

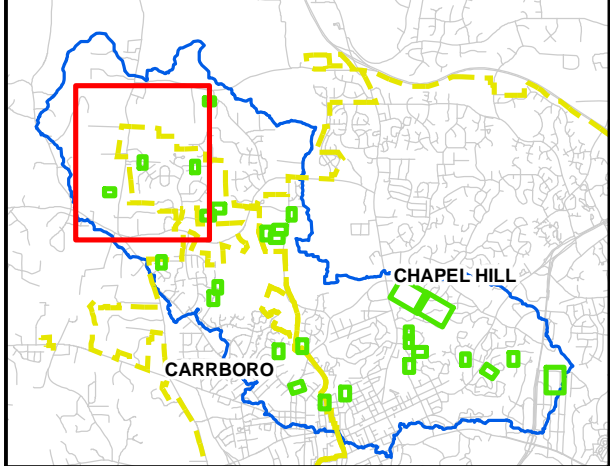
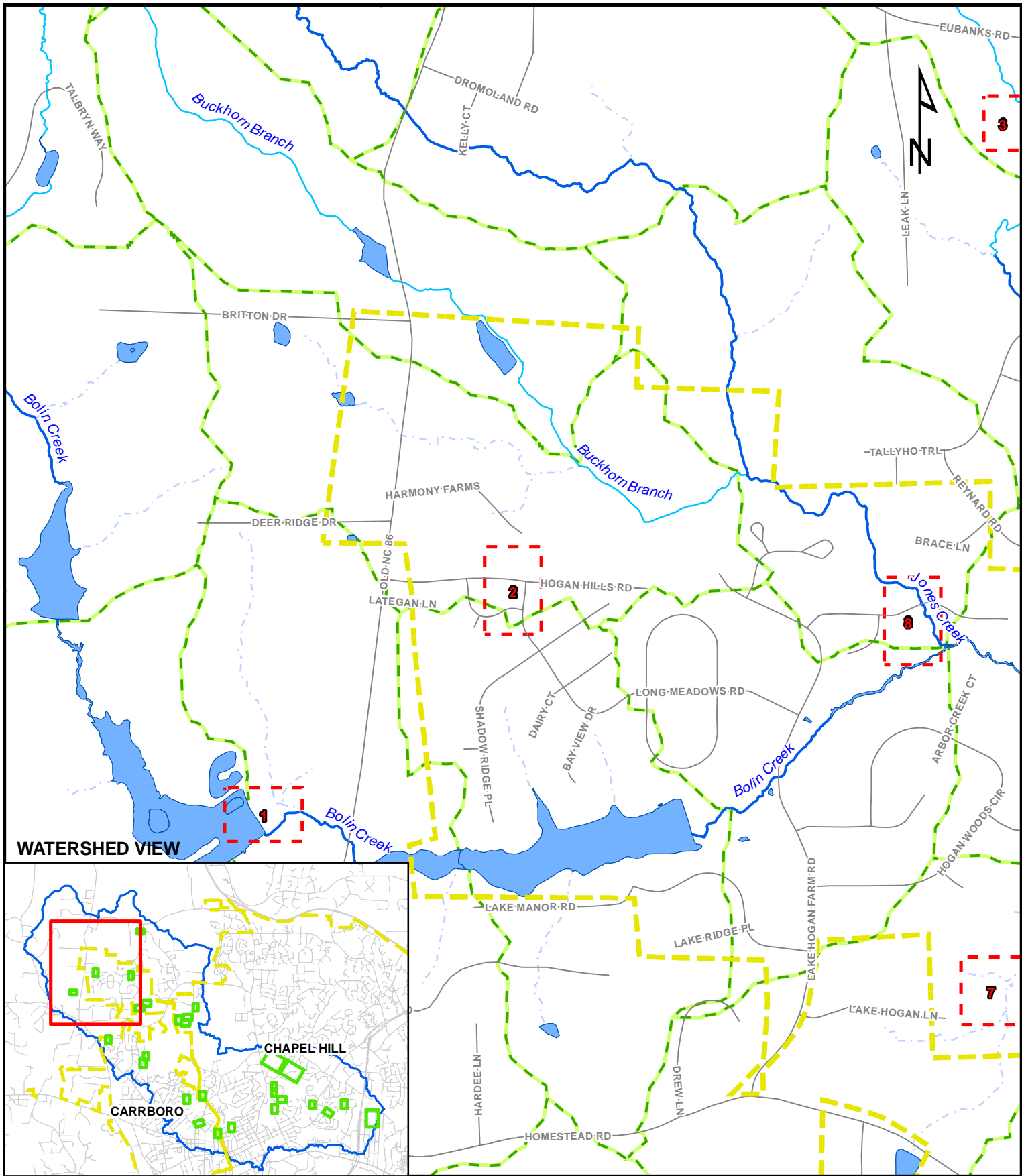
**SITE 2**

**Retrofit of Existing Stormwater Pond**

Index Sheet No.: 5  
Raw Data Name: BD 100



Estimated Construction Cost: \$44,000



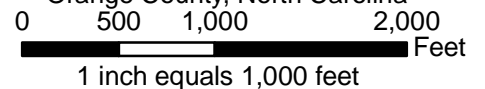
**Legend**

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



**SITE 2  
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 2	5.0	2.3	45.2%

**Location**

Site 2 is located at the corner of Hogan Hills Rd and Long Meadows Rd in the subdivision of Lake Hogan Farms.

**Problem Description**

The continuing development of the Lake Hogan Farms subdivision was observed to be impacting the surrounding stream systems, including Jones Creek and Bolin Creek. A number of small sediment basins, which were likely built during construction of the subdivision, are still in existence in various parts of the subdivision. These provide an opportunity for stormwater BMP retrofits for water quality treatment and the attenuation of peak flows, which should help to alleviate the stress on the surrounding streams. It should be noted that the BMPs that are in place were predominantly designed for the control of water quantity, not quality.

Site 2 is an existing stormwater basin was designed under an old ordinance whereby the basin discharges all rainfall events at a 10 year flow rate. The basin is composed of a flat, shallow depression with sparse plantings of hardwood saplings scattered throughout. The basin currently collects the runoff of Hogan Hills Rd and surrounding rooftops. The basin inlet is a reinforced concrete pipe and the outlet is a concrete vertical riser structure with a 6 inch diameter orifice which has an invert that is even with the basin's bottom elevation. This configuration creates a negative hydraulic effect, where a 1 year recurrence interval event is effectively discharged as a 10 year event. Also, with no permanent pool, soils that do not infiltrate, and no functional wetland system, this basin would not classify as any BMP that would be found in today's NC BMP manual. If the orifice were smaller, it would function to reduce the peak flow rates leaving the sites, and nothing more. Both the inlet and the outlet structures are located on the same side of the basin, further making the basin ineffective by not allowing sediment to settle and not obtaining enough nutrient treatment due to the flow path being only a few feet in length.

**Analysis**

**Proposed Solution**

The existing basin of Site 2 is a prime candidate for a BMP retrofit in the form of a stormwater wetland to provide water quality treatment. To properly function as a wetland, this site should have a few permanent pools established and the soil amended so that plants will thrive. To accommodate the needed hydrology, the outlet structure should be modified to temporarily store approximately 6 inches of water depth and the outlet orifice would be sized to handle the excess, while reducing the runoff rate of the 10 year storm down to a 2 year storm. This can be accomplished by creating several

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

orifices in increasing size as the stage increases in the pond. To allow the proper resonance time, the flow length must be increased by adding a berm and forcing the flow coming from the inlet pipe to be routed to the furthest point of the pond away from the outlet. Other pools and low marsh benches could be built to create the appropriate diversity of habitat for various aquatic and semi-aquatic plants, which will provide treatment of stormwater for nutrients. The site is a desirable one for a stormwater BMP in that the amount of earthwork will be minimal.

The current nutrient export rates, and potential benefit of a stormwater wetland here have been calculated based on land use, drainage area and percent imperviousness of the drainage area, and are displayed in **Table 2.1**:

**Table 2.1**

SITE 2	Pollutant Load (lbs)		
	TN	TP	TSS
EXISTING CONDITION	12.29	1.24	167.06
STORM WATER WETLAND TREATMENT REMOVAL %	40.00%	35.00%	85.00%
NET REDUCTION	4.92	0.43	142.00
FUTURE CONDITION	7.37	0.81	25.06

### **Constraints**

The biggest constraint at this site could potentially be landowner cooperation and land acquisition. If the neighborhood does not want standing water near their home, then the outlet would have to be retrofitted to reduce peak flows and perhaps A landowner that lives adjacent to the site was spoken to during field visits and stated that the site was unsightly now that they had removed wetland vegetation and regarded it witching the past 2 years. If work is done to the make the existing basin into a stormwater wetland for water quality treatment, the design must be such as to satisfy the neighbors and perform better than the previous basin.

### **Alternatives**

If the adjacent property owners do not want the wetland near their home, then the outlet would have to be retrofitted to reduce peak flows and possibly amend the retrofit the basin with a permeable soil layer, to allow some storage through infiltration. Cost would be similar to the wetland, but treatment would be significantly less. A compromise may be reached by allowing underground storage through a porous medium and a mantle of topsoil to support plant growth. This would achieve treatment of the stormwater, but the retrofit would begin to become much more expensive due to the amount of earthwork and required addition of porous medium.

### **Cost-Estimate Breakdown**

**Table 2.2** 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).

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

**Table 2.2**  
**SITE 2 Construction Costs**

Pay Item Description	Estimated Quantity	Unit	Unit Bid Price	Bid Amount
Stormwater Wetland	27573.0	CF	Equation Derived	\$38,156
			<b>Total</b>	<b>\$38,156</b>
Mobilization (5%)	1.0	LS		\$1,908
Contingencies (10%)	1.0	LS		\$3,816
			<b>Total + Mobilization and Contingencies</b>	<b>\$43,879</b>
<b>Maintenance Costs</b>				
Maintenance (5% of base construction cost)	1.0	Year		\$2,194

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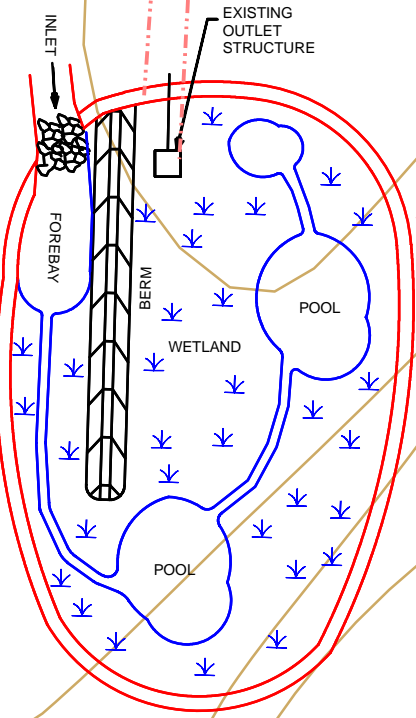


**SITE 2**

**HOGAN HILLS RD**

**LONG MEADOWS DR**

**LONG MEADOWS DR**

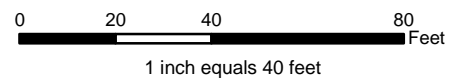


**Legend**

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



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



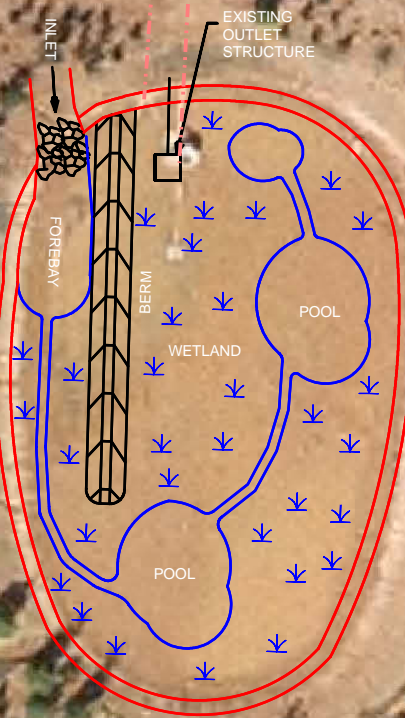


**SITE 2**

**HOGAN HILLS RD**

**LONG MEADOWS DR**

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**Legend**

- - - Stormwater Lines
- Perennial Stream
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**AERIAL PHOTO VIEW**  
 BOLIN CREEK WATERSHED  
 Geomorphic Analysis and Potential Site  
 Identification For  
 Stormwater Structures and Retrofits

