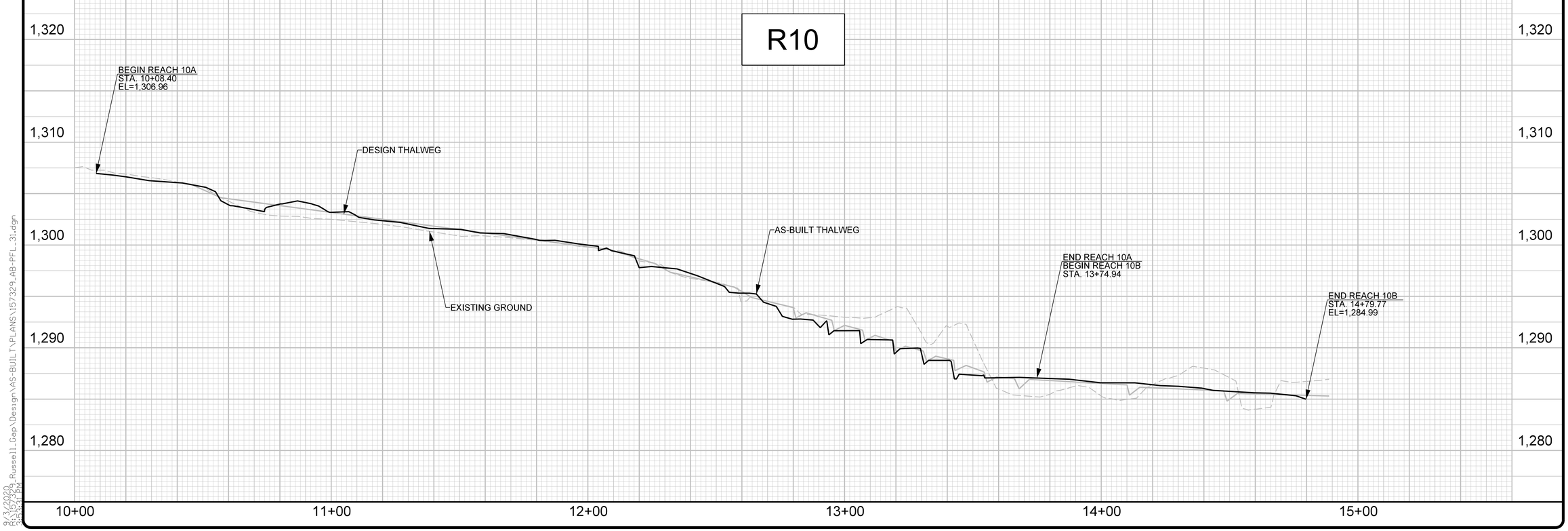

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	31

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

DocuSigned by: David S. Turner 1CB5EEA0BAC644F...

APPROVED BY:

9/11/2020

DATE:

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BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	32

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

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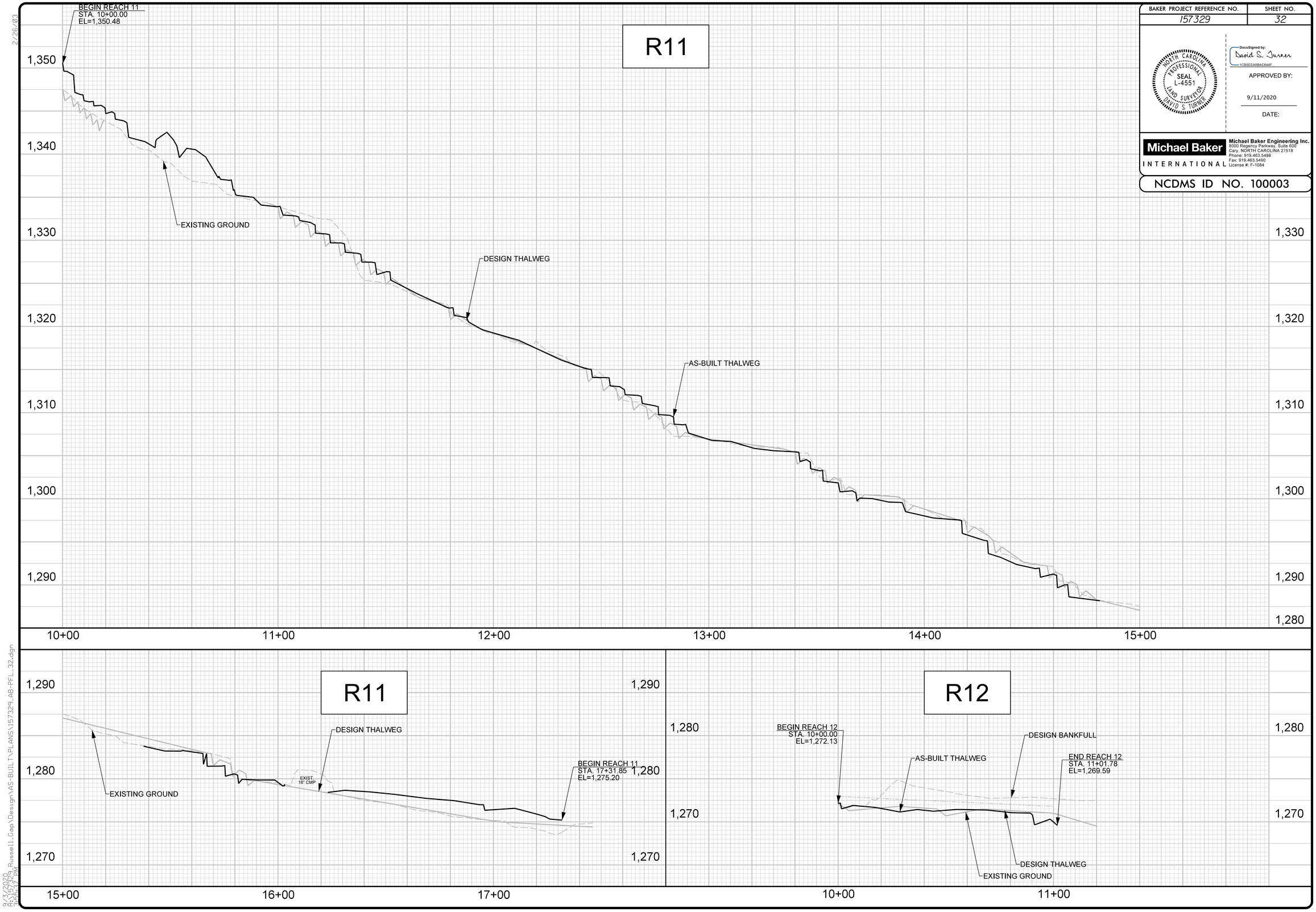

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2/26/03

R13 - R14

BEGIN REACH 13
STA. 10+00.00
EL=1,317.51

DESIGN BANKFULL

DESIGN THALWEG

EXISTING GROUND

END REACH 13 - BEGIN REACH 14
STA. 11+45.00
EL=1,307.54

AS-BUILT THALWEG

1,320 1,310 1,300 1,290 1,280 1,270

10+00 11+00 12+00 13+00 14+00 15+00

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R14

EXISTING GROUND

AS-BUILT THALWEG

DESIGN BANKFULL

DESIGN THALWEG

END REACH 14
STA. 17+15.03
EL=1,268.30

1,280 1,270 1,260

16+00 17+00

R15

BEGIN REACH 15
STA. 10+00.00
TIE TO EXISTING

EXISTING GROUND

EXIST. PIPE

AS-BUILT THALWEG

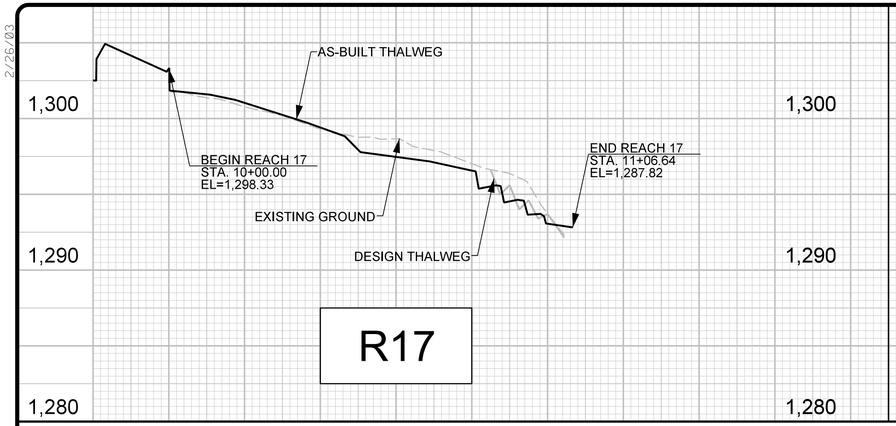
DESIGN THALWEG

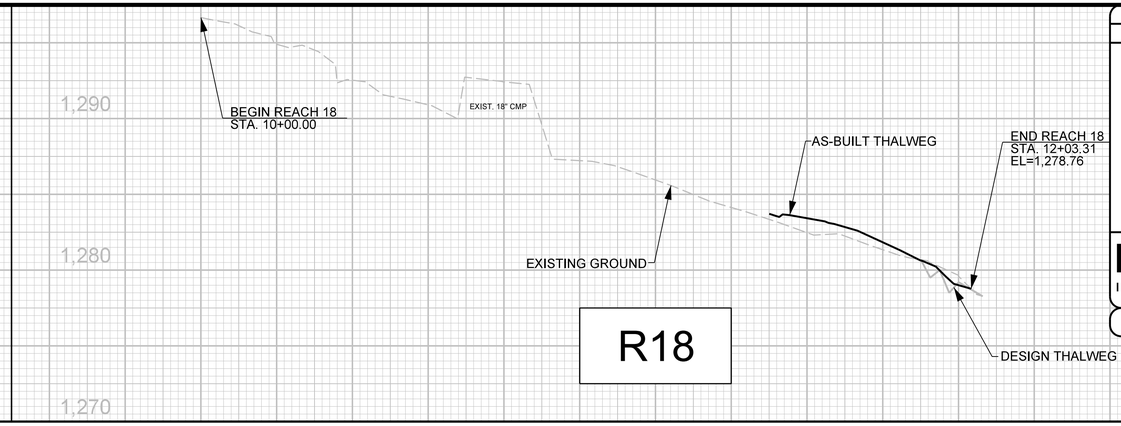
END REACH 15
STA. 13+03.45
EL=1,232.72

1,260 1,250 1,240 1,230 1,220

10+00 11+00 +40 12+00 13+00

2/26/03





BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	34

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

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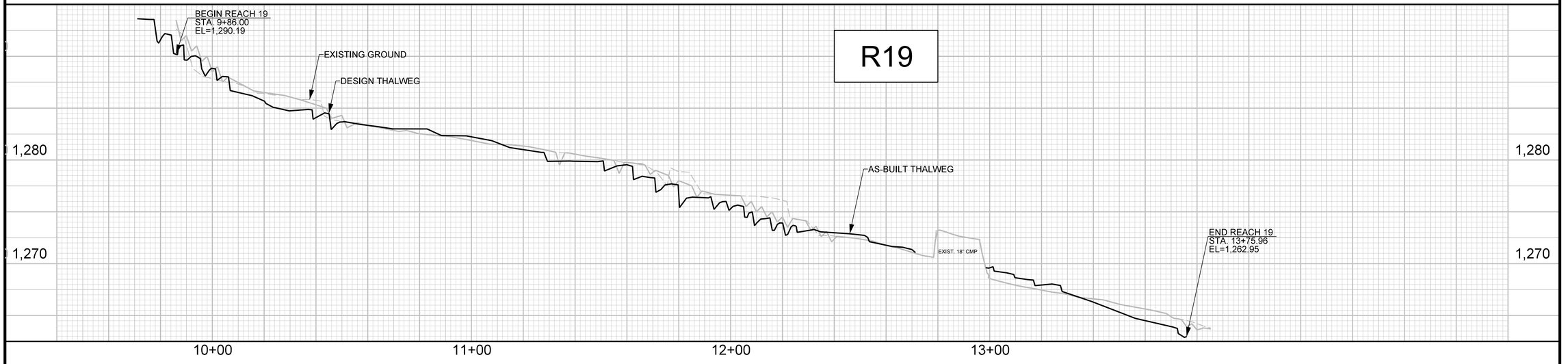

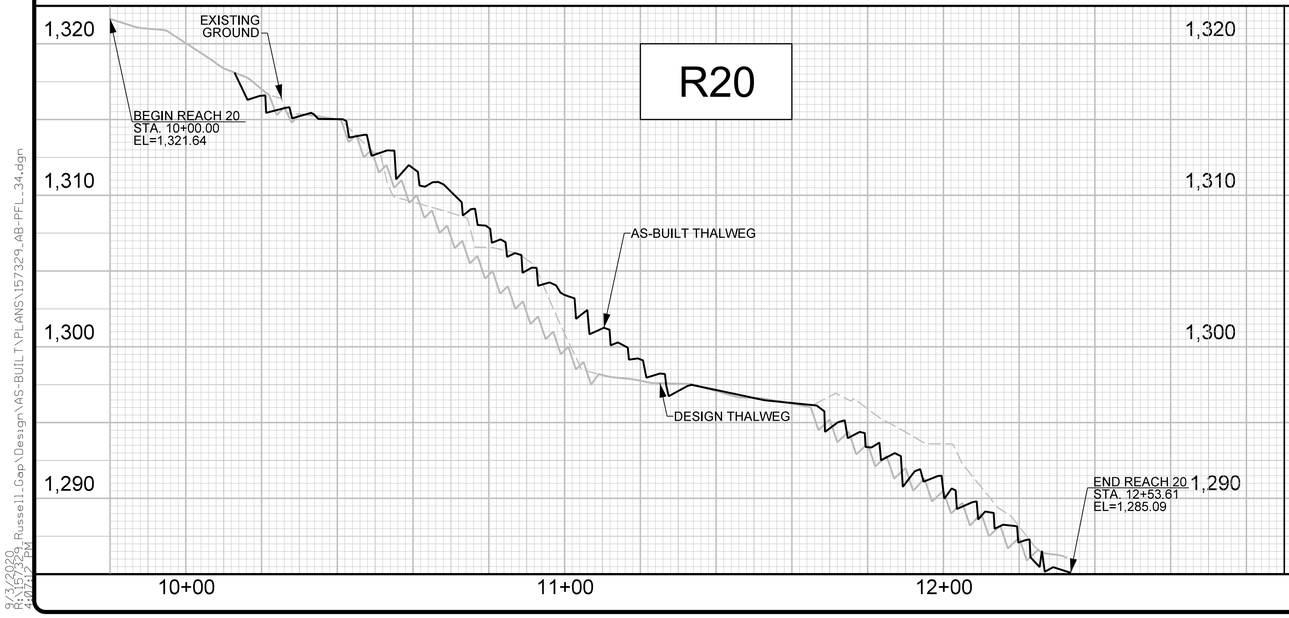

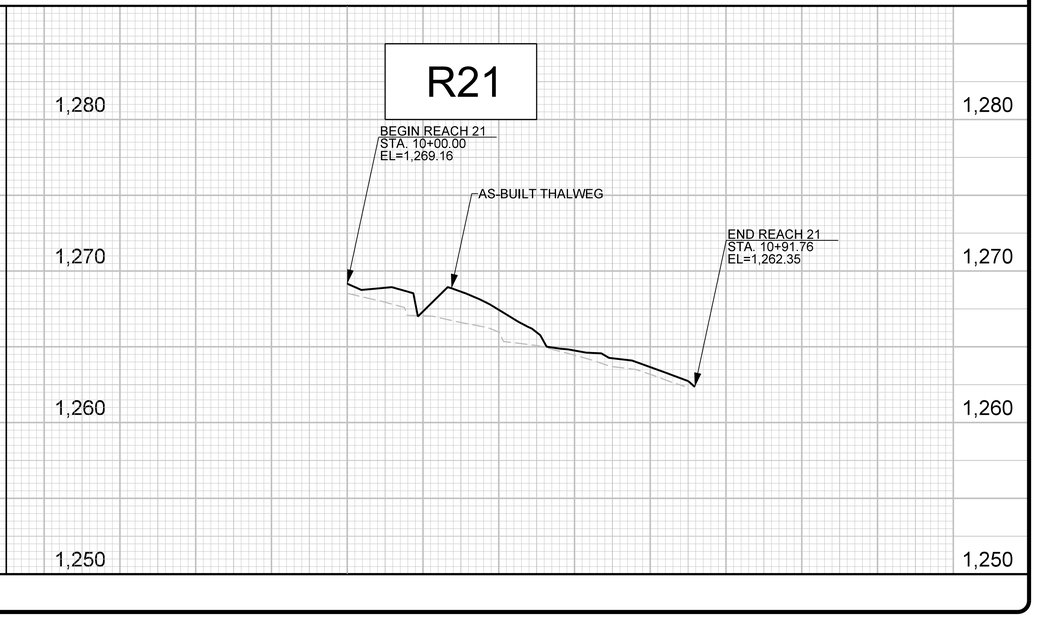

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4:02:12 PM

2/26/03

R22

BEGIN REACH 22
STA. 10+00.00
EL=1,255.96

AS-BUILT THALWEG

END REACH 22
STA. 11+19.46
EL=1,246.28

R22A

BEGIN REACH 22A
STA. 10+00.00
EL=1,254.95

AS-BUILT THALWEG

END REACH 22A
STA. 11+28.42
EL=1,253.61

R25

AS-BUILT THALWEG

DESIGN THALWEG

BEGIN REACH 25
STA. 10+00.00
EL=1,283.85

EXISTING GROUND

END REACH 25
STA. 14+30.52
EL=1,244.07

1,290
1,280
1,270
1,260
1,250
1,240
1,230

10+00
11+00
12+00
13+00
14+00

BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	35

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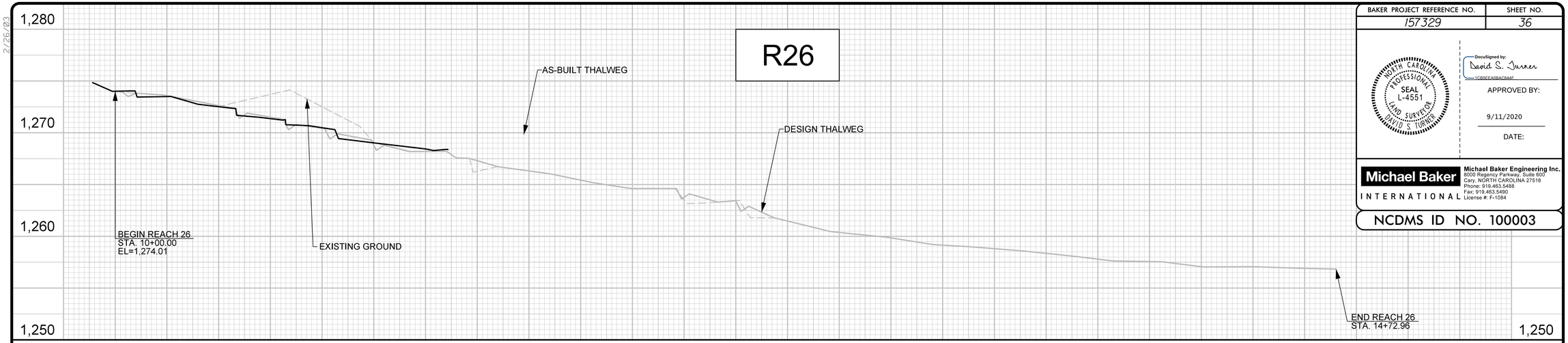
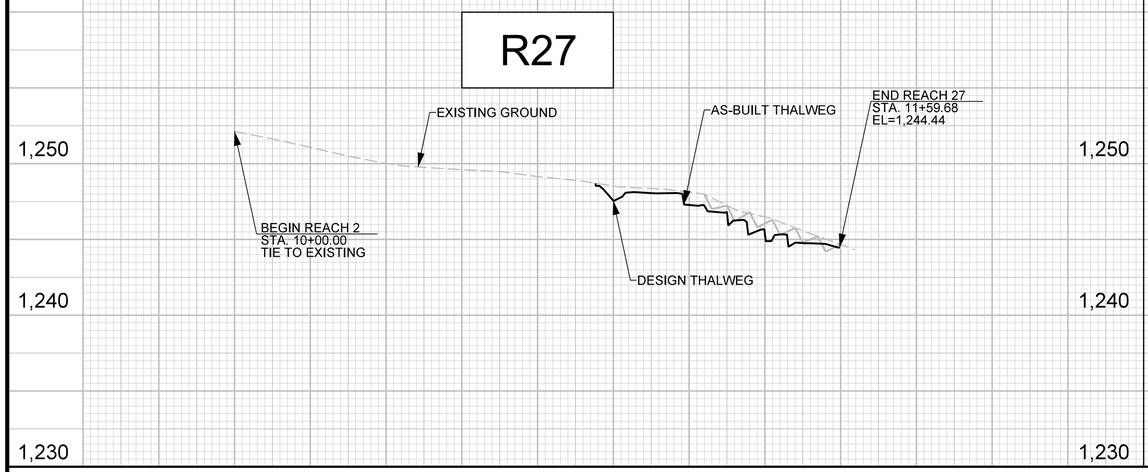
R26



R27



BAKER PROJECT REFERENCE NO.	SHEET NO.
157329	36

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

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