Dr. William Batchelor owns an undeveloped 6.06-acre tract of land on Lee Road 159 located just outside Auburn, Alabama, city limits (Figure 1). The property is currently dominated by dense pine growth. No perennial streams are identified by the United States Geological Survey (USGS). However, two defined channels and a region of significant flow have been identified onsite. There is also a culvert to the northeastern side of the property, which drains onsite. Current topography reveals a floodplain on the eastern end of the project site where standing water occurs following storm events. Furthermore, existing soils onsite contribute to extremely low infiltration rates (Figure 3). An exceptionally high water table has been identified onsite. These conditions lead to flooding following most rainfall events. Dr. William Batchelor plans to utilize the property for his place of residence in the future. However, existing site conditions impede site access and the feasibility of site development.

### Existing Site Conditions

- **Driveway Design**
  - 20-foot wide crusher run driveway
  - Provides the client with access to the proposed home in the event of a 50-year, 24-hour return storm
  - Designed to withstand 35 tons of compressive force from a fully-loaded concrete mixer as well as a minimum turning radius of 40 feet for safe navigation of construction equipment
  - Requires a minimum elevation of 486 feet to prevent overtopping in a 50-year, 24-hour return storm and does not exceed a vertical grade of 8% and (Figure 8)
  - Features a precast concrete box culvert bridge to allow the driveway to run over the constructed wetland
  - Includes a drainage swale running the length of the driveway and draining through culverts under the driveway for erosion protection
  - Comprises recommended materials suitable for subgrade should the client wish to pave the driveway in the future

### Design Objectives

1. Convey the peak flow from a 25-year, 24-hour storm into a 1-acre constructed wetland for stormwater retention and irrigation utilization
2. Design a 20-foot wide gravel driveway able to withstand at least a 25-year, 24-hour storm event; provide access to the proposed home; highlight existing oaks
3. Complete the project at a cost of $75,000

### Site Analysis

- **Onsite analysis was conducted through GPS mapping and data collection**
  - Soils: sandy top layer, clay-based bottom
  - High water table
  - Site location of natural features and driveway alignment
- **Surface flow analysis (Figure 3)**
  - Civil3D Water Drop Analysis and watershed delineation
  - WinTR-65 Flow Modeling (92.15 cfs peak flow for 25-year, 24-hour storm)
- **USGS Web Soil Survey**
  - Cowarts Loamy Sand (Figure 2)
  - Water Table (approximately 18 inches below ground surface)

### Economic Analysis

#### Table 1. Estimated cost components required for project completion quoted by local businesses

<table>
<thead>
<tr>
<th>Design Feature</th>
<th>Estimated Cost:*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructed Stormwater Wetland</td>
<td>$18,800</td>
</tr>
<tr>
<td>Crusher Run Driveway</td>
<td>$45,600</td>
</tr>
<tr>
<td>Onsite Conveyance Channels</td>
<td>$1,500</td>
</tr>
<tr>
<td>Erosion and Sediment Controls</td>
<td>$4,000</td>
</tr>
<tr>
<td>Estimated Total (excluding labor and equipment)</td>
<td>$75,000</td>
</tr>
<tr>
<td>Estimated Annual Maintenance and Operation Total</td>
<td>$900</td>
</tr>
</tbody>
</table>

*Costs estimated in above table include all estimated labor and equipment

### Project Summary

- A crusher run driveway set at a minimum elevation of 48' is recommended to provide the client with access to the proposed homestead in the event of a 50-year storm
- Two engineered channels will be designed in order to intercept and convey stormwater
  - It is recommended that a stormwater wetland be constructed to prevent onsite flooding for up to a 100-year return storm, providing a safe and fiscal alternative to traditional stormwater retention techniques
- The proposed design will prove to be environmentally-friendly: increasing water quality and reducing sediment/pollutant transport

### Acknowledgements

We would like to thank Dr. Mark Dougherty, Dr. William Batchelor, Dr. Jeremiah Davis, and Dr. Jack Montgomery for their contribution and assistance throughout this project.