

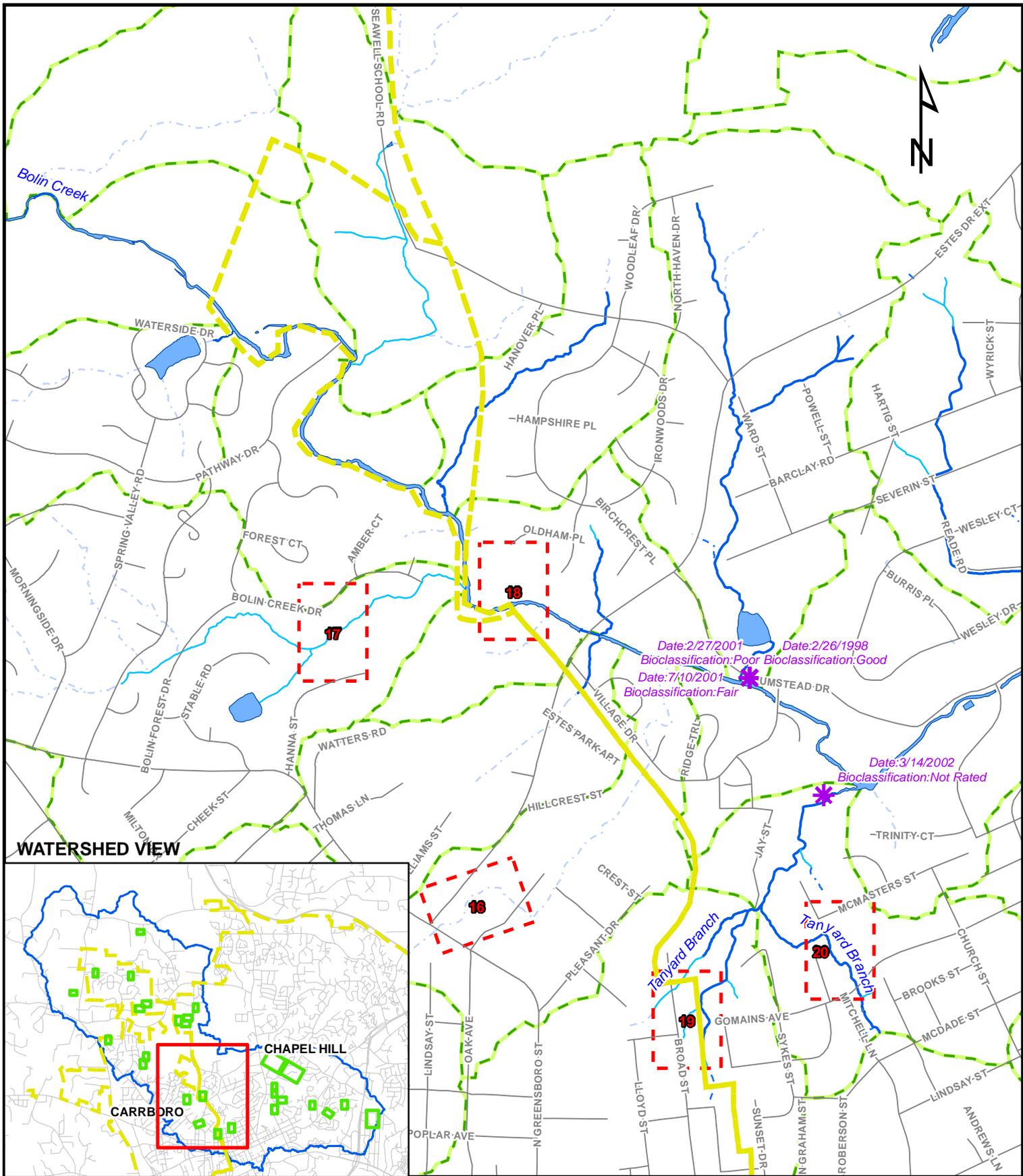
SITE 18

Restoration of Erosive Gulley Beneath Railroad Trestle, and Treatment of Pollutants From Subdivision

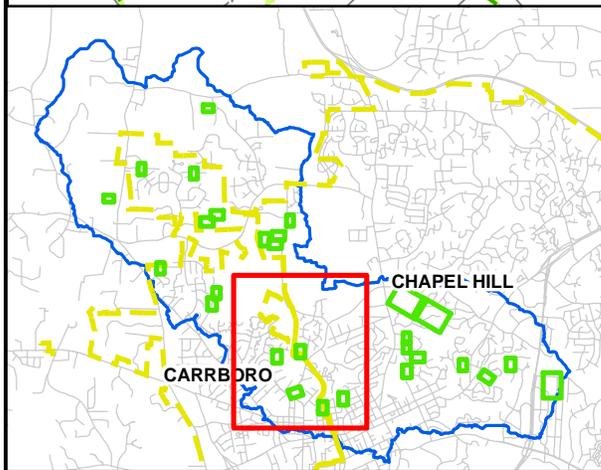
Index Sheet No.: 20
Raw Data Name: TA 19



Estimated Construction Cost: \$17,400



WATERSHED VIEW



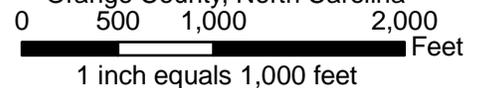
Legend

- Ambient Monitoring
- Benthic Monitoring
- Fish Sampling
- Municipal Boundary
- Orange County Roads
- Subwatersheds
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Stream, unknown flow



**SITE 18
VICINITY MAP**

Geomorphic Analysis and Identification of Potential Sites for Stormwater BMPs
Orange County, North Carolina



Project Description

	Drainage Area (acres)	Impervious Area (acres)	% Impervious
Site 18	4.7	0.8	16.0%

Location

Site 18 is located beneath a railroad trestle approximately 500 feet to the west of Estes Drive Extension. The railroad trestle crosses over Bolin Creek, and the site is located on the left bank, looking downstream. Access to the site can be obtained by traveling along an existing sewer easement and footpath that follows the stream.

Problem Description

Site 18 consists of two actively eroding headcuts on an exposed hillslope adjacent to a railroad trestle. Upslope of the gully is a subdivision and what appears to be an ephemeral stream discharging from the storm system of the neighborhood, which consists of a curb and gutter drainage system. The runoff that accumulates on the relatively high percentage of impervious surface concentrates in the gully just before reaching Bolin Creek, causing severe scour and mass wasting, and contributing sediment to the watershed, as well as any pollutants that may be contained in the runoff from the subdivision. There is also an indication that impacts from recreational use of this site could be adding to the problem of the erosive banks by causing bank failure in between rainfall events.

Potential pollutant loads and reduction have been calculated based on impervious area and land use, and are shown in **Table 18.2**.

Proposed Solution

Site 18 poses a unique situation for stormwater treatment; a steep slope and limited space between the area of the headcuts, the footers of the railroad trestle and Bolin Creek. A solution for treatment at this site is to construct a “bio-grade step”, which is a series of small bio-retention cells filled with a filter media, such as a mixture of sand, fines and organic mater (see Appendix A-Details). Ideally, this media will have a filtration rate of 1.0 to 2.0 inches per hour, to optimize pollution removal (Schueler, et. al., 2007). Each cell is connected to the other by the use of a drainage or seepage layer, thus allowing stormwater to filter through each cell without the expense of an underdrain. An underdrain is also an option if it is preferred. Each cell would have a given amount of volume to fill while infiltrating before cresting the berm and overflowing into the next cell downstream. Below the bio-grade step, a preformed scour hole (see Appendix A-Details), should be built to dissipate any overflow before reaching Bolin Creek. There is not enough room to dissipate energy via a level spreader.

This treatment option will provide a linear, grade-control solution to reduce erosive velocities of the stream, while also treating stormwater runoff for pollutants. A substantial amount of storage volume, with respect to drainage area, can help to reduce

*Bolin Creek Watershed
Geomorphic Analysis and Potential Site Identification for Stormwater BMPs and Retrofits*

the total runoff that Bolin Creek receives. This may also augment baseflow to Bolin Creek by delaying the release of the stored runoff volume. It is important to note that this bio-grade step should drain completely over a period of 5-7 days in order to insure that there is available storage volume for runoff from the next rain event. Thus, the design of the weeps or drainage layers is an important factor for the continual success of this project.

The depth of each cell can vary depending on choice of planting materials. Trees, with a deeper rooting structure, will require deeper soils, while herbaceous plants and shrubs can have soil as shallow as 1.5 feet (Schuler et. al, 2007). Potential pollution removal rates using this method have been estimated and are shown in **Table 18.2**.

Table 18.2

SITE 18	Pollutant Load (lbs)		
	TN	TP	TSS
EXISTING CONDITION	8.24	0.81	121.55
BIORETENTION TREATMENT REMOVAL %	35.00%	45.00%	85.00%
NET REDUCTION	2.89	0.36	103.32
FUTURE CONDITION	5.36	0.45	18.23

Constraints

The nearest right of way to this site is Estes Drive Extension, nearly 500 feet downstream. What appears to be an existing sewer easement, as evidenced by manholes, runs parallel with Bolin Creek and a maintenance path runs from Estes Drive Extension to the site. Thus, a drainage easement and access easement may already exist.

Other constraints consist of the avoidance of the railroad trestle, gaining permission to do work around it, and the difficult terrain.

Alternatives

No alternatives are proposed for this site.

Cost-Estimate Breakdown

Table 18.3 shows a conceptual itemized cost estimate for Site 18. These costs represent construction and maintenance costs only. The cost for the bio-grade step is derived from a cost per cubic foot treated for bioretention areas as reported by Schueler, et. al. (2007).

*Bolin Creek Watershed
 Geomorphic Analysis and Potential Site Identification for Stormwater BMPs and Retrofits*

Table 18.3
Site 18 Construction Cost

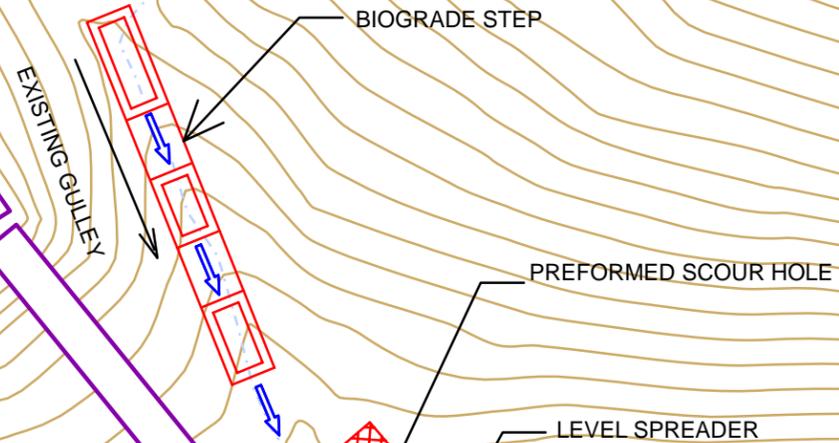
Pay Item Description	Estimated Quantity	Unit	Unit Bid Price	Bid Amount
Biograde Step	1200.0	CF	12.62	\$15,144
Total				\$15,144
Mobilization (5%)	1.00	LS		\$757
Contingencies (10%)	1.00	LS		\$1,514
Total + Mobilization and Contingencies				\$17,416
Maintenance Costs				
Maintenance (5% of base construction cost)	1.0	Year		\$871

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Geomorphic Analysis and Potential Site Identification for Stormwater BMPs and Retrofits*

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SITE 18



EXISTING RAILROAD TRESTLE

Legend

- Stormwater Lines
- Impervious Surfaces
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Stream, unknown flow
- Contours

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CONCEPTUAL PLAN VIEW
BOLIN CREEK WATERSHED
Geomorphic Analysis and Potential Site
Identification For
Stormwater Structures and Retrofits

0 20 40 80 Feet
1 inch equals 40 feet



SITE 18



Legend

- Stormwater Lines
- Perennial Stream
- Intermittent Stream
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- Stream, unknown flow



AERIAL PHOTO VIEW

BOLIN CREEK WATERSHED
 Geomorphic Analysis and Potential Site
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