



Town of Barnardsville – Site Visit Report, Recommendation and Cost Estimate

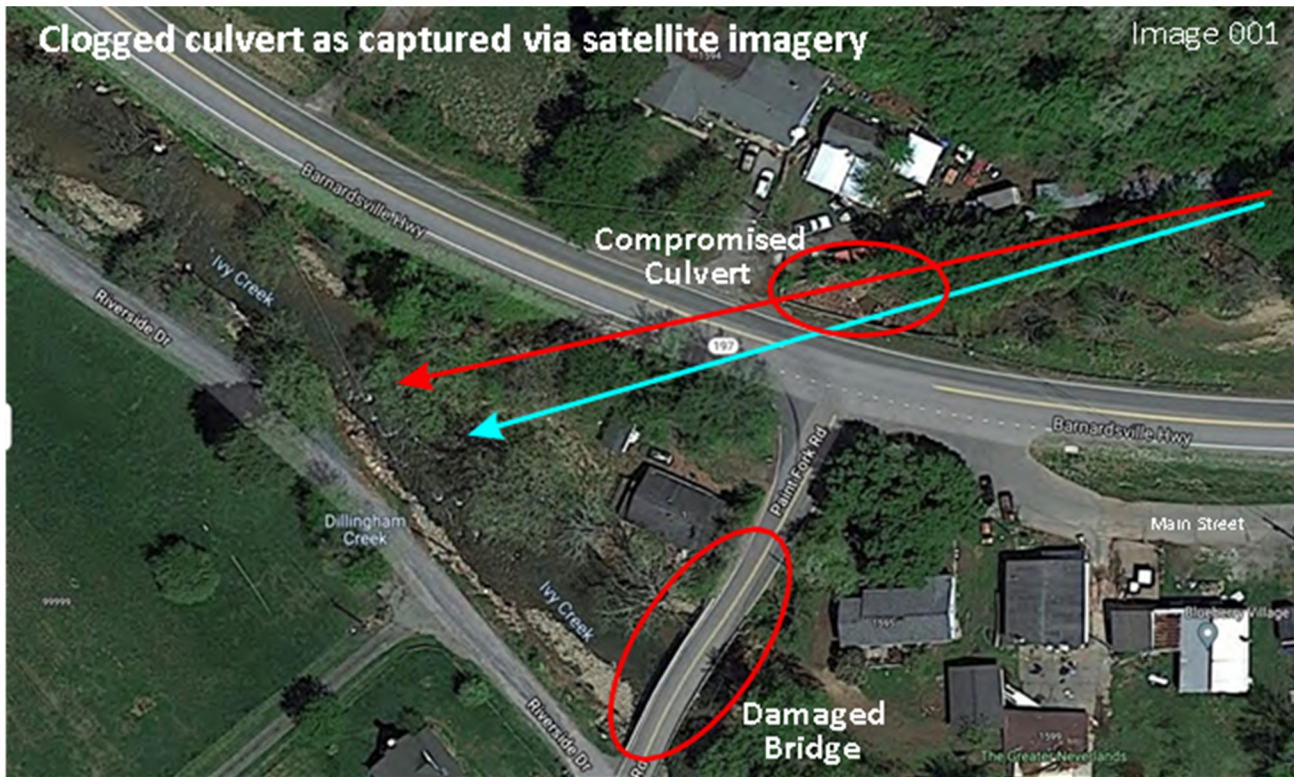
Assistance Request Background

NC State Senator, Chuck Edwards contacted Tom Reeder, (Policy Adviser, North Carolina Senate President Pro Tempore) seeking assistance with flooding, bridges, and other water resource related issues in the Town of Barnardsville, Buncombe County, NC. Mr. Reeder reached out to Charles Anderson with Resource Institute to discuss the project and develop a better understanding of the problems at hand. Senator, Chuck Edwards office provided background information to Resource Institute about the potential project site and history compiled by Mr. Eddie Harwood, (Barnardsville resident and community leader). The project site involves the Paint Fork Road bridge across Ivy Creek and the culvert where NC 197 (Barnardsville Highway) crosses North Fork Ivy Creek. Resource Institute has extensive experience with the coordination and management of stream restoration/stabilization and flood resiliency projects in North Carolina. RI is a recognized leader in this arena having implemented over one million feet of stream projects and hosted stream courses, workshops, and conferences for thousands of stream professionals in North Carolina and other locations in the United States.

Brief Historical Background of the Area (excerpts from Mr. Harwood's information)

Barnardsville, NC, located in Western North Carolina in Buncombe County, is a small, remote town which has a long history of flooding. There have been significant flooding events almost every year over the last decade with several major events since 2013. Many NC governing bodies are aware of and have been engaged in these flooding events and the aftermath of them. Citizens and business owners have sustained significant damage year after year as a direct result. Over many decades these agencies have installed bridges and culverts and other measures to address the floods in many locations in and around Barnardsville. Many of these devices are currently severely compromised structurally or simply not properly maintained and as a result, clogged with debris, thereby preventing proper flood management. In fact, in some cases the impacts are so severe that the flow of water has changed, and thereby also changed the areas which become flooded. One of the most problematic areas is in the center of town very near the U.S. Post Office, the local elementary school, and the largest industrial plant in the area.

Here, a culvert and bridge are located at the intersection of NC Hwy. 197 and Paint Fork Road (refer to satellite image) as they intersect Dillingham Creek, Ivy Creek, and the North Forks of Ivy Creek.



Issues

Paint Fork Road Bridge over Ivy Creek (See picture looking upstream at the bridge)

- Bridge has been damaged from previous storm events and has aging infrastructure showing signs of deterioration.
- Bridge has a central support that catches debris during runoff events, and this has an impact on sediment transport through the bridge.
- Central bar formed upstream of the bridge that acts as an island upstream of the bridge that further impacts sediment transport and induces sediment deposition. The increased sediment deposition (bedload) increases flood risk/damage to adjacent property owners and businesses.
- Streambank erosion from unstable banks contributes excess sediment to the stream corridor that adds to the existing issues.
- Stream channel dimensions are too large around the bridge to properly transport sediment (bedload) during runoff events.
- Ohio Electric Motors, the largest employer in the community is immediately upstream of the bridge and this infrastructure is invaluable to the company and its 300+ employees.

- Barnardsville Elementary School is also impacted by this bridge and is a safety concern for parents and emergency services access to the Paint Fork Road area.



November 12, 2021
North side of NC Hwy 197 looking at Paint Fork

View of Paint Fork Bridge over Ivy Creek(Dillingham Creek) looking upstream



November 12, 2021
Paint Fork Bridge foundation
(rusted steel and crumbling foundation)

View of Paint Fork Bridge structural concerns



November 12,
Paint Fork Bridge
(Rusted steel and missing bearing surface)

View of Paint Fork Bridge structural concerns



Aerial view of Barnardsville

Barnardsville Highway (NC197) over culvert crossing of North Fork Ivy Creek

- Culvert crossing approach and exit have a bad alignment with the stream that impacts sediment transport.
- Existing box culvert capacity is greatly reduced by the volume of sediment, bedload, and debris clogging > 75% of the right section of the culvert looking downstream.
- Clogged culvert raises water elevations of runoff events resulting in increased flooding/backwater upstream of the culvert.
- Elevated water elevations during these runoff events threaten property and businesses and pose safety threats to citizens and emergency personnel.



Barnardsville Highway (NC197) culvert crossing of North Ivy Creek looking upstream



Barnardsville Highway (NC197) culvert crossing of North Ivy Creek looking downstream

Site Visit

A team of vetted engineers and Resource Institute staff visited the site to provide input on this report. Alan Walker, RI Project Manager contacted Mr. Eddie Harwood to meet at the site. Alan Walker and Greg Jennings with Jennings Environmental met with Mr. Harwood on Monday, January 24, 2022, to gain additional information for assessment and development of conceptual plans and cost estimates. Greg Jennings has extensive experience with stream restoration/stabilization projects in western North Carolina. Engineers with Vaughn & Melton and Scenic Consulting also visited the site to assess the issues with the bridge, culvert crossing and road/highway concerns. These engineers have extensive experience with NCDOT projects.

During our site visit on January 24, 2022, with Mr. Harwood we discussed the history of the site, recent runoff events, changes in the watershed/floodplain and potential solutions. The potential solutions consisted of replacement of the bridge, changes to the culvert on the North Fork Ivey, to purchasing properties in the immediate floodprone vicinity of the bridge. The purchasing of the floodprone properties upstream of the bridge would allow rerouting of the North Fork Ivy Creek and improve sediment transport through the reach in addition to allowing the potential for a turn lane onto Paint Fork Road.

Recommendation and Cost Estimate

There are multiple band-aides and short term “fixes” that can be applied; however, this recommendation seeks to provide the best long-term solution to maximize flood resiliency, improve infrastructure, decrease/eliminate safety concerns in the area, improve stream/floodplain function in the project area and improve water resources in the watershed. (Attached conceptual plan)

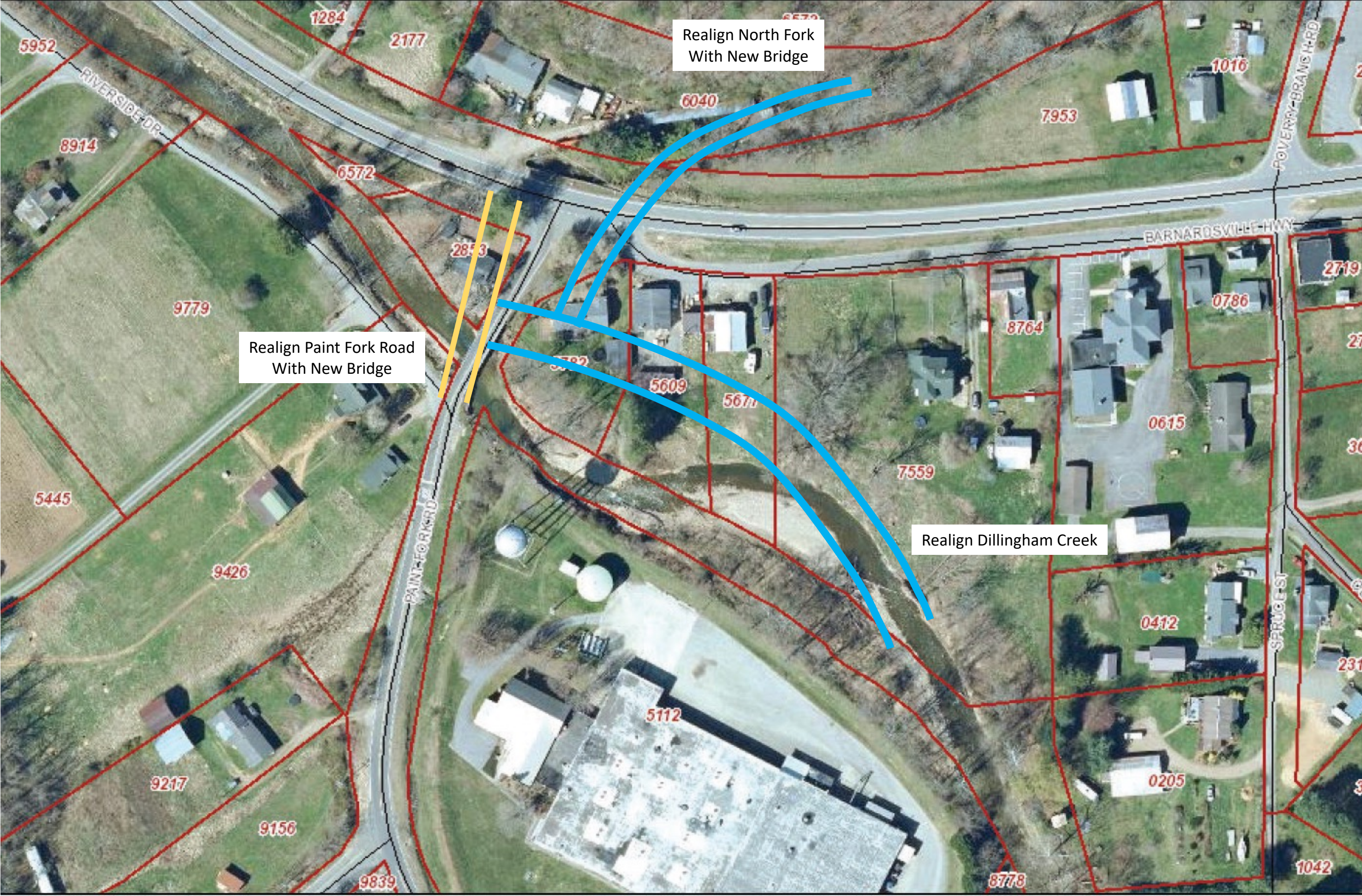
- Replace bridge on Paint Fork Road, this includes re-configuring the intersection of Paint Fork Road and Barnardsville Highway (NC197). Bridge would be sufficient length to span the floodprone width of Dillingham/Ivy Creek and maximize height above normal high water. Also, include a turn lane onto Paint Fork Road.
- Purchase nine (9) properties (list attached) in the floodprone area of the confluence of Dillingham/Ivy Creek and North Fork Ivy Creek. This will allow maximum potential to realign the Paint Fork Road bridge, reconfigure the intersection of Paint Fork Road and Barnardsville Highway, realign/restore/stabilize Dillingham/Ivy Creek up and downstream of the bridge, and reroute the North Fork Ivy Creek to enter Ivy Creek upstream of the new bridge. The rerouting of North Fork Ivy Creek would add an additional bridge where the new route of the North Fork Ivy would flow under the Barnardsville Highway. Existing structures would be removed to allow the establishment of a natural floodplain area.
- Realign/restore/stabilize Dillingham/Ivy Creek upstream of the bridge beginning at a location on the upstream property line of parcel #7559 and ending downstream of the new Paint Fork Bridge near parcel #6572. The new alignment would move the

stream away from the Ohio Electric Motor property and allow a better/perpendicular flow through the bridge. The proper stream dimensions would be designed to maximize sediment transport through the reach.

- Reroute/realign North Fork Ivy Creek to flow into Dillingham/Ivy Creek upstream of the new bridge on Paint Fork Road. The new alignment of North Fork Ivy will improve sediment transport through this reach and eliminate the mis-aligned culvert currently in place on the Barnardsville Highway.
- Install a bridge on Barnardsville Highway across the new alignment of the North Fork Ivy Creek. Bridge would be sufficient length to span the floodprone width of North Fork Ivy Creek and maximize height above normal high water.
- Establish a greenspace/park area for the community in the area between Dillingham/Ivy Creek and the Barnardsville Highway where the properties were purchased.
- Cost estimate for the above components including engineering, permitting, construction, construction oversight, project coordination and management is eleven million dollars - \$11,000,000.00

Barnardsville Property Owners Impacted with Proposed Stream Realignment

<i>Property Owner</i>	<i>PIN Number</i>	<i>Address</i>	<i>Book/Page</i>
HARWOOD, EDWARD	977545378200000	1595 BARNARDSVILLE HWY, BARNARDSVILLE, NC, 28709	6151 - 544
HARWOOD, EDWARD	977545285300000	443 PAINT FORK RD, BARNARDSVILLE, NC, 28709	5880 - 1729
DAVIS, SANDREA	977545560900000	217 BEDFORD RD, BARNARDSVILLE, NC, 28709	5533 - 1467
DAVIS, SANDREA	977545567700000	217 BEDFORD RD, BARNARDSVILLE, NC, 28709	5462 - 707
MIMKEN, TIMOTHY & MIMKEN, SAMUEL	977545755900000	1619 BARNARDSVILLE HWY, BARNARDSVILLE, NC, 28709	6133 - 1923
HARWOOD, LINDA & HARWOOD, EDWARD	977546604000000	78 TABBY TRL, HILTON HEAD ISLAND, SC, 29926	2280 - 115
BUCKNER, FRANCES	977545795300000	22 RIVERSIDE DR, BARNARDSVILLE, NC, 28709	
MAGEE, TIMOTHY & MAGEE, ASHLEY	977545876400000	1623 BARNARDSVILLE HWY, BARNARDSVILLE, NC, 28709	6063 - 1301
RHINEHART, GREGORY & RHINEHART, JENNIFER	977546657200000	70 SOUTHWOOD DR, WEAVERVILLE, NC, 28787	5130 - 208



Realign North Fork
With New Bridge

Realign Paint Fork Road
With New Bridge

Realign Dillingham Creek

5952

1284

2177

6040

7953

1016

8914

6572

2853

9779

BARNARDSVILLE HWY

0786

2719

Realign Paint Fork Road
With New Bridge

3782

5609

5671

8764

0615

5445

7559

Realign Dillingham Creek

9426

PAINT-FORK RD

0412

SPRUCE ST

9217

5112

231

9156

0205

9839

8778

1042