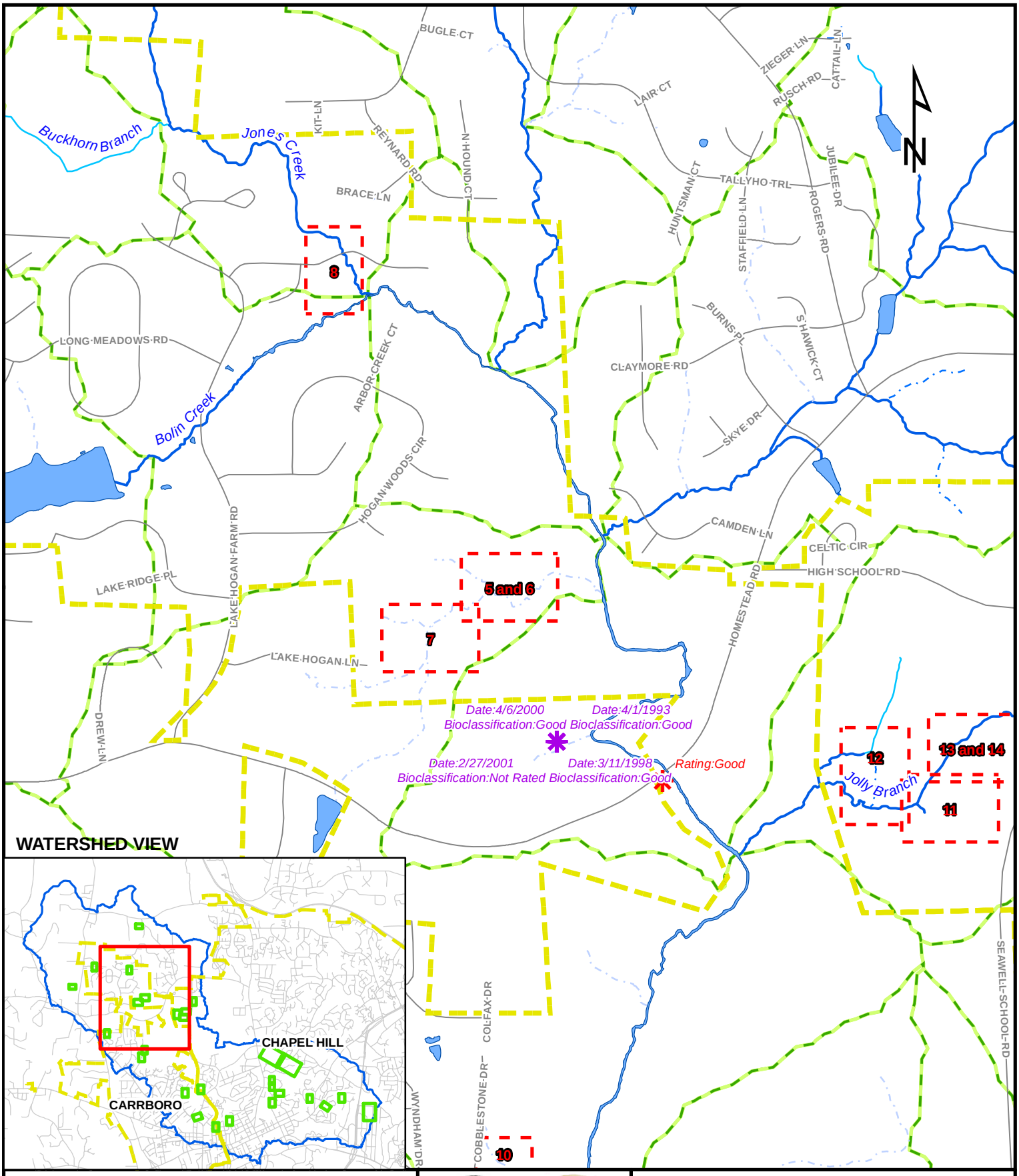
SITE 5

Index Sheet No.: 11
Raw Data Name: None

Estimated Construction Cost: $22,700



Legend

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

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SITE 5 and 6
VICINITY MAP

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

0 500 1,000 2,000 Feet

1 inch equals 1,000 feet

Project Description

	Drainage Area (acres)	Impervious Area (acres)	% Impervious
Site 5	3.2	1.0	29.6%

Location

Site 5 is located east of N. Cammelia Drive in the subdivision of Winmore, which is located off of Homestead Rd. At the time of this report, the subdivision was still under construction.

Problem Description

Site 5 is an existing stormwater BMP that was initially designed to act as a sediment basin during the construction of the subdivision Winmore, and which, according to the Winmore site plan, will be converted into a "pocket wetland" following construction. At the time of this report, the basin was still acting its capacity as a sediment basin. These BMP's are good examples of how the science of watershed management has progressed over the last few years. There are several features of the BMP that would be very different in order to meet the current BMP guidelines of the State. Earth Tech believes that the BMP's such as this one can benefit from retrofits that provide stability to the receiving channel and enhance water quality treatment.

The velocity dissipater of the basin outlet consists only of a rip-rap apron, with no pre-formed scour depression. During the field investigation, the aprons were observed to be showing indications of instability, "cut-arounds" and demonstrated a consistent problem of concentrated flows eroding the floodplain within the riparian zone. In most cases, the erosive forces of concentrated flows had yet to truly cause gullies, but the process has begun. There were headcuts beginning to form in the streambank where the concentrated flows joined the channel. These will most likely work their way through the floodplain from the channel, causing channel instability and contributing significant amounts of sediment to the stream.

The basin currently has no overflow spillway. Though this is not a requirement for North Carolina permits, many states require secondary spillways to be installed on stormwater structures in order to reduce the risk of the massive sediment inputs to a natural system when a structures berm is overtopped and fails. Earth Tech witnessed this effect on a site in north Raleigh in the spring of 2007 when a channel was completely denuded by clay silt after the failure of an upstream sediment basin.

The vegetated swale leading into the basin is relatively steep and showing definitive signs of eroding or incision. There are no check dams, or hydraulic structures that would serve to reduce channel velocities to a point lower than the critical shear stress velocity for the designed flexible lined channel.

Proposed Solution

Potential retrofits to this BMP include improving the swale leading into the wetland, construction of an overflow spillway, and using a pre-formed scour hole or energy dissipater basin (stilling basin) with a level spreader at the outlet discharge location. The swale may be retrofitted with grade control steps to flatten slopes incrementally or may be retrofitted to act as a "bio grade" steps as suggested in other sites within the Bolin Creek watershed. This will provide some storage of storm flow for base flow augmentation and reduce the erosive velocities that are present in the existing channel. The overflow spillway would provide some insurance from berm failure during high intensity rainfall events.

A pre-formed scour hole or other energy dissipater basin that is placed at the outlet pipe from the wetland will serve to adequately retain high energy flows and encourage energy dissipating turbulence at the desired location of the outlet. The existing aprons are not depressed and flows are apparently quickly flowing over or around the apron and onto native soils. A level spreader would provide for diffused flows verses the concentrated flows that exist with the current design. The stream bank should vegetated with appropriate plants to create a filter strip between the level spreader and the channel, which will assist with floodplain stability and nutrient treatment.

Table 5.1 shows an estimated decrease in pollutant load on this site as a result of the proposed treatment. Because the site is still under construction, the percent impervious surface used in this calculation is based off a projected percent impervious, based on typical percentages in subdivision areas.

Table 5.1

SITE 5	Pollutant Load (lbs)		
	TN	TP	TSS
EXISTING CONDITION	9.92	1.57	292.55
STORM WATER WETLAND TREATMENT	20.00%	17.50%	42.50%
NET REDUCTION	1.98	0.27	124.33
FUTURE CONDITION	7.94	1.29	168.21

Constraints

There are few constraints to this retrofit. Site access is very good, but working in the riparian zone will require permitting and sensitivity to the channel.

Alternatives

There are no proposed alternative for this project.

Cost-Estimate Breakdown

Table 5.2 shows a conceptual itemized cost estimate. These costs represent construction and maintenance costs only. The cost for stormwater wetlands is derived from an equation developed by Brown and Schueler (1997).

Table 5.2

Site 5 Construction Cost

Pay Item Description	Estimated Quantity	Unit	Unit Bid Price	Bid Amount
Stormwater Wetland	10741.0	CF	Equation Derived	$19,704
			Total	$19,704
Mobilization (5%)	1.0	LS		$985
Contingencies (10%)	1.0	LS		$1,970
	Total + Mobilization and Contingencies			**$22,660**
Maintenance Costs				
Maintenance (5% of base construction cost)	1.0	Year		**$1,133**

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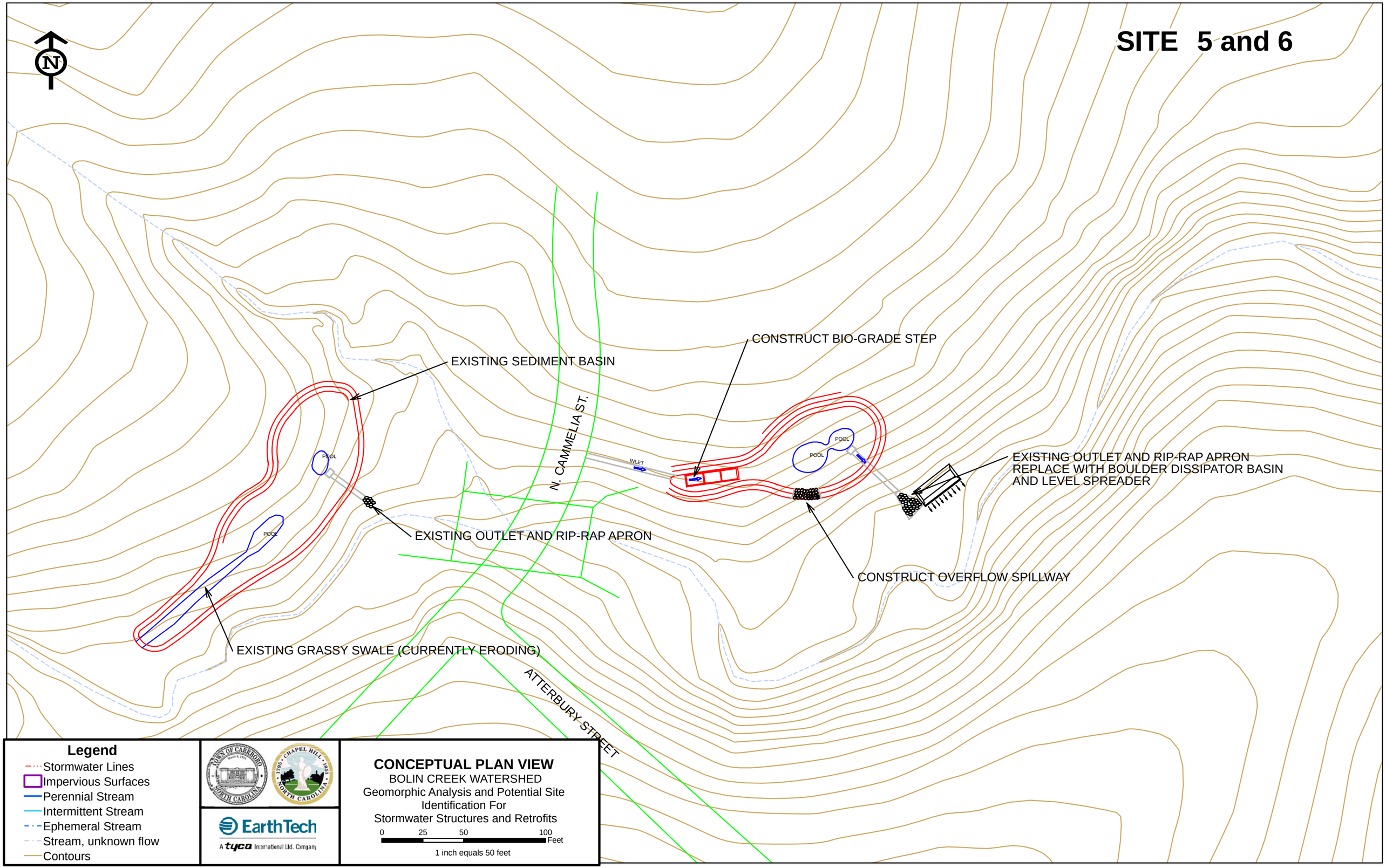
SITE 5 and 6



Legend

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

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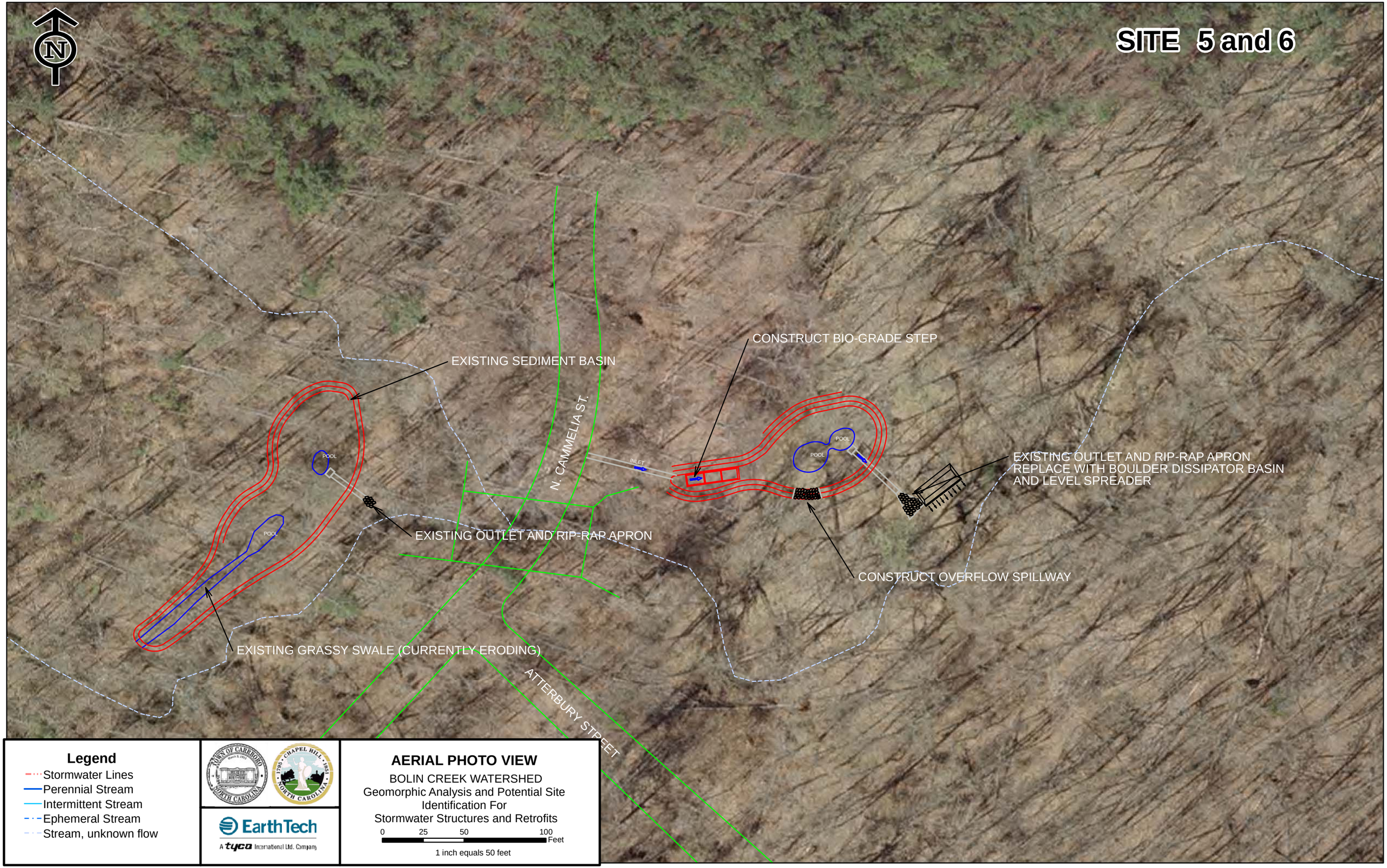
CONCEPTUAL PLAN VIEW
BOLIN CREEK WATERSHED
Geomorphic Analysis and Potential Site Identification For
Stormwater Structures and Retrofits

0 25 50 100 Feet

1 inch equals 50 feet



Legend

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

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AERIAL PHOTO VIEW

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

0 25 50 100 Feet

1 inch equals 50 feet