

### **Pinehurst Formation**

The Pinehurst Formation is mapped on the top of all of the ridges in this multi county sandhill region. This unit may be a weathering fraction of the underlying Middendorf. Nevertheless, there is a 0.5 to 1.0 meter layer of white loose A-2-4 sand at the surface over much of the project area that is over residual soil from the Slate Belt, as well as Cretaceous sand.

### **Middendorf Formation**

In most of the project area, the A-2-4 Pinehurst, is underlain by the Cretaceous Middendorf Formation. The Middendorf is a formation with laterally discontinuous beds that may include clean A-2-4 sand, A-1b, gravel, or lenses of nearly pure kaolinitic clay. The medium dense A-2-6 or A-2-7 clayey sand that was found in the bulk of the samples is probably typical. In outcrop, this is a moderately indurated, red and white mottled clayey sand that is more likely to be kaolinitic than montmorillonitic.

### **Slate Belt Rock**

A blue-gray fine-grained metasedimentary rock with a slaty cleavage is the basement rock in this area. Where exposed to the surface, soils generated from this rock wash away nearly as fast as they develop. The sand cover in the project area, protects an A-6 or A-7 residual soil layer up to 6m thick of clay from erosion. This weathering related soil seems to have a higher liquid limit than the deposited soil of the Middendorf.

### **Rock Properties**

Though residual soil typical of Carolina Slate Belt was identified, borings were not continued to auger refusal and rock was not confirmed anywhere on the project.

### **Groundwater Properties**

#### **Water Wells**

One dug well approximately 0.76m cased in RCP was noted at 23+85/14Rt -L-.

#### **Springs and Draws**

Areas of near surface groundwater were associated with two geologic environments:

1.) Upper limit of the Slate Belt, and 2.) clayey stratigraphy of the Middendorf.

The following elevated groundwater areas are of the Slate Belt related type.

At 11+40 the wetland that is plotted is probably an upstream part of Ellerbe Springs.

At Sta. 14+30 to 14+60 groundwater was measured near the surface and a wetland area is noted on the map.

At Sta. 34+40 to Sta. 34+90 near-surface groundwater was noted, but no wetland is plotted.

At Sta. 37+10 to Sta. 37+80 near-surface groundwater was noted, but no wetland is plotted.

The following elevated groundwater areas are of the Middendorf type.

At Sta. 31+30 to Sta. 31+50 groundwater was recorded in an elevated position, above the projected Slate Belt elevation.

At Sta. 39+00 to Sta. 40+40 groundwater was recorded in an elevated position, well above the projected Slate Belt elevation.

## **Geotechnical Descriptive Analysis of the Project**

### **Summary**

The project begins on NC-73, at sta. -L- 8+50 west of U.S.220, elevation 133m, rises to 139m, and drops to elevation 134m at U.S. 220, sta. -L- 10+40. The topography then rises to elevation 139m and drops to elevation 131 at an unnamed stream at sta. -L- 14+50. The elevation then rises to a crest elevation of 159m where SR 1453 is crossed at sta. -L- 23+10, then drops to elevation 126 at sta. -L- 34+80. An inter-stream divide with a crest at sta. -L-36+40 and elevation 135 is crossed before the right of way returns to elev. 128m at sta. -L- 37+40. There is then a steady rise in elevation to elevation 140m and sta. -L- 42+60, then a slight drop to elevation 137 at sta. -L-44+50 and the end.

#### **Sta. -L- 8+50 to -L-10+93**

This segment will be resurfaced. It begins on Slate Belt outcrop, gains 5m of elevation and climbs through the residual soil and into Cretaceous Middendorf to a crest of 138.5m at sta. -L- 10+20, before dropping to U.S. 220 and elevation 136 at the end of the repaving part of the project.

#### **Sta. -L- 10+93 to 11+80**

This segment traverses an unnamed draw with an identified wetland, and is all on fill. The existing stratigraphy is basal Middendorf, and includes loose sand, loose clayey sand and stiff gravelly sandy clay. Groundwater was measured near the surface.

#### **Sta. -L-11+80 to -L-13+70**

This segment traverses one of the rolling hills of the Piedmont. It is all in Cretaceous sand, under a cut up to 4m thick. Loose to medium dense A-2-6 and A-2-7 were found at and below grade. In the material to be cut, most of the samples returned P.I. values above 20. No water was recorded, but it is conceivable that groundwater occurs perched on the higher P.I. intervals.

#### **Sta. -L- 13+70 to 15+00**

This segment traverses an unnamed "U-shaped" draw with an identified wet land in the center. Beginning and ending elevation is 135m, dropping to 131m in the center of the segment. The base of the Coastal Plain Stratigraphy is traversed in this section, and though the A-7-5 and A-7-6 residual soil does not occur at the surface it was found under about a meter of cover. It was wet, very stiff, with one "medium stiff" value, and will be under 4.5 meters of fill in the deeper section.

#### **Sta. -L- 15+00 to -L- 17+00**

This 200m segment is in cut, with some high P.I. soil above and below grade, and groundwater within a meter of grade. The A-2-6 and A-2-7 soil in the sub-grade is very loose at depth, but there is medium dense material at grade.

#### **Sta. -L- 17+00 to -L- 32+40**

The segment begins at elevation 141m, ends at 141m and achieves elevation 159m at Crawford road at the summit of a broad rolling hill. The segment is at grade or on fill up to 4m thick, as swales of shallow relief are traversed. The subgrade is dry, medium dense A-2-4, A2-6 and A-2-7. Right at the end of the segment at 31+40, a small wetland in a swale is supported by high PI soil in the sub-grade, and will receive 4m of fill overhead.

#### **Sta.-L-32+40 to -L-35+40**

This segment traverses the lowermost Cretaceous Section, and finishes on residual soil derived from Slate Belt rock. The clayey sand of the Cretaceous and the clayey residual soil returned P.I. values above 20 and up to 31, and were med. stiff to hard. Groundwater was found at the surface from Sta. -L- 34+40 to -L-35+00, and may extend to the clayey soil at Sta. -L- 33+50. All of this segment will be on fill, mostly over 3m thick.