Investigation of Pavement and Subgrade Distress at Alabama Highway 5

by

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A thesis submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of Masters of Science

Auburn, Alabama
August 6, 2016

Keywords: expansive clays, trees, pavements

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ABSTRACT

The primary objectives of this study were to determine the root causes for subgrade failure and associated pavement distress along Alabama Highway 5 in Perry County, Alabama. In order to accomplish these goals photographic, video, laboratory and field data were collected regarding the preconstruction conditions of the Alabama Highway 5 research site. These tasks were performed in coordination with larger research objectives to evaluate various remediation strategies for existing shrink-swell clays in western Alabama. It is hypothesized that the seasonal variation in moisture demands of large trees growing within a zone of influence of the roadway has a detrimental effect on the subgrade through shrinking and swelling of expansive clays and consequently causes localized pavement distress. To verify this, laboratory tests – including one dimensional swell, soil water characteristic curves, and standard AASHTO classification tests – have been performed. A survey of the trees greater than 6 inches in diameter and within 60 feet of the roadway, ±10 feet based on the diameter of trees present, was conducted to draw correlations between observed pavement distress and the moisture demand of trees. Additional observations included an estimation of shear strength through published correlations. International Roughness Index surveys were performed to determine the roadway roughness. It has been shown that soils at Alabama Highway 5 have considerable swell potential generating pressures between 500 and 1500 psf. The shrink/swell cycle is predominately driven by suction pressures either from the soils themselves or nearby vegetation. The soils suction potential has wide ranging impacts including variable shear strength and volumetric changes, which have led to pavement and slope distress.

ACKNOWLEDGEMENTS

I would like to thank the Alabama Department of Transportation for their commitment to the Alabama 5 research project and making it possible.

I would like to acknowledge my committee members, Dr. J. Brian Anderson, Dr. Jack Montgomery and Dr. Justin Marshall for their encouragement and guidance.

I would like to express my deepest gratitude to Dr. J. Brian Anderson for his guidance and friendship. Three years ago when I started graduate school as a part time student, Dr. Anderson took a chance on me as a graduate student and brought me in the loop on the Alabama 5 project. His commitment to me as a student has gone above and beyond and his vested interest in my future has lead me to aspire for bigger and greater things. I owe much of my success to his mentorship.

I would like to acknowledge the other graduate and undergraduate research assistants who contributed endless time and energy in the laboratory and onsite.

Jeremy Herman	Lester Lee	Connie Fike
Dan Jackson	Matt Barr	Jameson Moulis
Dylan Jones	Jonathan Hogan	

Finally, I would like to thank my parents who have always encouraged me to reach for the stars and settle for nothing less than excellence. I would especially like to thank my father who spent many long summer afternoons surveying trees with me in Perry County. Without his help and drive the tree survey would not have been possible.

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LIST OF ABBREVIATIONS OR SYMBOLS

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation
AL	Alabama
ALDOT	Alabama Department of Transportation
ASTM	American Society for Testing and Materials
atm	atmospheres
A_S	Area of Specimen
$\bar{c}$	Effective Cohesion
CF	Calibration Factor
CR	County Road
D_0	Specimen Diameter
D_1	Depth to Overburden/Swell Equilibrium for Layer 1
D_2	Depth to Overburden/Swell Equilibrium for Layer 2
$D_{O/S}$	Approximate Depth of Overburden/Swell Equilibrium
EOP	Edge of Pavement
ESAL	Equivalent Single Axle Load
e	Void Ratio
FHWA	Federal Highway Administration
g	gram

G_s	Specific Gravity
HMA	Hot Mix Asphalt
Hwy	Highway
H_s	Height of Solids
H_0	Initial Specimen Height
IRI	International Roughness Index
kPa	Kilopascals
M	Total Mass of Sample
M_{cms}	Mass of container and moist specimen
M_{cds}	Mass of container and oven dry specimen
M_c	Mass of container
M_R	Mass Consolidation Ring
$M_{R+WS,I}$	$(Mass\ Consolidation\ Ring + Wet\ Specimen)_{initial}$
$M_{R+WS,F}$	$(Mass\ Consolidation\ Ring + Wet\ Specimen)_{final}$
$M_{R+DS,F}$	$(Mass\ Consolidation\ Ring + Oven\ Dry\ Specimen)_{final}$
M_s	Mass of Solids
$M_{S,0}$	Initial Specimen Mass
MP	Mile Post
MPa	Megapascals
NCAT	National Center for Asphalt Technology
NCHRP	National Cooperative Highway Research Program
No.	Number
P_s	Swell Pressure

psf	pounds per square foot
pcf	pounds per cubic foot
PS	Potential Swell
ROW	Right of Way
SR	State Route
SWCC	Soil Water Characteristic Curve
USGS	United States Geologic Service
u_w	Pore Water Pressure
w	Moisture content
u_a	Pore Air Pressure
u_w	Pore Water Pressure
V	Total Volume
V_e	Excitation Voltage
V_s	Signal Output Voltage
V_s	Volume of Solids
V_v	Volume of Voids
V_0	Voltage when no physical input has been applied to the sensor
USCS	Unified Soil Classification System
ε_{fs1}	Percent Free Swell Strain of Layer 1
ε_{fs2}	Percent Free Swell Strain of Layer 2
γ_m	Moist Unit Weight
ρ_w	Density of water
σ	Total Stress

$\bar{\sigma}$	Effective Stress
σ_y	Total Overburden Stress
ψ_T	Total Suction
ψ_m	Matric Suction
ψ_o	Osmotic Suction
$(\sigma_y - u_a)_{field}$	*In situ* net normal stress
$(u_a - u_w)_e$	Matric Suction Equivalent

CHAPTER ONE: INTRODUCTION

M.L Steinberg (1981) estimated that expansive clays caused between 7 and 9 billion dollars annually in damages. Based on the Bureau of Labor Statistics' Consumer Price Index Inflation calculator, this is equivalent to over 15 billion dollars annually in the United States today (U.S. Bureau of Labor Statistics 2016). Steinburg also estimated that approximately half of the damages occur to the roadway system, while additional damages are incurred by other transportation facilities. These include airport runways, railroads, canals, pipelines and sidewalks (Steinburg 1985).

Alabama Highway 5 is an important route for heavy trucks travelling between Mobile and Birmingham. Originally a part of the farm to market network of roadways, the pavement was not designed to support modern day trucking. The pavement structure was built directly on top of expansive clays without an aggregate base coarse. Rapid deterioration of the pavement structure has led to resurfacing and maintenance work on an almost annual basis. This investigation is primarily focused on the contribution of the subgrade to pavement damage. The expansive nature of the subgrade and surrounding vegetation has resulted in an unsustainable cycle of subgrade shrinkage and swelling.

In order to investigate pavement and subgrade distress along Alabama Highway 5, extensive photograph, video, laboratory and field data were collected regarding the preconstruction conditions of the Alabama Highway 5 research site. These tasks were performed in coordination with larger research objectives to evaluate various remediation strategies for existing shrink-swell clays in western Alabama. It is hypothesized that the seasonal variation in moisture demands of large trees growing within a zone of influence of the roadway has a detrimental effect on the subgrade through shrinking and swelling of expansive clays and consequently causes localized pavement distress.

OBJECTIVES

The objective of this investigation was to determine the root causes for subgrade failure and associated pavement distress along Alabama Highway 5 in Perry County, Alabama.

SCOPE OF WORK

This document describes the methods, equations, background information and relevant literature used to provide a thorough explanation of the subgrade contribution to ongoing pavement distresses. In order to accomplish these goals, extensive photograph, video, laboratory and field data were collected regarding the preconstruction conditions of the Alabama Highway 5 research site. These tasks were performed in coordination with larger research objectives to evaluate various remediation strategies for existing shrink-swell clays in western Alabama. Laboratory tests – including one dimensional swell (ASTM 4546), soil water characteristic curves, and standard AASHTO classification tests – have been performed. A survey of the trees greater than 6 inches in diameter and within 60 feet of the roadway, plus or minus 10 feet based on the diameter of trees present, was conducted to draw correlations between observed pavement distress and the moisture demand of trees. Additional observations included an estimation of shear strength through published correlations. International Roughness Index surveys were performed to determine the roadway roughness.

CHAPTER TWO: BACKGROUND AND LITERATURE REVIEW

BACKGROUND

Unsaturated Soil Mechanics

According to Terzaghi in *Theoretical Soil Mechanics*, soil mechanics is "the application of the laws of mechanics and hydraulics to engineering problems dealing with sediments and other unconsolidated accumulations of solid particles produced by mechanical and chemical disintegration of rocks, regardless of whether or not they contain and admixture of organic constituents" (Terzaghi 1943). Traditional, or saturated, soil mechanics addresses a variety of engineering problems by making one of the following assumptions: the soil particles are saturated and cohesive, the soil particles are saturated and cohesionless, or the soil particles are completely dry and cohesionless. Use of these assumptions allows for a two phase system of analysis: solids, and water or air. While soils meeting the aforementioned assumptions exist in nature and provide a starting place for analysis, a considerable number of engineering problems deal with soils falling between these extremes. Unsaturated soil mechanics addresses engineering problems and behaviors of cohesive and cohesionless soils that have varying amount of water and air throughout the soil mass. These partially saturated or unsaturated soils require a four phase system of analysis: solids, water, air, and a contractile skin – located at the air water interface. In Figure 1, Fredlund and Rahardjo (1993) have broken down the differences between saturated, or traditional, soil mechanics and unsaturated soil mechanics into a flow chart.

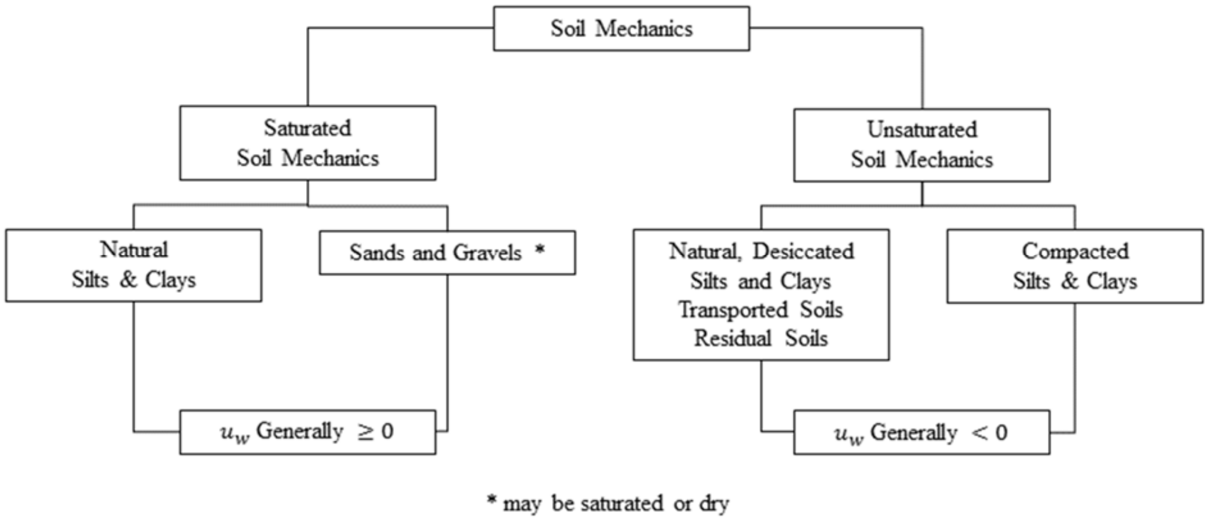

Figure 1: Categorization of Soil Mechanics (Fredlund and Rahardjo 1993)

Unsaturated Soil

When discussing unsaturated soils, it is important to visualize the different zones of soil under consideration. For the purposes of this section, assume a single homogenous and isotropic soil layer infinitely deep with a water table at a known depth below the ground's surface. The soil layer can then be broken up into four distinct zones based on pore water pressure and degree of saturation. Figure 2 depicts the different zones with their associated saturations and pore water pressures.

Below the water table is the "free water zone," which has positive pore water pressure and is completely saturated with no air voids. Additionally, free water has no dissolved solutes, including air, has no interactions with other phases that would result in curvature at the air-water interface, and is acted upon only by gravity (Lu and Likos 2004). This state is in thermodynamic and chemical equilibrium and is used as the reference condition as the soil system transitions from saturated to unsaturated conditions. Soil suction is considered to be the decrease in pore water potential relative to the free water potential of zero. It is generally expressed as a positive value (Lu and Likos 2004).

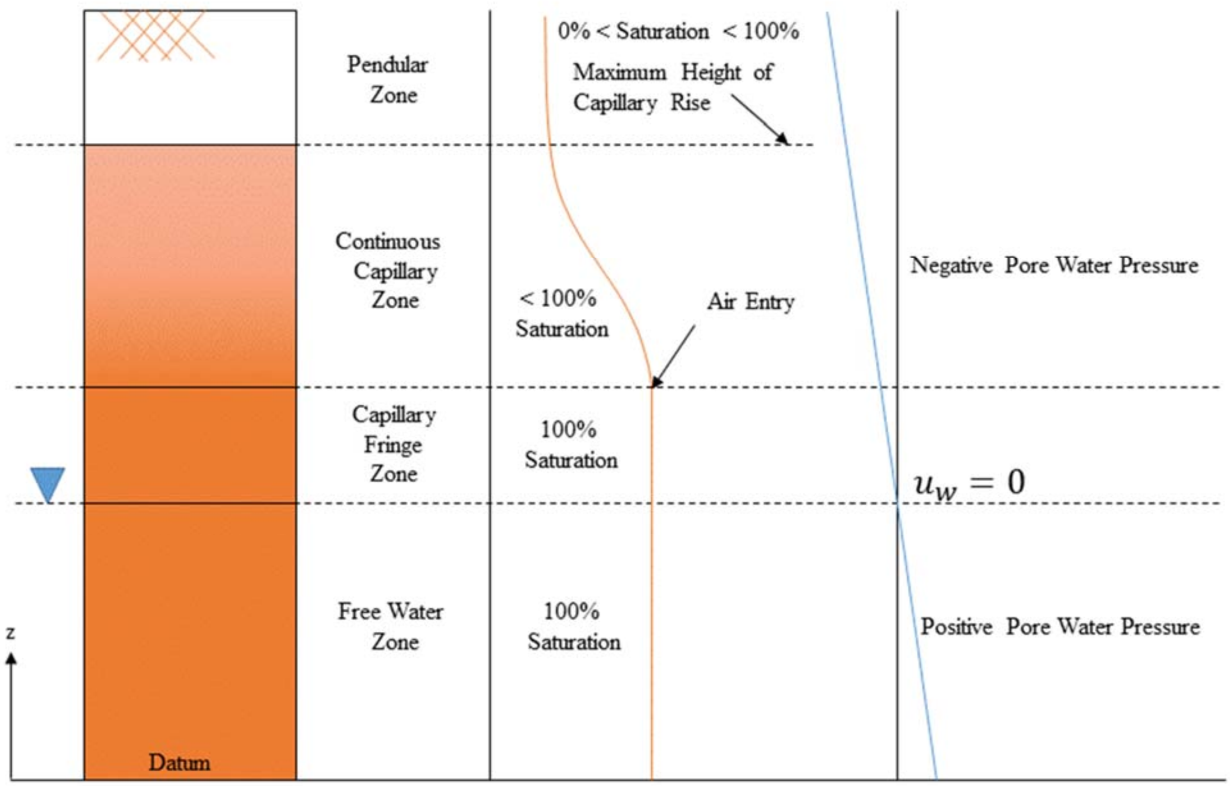

Figure 2: Saturated and Unsaturated Soil Zones (after Lu and Likos 2004)

Soil suction can be broken into osmotic and matric suction. Osmotic suction expresses the change in chemical potential of the water as solutes dissolve. Matric suction expresses the change in thermodynamic potential due to the combined effects of capillarity and short range adsorption of water molecules (Lu and Likos 2004). For the purposes of this investigation, osmotic suction is not considered since the ground and pore water are assumed homogenous. Equation 1 shows the combination of matric and osmotic suction to produce total suction.

$$\psi_T = \psi_m + \psi_o \tag{1}$$

where:

$$\psi_T = Total\ Suction$$

$$\psi_m = Matric\ Suction$$

$$\psi_o = Osmotic\ Suction$$

Matric suction can be quantified by the difference between the pore air pressure and the pore water pressure.

$$\psi_m = u_a - u_w \tag{2}$$

where:

$$u_a = pore\ air\ pressure$$

$$u_w = pore\ water\ pressure$$

Above the water table is the "capillary fringe zone," which can vary greatly in thickness depending on the grain size distribution of the soil. Within the capillary fringe the soils are fully saturated due to capillary rise, but experience negative pore water pressure to maintain hydraulic equilibrium. The pores in a soil matrix form an interconnected pathway of varying diameter, which behaves like a capillary tube. The diameter of the tube drawing water limits the height of capillary rise. Similarly, the capillary fringe zone is limited by the maximum pore diameter in the stratum, because when the pore diameter becomes sufficiently large for capillary action to cease along a single pathway, air entry occurs and unsaturated soils begin.

The continuous capillary zone begins at the air entry point and continues until the maximum height of capillary rise is achieved. This zone becomes increasingly desaturated with increasing elevation, “reflecting the fact that fewer and smaller capillary fingers are present for a given cross section of the soil column with increasing elevation” (Lu and Likos 2004). Beyond the maximum height of capillary rise pore water primarily exists in the form of pendular water menisci between the solid soil particles. This pendular region has relatively large matric suction and low water content.

Throughout the soil matrix above the water table, short-range adsorbed water plays an important role in matric suction as well. While the capillary effect arises from the curvature of the air-water interface, the short-range adsorption effects are derived from electrical and van der Waals force fields that develop at the solid-liquid interface (Lu and Likos 2004). The properties of adsorbed water and free water are different due to short-range physical and physicochemical interactions with the soil surface. This is especially true at low degrees of saturation and or pendular soil conditions (Lu and Likos 2004). For fine-grained soils, such as clay, the solid particles can carry a net electric charge, which interacts with the polarity of water to maintain a bond between the molecules. Because of the comparatively large surface area and surface charge of clay particles, short-range adsorption can dramatically affect the matric suction at relatively low water contents.

States of Stress

When characterizing the behavior of a given soil, the state of stress of that soil must be considered. State variables are any variable required to describe the state of stress of a system for a given phenomenon but are not material variables. Material variables are intrinsic properties to a given material and can vary between material types. Material and state variables can be used in conjunction to describe the state of a system with multiple phases (Fung 1965).   In saturated soil mechanics, the effective stress $(\bar{\sigma})$ experienced by the solid phase can be described in terms of total stress (σ) and pore water pressure (u_w).

$$\bar{\sigma} = \sigma - u_w \tag{3}$$

For saturated soils, $(\sigma - u_w)$ is a single stress state variable. The pore water pressure is considered to be compressive (positive), isotropic, and to contribute fully to the effective stress principle. Stress state variables are not dependent on the physical properties of the materials.

Fredlund and Morgenstern (1977) published a "theoretical stress analysis of an unsaturated soil on the basis of multiphase continuum mechanics." For the purposes of this investigation, Fredlund and Morgenstern's method of analysis will be used. In Fredlund and Morgenstern's method of analysis, as summarized by Fredlund and Rahardjo (1993), the soil is considered to be chemical inert, incompressible and consist of four phases: air, soil solid, water and the contractile skin. Figure 3 depicts an unsaturated soil element with all four phases.

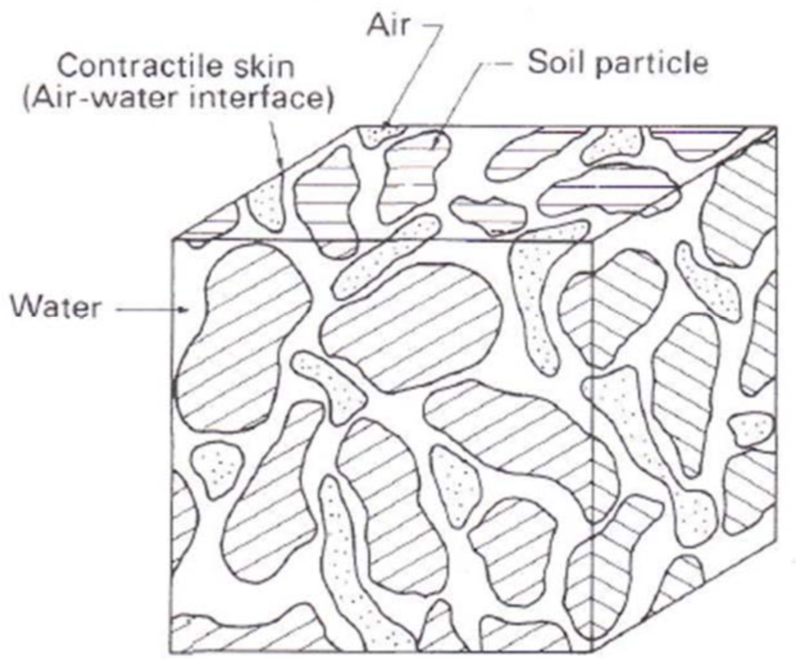

Figure 3: Unsaturated Soil Element (Fredlund and Rahardjo 1993)

Two independent stress states must be used to describe the stress state of an unsaturated soil due to the existence of the contractile skin. Three stress state variables are available for use and a minimum of two must be used in any constitutive relationship. Table 1 describes the possible combinations of stress state variables available for use to describe an unsaturated soil (Fredlund and Rahardjo 1993).

Table 1: Possible Combinations of Stress State Variables for an Unsaturated Soil (Fredlund and Rahardjo 1993)

Reference Pressure	Stress State variables
Pore Air, u_a	$(\sigma - u_a)$ and $(u_a - u_w)$
Pore Water, u_w	$(\sigma - u_w)$ and $(u_a - u_w)$
Total Stress, σ	$(\sigma - u_a)$ and $(\sigma - u_w)$

Please note that matric suction is one of the two stress state variables when pore air or pore water is used as the reference pressure. While each of the three possible combinations can be used in constitutive relations, the majority of the published research and text books use air as the reference pressure.

Shear Strength

In saturated soil analysis, the Mohr-Coulomb failure criterion can be used to determine the shear strength of a given soil in conjunction with Terzaghi's effective stress equation.

$$\tau = \bar{c} + \bar{\sigma} \tan \phi' \tag{4}$$

where:

$$\tau = shear\ strength$$

$$\bar{c} = cohesive\ intercept$$

$$\phi' = effective\ angle\ of\ internal\ friction$$

The slope of the failure criterion is defined by the effective angle of internal friction and the y-intercept by the effective cohesion. Figure 4 depicts the Mohr-Coulomb failure criterion for a saturated soil.

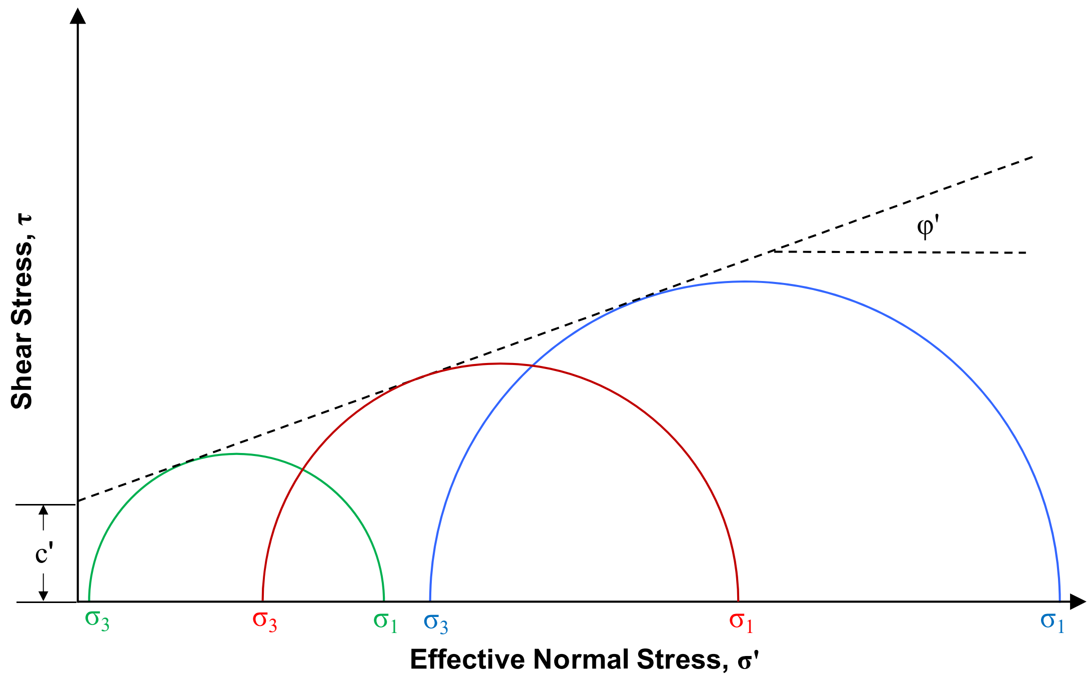

Figure 4: Mohr-Coulomb Failure Criterion (Saturated Soil) (Burrage 2016)

Using the system of stress analysis developed by Fredlund et al., shear strength is determined using two independent stress state variables (Fredlund et al. 1978). Matric suction $(u_a - u_w)$ and net normal stress $(\sigma - u_a)$ are used to develop the following shear strength equation for an unsaturated soil.

$$\tau = \bar{c} + (\sigma - u_a)\tan\phi' + (u_a - u_w)\tan\phi^b \tag{5}$$

where:

$\bar{c}$ "is the effective cohesion when matric suction and net normal stress is zero"

ϕ' "is the angle of internal friction with respect to changes in [net normal stress] when [matric suction] is constant"

ϕ^b "is an angle that can be regarded as controlling an apparent cohesion which is related to levels of matric suction… in the sample" (Burrage 2016)

Figure 5 depicts the Mohr-Coulomb failure criterion for an unsaturated soil.

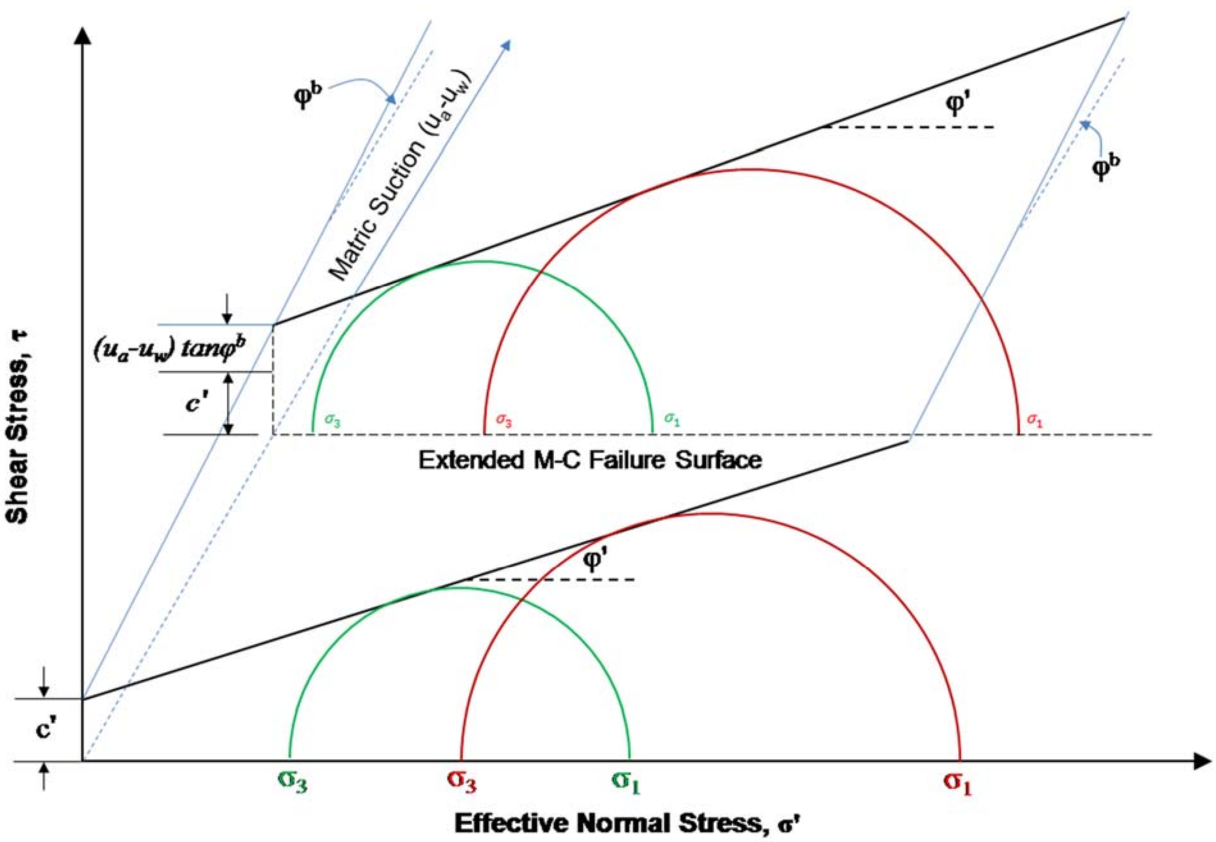

Figure 5: Extended Mohr-Coulomb Failure Criterion (Unsaturated Soil) (Burrage 2016)

Volumetric Change in Expansive Soils

According to Fredlund and Rahardjo, "[a]n unsaturated soil will undergo volume change when the net normal stress or the matric suction variable changes in magnitude… Under a constant total stress, an unsaturated soil will experience swelling and shrinkage as a result of matric suction variations associated with environmental changes" (Fredlund and Rahardjo 1993). Changes in matric suction are due to changes in the volumetric water content of the soil. As the water content of a given soil specimen increases the matric suction decreases and increases with an increase in water content. The potential of a given soil to shrink or swell, depends on its material properties: clay content, plasticity index, shrinkage limit, initial water content and matric suction (Fredlund and Rahardjo 1993). Holtz and Kovacs (1981) provided some guidelines for the probable expansion of a soil based on soil properties as shown in Table 2.

Table 2: Probable Expansion as Estimated from Classification Test Data[a] (from Holtz and Kovacs 1981)

Degree of Expansion	Probable Expansion as a % of the Total Volume Change (Dry to Saturated Condition)[b]	Colloidal Content (% - 1 μm)	Plasticity Index, PI	Shrinkage Limit, w_s
Very High	>30	>28	>35	<11
High	20-30	20-31	25-41	7-12
Medium	10-20	13-23	15-28	10-16
Low	<10	<15	<18	>15

[a]After Holtz (1959) and U.S.B.R. (1974)
[b]Under a surcharge of 6.9 kPa (1 psi)

Montmorillonite expansive clays belong to the smectite mineral group and experience large volume changes because of the physical and chemical makeup of their mineral structure. Based on work by Casagrande (1948), Holtz and Kovacs (1981) recommend using Atterberg limits to identify active clay minerology. Clays with a montmorillonite composition generally plot near the U-line on Casagrande's plasticity chart, Figure 6. By using the plasticity chart to estimate mineral content, general information about the activity level of the clay can be approximated without specialized testing.

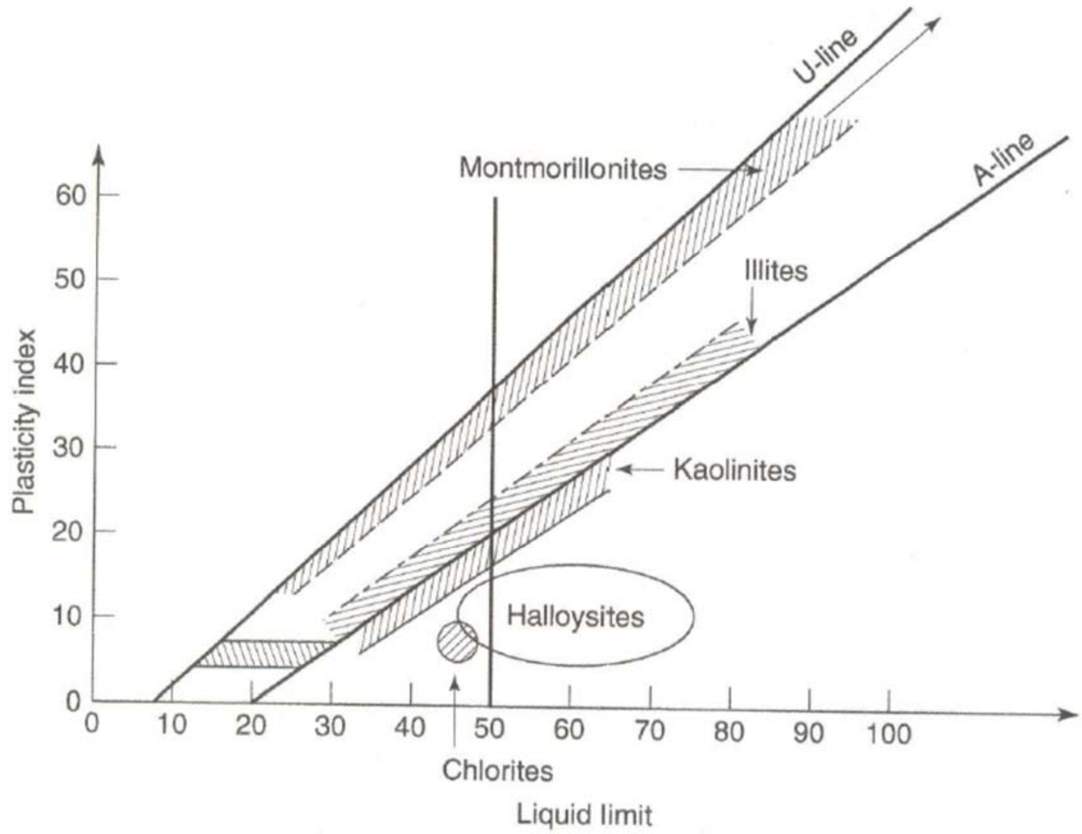

Figure 6: Location of Common Clay Minerals on Casagrande's Plasticity Chart (developed from Casagrande 1948 and data in Mitchell and Soga 2005) (Holtz and Kovacs 1981)

Montmorillonite is composed of an alumina octahedral sheet located between two silica tetrahedral sheets (Mitchell 1976). This configuration creates a plate-like structure with negative charges along the broad surface and positive charges along the edges of the soil particle. Figure 7 depicts the structure of a montmorillonite mineral.

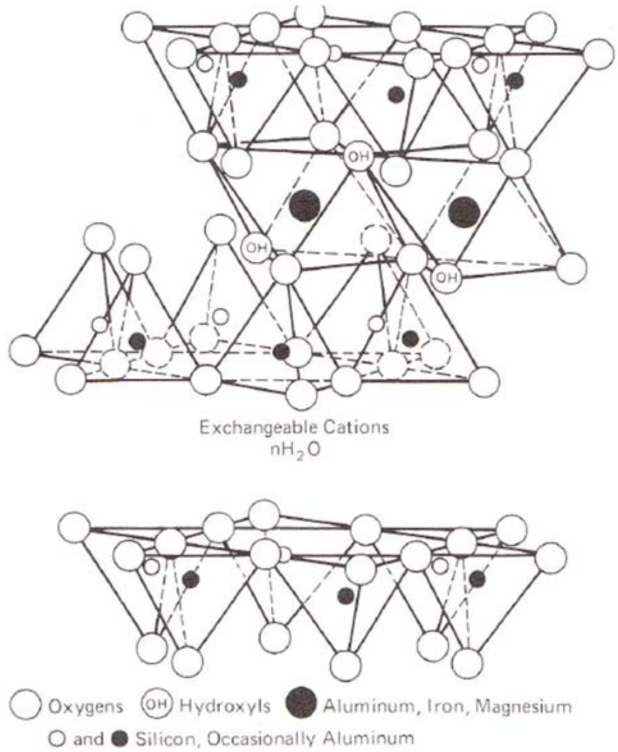

Figure 7: Diagram of the Montmorillonite System (Mitchell 1976)

The polar nature of water creates an adsorptive bond between the montmorillonite soil solids and water molecules. Consequently, expansive soils have a high water storage capacity and are slow to drain. The adsorption of water around the clay particles expands the surrounding diffused water layer, forcing the particles a part (Nelson and Miller 1992). The resulting increase in volume is referred to as swelling. Shrinkage occurs when water is removed from soil matrix by desiccation, causing the diffused water layer surrounding the clay particles to shrink and draw the clay particles back together. Figure 8 depicts the swelling of smectite clays.

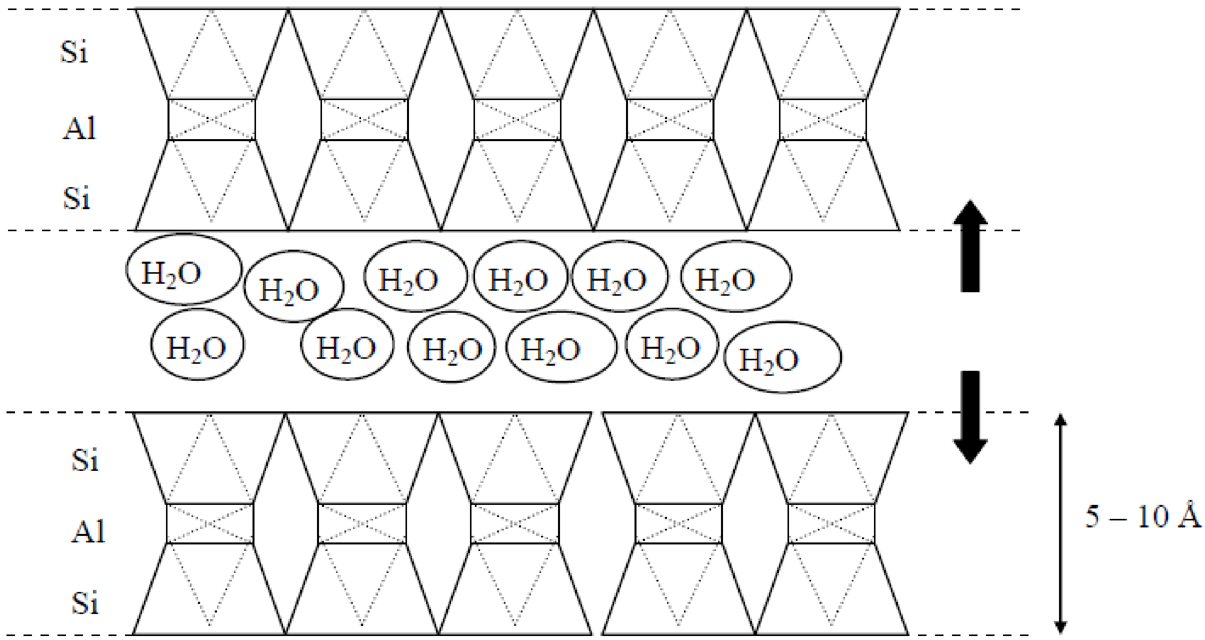

Figure 8: A Diagram Showing the Intercalation of Water Molecules in the Inter-plane Space of Clay Smectites (Taboada 2003)

This phenomenon does not occur in silts or sands because the individual soil particles are too large to be influenced by the polarity of water, and they are typically rounded or angular shapes.

The volumetric change of an unsaturated soil can be described in terms of two state variables. Fredlund and Rahardjo (1993) explain the constitutive relations between volumetric change of the solid and water phases as a function of net normal stress and matric suction. Because two state variables are required to describe the volumetric change of the solid and/or water phase, a three-dimensional surface is formed, as depicted in Figure 9, to describe the volume changes over a range of net normal stresses and matric suctions.

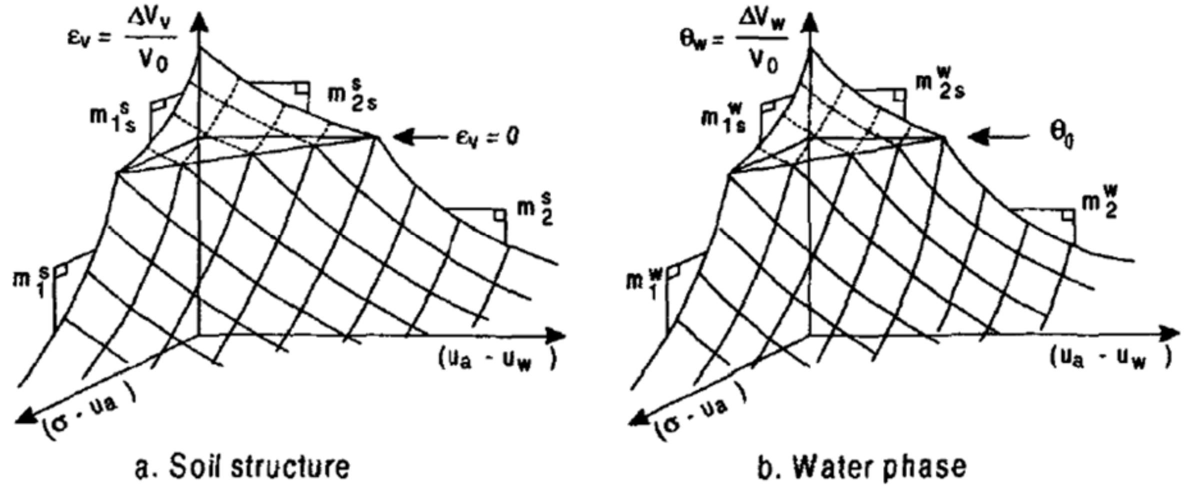

Figure 9: Three-dimensional Constitutive Surfaces for Soil Structure of an Unsaturated Soil (Fredlund and Rahardjo 1993)

Figure 10 depicts the changes in void ratio across a range of net normal stresses and matric suctions.

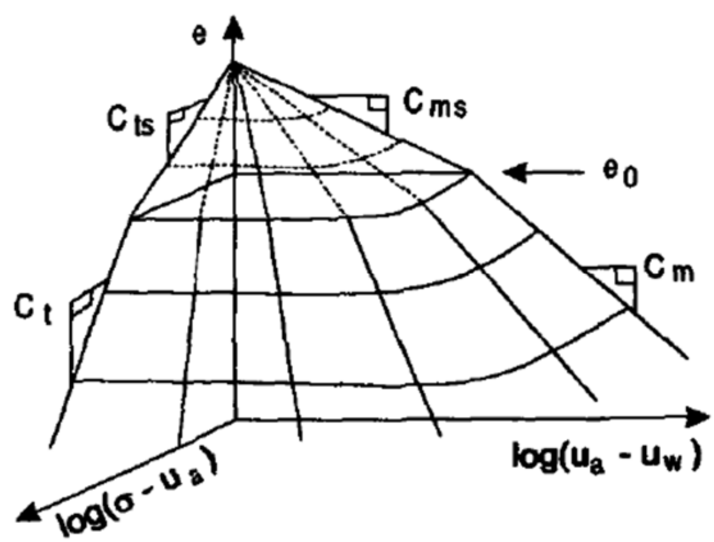

Figure 10: Semi-logarithmic Plot of Void Ratio versus Net Normal Stress and Matric Suction (Fredlund and Rahardjo 1993)

According to Figure 9 and Figure 10, the volume change potential of a soil mass is limited by the net normal stress and the matric suction.

Soil Water Characteristic Curves

Soil water characteristic curves (SWCC) describe the constitutive relationship between matric suction and volumetric water content of a given soil mass. Low water contents correspond to high suction values, while high water contents correspond to low suction values (Lu and Likos 2004). The general shape of a soil water characteristic curve is depicted in Figure 11. Referring back to the terminology in Figure 2, the pendular zone corresponds with the "Tightly Adsorbed" regime and the "Adsorbed Film" regime, and the "Capillary" regime corresponds to the continuous capillary zone. When the concentration of dissolved solutes is constant over the range of water contents, the osmotic suction will likewise remain constant (Lu and Likos 2004). Thus, changes in total soil suction will be due solely to changes in matric suction.

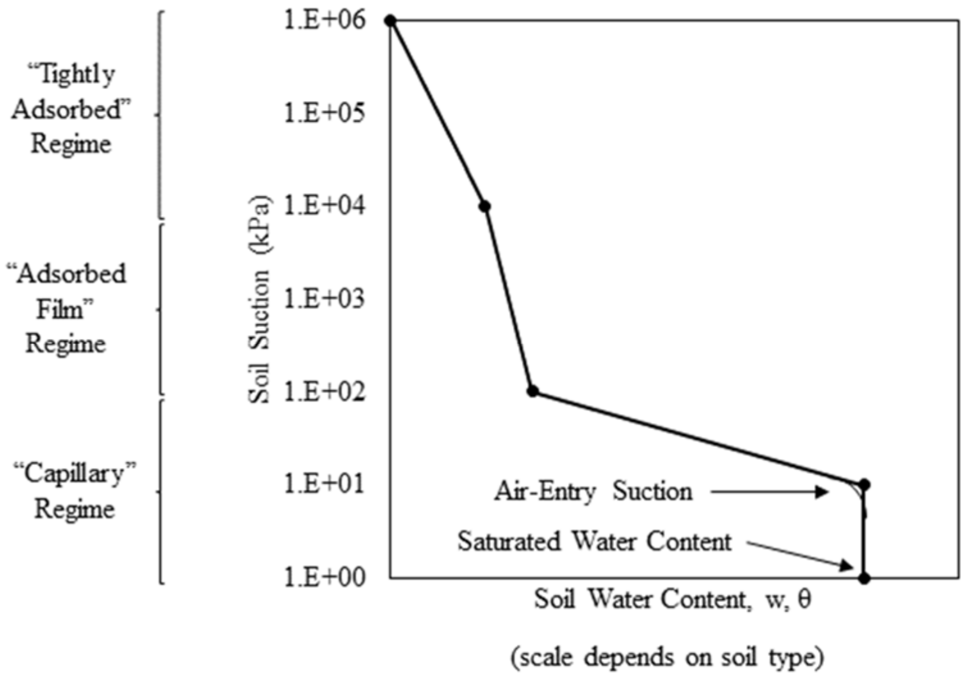

Figure 11: Illustration of McQueen and Miller's (1974) Conceptual Model for General Behavior of the Soil-Water Characteristic Curve (after Lu and Likos 2004)

The shape of a SWCC is controlled by the material properties of a given soil, including grain (pore) size distribution, density, organic content, percent clay, and mineralogy (Lu and Likos 2004). Figure 12 illustrates typical SWCCs for sand, silt and clay showing the dependency on soil type (Lu and Likos 2004). Sandy soils experience high values of matric suction over a relatively small range of water contents because of their small specific surface and limited adsorption capabilities. Clays experience high matric suction values over a wide range of water contents due to their high specific surface and charged surfaces. Non-expansive clays, such as kaolinite, adsorb less water than expansive clays, such as montmorillonite, in the tightly adsorbed and adsorbed film regimes. The SWCC is most significant for expansive clays due to their volume change capacity during the sorption process (Lu and Likos 2004).

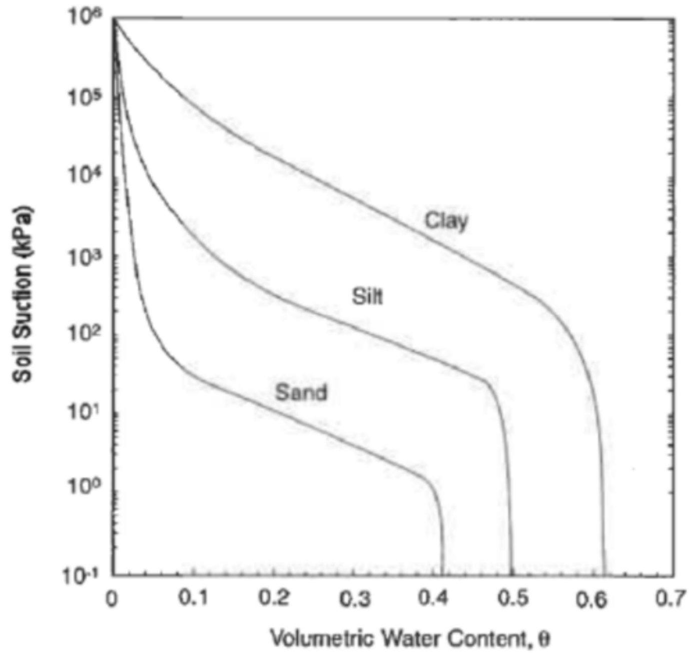

Figure 12: Representative Soil-Water Characteristic Curves for Sand, Silt and Clay (Lu and Likos 2004)

LITERATURE REVIEW

M.L Steinberg estimated that expansive clays caused between 7 and 9 billion dollars annually in damages (1981). Based on the Bureau of Labor Statistics' Consumer Price Index Inflation calculator, this is equivalent to over 15 billion dollars annually in the United States today (U.S. Bureau of Labor Statistics 2016). Steinburg also estimated that approximately half of the damages occur to the roadway system, while additional damages are incurred by other transportation facilities. These include airport runways, railroads, canals, pipelines and sidewalks (Steinburg 1985). In the background information, the mechanisms and material properties that allow expansive soils to undergo volumetric change and the relationship between those changes and matric suction were addressed. The literature review will investigate how the unique mechanics of expansive clays combine with external environmental factors to the detriment of the roadway system.

Variable Shear Strength

In a paper by Al-Mhaidib et al., sixty triaxial tests were performed on an expansive shale, classified as a fat clay by the Unified Soil Classification System (USCS). The samples were mixed to create uniform unsaturated remolded specimens, with 100% passing the No. 40 sieve, at a predetermined water content (Al-Mhaidib and Al-Shamrani 2006). The specimens were consolidated under an isotropic confining pressure for approximately 24 hours, at which point water was introduced to the specimen and allowed to swell. The specimens swelled to 0%, 25%, 50%, 75%, and 100% of the ultimate vertical swell. Once the predetermined percent swell was achieved, the specimen was sheared and the shear strength calculated. The results were expressed in terms of the "Shear Ratio," which is a ratio of the shear strength of the swelled specimen and the non-swelled specimen (Al-Mhaidib and Al-Shamrani 2006).

$$Shear\ Ratio = \frac{Shear\ Strength\ of\ swelled\ specimen}{Shear\ strength\ of\ non\text{-}swelled\ specimen} \tag{6}$$

Table 3 summarizes the calculated values for shear ratio for each of the swelled triaxial tests performed. As demonstrated by the laboratory test data, the authors concluded that swelling of expansive clays has a significant negative impact on the shear strength of the material. In the case of samples allowed to swell to their ultimate vertical swell, approximately 10% of the shear strength remained as compared to the non-swelled samples.

Table 3: Calculated Values for Shear Ratio for all Tested Specimens (Al-Mhaidib and Al-Shamrani 2006)

		% Vertical Swell Before Shearing			
Initial water content (%)	confining pressure (kPa)	25	50	75	100
14	25	0.32	0.09	0.07	0.04
	50	0.33	0.17	0.09	0.06
	100	0.35	0.20	0.15	0.08
	150	0.37	0.20	0.15	0.07
	Average	0.34	0.17	0.12	0.05
18	25	0.26	0.11	0.08	0.05
	50	0.26	0.16	0.11	0.08
	100	0.28	0.20	0.17	0.10
	150	0.33	0.22	0.18	0.11
	Average	0.28	0.17	0.14	0.09
22	25	0.36	0.27	0.18	0.11
	50	0.37	0.30	0.22	0.14
	100	0.39	0.32	0.27	0.20
	150	0.44	0.35	0.30	0.22
	Average	0.39	0.31	0.24	0.17
Average		0.34	0.22	0.16	0.11

The EPRI Manual provides several methods to approximate the shear strength of a clay based on Atterberg limits (Kulhawy and Mayne 1990). Figure 13 shows a correlation between plasticity index and critical void ratio friction angle.

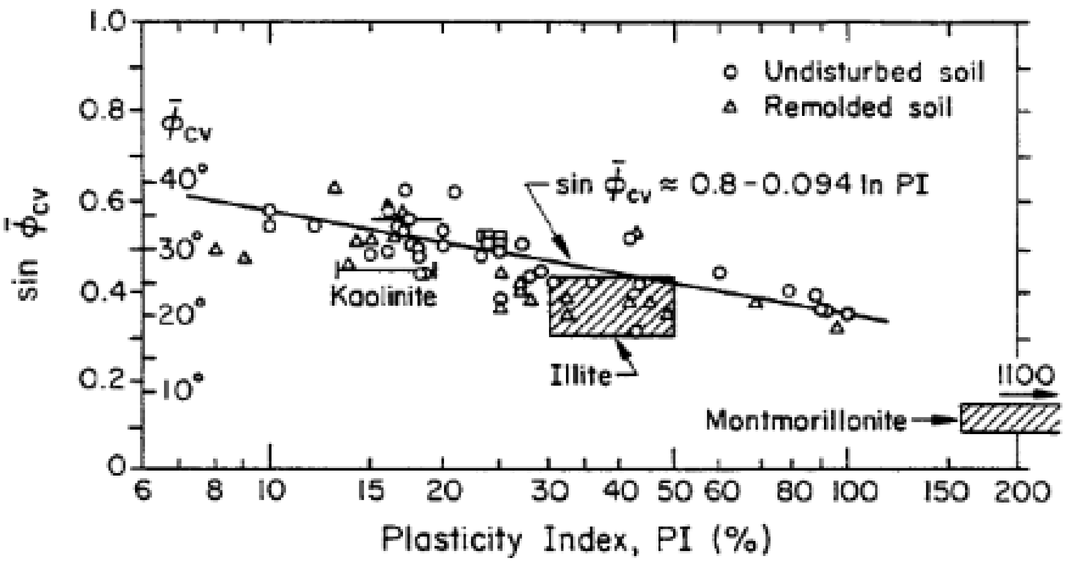

Figure 13: Critical Void Ratio Friction Angle (Kulhawy and Mayne 1990)

Figure 14 shows a correlation between Plasticity Index and the undrained shear strength ratio based on vane shear tests. Using these correlations as a guide, the shear strength of a clay can be approximated using the Atterberg Limits.

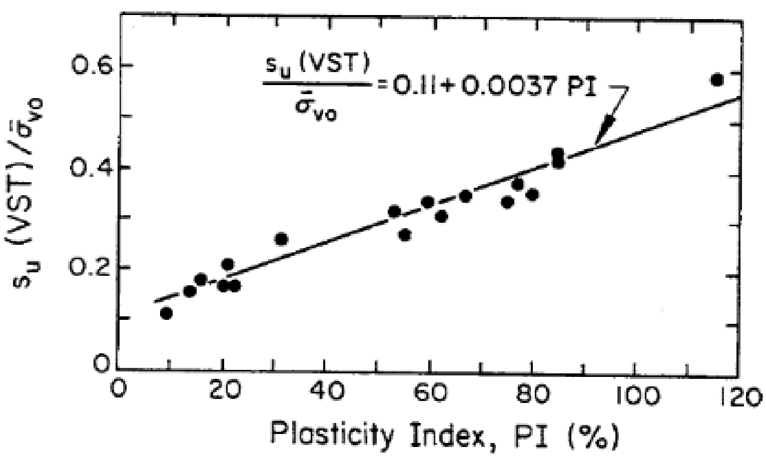

Figure 14: Undrained Shear Strength Ratio versus Plasticity Index based on Vane Shear Tests (Kulhawy and Mayne 1990)

Influence of Climate

The climate of a region is characterized by its seasonal amounts of precipitation and evapotranspiration. Evapotranspiration is the process by which water is removed from the soil by evaporation into the atmosphere and transpiration through vegetation. This process results in an upward movement of soil water through the soil matrix, desiccating the soil and increasing matric suction. Areas with excessive evapotranspiration can result in significant desiccation of expansive soils (Holtz 1983; Zornberg and Gupta 2009). In the event of heavy rains or irrigation, water moves downward through the soil matrix, increasing saturation and decreasing matric suction. Excessive precipitation in areas with expansive soils results in significant swelling (Nelson and Miller 1992). Figure 15 depicts the deformation and fluid flow phenomena in an unsaturated expansive soil (Lu and Likos 2004).

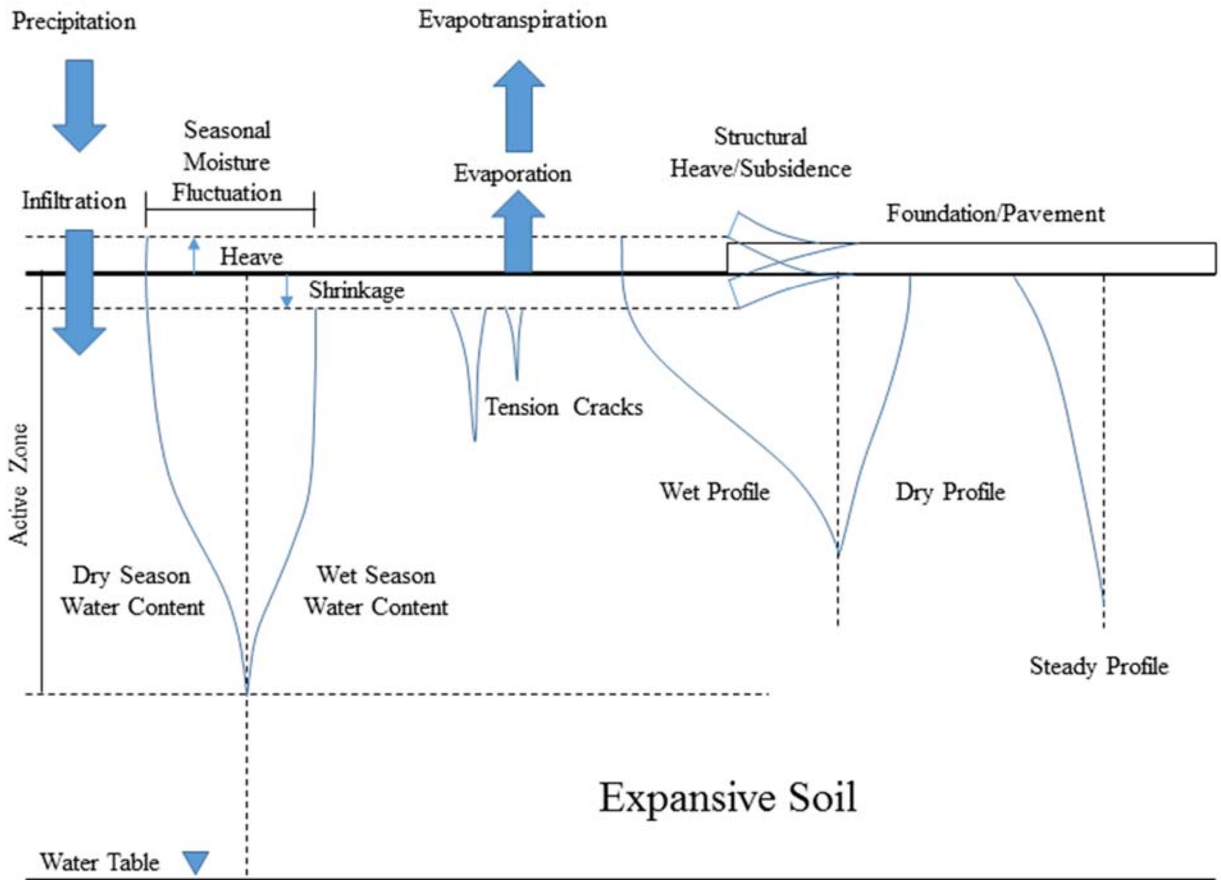

Figure 15: Deformation and Fluid Flow Phenomena in a Near-Surface Deposit of Unsaturated Expansive Soil (after Lu and Likos 2004)

As depicted, the impact of the environment on water content, and resulting volumetric changes, of the soil can cause structural heave or subsidence in foundation or pavement structure built on expansive soils. Arid regions and semi-arid regions, such as Alabama, typically have short, heavy precipitation events, which facilitate the most dramatic shrink-swell behavior (Fredlund and Rahardjo 1993; Nelson and Miller 1992). According to Fredlund and Rahardjo, an arid climate is where, "the annual evaporation from the ground surface exceeds the annual precipitation" (Fredlund and Rahardjo 1993). Seasonal changes in temperature and precipitation can exacerbate damage to structures by creating a continuous cycle of shrinkage and swelling.

Influence of Vegetation

Vegetation consumes water through its root systems and generates transpiration forces on soil water causing desiccation (Holtz 1983; Zornberg and Gupta 2009). The transpiration forces exerted by the vegetation occur at the root tips, generating suction pressures within the soil mass. Large plants, such as trees, develop extensive root systems and have a correspondingly larger zone of transpirational influence (Holtz 1983). The zone of transpirational influence can extend beyond the immediate vicinity of the roots (Holtz 1983). According to Fredlund and Rahardjo, "Most plants are capable of applying 1-2 MPa (10-20 atm) [20,885-41,770 psf] of tension to the pore-water prior to reaching their wilting point" (Fredlund and Rahardjo 1993).

According to G. Biddle, ninety percent of the root system of a tree is typically within 600 mm (23.6 inches) of the ground's surface with the remaining ten percent extending deeper (Biddle 2001). "However, if the opportunistic exploitation of the soil encounters favorable conditions at any location, roots will proliferate" (Biddle 2001). The structural roots provide a radial and typically uniform foundation for the tree, distributing its weight and anchoring it into the ground. Beyond the structural root system develops a subdividing system of fine conducting roots and fine feeder roots. Water uptake only occurs in the fine feeder roots (Biddle 2001). Figure 16 depicts the soil-plant-atmosphere relationship. In Figure 16 fine feeder roots are referred to as "active roots," while structural roots are referred to as "main roots."

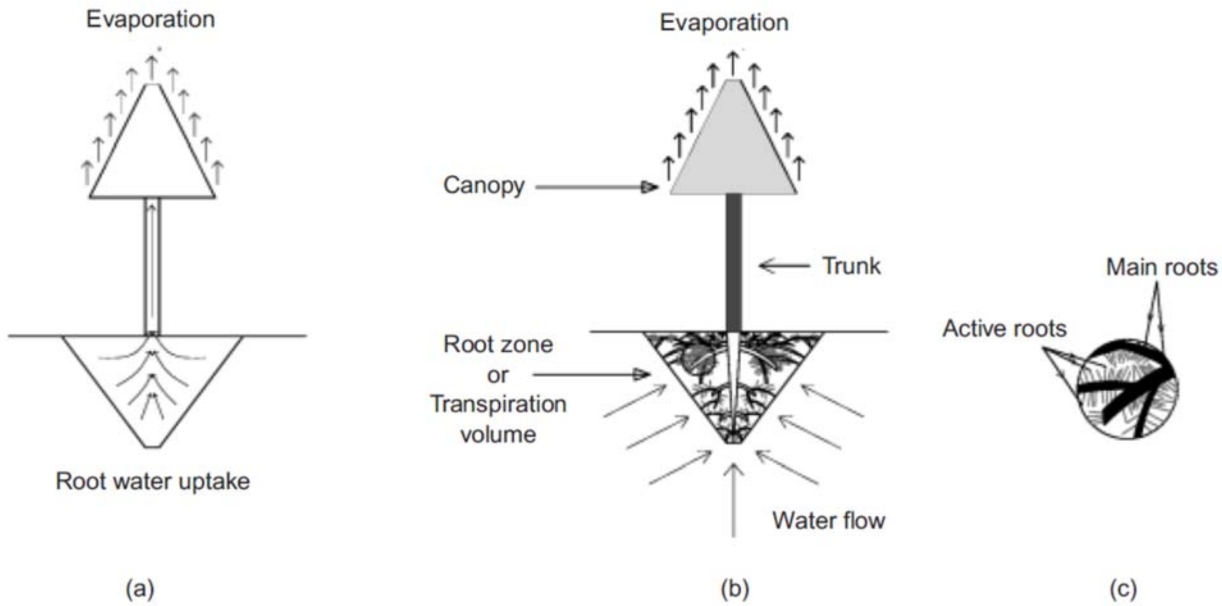

Figure 16: Schematic Sketch of Soil-Plant-Atmosphere System (a) Transpriation (b) Soil-plant-atmosphere interaction (c) Active and main roots (Indraratna et al. 2006)

These roots grow in patterns and in areas most conducive to obtain water and nutrients, typically resulting in a non-uniform distribution based on local soil conditions, elevations and the presence of water (Biddle 2001). "Roots will… proliferate near any natural water source, and, if they encounter them, will exploit deep aquifers such as bands of sand within an otherwise hostile clay soil, particularly if there is lateral inflow to replenish the source. In the same way they will exploit artificial sources of water, such as leaking drains, or the moisture condensing on the underside of paving slabs" (Biddle 2001). In general roots have difficulty penetrating soils with a bulk density greater than 1.8 g/cm^3 (112.4 pcf) (Biddle 2001). Throughout development, roots have a high mortality rate, such that a large portion of the root system dies each winter as the tree becomes dormant, resulting in a dynamic system capable of adapting to changing conditions (Biddle 2001). While it should be noted that the overall size of the crown of a tree and its root system are related, it is not possible to draw reliable conclusions about the size of the root spread based on the crown size or height of a tree because of the influence of the soil on root propagation (Biddle 2001).

Vegetation requires the use of water during photosynthesis. Thin films of water surround the cells of a leaf and aide in carbon dioxide absorption into the cells. Ultimately, the water will evaporate from the films in a process called transpiration. More than 99% of the water consumed by vegetation is lost through transpiration (Biddle 2001). The loss of water from the leaves creates a suction gradient that extends through the vascular tissue of the plant to the roots, drawing water up from the roots to the leaves (Biddle 2001). T.E. Dawson investigated water use by sugar maple trees (*Acer saccharum*) trees from isotopic, energy balance and transpiration analyses to determine the role of tree size and hydraulic lift (Dawson 1996). In his paper, Dawson asserts that large trees, greater than 10 meters (32.8 feet) tall have higher daily transpiration rates than small trees, 3 to 5 meters (9.8 to 16.4 feet) tall (Dawson 1996). However, small trees demonstrated sensitivity to environmental factors resulting in greater variability in daily transpiration rates (Dawson 1996). In terms of the hydraulic balance between ground water and plant transpiration, larger trees and older forest stands had a greater impact than smaller trees (Dawson 1996). The smaller trees tended to pull water from soil water close to the tree itself, while larger trees are capable of hydraulic lift (Dawson 1996). The hydraulic lift of a large tree allows it to pull water from relatively long distances from the tree trunk, re-saturate the soil within the root bulb as a shallow water reservoir, and then absorb the water for growth (Dawson 1996). The smaller trees investigated did not carry out hydraulic lift (Dawson 1996). While large trees have a greater impact on the hydrologic balance than small trees, a mixed stand of large and small trees will have the greatest impact (Dawson 1996). Figure 17 depicts the soil water potential (matric suction) and the leaf water potential at a depth of 20 cm (7.9 inches) during the 1993 growing season (Dawson 1996). These values are an average of both small and large trees, but the large trees consistently had larger leaf water potential than small trees (Dawson 1996). For Figures 17 and 18, suction is negative.

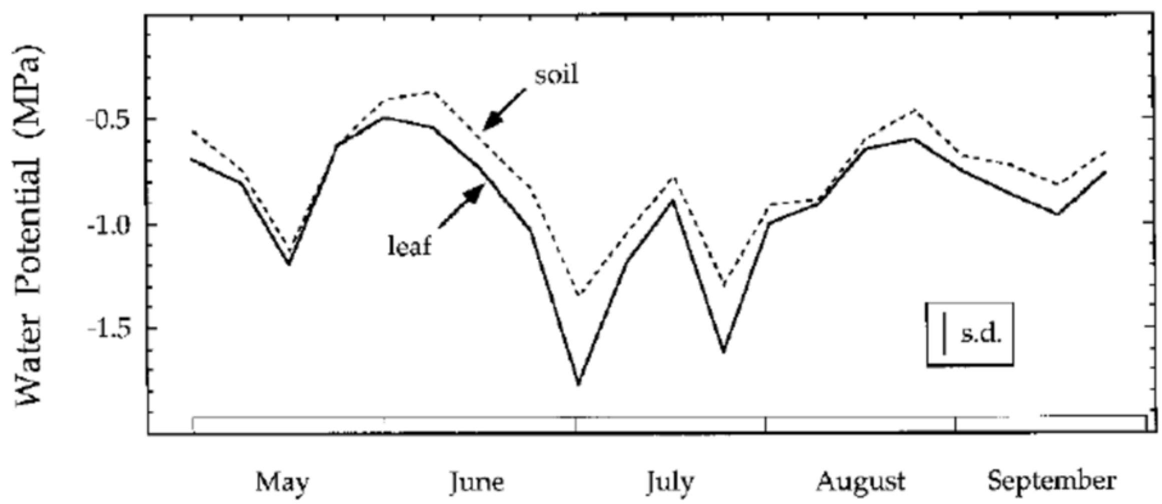

Figure 17: Average Soil Water Potential at 20cm Depth During 1993 Growing Season (Dawson 1996)

Figure 18 demonstrates typical patterns of average soil water potential around the root systems of three large and three small sugar maple trees during a drought in early July (Dawson 1996). It should be noted that the matric suction is at its peak at the end of daylight hours. Changes in soil water potential between day and night around the large trees was due to nighttime soil water recharge via hydraulic lift (Dawson 1996).

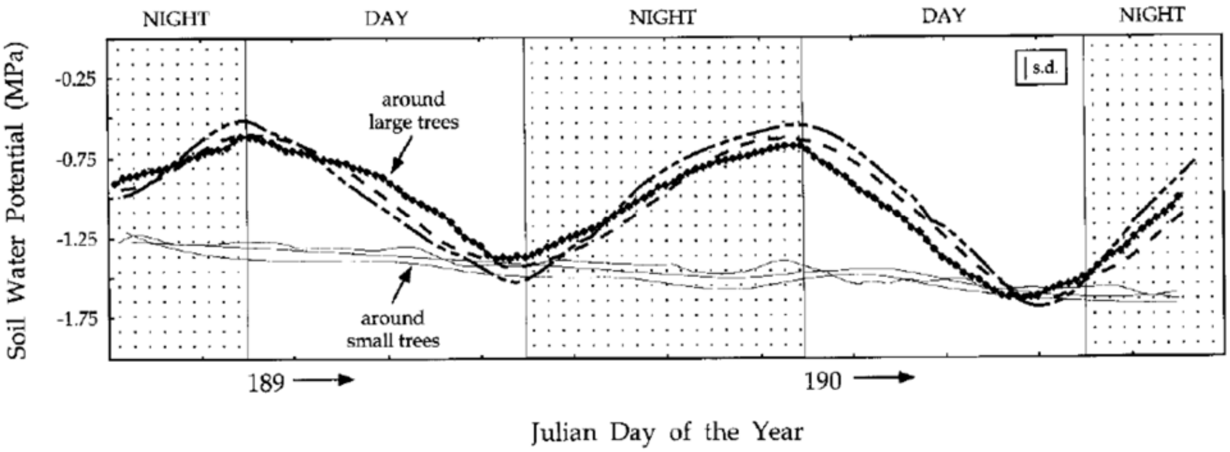

Figure 18: Average Soil Water Potential Around the Root Systems of Three Large and Three Small Trees During the Early July Drought Period (Dawson 1996)

In the case of expansive clays, the water consumption of vegetation can play an important role in the shrink swell cycle. The water demand of a plant is determined by the soil conditions and availability of water, and can be defined as "the ability of vegetation to cause drying of a clay subsoil" (Biddle 2001). Some species of trees have a higher water demand than others, because they require more water to prevent wilting and maintain good health. Figure 19 is a classification of tree genera based on water demand. It is important to notice that in the broad-leaf category, tree species in the Quercus and Ulmus genera require the highest water demand and have root systems that extend deepest and furthest. By contrast, coniferous tree species in the Pinus and Juniperus genera have some of the lowest water demand and the shallowest and shortest root systems.

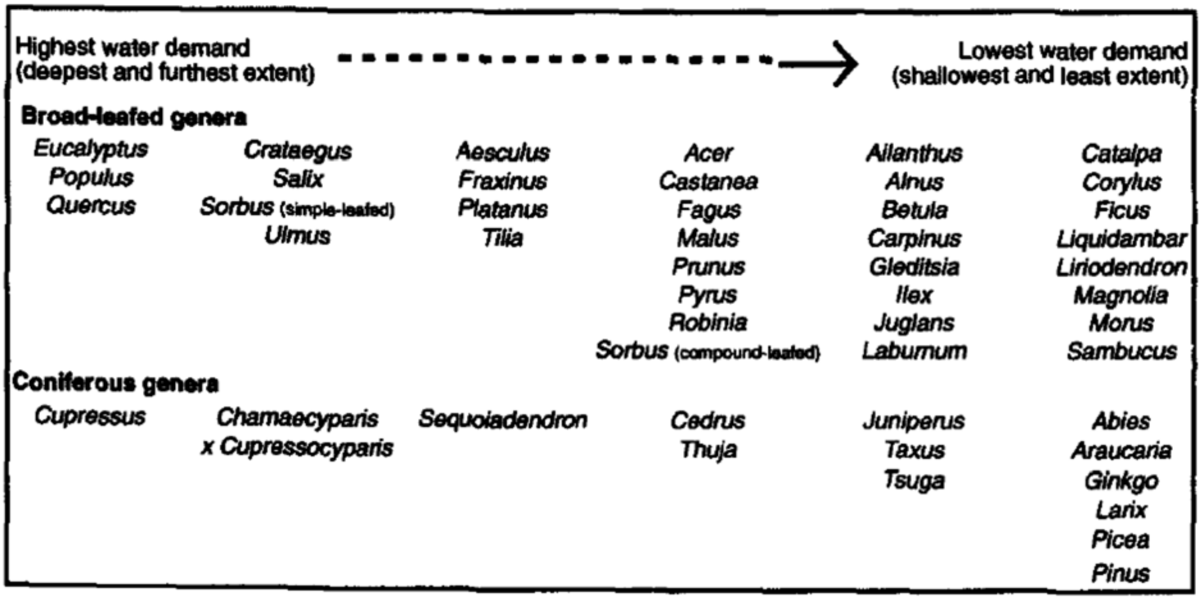

Figure 19: A Tentative Classification of the 'Water Demand' of Different Tree Genera in the UK (Biddle 2001)

B. Indraratna et. al. (2006), presented a parametric study performed via numerical model to identify the suction effects induced by tree roots on ground conditions. In the numerical model osmotic suction was not considered, limiting the suction effects to those of matric suction. The model considered the impact of soil matric suction, root density and potential transpiration of the plant (Indraratna et al. 2006). The soil was assumed to be an over-consolidated clay, whose matric suction can be described based on plasticity index and the SWCCs presented in Figure 20.

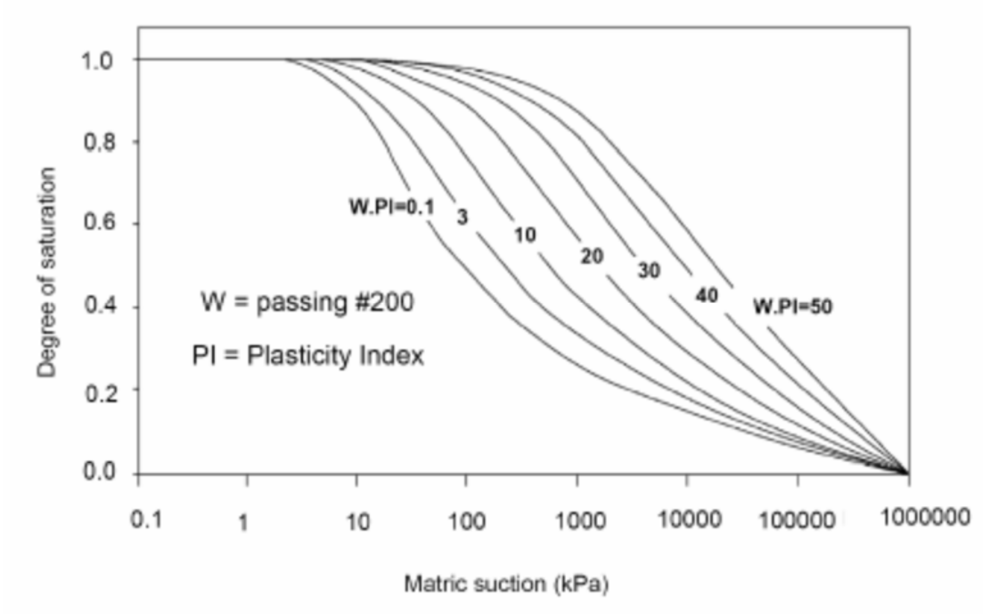

Figure 20: Predicted Soil Water Characteristic Curve (modified by Indraratna et al. 2006 after Zapata et al. 2000)

The geometry and boundary conditions of the model are depicted in Figure 21.

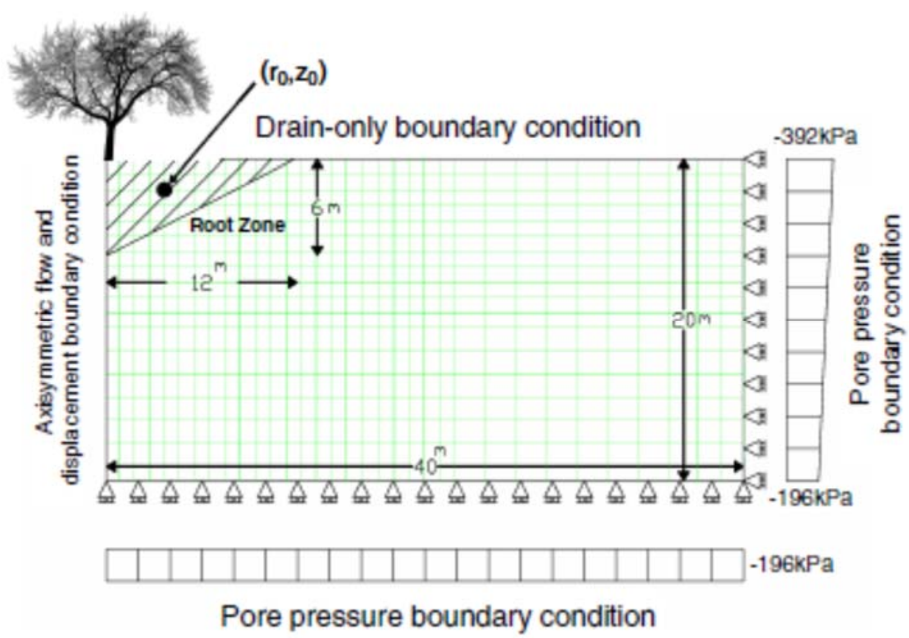

Figure 21: The Geometry and Boundary Conditions of the Model (Indraratna et al. 2006)

The assumed initial parameters used in the numerical analysis are summarized in Table 4.

Table 4: The Initial Assumed Parameter Values in the Numerical Parametric Study (Indraratna et al. 2006)

Parameter	Value	Comments
(r_0, z_0)	(4m, 2m)	Corresponding to radial and vertical coordinate of gravity centre of root zone
$\beta_{\max}(t)$	25 m^{-2}	Taken from the general shape suggested by Landsberg (1999)
$k_1 = k_2$	2 m^{-1}	Applied by Knight (1999)
k_3	8.74×10^{-2} m^{-2}	Taken from the general shape suggested by Landsberg (1999)
k_4	0.014 m^{-1}	Assuming $H_{root} = -76.5m$ and $R_c = 0.05$ *
$(r_{\max}, z_{\max})$	(12m, 6m)	Root zone boundary
ψ_{an}	4.9 kPa	Feddes et al. (1976), Clay soil and air content of 0.04
ψ_d	40 kPa	Feddes et al. (1976; 1978), $40 < \psi_d < 80\ kPa$
ψ_w	1500 kPa	Feddes et al. (1976; 1978), $1500 < \psi_w < 2000\ kPa$
γ_d	18 kN/m^3	Typical earth soil
C_s	0.05	Average value for clay soils in vicinity of building foundations
k_s	5×10^{-8} m/s	Typical value for clay soils in vicinity of building foundations(e=1)
passing #200 × Plasticity Index	20	-
T_P	8 mm/day	Myers and Talsma (1992), Pinus Radiata tree (ACT, Australia)
Initial void ratio(e_0)	1	Typical clay soil

*by comparing Equations (4) and Nimah and Hanks (1973) model, k_4 can be estimated by $k_4 = -(1+R_c)/H_{root}$, where H_{root} is the effective water potential in the root at the soil surface where z is considered zero and R_c is the flow coefficient in the plant root system.

Based on these parameters, geometry and SWCCs, Indraratna et al. determined that the maximum change in matric suction will occur at the center of gravity of the root mass (r_0, z_0) and will decrease with increasing distance from that point (Indraratna et al. 2006). For the model the center of gravity of the root mass of a pine tree was estimated at (4m,2m), but will change based on tree species and soil conditions. The radius of the influence zone is considered to be the area where surface settlement is at least 25 mm (approximately 1 inch) and was determined to be approximately 14 meters (45.9 feet) from the center axis of the tree (Indraratna et al. 2006). It was also noted that "[t]he ground settlement decreases rapidly with the horizontal distance from the tree trunk, and beyond 30 m[eters], the predicted settlement is not significant" (Indraratna et al. 2006). Figure 22 shows the settlement results with increasing distance from the tree and depth.

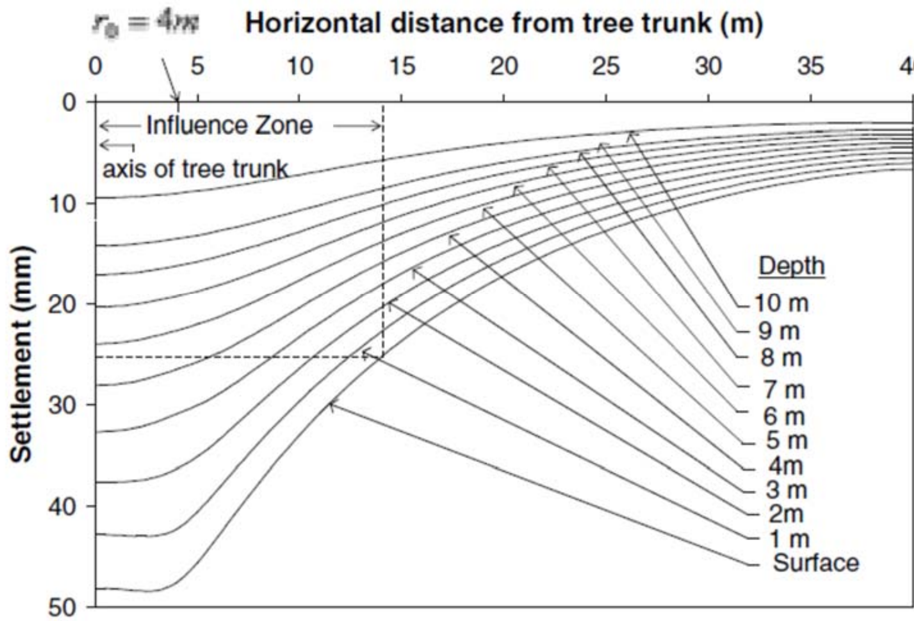

Figure 22: Ground settlement profile at various depths (Indraratna et al. 2006)

The initial transpiration rate of 8 mm/day is based on a pine tree (Indraratna et al. 2006). To account for transpiration rate variability, which is expected among different species, a range of transpiration rates were considered parametrically. The authors found that increasing transpiration rates correspond to increased ground settlement (Indraratna et al. 2006). "About 70% more settlement is induced at the ground surface when the potential transpiration increases from 4 to 14 mm/day, and the maximum settlement point still corresponds to r_0=4m" (Indraratna et al. 2006).

Structural Damage due to Vegetation

Numerous cases of structural damage to buildings and pavement structures founded on expansive clays have been documented. Depending on site conditions, these damages may result purely from cycles of dry and wet weather causing the clays to shrink and swell. However, the presence of tree(s) can provide a significant addition to the desiccation of the clays, exacerbating the cycle.

In Houston a four story steel frame office building, founded on belled drilled shafts at a depth of 9 feet, was constructed on top of expansive clays. Five live oak trees between 14 and 21 inches in diameter were located on the southern face of the building, and four live oak trees were located on the northern face of the building. Over time, significant structural damage in building and foundation settlement was observed (Tand and Vipulanandan 2011). A settlement survey of the building floor slab, Figure 23, was performed, and settlements ranged from 1 to 1.5 inches on the north face and 3 to 5 inches on the south face. The settlement of the slab resulted in significant structural damage (Tand and Vipulanandan 2011). The author makes a strong case that the demand for water of the oak trees resulted in desiccation of the expansive soils below the slab and foundations, resulting in settlement. This argument was further supported by the removal of the oak trees on the north face and subsequent rebound of the soils.

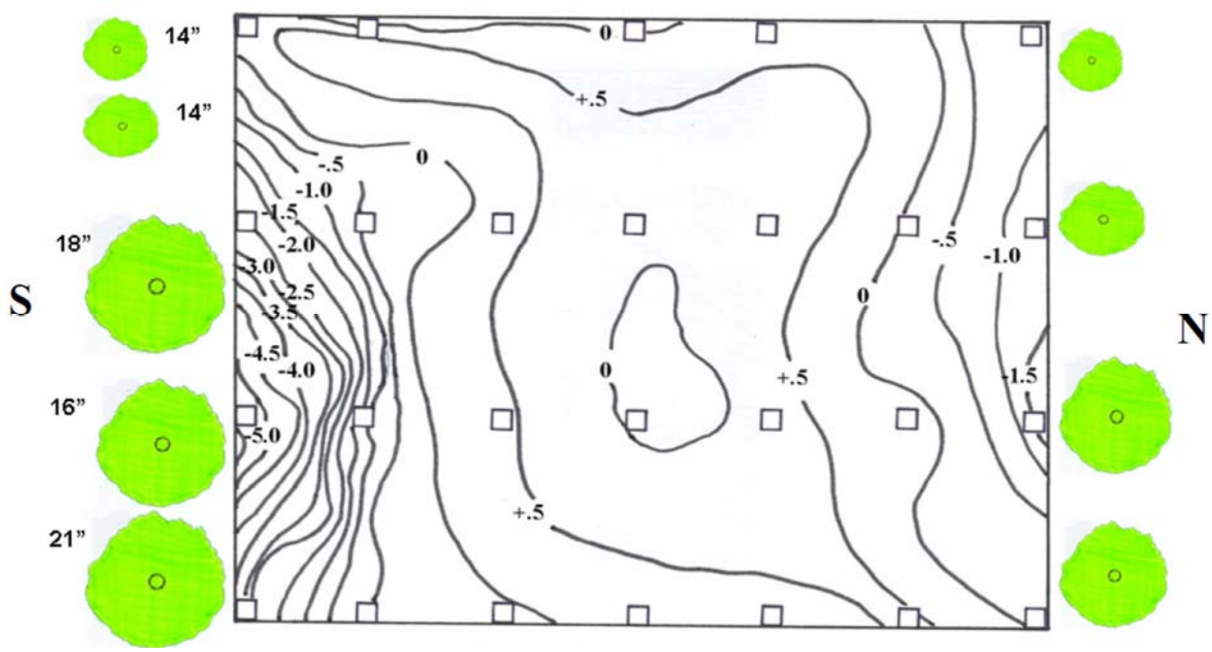

Figure 23: Elevation Contours with Trees (inches) (Tand and Vipulanandan 2011)

Cases of structural damage to pavements constructed on expansive clays typically result in longitudinal cracking induced by moisture fluctuation. While the center of the pavement remains at a relatively constant water content, the edges are subject to water infiltration and desiccation. The longitudinal cracks are the result of flexion of the pavement due to settlements in the dry season and heave in the wet season (Zornberg and Gupta 2009). Figure 24 illustrates the formation of longitudinal cracks due to moisture fluctuation.

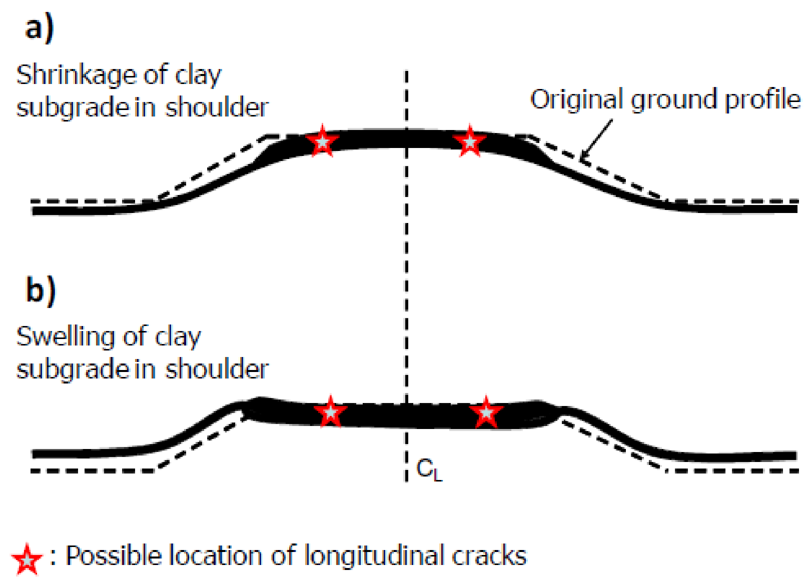

Figure 24: Formation of longitudinal cracks during (a) dry and (b) wet seasons (Zornberg and Gupta 2009)

In central Oklahoma, significant pavement damage has been observed and documented by D.R. Snethen in the vicinity of large trees. In "Influence of Local Tree Species on Shrink/Swell Behavior of Permian Clays in Central Oklahoma," Snethen documents three cases studies of structural damage due to vegetative influence. In the case of 32nd Street, Stillwater, Oklahoma, a 75mm (2.95 inch) layer of hot mix asphalt (HMA) was placed on top of "gravelly clay layer created by several applications (75 to 100 mm) of crusher-run limestone gravel which was compacted into the native clay by traffic" in 1997 (Snethen 2001). Table 5 summarizes the properties of soils encountered at 32nd Street, Stillwater, Oklahoma.

Table 5: Soil Properties at 32nd Street, Stillwater, Oklahoma (Snethen 2001)

Depth (mm)	%-200	% Clay	LL	PI	Moist Density (g/cm^3)	Available Moisture Capacity (mm/mm)
0-150	60-95	27-35	37-50	14-25	1.30-1.60	0.15-0.22
150-475	60-90	35-60	41-70	20-40	1.35-1.65	0.10-0.20
475-875	55-90	35-60	41-70	20-40	1.35-1.65	0.02-0.20

According to Snethen, pavement damage was not observed until the summer of 1999, approximately 2 years after construction, when "arc-shaped hairline cracks" were observed near a large Chinese Elm tree (*Ulmus parvifolia*) growing at the right of way (ROW) boundary (Snethen 2001). The area experienced very dry periods in 1999 and 2000 (Snethen 2001). Snethen observed cracks 3 mm wide with "no appreciable vertical displacement across the crack" and states that the "most likely cause of the crack is shrinkage of the subgrade soil caused by differential drying from the influence of the Chinese Elm tree as it disproportionately depleted the subgrade moisture during the hot, drier climatic conditions" (Snethen 2001). The cracking pattern observed on 32nd Street and relative distances to the Chinese Elm tree are depicted in Figure 25.

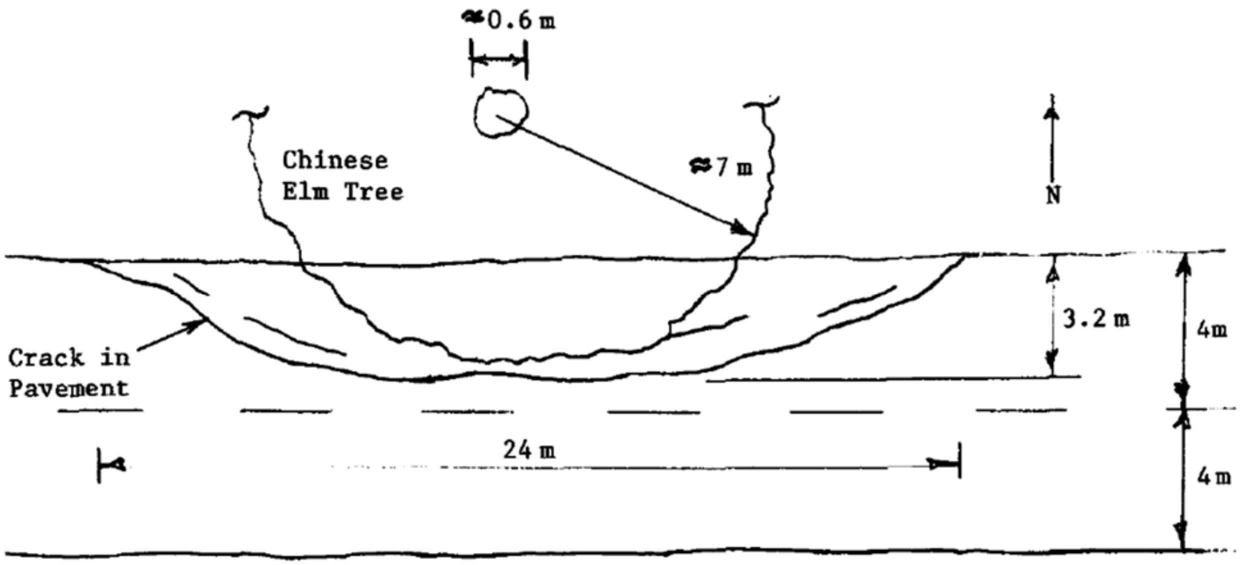

Figure 25: Arc-shaped Cracks in HMA Pavement Along 32nd Street, Stillwater, OK (Snethen 2001)

Remedial Action

The end effect of evaporation and transpiration is the desiccation and shrinkage of expansive soils. To mitigate the effects of transpiration Biddle suggests four solutions:

1. "fell the offending tree to eliminate all future drying"
2. prune the tree to reduce drying by the area of transpiration (leaves) and "the amplitude of seasonal movement"
3. "control the root spread to prevent drying beneath the foundation"
4. "supplementary watering to prevent the soil from drying" (Biddle 2001)

Ideally, trees that are causing structural damage to buildings and pavement structures should be cut down. Once they are cut down all transpiration will cease and the water content will stabilize (Biddle 2001). Volumetric fluctuations will be limited to those induced by climate.

When felling the tree is not an option, pruning should be considered. Before the 1970s in the United Kingdom, pruning was an effective method of controlling damage by trees (Biddle 2001). In the 1970s, the tree management policies were changed allowing trees along streets to grow progressively larger crowns, increasing their rates of transpiration. It should be noted that unless adequate leaf area is pruned away, the treatment will be ineffective (Biddle 2001). Figure 26 and Figure 27 depicts soil/building movement if the offending tree is felled or pruned.

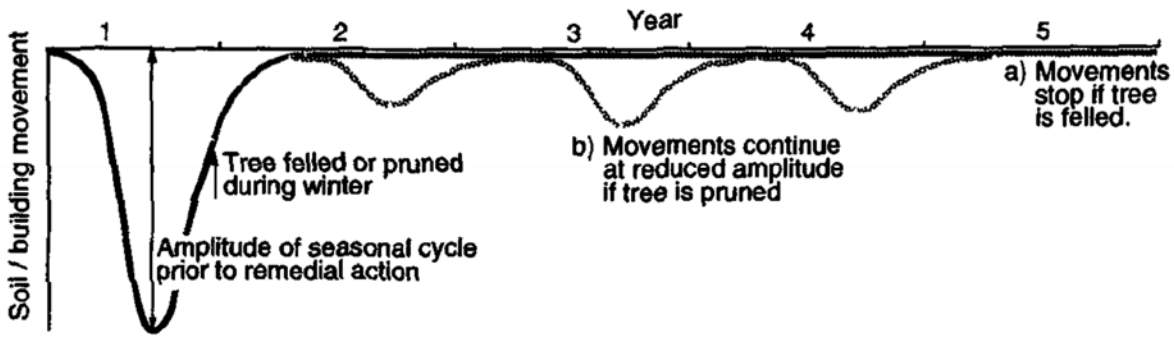

Figure 26: Diagram of Remedial Options if Drying is Predominately Seasonal (Biddle 2001)

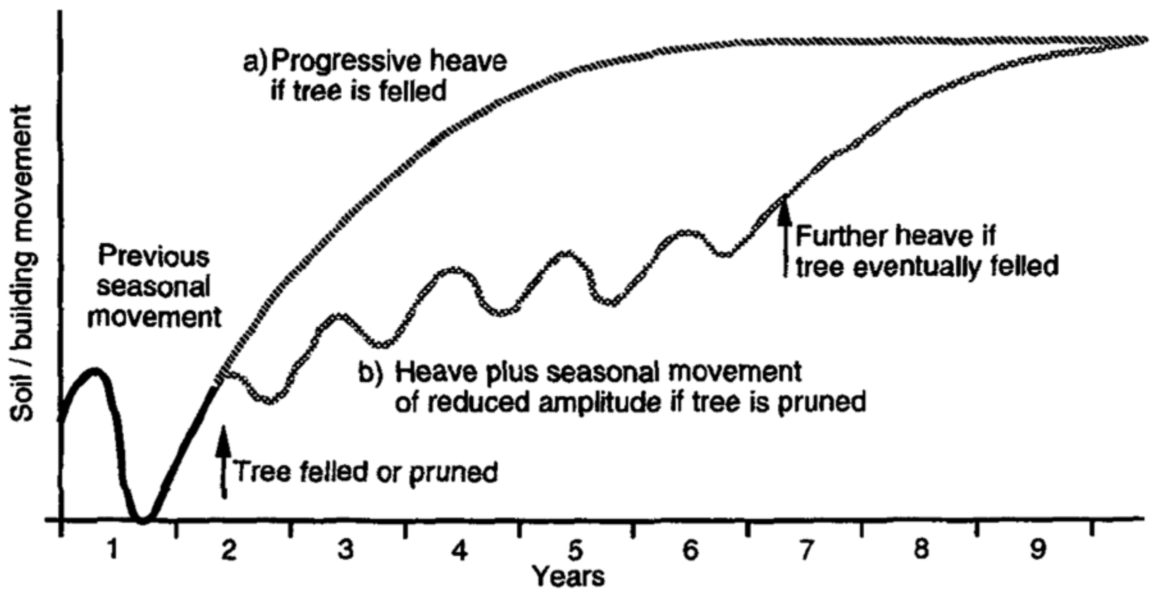

Figure 27: Effect of Pruning or Felling if there is a Significant Persistent Moisture Deficit; Stability Not Achieved (Biddle 2001)

Controlling the root spread either through root severance or vertical barriers is can be difficult to implement and maintain due to the dynamic nature of tree roots. The barrier/severance must be sufficiently far from the trunk to maintain stability. Vertical barriers must be sufficiently deep so that the roots do not grow around or under them (Biddle 2001). It is also possible to prevent the soil from shrinking through desiccation if the soil is continuously wet. However, "the quantities of water required by the tree usually make this impractical, particularly as water may not be available when it is most needed during periods of drought" (Biddle 2001).

CHAPTER THREE: SITE DESCRIPTION

This investigation was part of Alabama Department of Transportation (ALDOT) rehabilitation project, Project No. 99-305-535-005-401, to plane and resurface SR-5 from the Dallas County Line, mile post (MP) 50.802, to MP 54.85 in Perry County, Alabama (Alabama Department of Transportation 2014). The project is approximately 4.048 miles in length. In addition to the structural resurfacing, the project includes a series of research objectives to mitigate the damaging effects of high plastic clay, such as those found on site. Figure 28 is an aerial image from Google Earth indicating the beginning and end of the project.

According to the ALDOT Materials Report, dated February 3, 2014, SR-5 was last resurfaced in 1995 using approximately 125 lbs/sy of Latex Rubber modified Bituminous Concrete Wearing Surface under Project No. 99-305-535-005-304 (Alabama Department of Transportation 2014). Since that time asphalt patching has been required at numerous locations throughout the project and the pavement serviceability has dropped below tolerable limits.

Figure 28: Google Map of Alabama Highway 5: MP 50.8-54.3 (Google Earth 2014)

The project is primarily located in the Mooreville Chalk formation, which is generally characterized by “yellowish gray to olive-gray compact fossiliferous clayey chalk and chalky marl” (Szabo et al. 1988). This formation generally weathers to form a moderately to highly plastic clay overburden. These soils are generally considered unsuitable for structural fill and expansive in nature. Expansive soils experience volume changes due to changes in their environment because of their intrinsic and extrinsic properties (Patrick and Snethen 1976). A portion of the site, in the area of borings 7.0 to 8.0, is located in alluvial deposits, which are characterized by “varicolored fine to coarse quartz sand containing clay lenses and gravel in places” (Szabo et al. 1988). Inter-bedding of the Mooreville Chalk formation clays and the alluvial deposits from erosion and deposition should be expected in the general areas of Borings 6.0, 6.5 and 8.5. Figure 29 shows the project site with the USGS geologic map for the area overlain (Szabo et al. 1988).

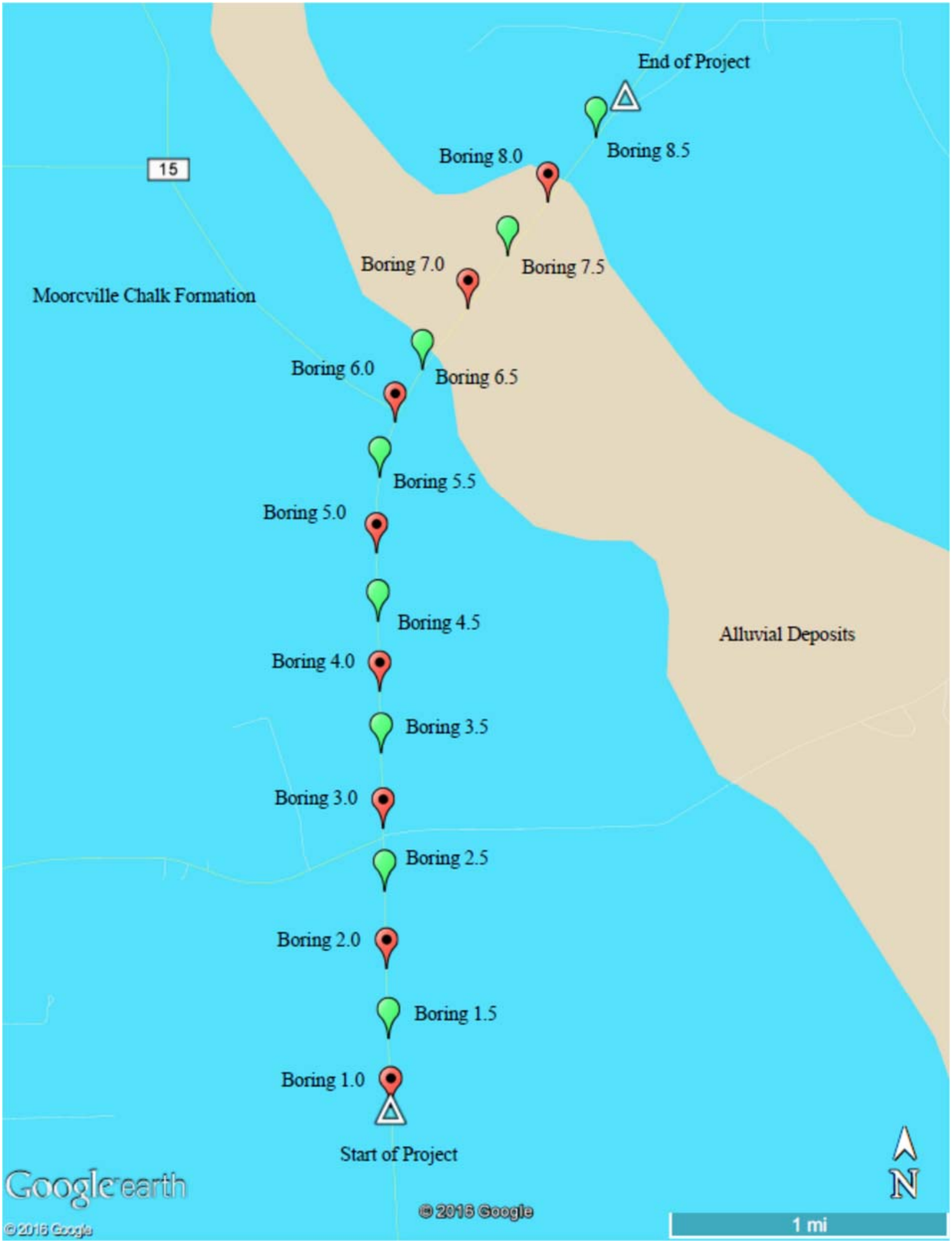

Figure 29: Google Map of Alabama Highway 5 (Google Earth 2014) overlaid with USGS Soil Survey Map (Szabo et al. 1988)

The climate in the project area is general categorized as semi-arid (Fredlund and Rahardjo 1993). The NOAA National Climatic Data Center has published 30-year climate normals for Selma, Alabama from 1981 to 2010, Table 6, including total monthly precipitation, and the maximum, minimum and average monthly temperature.

Table 6: Historical Weather Data for Selma, Alabama, 1981-2010 (NOAA National Climatic Data Center 1981-2010)

Month	Total Precipitation Normal	Mean Maximum Temperature Normal	Mean Minimum Temperature Normal	Mean Average Temperature Normal
January	4.75	57.4	35.4	46.4
February	5.03	61.5	38.9	50.2
March	5.47	69.6	44.7	57.1
April	3.93	76.4	51	63.7
May	3.26	84	60.5	72.3
June	4.07	89.8	68.3	79.1
July	4.72	92	71.3	81.7
August	4.42	91.6	70.9	81.3
September	3.32	86.9	65.5	76.2
October	2.68	77.7	54	65.9
November	4.55	68.6	43.7	56.2
December	4.89	59.1	37.3	48.2

Figure 30 depicts these normals and demonstrates the seasonal variation in precipitation and temperature visually.

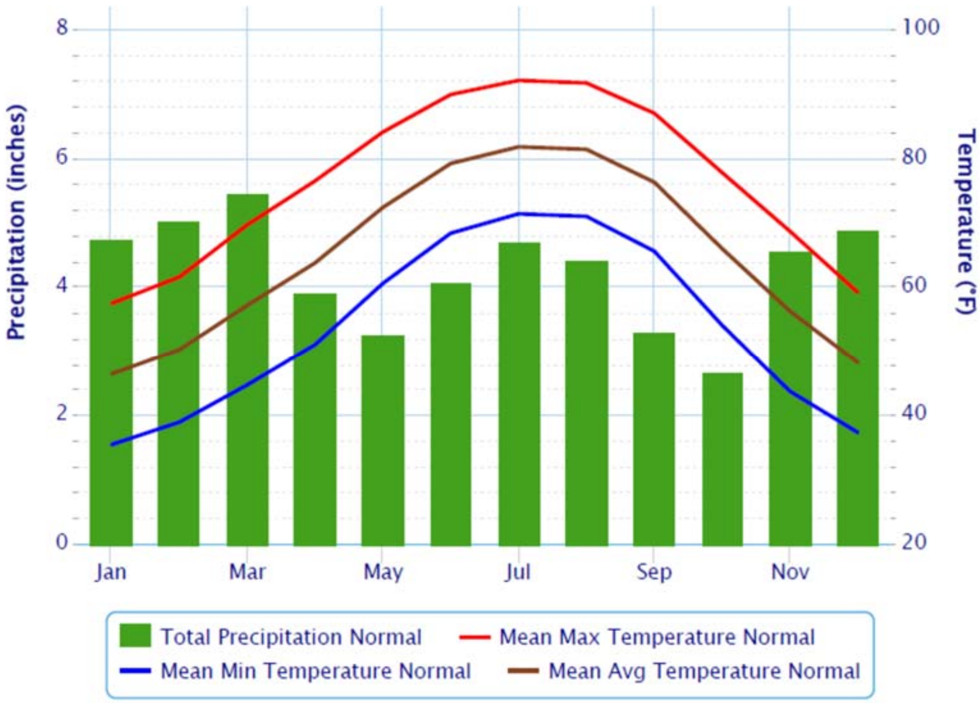

Figure 30: Historical Weather Data for Selma Alabama, 1981-2010 (NOAA National Climatic Data Center 1981-2010)

CHAPTER FOUR: RESEARCH METHODS

FIELD WORK

In order to achieve the research objectives, four avenues of site investigation have been pursued:

1. subsurface investigation and soil sample collection
2. site reconnaissance
3. a survey of the trees greater than 6 inches within 60 ± 10 feet of the roadway
4. International Roughness Index Surveys

Soil Sample Collection and Subsurface Investigation

A subsurface investigation was performed in November 2013, and included seventeen soil test borings in the roadway. Additional sample collections were performed in April 2015 and May 2016. The borings were performed using a CME 55 truck mounted drill rig with solid stem augers and an automatic hammer, Figure 31. Soils were sampled using thin-wall tube samplers and two-inch outer diameter split barrel samplers. The soils were continuously sampled using the thin-walled tubes until the soils were sufficiently stiff to refuse further sampling by this method. A single standard penetration test was then performed and a split barrel sample collected. Boring depths varied based on the ability to obtained undisturbed samples. Auger refusal was not encountered at any of the boring locations. Boring locations were approximately one quarter of a mile a part, based on GPS. Elevation information was determined using Google Earth and should be considered approximate. Boring logs with descriptions of the materials encountered can be found in Appendix A. Field testing was performed in general accordance with ASTM standards or generally accepted methods.

Figure 31: CME 55 Truck Mounted Drill Rig

Tree Survey & Pavement Observations

It is hypothesized that seasonal variation in the moisture demand of large trees growing within a zone of influence of the roadway has a detrimental effect on the expansive subgrade, causing localized pavement distress. It has also been observed by the author, qualitatively, that areas with the greatest pavement distress generally correspond to areas with large or numerous deciduous trees. To identify and track these trends over time, a survey of the trees greater than 6 inches in diameter within 60 ± 10 feet of the roadway was performed throughout the project. For each tree greater than six inches, its position longitudinally along the roadway and laterally from the edge of pavement was recorded, along with species and trunk diameter. If a tree naturally divided into a cluster of trunks sharing a single root system, it was identified and located as a single cluster, but the diameter of each off-shoot trunk was measured individually.

To qualitatively correlate the impacts of the trees on the roadway, additional qualitative observations were made regarding pavement damage and photographs taken along the length of the roadway. These observations were combined with the tree survey in a site map. As the project progresses through and beyond the construction phase, previous areas of pavement distress can be located on the map, along with areas with potentially significant damage due to trees can be identified.

Tree Identification

During the survey, twenty-eight different species of trees were identified according to their common and scientific names. The following artistic depictions and photographs were used to aide in species identification, Figures 33 through 51. Biddle's classification of trees based on water demand indicates that trees from the genus Quercus – the oak trees – and Ulmus – the elm trees – have some of the highest water demand, and largest root systems (Biddle 2001).

Quercus: The Oak Trees

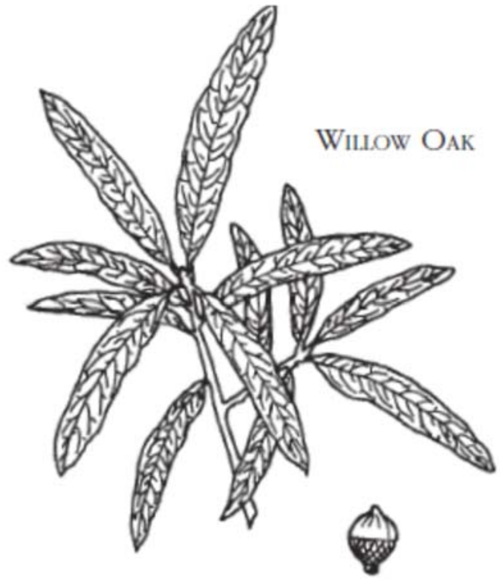

Figure 32: Artistic Depiction of Willow Oak Leaves and Acorn (*Quercus phellos*) (Alabama Cooperative Extension Service 2014)

Figure 33: Photograph of Willow Oak Leaves, Perry County (Photo Taken 06/02/15)

Figure 34: Artistic Depiction of Laurel Oak Leaves and Acorn (*Quercus laurifolia)* (Alabama Cooperative Extension Service 2014)

Figure 35: Artistic Depiction of Water Oak Leaves and Acorn (*Quercus nigra*) (Alabama Cooperative Extension Service 2014)

Figure 36: Artistic Depiction of White Oak Leaves and Acorns (*Quercus alba*) (Alabama Cooperative Extension Service 2014)

Figure 37: Artistic Depiction of Southern Red Oak Leaves and Acorns (*Quercus falcata*) (Alabama Cooperative Extension Service 2014)

Ulmus: The Elm Trees

Figure 38: Artistic Depiction of American Elm Leaves (*Ulmus americana*) (Alabama Cooperative Extension Service 2014)

Figure 39: Photograph of American Elm Leaves (Photo Taken 06/28/16)

Figure 40: Artistic Depiction of Winged Elm Leaves (*Ulmus alata*) (Alabama Cooperative Extension Service 2014)

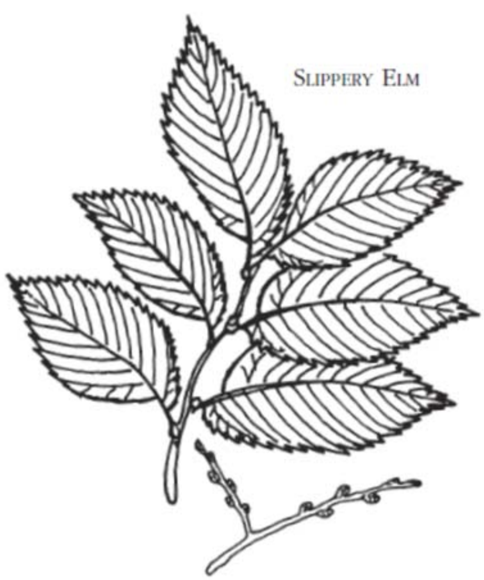

Figure 41: Artistic Depiction of Slippery Elm Leaves (*Ulmus rubra*) (Alabama Cooperative Extension Service 2014)

Figure 42: Photograph of Slippery Elm Leaves (Photo Taken 06/02/15)

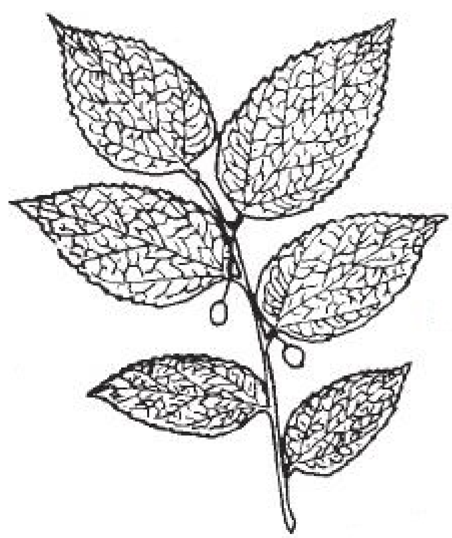

Figure 43: Artistic Depiction of Sugarberry Leaves and Berries (*Celtis laevigata*) (Alabama Cooperative Extension Service 2014)

Figure 44: Photograph of Sugarberry Leaves and Berries (Photo Taken 06/02/16)

Miscellaneous Deciduous Trees

Figure 45: Artistic Depiction of Green Ash Leaves and Fruit (*Fraxinus pennsylvanica*) (Alabama Cooperative Extension Service 2014)

Figure 46: Photograph of Green Ash Leaves and Fruit (Photo Taken June 2016)

Figure 47: Artistic Depiction of White Ash Leaves and Fruit (*Fraxinus americana*) (Alabama Cooperative Extension Service 2014)

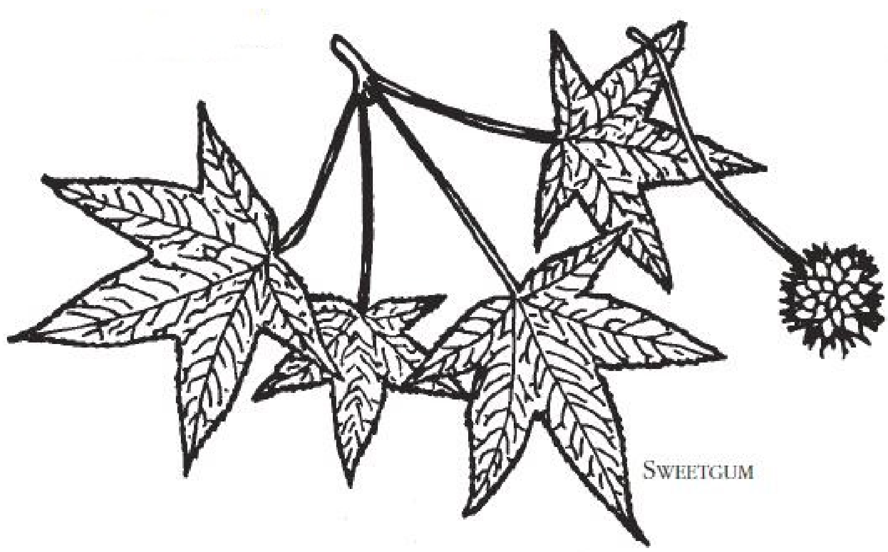

Figure 48: Artistic Depiction of Sweet Gum Leaves and Fruit (*Liquidambar styraciflua*) (Alabama Cooperative Extension Service 2014)

The water consumption of a Pecan Tree can vary greatly depending on its size. Accoring to Ted Sammis at New Mexico State University, a young tree may consume a gallon or less per day whereas a fully mature tree can consume as much as 150 to 250 gallons of water per day (Sammis 1999). These consumption rates represent the maximum water use at peak temperatures during the summer, and will vary with tree size and stage of the nut-bearing cycle (Sammis 1999).

Figure 49: Artistic Depiction of Pecan Tree Leaves and Fruit (*Carya illinoinensis*)

Miscellaneous Evergreen Trees

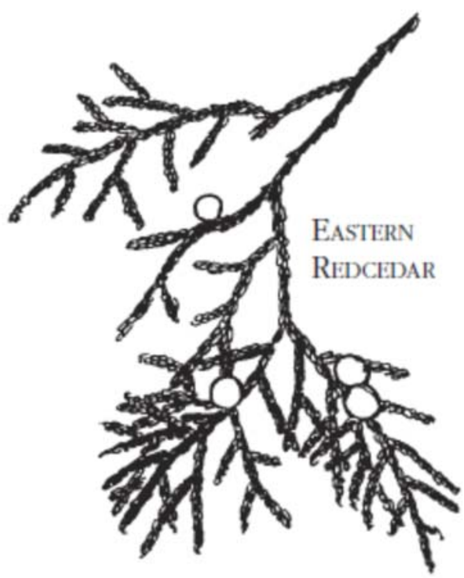

Figure 50: Artistic Depiction of Eastern Red Cedar Needles and Fruit (*Juniperus virginiana*) (Alabama Cooperative Extension Service 2014)

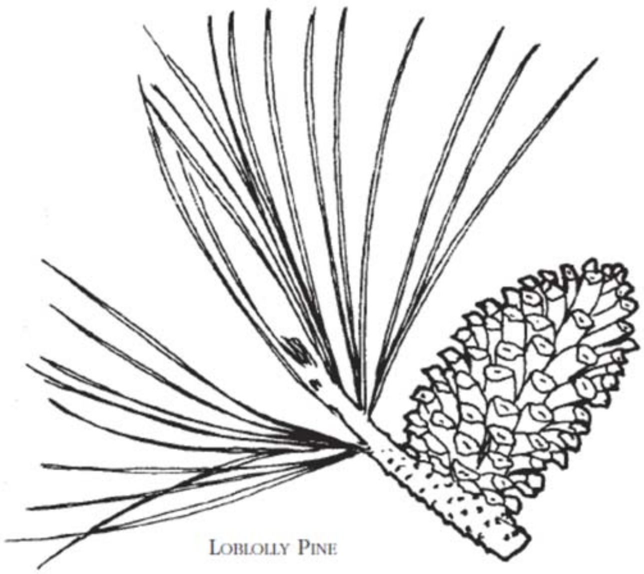

Figure 51: Artistic Depiction of Loblolly Pine and Cone (*Pinus taeda*) (Alabama Cooperative Extension Service 2014)

International Roughness Index (IRI) Surveys

The international roughness index (IRI) measures variations in a pavement surface along thin slices or profiles, Figure 52. These surface variations can produce significant vehicle vibrations and poor ride quality, safety hazards noise, and or drainage problems (Sayers and Karamihas 1998).

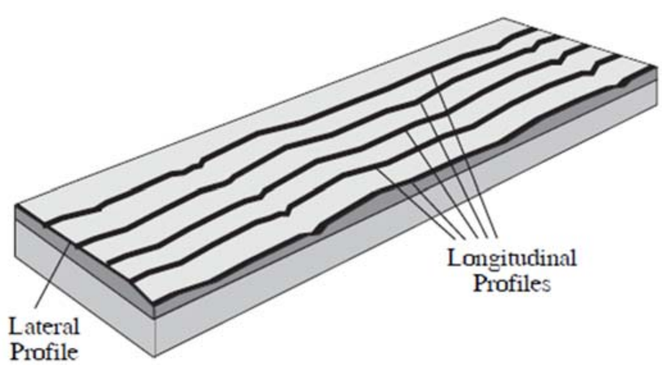

Figure 52: Pavement Profiles (Sayers and Karamihas 1998)

A pavement profile is created when elevation data is collected over a predetermined distance. For this project profile information was collected using an inertial profiler, Figure 53, a vehicle with accelerometers and laser transducers installed for data collection. The accelerometers provide a reference elevation while the laser transducers determine the surface elevation relative to the accelerometers. The distance between each data point is then calculated from the time elapsed and speed traveled. Typically, inertial profilers develop profiles for each wheel path.

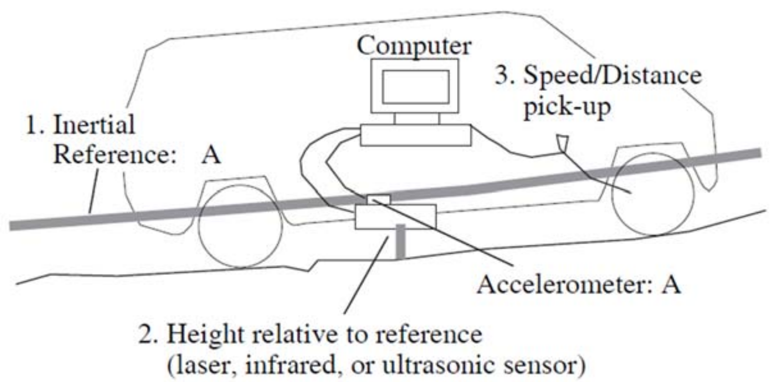

Figure 53: Inertial Profiler Schematic(Sayers and Karamihas 1998)

The National Cooperative Highway Research Program (NCHRP) developed the IRI in the 1970s as an indicator of pavement roughness, which is typically measured in units of inches per mile (Sayers and Karamihas 1998). The mathematical model is based on the "quarter car," a reference vehicle that can convert elevation information into IRI values. According to Sayers and Karamihas (1998):

> The quarter-car filter calculates the suspension deflection of a simulated mechanical system with a response similar to a passenger car. The simulation suspension motion is accumulated and divided by the distance traveled to give an index with units of slope (in/min). (Sayers and Karamihas, 1998)

An IRI value can be determined over any distance. This distance is typically chosen according to project needs. For AL 5, the National Center for Asphalt Technology (NCAT) ARAN inertial profiler, determined IRIs on May 30, 2014 and November 11, 2014 to provide pre-construction baseline information. On each date four IRI profiles were developed, one per wheel path, between MP 50.8 and 54.3. Three passes along the roadway were made for each profile to minimize error and account for variability. A single IRI value was calculated per 50-foot section of roadway, and the three passes averaged to determine the final IRI.

The FHWA has provided IRI performance thresholds to be used in pavement evaluation, Table 7. Based on these thresholds, agencies can evaluate the resurfacing needs of many lane miles quickly and efficiently. To put the IRI values into perspective, Figure 54 plots typical IRI values against common roadway surfaces.

Table 7: FHWA IRI Thresholds (Federal Highway Administration 2011)

Category	IRI Threshold
Good	< 95
Acceptable	$95 \leq IRI \leq 170$
Not Acceptable	> 170

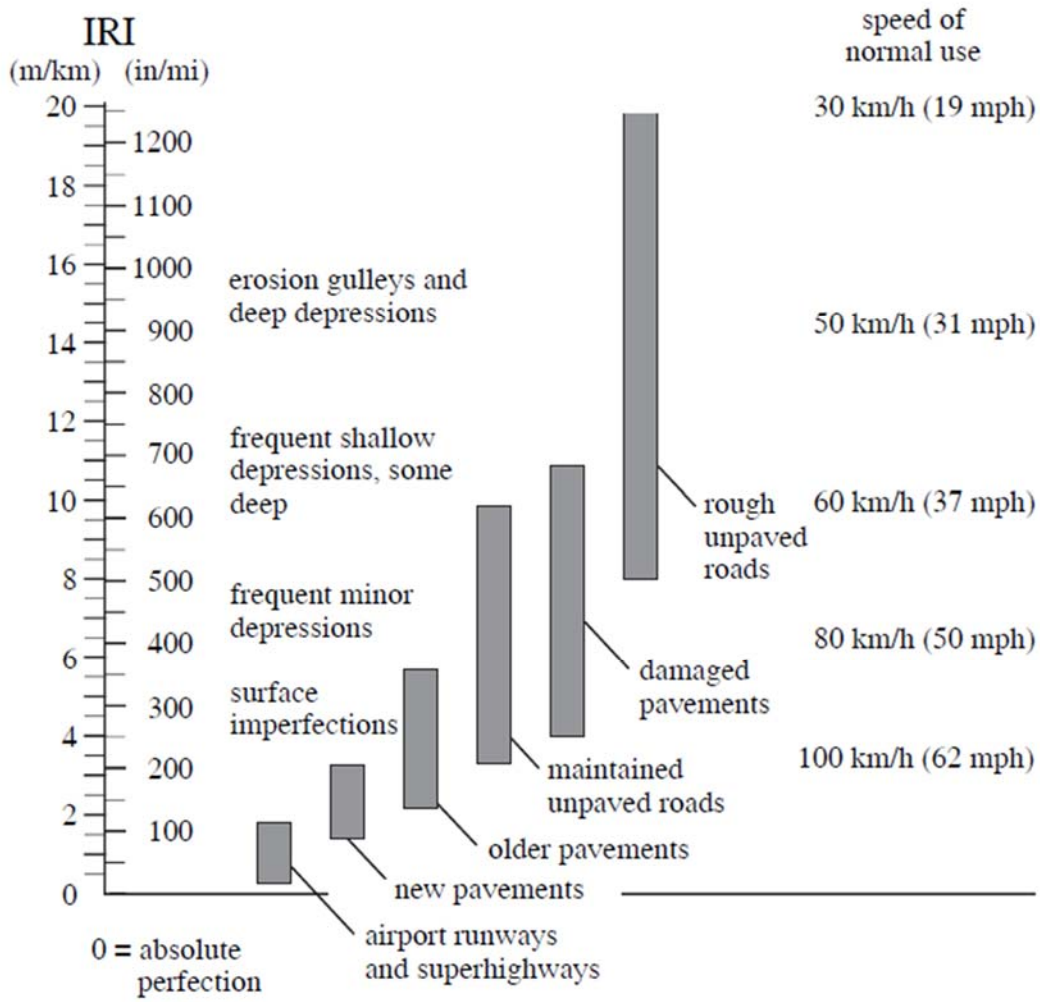

Figure 54: IRI versus Roughness (Sayers and Karamihas 1998)

LABORATORY TESTING

The capacity of the soil to shrink and swell is one of the primary causes of pavement damage and longitudinal cracking along Alabama Highway 5. To assess the potential of the soil to shrink or swell, one-dimensional swell tests were performed and soil water characteristic curves were developed. Additional required testing included Atterberg limits, grain size distributions, and specific gravities. Based on the laboratory results and visual classification, the samples were classified according to USCS. AASHTO classifications have been noted where confirming laboratory tests were performed.

One Dimensional Swell

One dimensional swell tests and shrinkage limits provide upper and lower boundaries for the potential volumetric change free swell, and swell pressure data in the fat clays encountered. The free swell is a percent swell that occurs after water is absorbed into the specimen at a fixed seating pressure of 20 psf (1 kPa) and can be determined by testing a single specimen (ASTM 2014). The swell pressure is determine by testing multiple specimens at different axial stresses and represents “the minimum stress required to prevent swelling” (ASTM 2014). One-dimensional swell tests were performed on intact specimens from borings 8.5, 7.5, 6.5, 5.5, 4.5, 3.5, 2.5 and 1.5 in accordance with ASTM D4546 Test Method A, the “Standard Test Methods for One-dimension Swell or Collapse of Soils”. These tests were performed using Sigma-1™ Icon and GeoJac™ Icon automated loading systems manufactured by Trautwein Soil Testing Equipment Company.

Sample Preparation and Procedure

One-dimensional swell tests require undisturbed thin walled tube samples. ALDOT collected the samples in accordance with ASTM D1587 “Standard Practice for Thin-Walled Tube

Sampling of Fine-Grain Soils for Geotechnical Purposes." The tubes were sealed using expandable packers, capped and externally sealed with waterproof tape. Labeling consisted of project identification, boring number and tube depth. Visual classifications and descriptions of the extruded soils were recorded to develop a detailed stratigraphy for the boring logs.

Sample preparation consisted of trimming the soil sample with a spatula and gradually lowering the specimen ring onto the sample while minimizing sample disturbance, Figure 55. The specimen rings had a cutting edge on the top of the ring to facilitate specimen preparation. After lowering the specimen ring onto the sample so that the sample protruded from the top and bottom of the specimen ring, the sample was trimmed flush with the top and bottom of the specimen ring. Voids created at the top or bottom of the sample were filled with the sample cuttings, trimmed smooth, and the ring cleaned so that no excess soils remained on the exterior of the ring.

Figure 55: Prepared Swell Test Specimen

The prepared soil specimens and rings were weighed and measured, to determine the initial wet mass and the initial volume of the specimens, before placement in the consolidometer. The remaining soil sample and cuttings were used to determine the natural water content in accordance with ASTM D2216, the "Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass." The soils were classified in accordance with the Unified Soil Classification System, ASTM D2487. The specific gravities of the soils were determined in accordance with ASTM D854, the "Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer."

After preparation of the soil specimen within the specimen ring, filter paper and air dry porous stones were placed at the top and bottom of each specimen before placement in the consolidometer. This method of preparation allows the soil specimens to be doubly drained. The consolidometer assemblies were placed in their respective load frames without water and wrapped in plastic wrap to prevent moisture loss. Each of the specimen rings, consolidometer assemblies and porous stones complied with the applicable requirements as described in ASTM 4546.

To develop a deformation versus vertical stress curves and determine the swell pressure of a given soil sample, a minimum of three specimens were allowed to swell under different vertical stresses. For each boring location and soil layer, Table 8 summarizes the vertical stresses at which specimens were tested that yielded final test results.

Table 8: Summary of Vertical Stresses for One Dimensional Swell Test (Yielding Results)

Boring/MP	Layer	Vertical Stress (psf)						
		20	360	600	720	1440	2000	2500
1.5 MP 51.10	1	x	x		x	x		
	2	x			x	x	x	
2.5 MP 51.60	1	x	x		x	x		
	2	x	x		x	x		x
3.5 MP 52.10	1	x	x		x	x		
	2	x	x		x	x		
4.5 MP 52.60	1	x	x		x	x		
	2	x	x		x			
5.5 MP 53.10	1	x	x		x	x		
	2	x	x		x		x	x
Tree / 6.0 MP 53.35	1	x	x		x	x		
	2	x			x	x		x
6.5 MP 53.60	1	x	x		x	x		
	2	x	x		x			
7.5 MP 54.10	1	x	x		x	x		
	2	x	x	x		x		

Specimens tested at 20 psf were allowed to consolidate under a 20 psf vertical stress. The Trautwein software allows the user to visualize the time versus displacement curve as the test progresses. At the end of consolidation, approximated based on the shape of the time versus displacement curve, the 20 psf specimens were inundated with water and allowed to swell for between one and five days. Once swelling was complete, some of the 20 psf specimens were allowed to consolidate in accordance with ASTM D4546-03 the "Standard Test Method for One Dimensional Swell or Settlement Potential of Cohesive Soils" for comparison and confirmation of results. The ASTM D4546-03 method is addressed in a separate section. The percent swell that occurs after water is absorbed into the specimen at a fixed vertical pressure of 20 psf (1 kPa) is the free swell of a soil.

Specimens swelling under greater vertical stress were allowed to consolidate incrementally. The unsaturated consolidation load increments for specimens tested at different vertical stresses are summarized in Table 9.

Table 9: Unsaturated Consolidation Increments for Swell Test

One Dimensional Swell Test		Unsaturated Consolidation Increments (psf)								
		20	180	360	600	720	1440	1600	2000	2500
Vertical Stress (psf)	20	60 min								
	360	10 min	10 min	60 min						
	600	10 min	10 min	10 min	60 min					
	720	10 min	10 min	10 min		60 min				
	1440		10 min	10 min		10 min	60 min			
	2000			10 min		10 min		10 min	60 min	
	2500			10 min		10 min	10 min			60 min

At the end of consolidation, approximated based on the shape of the time versus displacement curve, the specimens were inundated with water and allowed to swell for approximately five days.

Equipment and Data Collection

The Sigma-1™ ICON has a loading capacity of 5000 pounds and has a DCDT deformation sensor to monitor the sample deformation during testing. Figure 56 depicts the load frame assembly without a specimen. Swell specimens were contained within a consolidometer which was placed on the “platen” for testing.

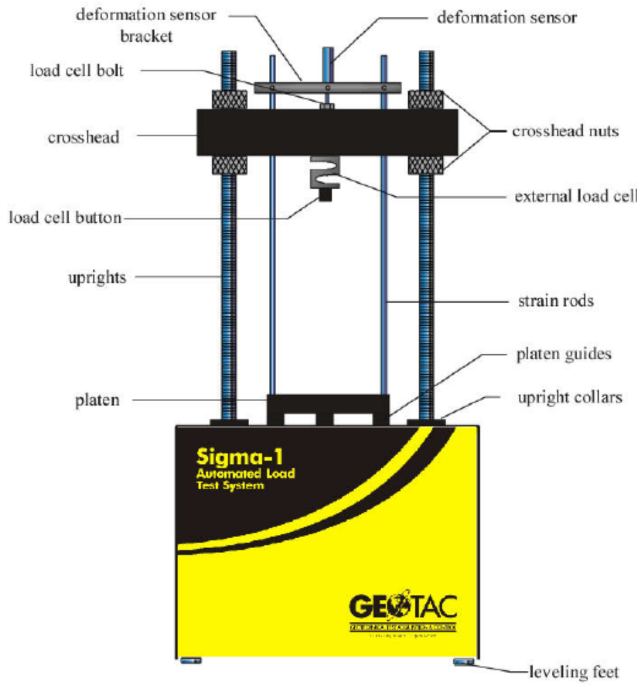

Figure 56: Sigma-1™ ICON Automated Load Test System for Incremental Consolidation Testing (Trautwein Soil Testing Equipment Company 2001)

The GeoJac™ ICON has a loading capacity of 2000 pounds and has a DCDT deformation sensor to monitor the sample deformation during testing. Figure 57 depicts the load frame assembly without a specimen. Swell specimens were contained within the consolidometer which was placed on the base for testing.

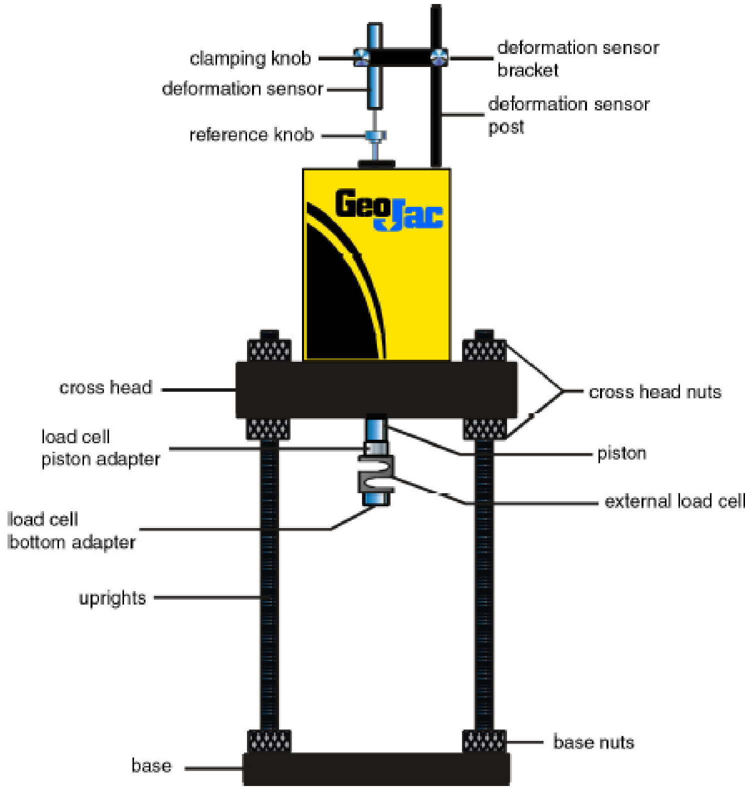

Figure 57: GeoJac™ ICON Automated Load Test System for Incremental Consolidation Testing (Trautwein Soil Testing Equipment Company 2001)

The automated loading capabilities of both systems allowed the specimens to be loaded at preprogramed time intervals and load increments. The loading and data acquisition schedules used for each specimen met and or exceeded the minimum requirements of ASTM 4546.

The swell data collected by the data acquisition components of the Sigma-1™ ICON and GeoJac™ ICON automated load test systems was reduced from raw data output files, which provided the DCDT deformation sensor and the strain gage sensor outputs in terms of voltages along with the necessary calibration factors. Table 10 summarizes the relevant calibration information for the strain gages and DCDT deformation sensors.

Table 10: Sigma-1™ ICON and GeoJac™ ICON Sensor Calibration Information

Sensor	ID	Calibration Factor (CF)	Engineering Unit
External Load Cell	694382	-1545986.927	Pound – force
External Load Cell	326014	-999837.0134	Pound – force
External Load Cell	326015	-1000183.932	Pound – force
External Load Cell	326007	-999343.2052	Pound – force
External Load Cell	303566	-250393.9	Pound – force
External Load Cell	326016	-1001749.49	Pound – force
External Load Cell	304911	-250247.7902	Pound – force
DCDT	LP-1012	3.037212635	Inch
DCDT	LP-731	3.01189914	Inch
DCDT	LP-730	3.013174254	Inch
DCDT	LP-729	3.013064253	Inch
DCDT	LP-728	3.010573747	Inch

According to the instruction manual for all GeoTac Systems, including the Sigma-1™ ICON system and the GeoJac™ ICON system, the calibration factor "is defined as the magnitude of physical input applied to a sensor that would produce 1 volt of signal output while using 1 volt of excitation" (Trautwein, 2001). The Zero value represents the voltage output of the sensor when no physical input has been applied to the sensor. As a result, Equation 7 converts the signal output (V_s) of the external load cell and the DCDT deformation sensor from volts to engineering units.

$$P = CF\left(\frac{V_s - V_0}{V_e}\right) \tag{7}$$

Using this conversion method yields engineering units of pounds for the external load cell and inches for the DCDT deformation sensor.

For one-dimensional swell tests in accordance with ASTM 4546, the Trautwein consolidometer assemblies and specimen rings were utilized. Table 11 summarizes the weights and dimensions of the specimen rings used during for one-dimensional swell tests.

Table 11: Summary of the Dimensions and Weight of the Specimen Rings

Specimen Rings			
Ring	Average Height (inch)	Average Diameter (inch)	Mass (g)
1	0.994	2.500	214.74
2	0.999	2.500	217.52
3	0.991	2.499	215.56
4	0.999	2.499	217.61
5	0.998	2.493	216.61

Data Reduction and Swell Calculations

To demonstrate the development of a stress strain curve for one dimensional swell, the data and graphs for a typical AL5 soil sample have been used as an example. The initial dimensions and conditions of the specimen are presented in Tables 12 and 13.

Table 12: Summary of Specimen Rings' Dimensions and Weight

Vertical Stress	Specimen Ring Properties				Soil Specimen		
	Mass of Specimen Ring (g)	Mass with Soil Sample (g)	Height (H_0) (inch)	Diameter (inch)	Water Content (w) (%)	Average Water Content (%)	Specific Gravity (G_s)
20 psf	214.74	362.41	0.994	2.500	36.4	38.2	2.749
					40.0		
360 psf	217.61	365.81	0.999	2.499	29.5	36.0	2.749
					42.5		
720 psf	217.52	376.81	0.993	2.500	27.8	27.9	2.749
					28.1		
1440 psf	215.56	369.53	0.991	2.499	34.0	34.2	2.749
					34.4		

In order to calculate the natural water content the Equation 8 is used:

$$w = \frac{M_{cms} - M_{cds}}{M_{cds} - M_c} \times 100 \tag{8}$$

where:

$M_{cms} = mass\ of\ container\ and\ moist\ specimen$

$M_{cds} = mass\ of\ container\ and\ oven\ dry\ specimen$

$M_c = mas\ of\ container$

Based on this information, the following values can be determined using the following equations: the cross-sectional area of the sample, the mass of solids (M_s), the volume of solids (V_s), the height of solids (H_s), the total volume (V), the initial volume of voids (V_v), and the initial void ratio (e_0).

$$M_s = \frac{M}{1+w} \tag{9}$$

where:

$$M = Total\ Mass\ of\ Specimen$$

$$V_s = \frac{M_s}{G_s \rho_w} \tag{10}$$

where:

$$\rho_w = density\ of\ water$$

$$H_s = V_s \times Area\ of\ Specimen \tag{11}$$

$$V\ = Area\ of\ Specimen \times Height\ of\ Specimen \tag{12}$$

$$V_v = V - V_s \tag{13}$$

$$e = \frac{V_v}{V_s} \tag{14}$$

The mass of solids (M_s), the volume of solids (V_s), the height of solids (H_s), the total volume (V), the initial volume of voids (V_v), and the initial void ratio (e_0) for each of the soil specimens can be found in Table 13. These values describe the initial state of the soil specimens before testing.

Table 13: Initial Conditions of the Example Soil Specimens

Vertical Stress	Area of Sample (cm^2)	M_s (g)	V_s (cm^3)	H_s (cm)	V (cm^3)	V_v (cm^3)	e_0
20 psf	80.42	105.46	38.36	3085.02	79.9	41.54	1.08
360 psf	80.38	104.04	37.85	3042.40	80.3	42.45	1.12
720 psf	80.41	124.35	45.23	3636.92	79.71	34.47	0.76
1440 psf	80.34	114.54	41.67	3347.87	79.74	38.07	0.91

For each test specimen, the following information must be recorded:

$$M_R = Mass\ Consolidation\ Ring$$

$$A_S = Area\ of\ Specimen$$

$$M_{S,0} = Initial\ Specimen\ Mass = M_{R+WS,I} - M_R$$

$$M_{R+WS,I} = (Mass\ Consolidation\ Ring + Wet\ Specimen)_{initial}$$

$$M_{R+WS,F} = (Mass\ Consolidation\ Ring + Wet\ Specimen)_{final}$$

$$M_{R+DS,F} = (Mass\ Consolidation\ Ring + Oven\ Dry\ Specimen)_{final}$$

The specimens swelled in the manner described in the Sample Preparation and Procedures section. To calculate strain for each of the load increments, the height of the specimen after inundated swell/collapse was compared to the height of the specimen after unsaturated consolidation. The example 360 psf load increment is used to demonstrate strain calculations. The initial specimen height (H_0) and the initial specimen diameter (D_0) are equal to the height and diameter of the specimen ring. Figure 58 depicts the one-dimensional displacements of the 360 psf example specimen over the course of the swell test.

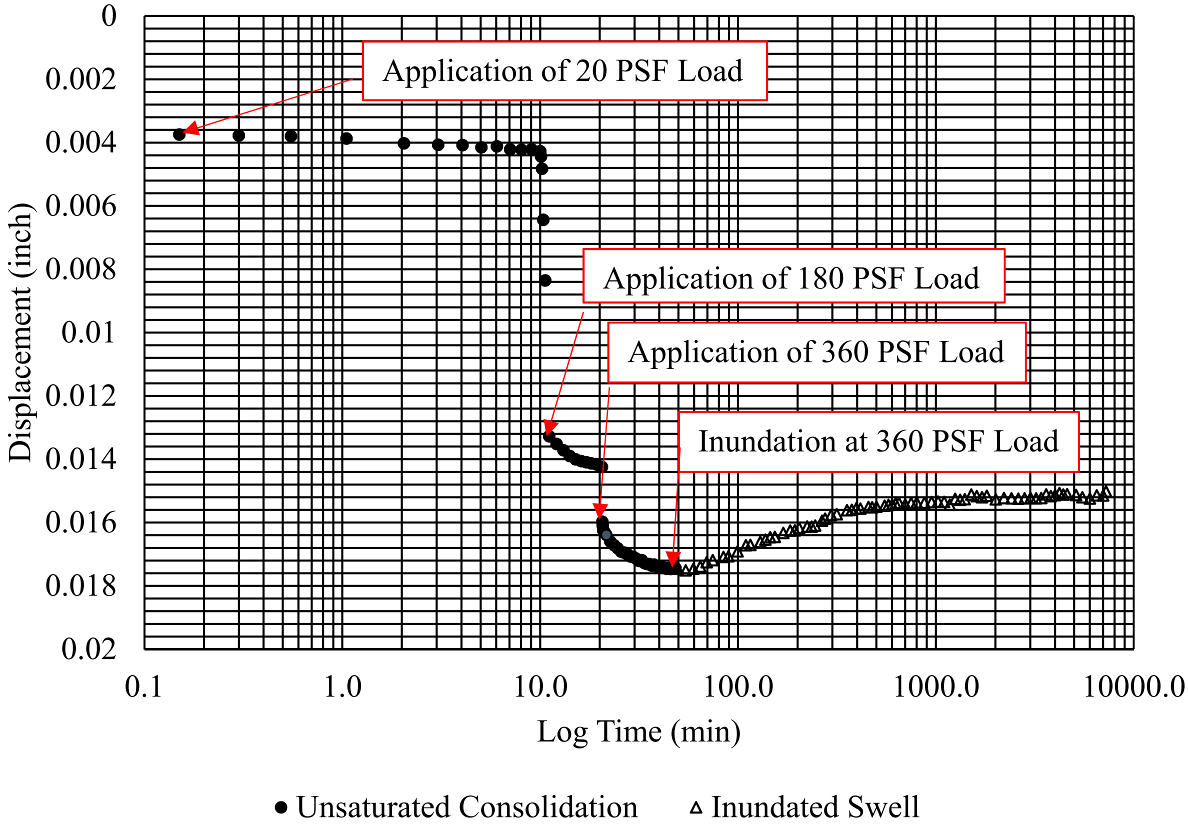

Figure 58: One Dimensional Displacement of a 360 psf Specimen throughout Testing

When evaluating the results, the output data is typically broken into two groups and plotted against log time: unsaturated consolidation data and inundated swell data. Figure 59 shows the unsaturated consolidation increments on a single plot and identifies h_a and h_b reference points when are used to calculate the displacement during unsaturated consolidation (Δh_1).

$$\Delta h_1 = h_b - h_a \quad (15)$$

The reference point h_a is the initial dial reading at the start of testing and the reference point h_b is the dial reading at the end of unsaturated consolidation, determined visually based on the shape of the consolidation curve. Determination of the end of consolidation was based on the Casagrande method (Holtz and Kovacs 1981). Before inundating the specimen, the displacement data should be linear and relatively flat.

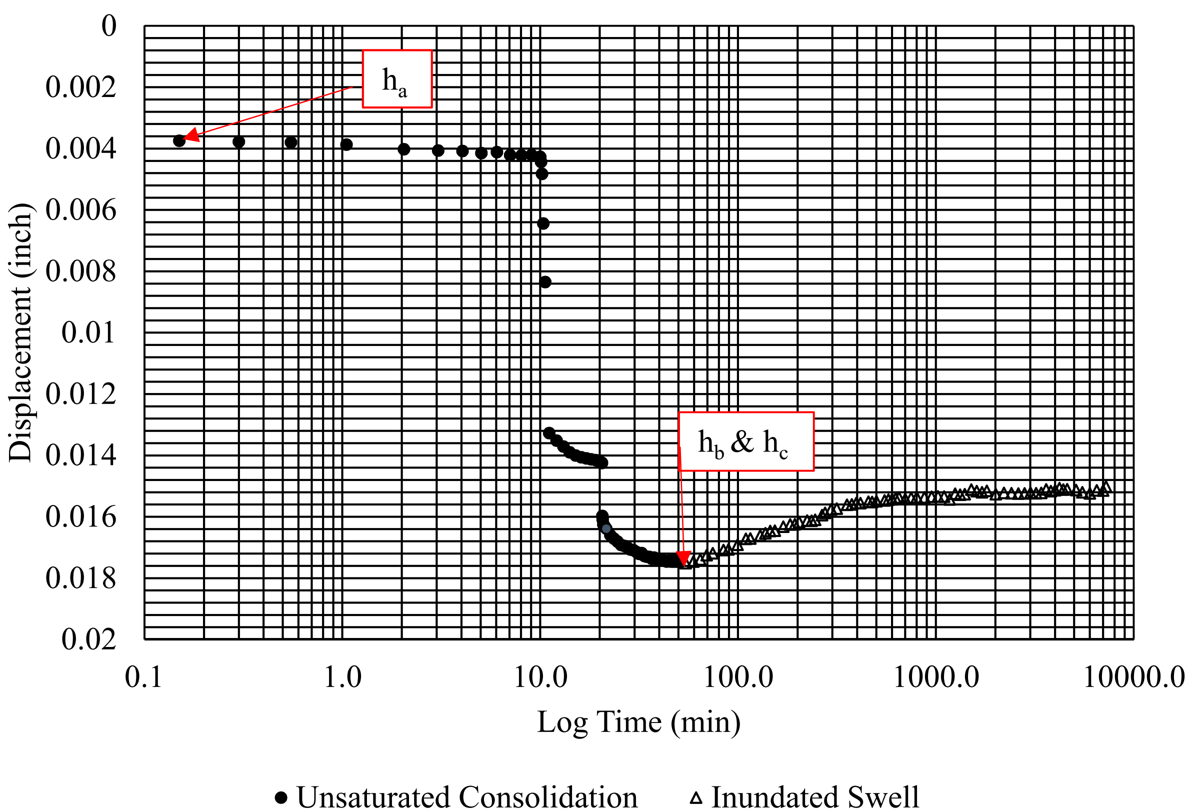

Figure 59: Example 360 psf Unsaturated Consolidation Curve(s)

It should be noted that the reference point h_c has also been identified in Figure 59 and is equal to h_b, but represents the start of swell or inundation. Use the Equation 16 to calculate the height of the specimen (h_1) at the point of inundation and the start of swell.

$$h_1 = H_0 - \Delta h_1 \tag{16}$$

Figure 60 only shows the inundated swell of the 360 psf specimen. As previously mentioned, reference point h_c indicates the dial reading when unsaturated consolidation is complete and water is added to the consolidometer to saturate the sample. According to ASTM D4546, "[d]epending on the stress level on each specimen, the effect of inundation might be swell, collapse, slight swell and then collapse, or slight collapse and then swell" (ASTM 2014). Reference point h_d indicates the point that ASTM D4546 describes as "the final amount of wetting-induced swell or collapse deformation" (ASTM 2014).

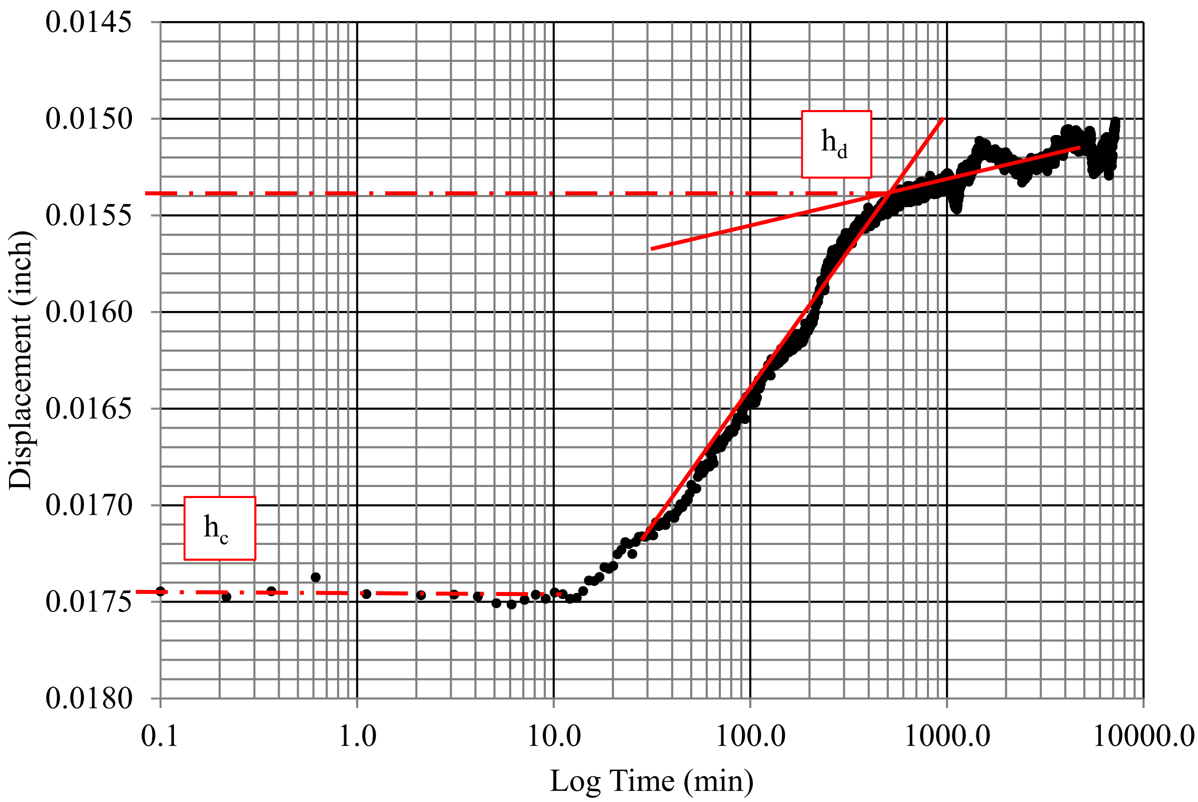

Figure 60: Example 360 PSF Inundated Swell Curve

The deformation of the specimen during inundated swell/collapse is the difference between the reference points h_c and h_d.

$$\Delta h_2 = h_d - h_c \quad (17)$$

The height of the specimen at the end of swell/collapse can be determined using the Equation 18.

$$h_2 = h_1 - \Delta h_2 \quad (18)$$

To determine the percent strain of the specimen during testing, the deformation of the specimen while inundated was compared to the height of the specimen after unsaturated consolidation. For these equations, positive strain indicates swelling and negative strain indicates collapse.

$$\varepsilon = -100 * \frac{\Delta h_2}{h_1} \tag{19}$$

The 360 psf example specimen was allowed to consolidate without being inundated with water during the 20 psf, 180psf and 360 psf increments which resulted in a consolidating displacement of approximately 0.01375 inches. Once the water was added to the system, swelling action commenced, resulting in a swelling displacement of 0.0021 inches. Under the 360 psf load increment, 21.3% strain was calculated for the specimen.

To identify the location of reference point h_d, a Casagrande construction has been utilized. Figures 61 to 63, depict typical curve shapes encountered during testing of the AL5 expansive clays. Figure 61 is an example of the ideal free swell curve for an expansive soil. The “S” shape of the curve makes identification of h_d fairly simple, since it falls at the intersection of the primary and secondary swell tangents.

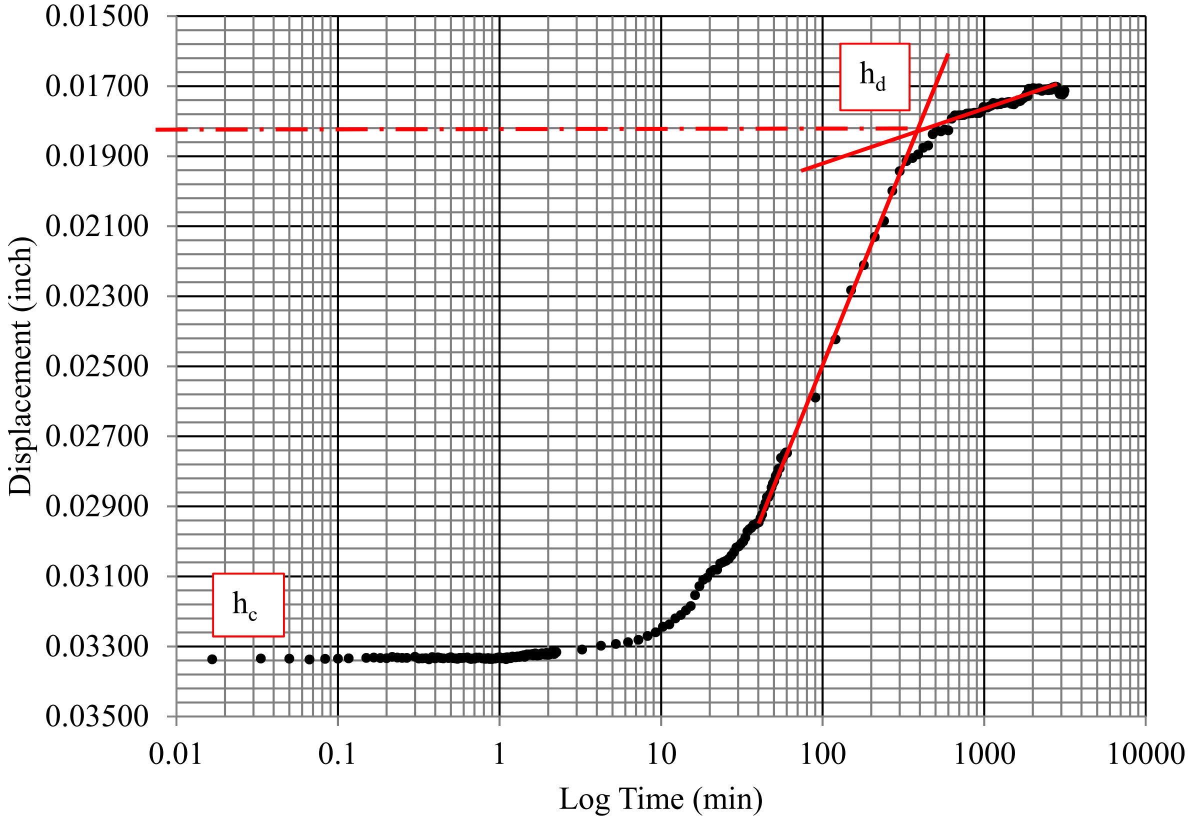

Figure 61: One Dimensional Displacement of a 20 psf Specimen during Inundated Swell

Figure 62 depicts the displacement of a 600 psf specimen that has a clearly identifiable primary swell but collapsed rather than transitioning in secondary swell. As a result, the greatest swelling deformation achievable by the given specimen under a 600 psf load is the difference between dial readings h_c and h_d.

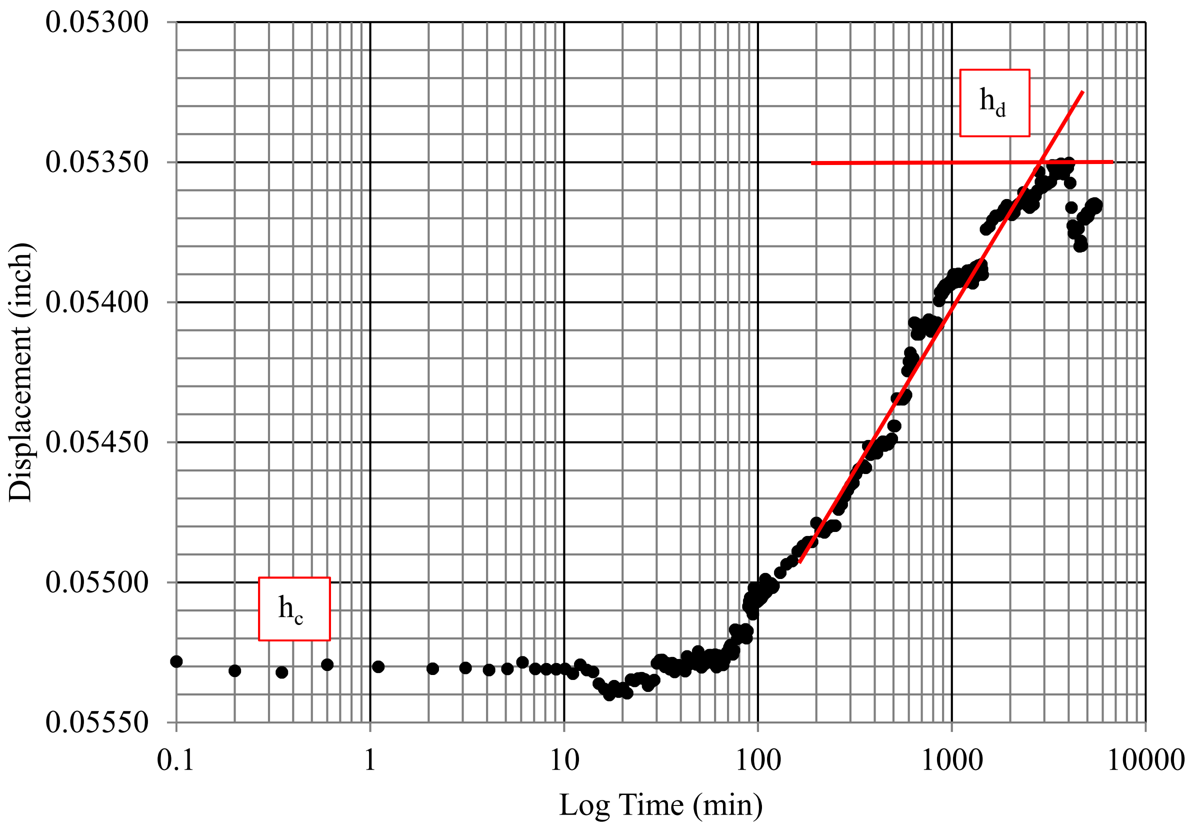

Figure 62: One Dimensional Displacement of a 600 psf Specimen during Inundated Swell

Figure 63 depicts the displacement of a 1440 psf specimen that has a clearly identifiable primary collapse portion but does not have the typical reverse "S" curve traditionally associated with consolidation curves. It is not clear at this time what mechanisms result in the alternation between swell and collapse. However, a possible explanation is that as the soil swells the shear strength drops below the applied vertical stress resulting in soil collapse expelling water from the diffused layers. Subsequent swelling occurs when the specimen has collapsed to a void ratio where the swell pressure is greater than the applied vertical stress. The cause of the soils swell-collapse-swell behavior has not been identified at this time.

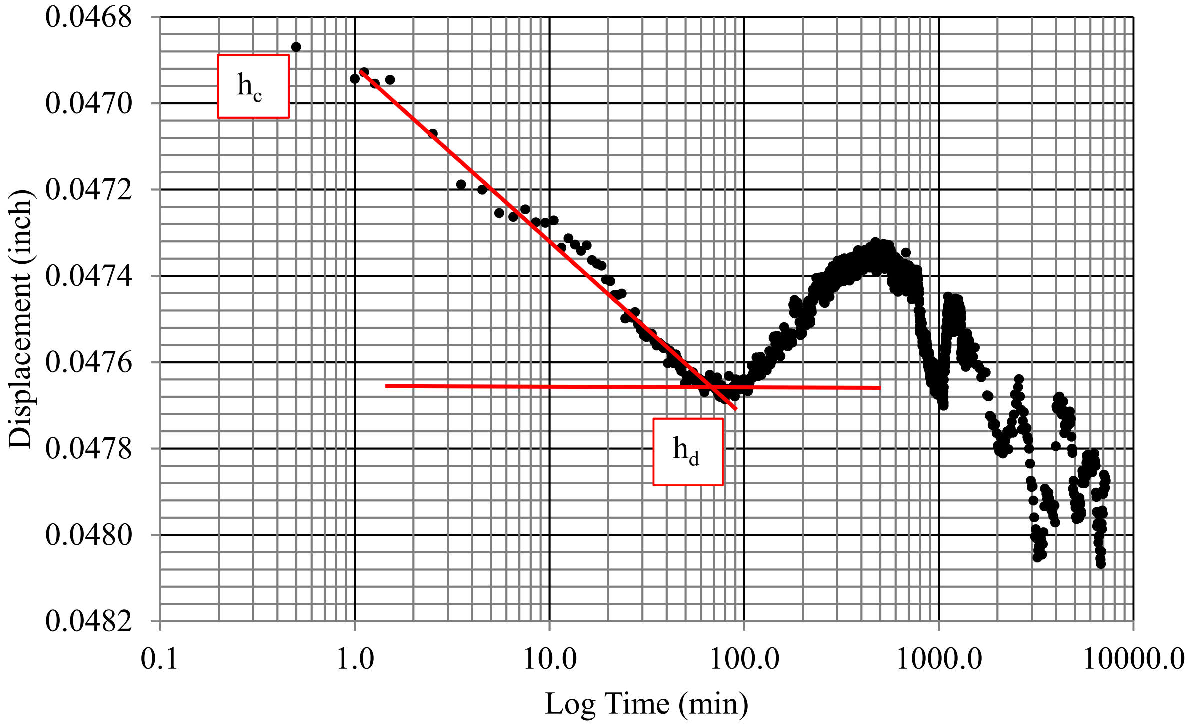

Figure 63: One Dimensional Displacement of a 1440 psf Specimen during Inundated Collapse/Swell

Returning to the example, the following figures summarize the swell and collapse of the 20 psf, 720 psf and 1440 psf load specimens used to determine the final swell pressure. Figure 64 depicts the one dimensional displacements of the 20 psf example specimen over the course of the swell test. The specimen was allowed to consolidate without being inundated with water during the initial 20 psf load increment resulting in a consolidating displacement of 0.0037 inches. Once the water was added to the system, swelling action commenced, resulting in a swelling displacement of 0.01015 inches. Under the 20 psf load increment, 102.2% strain was calculated for the specimen.

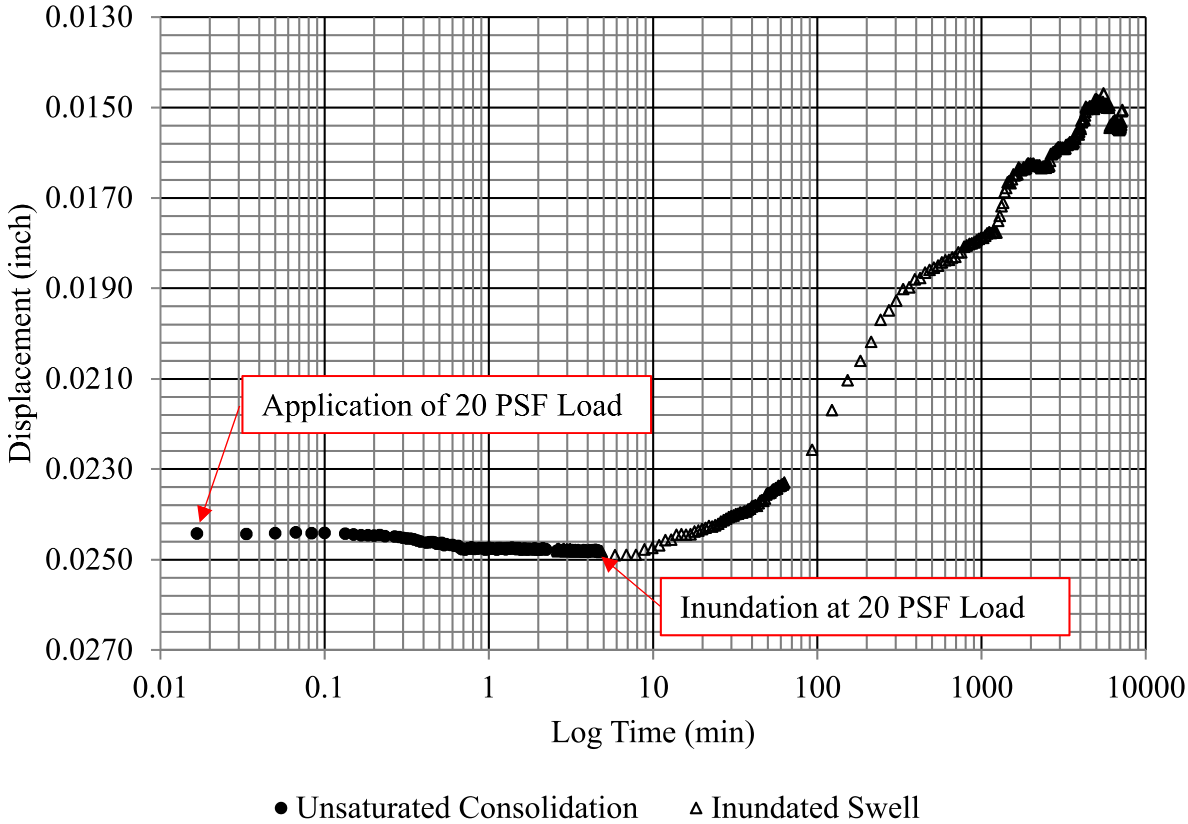

Figure 64: One Dimensional Displacement of a 20 psf Specimen throughout Testing

Figure 65 depicts the one dimensional displacements of the 720 psf example specimen over the course of the swell test. The specimen was allowed to consolidate without being inundated with water during the 20 psf, 180 psf, 360 psf and initial 720 psf load increments, resulting in a consolidation deformation of 0.00664 inches. Once the water was added to the system, swelling action commenced, resulting in a swelling displacement of 0.00084 inches. Please notice that as the vertical load increases the soils ability to swell decreases. Under the 720 psf load increment, 8.5% strain was calculated for the specimen.

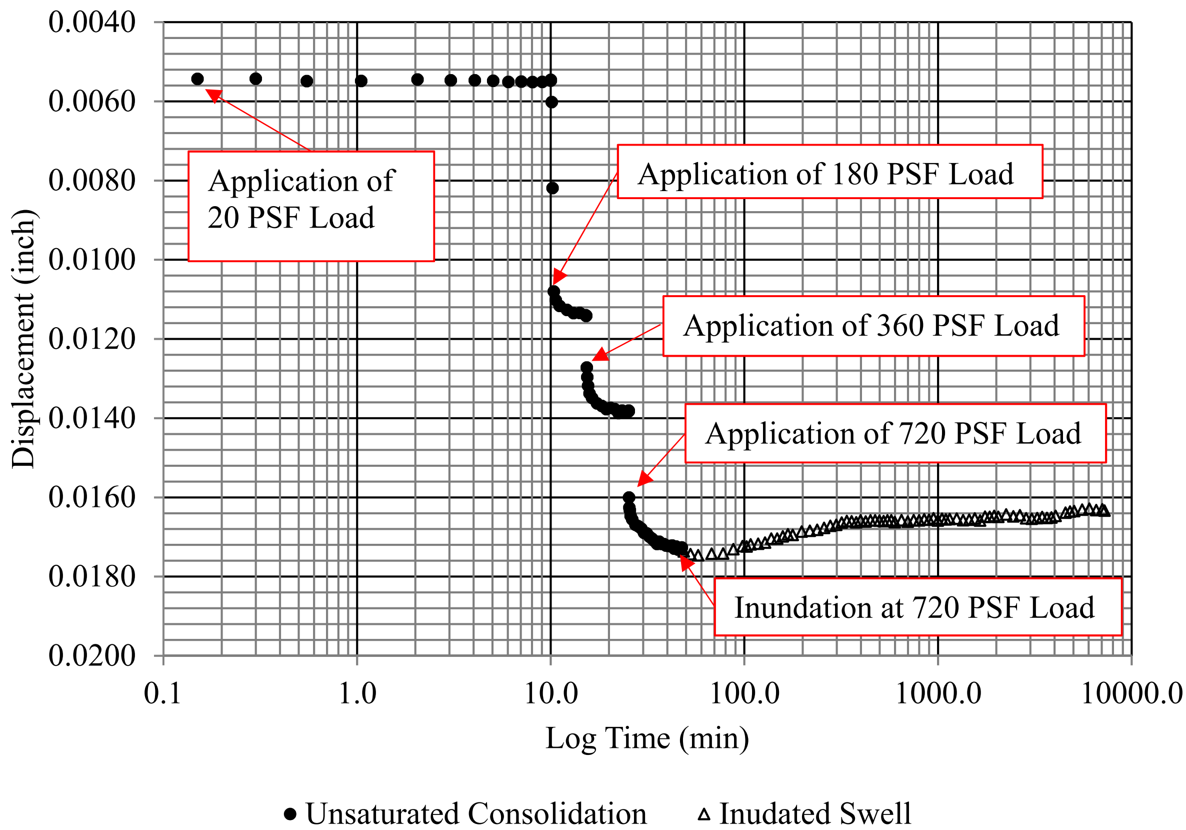

Figure 65: One Dimensional Displacement of a 720 psf Specimen throughout Testing

Figure 66 depicts the one dimensional displacement of the 1440 psf example specimen over the course of the swell test. The specimen was allowed to consolidate without being inundated with water during the 180 psf, 360 psf, 720 psf and initial 1440 psf load increments, resulting in a consolidation deformation of 0.02033 inches. Once the water was added to the system, the specimen continued to collapse, because the vertical load applied to the specimen was greater than the swell pressure of the soil. The specimen continued to displace an additional 0.00107 inches. Under the 1440 psf load increment, -11.0% strain was calculated for the specimen. If the vertical load applied to the specimen were equal to the swell pressure of the specimen, the data would result in zero displacement and a flat linear data set.

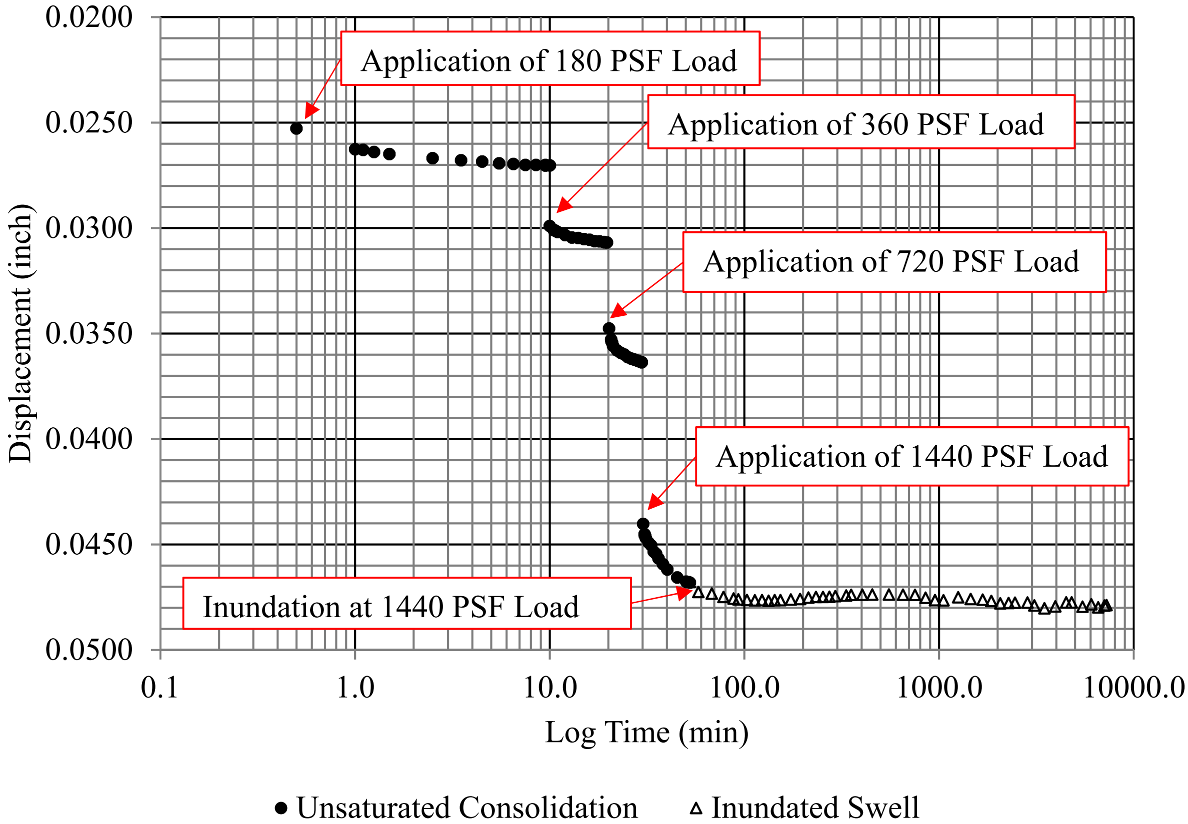

Figure 66: One Dimensional Displacement of a 1440 psf Specimen throughout Testing

After calculating the percent strain for each load increment, the resulting strains were plotted against the vertical pressure applied to the specimens, Figure 67. A linear or logarithmic regression was fitted to the results depending on the shape of the curve. Assuming that a linear or logarithmic regression provides a good fit for the results, the swell pressure is equal to the point where the regression line crosses the vertical pressure axis. To determine the precise swell pressure at each location, the regression equation was used to solve for vertical pressure. Figure 67 depicts the calculated percent strain versus the applied vertical pressure for the example data with a logarithmic regression and equation. The resulting swell pressure of the soils at this location is 912 psf.

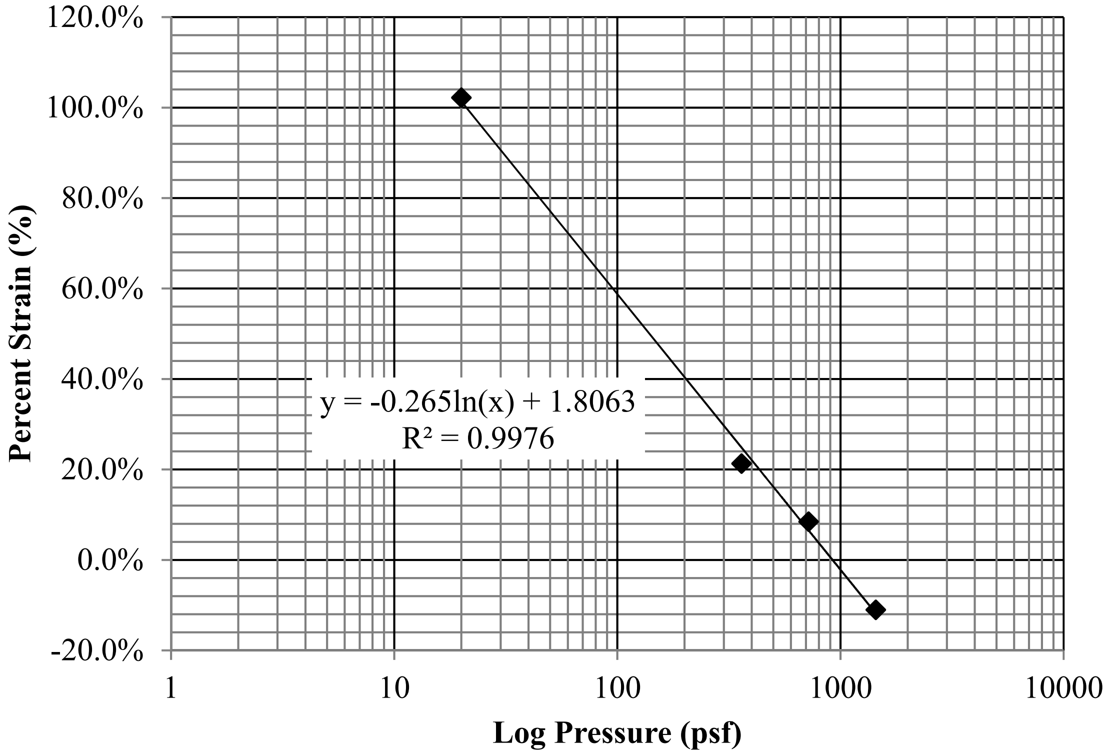

Figure 67: Example Swell Pressure Results (912 psf)

ASTM D4645-03

ASTM D4546-03, the "Standard Test Methods for One Dimensional Swell or Settlement Potential of Cohesive Soils," is the former standard for determining the swell pressure and percent swell of a soil. Unlike the 2014 method, the 2003 method requires the preparation of one specimen which is allowed to swell under a 20 psf vertical load and then allowed to consolidate under different vertical stresses until the specimen returns to its initial void ratio. Samples are prepared in the same manner described for ASTM D4546-14. Data reduction is described in detail in the ASTM D4546-03, and closely follows the methods used for a Casagrande consolidation test. Figure 68 depicts the results of the example specimen using the 2003 test method.

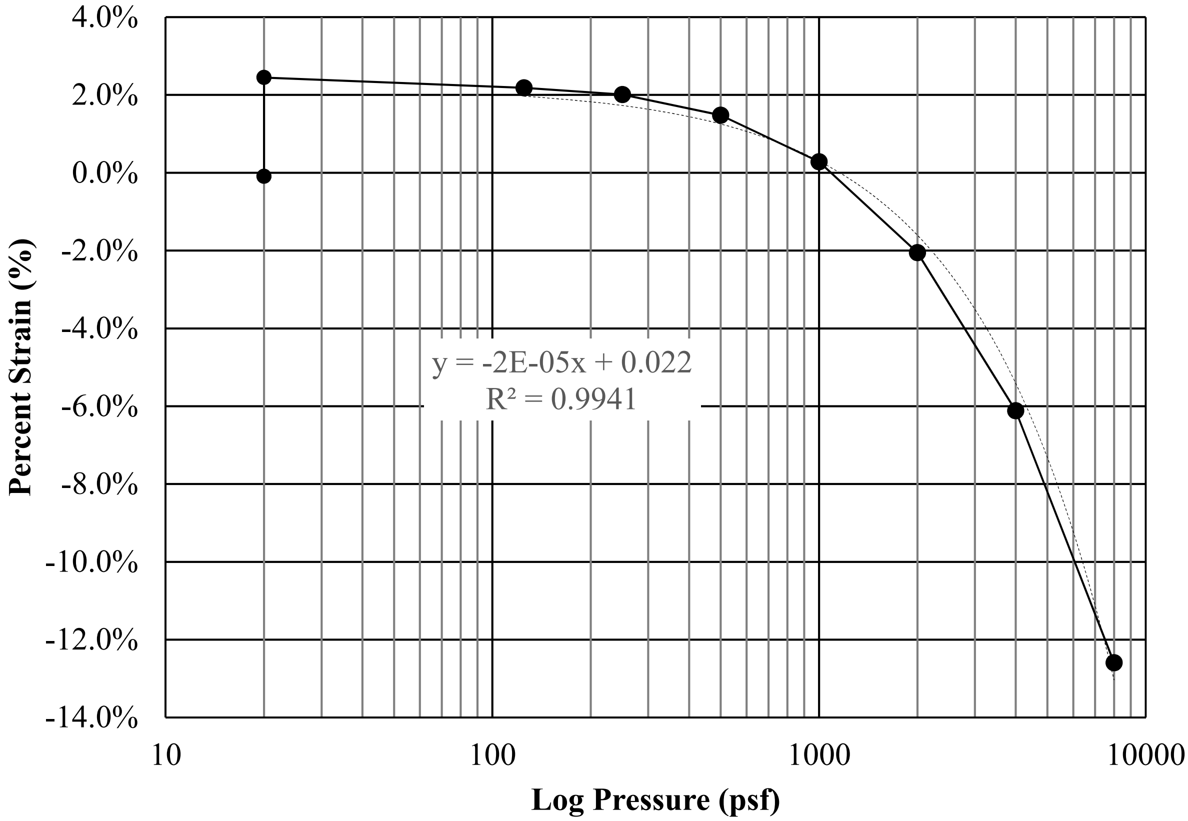

Figure 68: Example Swell Pressure Results Using ASTM D4645-03 (1100 psf)

While the results using the 2014 test method – 912 psf – and the 2003 test method – 1100 psf – are not exactly the same, they are comparable. Differences can be attributed to variations in the *in situ* depth and soil matrix composition of the specimens. Both test methods were performed on a limited number of samples as a means to verify accuracy of the methods used and results obtained.

Test Limitations

As noted in ASTM Standard D4546, one dimensional swell tests by the 2003 and 2014 methods, can be used to predict heave and settlement of expansive clays within the limitations of the test method. The one dimensional swell results can be greatly affected by oversized particles in the soil matrix, variations in the soil matrix composition between specimens, sample disturbance, and water content variation between specimens themselves or moisture content variation due to sample extraction and preparation (ASTM 2014). Long term storage of the samples is not recommended due to the influence of thin-walled sampling tube rust and penetration of drilling fluid or free water (ASTM 2003). Stored samples should be extruded in the direction of sampling and stored in a manner to control moisture loss. According to ASTM D4546-2003:

> "Rates of swell or collapse as measured by laboratory time rate curves are not always reliable indicators of field rates of heave/settlement due to soil nonuniformity, fissures or localized permeable layers within the soil mass, variability in percentage of oversize particles, and non-uniform wetting (different sources of water, concurrent vertical downward percolation and lateral percolation for canyon sides, localized wetting anomalies due to leaking buried utility lines, cyclic wetting episodes)" (ASTM 2014).

Soil Water Characteristic Curves

Soil water characteristic curves were developed for eight locations along the project site using remolded samples. Each location was divided into two layers and a SWCC was developed for each layer. ASTM D5298, the "Standard Test Method for Measurement of Soil Potential (Suction) Using Filter Paper," is the standard method for using filter paper as a passive sensor to measure matric and total suction potential.

Each specimen, prepared at different gravimetric water contents, was sealed in airtight containers for a minimum of seven days. This allowed the vapor pressures of the pore water in the specimen, the pore water in the filter paper and the vapor pressure in the void to come into equilibrium. To achieve comparable soil densities between each specimen, approximately 290 g of oven dry soil was compacted into 200 mL of the specimen jar. Figure 69 depicts a SWCC specimen jar marked with 50 ml increments. Each specimen received a unique specimen number, which was cross-reference with the target water content and soil sample used. Typically, ten specimens were prepared per soil sample; however, in some cases, more specimens were prepared to develop a fuller range of data. During the 2015 soil sampling, *in situ* specimens were collected in a limited number of borings, prepared and sealed to determine the *in situ* suction.

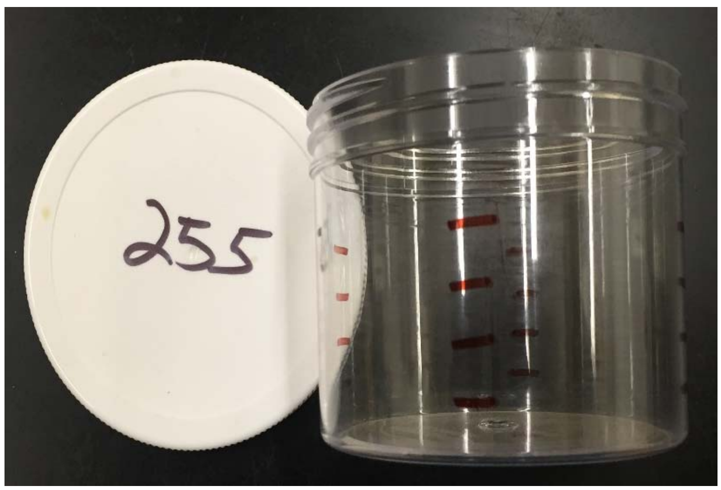

Figure 69: Specimen Jar for SWCC

Once the specimen has been compacted to the predetermined gravimetric water content and volume, a washer coated in WD40 was placed on top of the soil with a half-inch piece of PVC pipe, Figure 70. The washer and PVC piece serve as a stand on which to balance the filter paper and to prevent the filter paper from coming into contact with the soil. By preventing contact between the soil and filter paper, vapor transfer can only take place through the air in the jar's void. Consequently, only total suction is measured.

Figure 70: SWCC Specimen with Washer and PVC Pipe Piece

Figure 71 and Figure 72 shows two pieces of dry filter paper, previously stored in a vacuum chamber, balanced on the PVC piece. Ashless Whatman Filter Papers, No. 42, were used based on the recommendations of C. Feuerharmel et al. (2006). The edge of the top filter paper has been bent upward to aide in rapid removal during the next phase of testing.

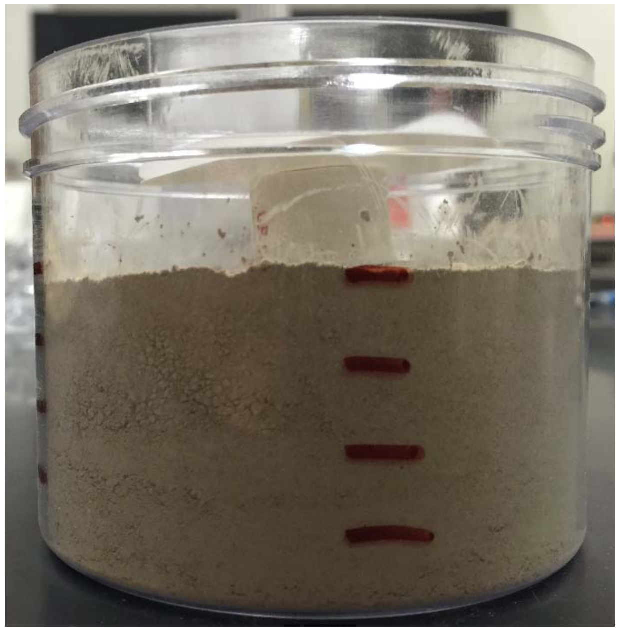

Figure 71: SWCC Specimen with Filter Paper (Profile View)

Figure 72: SWCC Specimen with Filter Paper (Plan view)

The specimen was then sealed with electrical tape to ensure the jar remained air tight, Figure 73. Prepared specimens were stored in an insulated chest for a minimum of seven days.

Figure 73: SWCC Specimen Sealed

Once the specimens reached equilibrium, the water content of the filter paper and the volumetric water content of the soil was determined. Metal containers were used to obtain the water content of the filter paper. The transfer of the filter papers, with tweezers from the specimen jar to the metal container, must take place in less than 5 seconds. If the water content of the top and bottom filter papers differed by more than 5%, the test was considered to be invalid. The filter papers dried in an oven at 110 ± 5°C with the lids slightly ajar for a minimum of 2 hours, and then with the lids closed for a minimum of 15 min. Hot and cold tare weights were taken to account for temperature effects on mass measurement. The mass of the filter paper and tare weights were determined to the nearest 0.00001 gram. Using this method, the total suction was determined for each of the SWCC specimens at different volumetric water contents. Together they develop a SWCC for that location and layer.

Specific Gravity

The specific gravity of a soil expresses the density of the soil solids relative to the density of water. ASTM D854 is the “Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer” and only applies to soils passing the No. 4 sieve. All of the soils tested from the Alabama Highway 5 project passed the No. 4 sieve and were oven dried in accordance with Test Method B. For each location and layer, a minimum of three specific gravity tests were performed and the results averaged. The resulting average specific gravity was used in subsequent calculations and analysis.

Shrinkage Limits

The soil’s ability to shrink due to moisture loss plays as an important role in causing pavement distress as its ability to swell. There is a point, the shrinkage limit, where the soil is at its volumetric minimum but is not dry. To determine the water content at which shrinkage stops, ASTM Standard 4943, the “Standard Test Method for Shrinkage Factors of Soils by the Wax Method” was used.

The shrinkage limits are performed on material passing the No. 40 sieve in accordance with the ASTM Standard. Specimens are remolded into a calibrated container with a water content at or slightly above the liquid limit and then allowed to air dry until it reached a consistent and lighter color. The specimen is then oven dried to constant mass and coated with wax. Initial air-drying of the specimen helps to prevent cracking of the specimen, which would void the test specimen. The specific gravity of the wax must be determined prior to use. The wax-coated specimen is then submerged into water. The masses of the oven dry specimen, the wax coated specimen and the displaced water must be recorded. The shrinkage limit is then calculated.

CHAPTER FIVE: RESULTS

FIELD

The primary objective of this investigation was to determine the causes of pavement damage along the research section of Alabama 5. Based on the qualitative observations and the quantitative results, the author has concluded that the accelerated pavement damage is due to heavy and high traffic volume, a shrink/swell cycle of expansive clays exacerbated by the presence of large deciduous trees, and variable shear strength of the soils.

The field work component of this investigation consisted of site reconnaissance, soil sampling, a tree survey, and International Roughness Index surveys. This chapter will summarize the findings of each activity and bring them into perspective with the reviewed literature.

Traffic

According to the ALDOT materials report dated February 3, 2014, the 2014 AADT was 1,410 vehicles per day with 36% truck traffic and the projected AADT for 2034 is 2,200 vehicles per day (Alabama Department of Transportation 2014). ESAL values are calculated to be 2.35×10^6 (Alabama Department of Transportation 2014). From the start of project to the end of project, the only intersections with AL5 are local and county roads. There are no major routes intersecting with AL5, that would contribute to, or detract from daily traffic volumes. For this reason, it is assumed that AADT for AL 5 is constant from start to end of project. The traffic volumes and percentage of truck traffic was visually corroborated during field work. Traffic is a primary factor in pavement deterioration along AL 5.

Site Observations by Damage Type

During the reconnaissance phase of the project, general information regarding the condition of the site pre-construction, was collected and photographed. Several damage trends were observed at the time:

1. The severity of damage appeared to increase when deciduous trees were present.
2. Longitudinal cracking and rutting was common in areas with deciduous trees.
3. The severity of damage appeared to be unaffected by the presence of coniferous trees.
4. From the start of project, MP 50.85, to approximately MP 52.82, differential heave was observed in the roadway.
5. Various slopes throughout the project appeared to be in distress.
6. Superficial pavement damage was observed throughout the project without any apparent pattern or trend.

The following figures are used to illustrate these common observations throughout the project site.

Heave

The first 2.4 miles of the project is generally characterized by heave. For the purposes of this investigation differential heave is a general term used to describe sections of roadway that may experience different amounts of heave (or subsidence) do to varying swell potentials or availability of water. As a result, motorists may experience a rolling (over long sections) or bumpy (over short sections) ride. Figure 74 illustrates this concept as observed by the author.

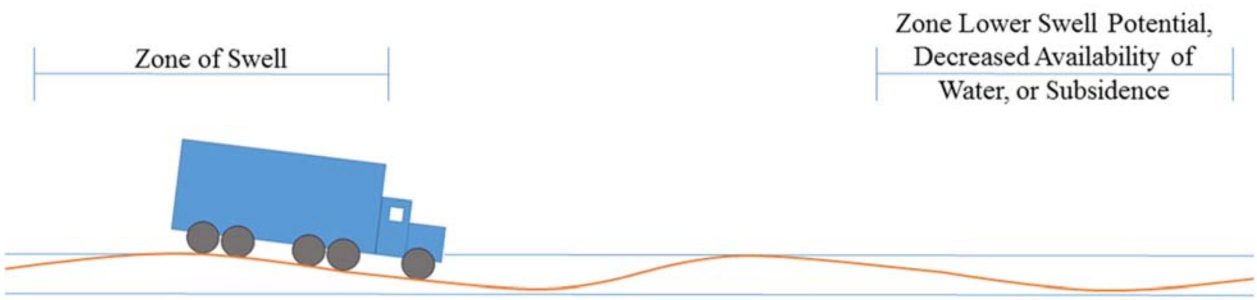

Figure 74: Illustration of Differential Heave (Not to Scale)

Figure 75 is a Google Earth image of the highway and surroundings from Boring B1.0, MP 50.85, to boring B5.0, MP52.85. The area of interest stops just short of the large deciduous trees in the image, approximately MP 50.75. It is suggested that the moisture fluctuation in this zone is significantly less varied than the rest of the project for several reasons.

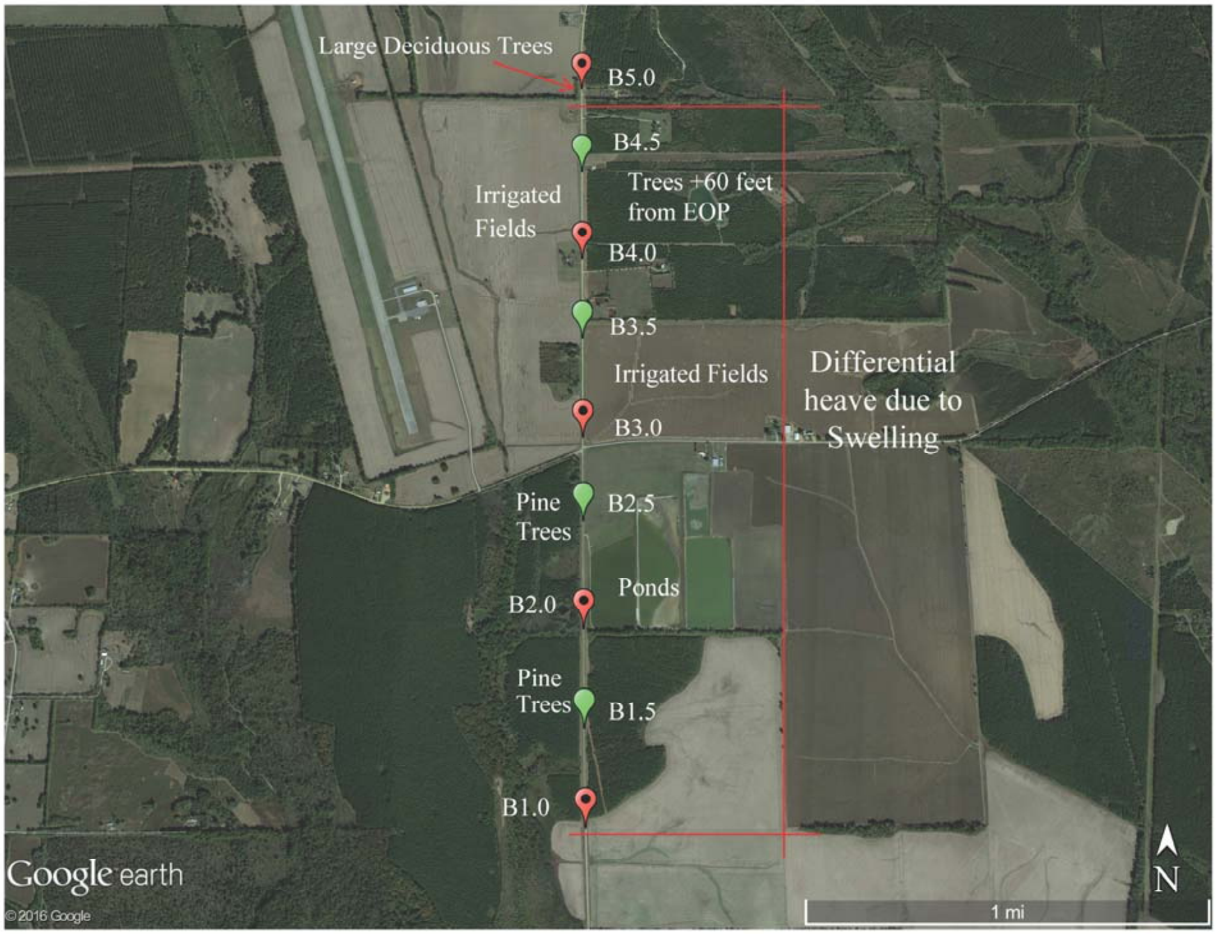

Figure 75: Google Earth Image of AL 5 from Borings B1.0 to B5.0 (after Google Earth 2014)

In areas with irrigated fields and no trees, the moisture fluctuation of the soil is purely controlled by the climate and irrigation patterns of the farmers. Figure 30 shows the 30-year normal precipitation and weather patterns for Selma, Alabama. As indicated in the figure, April through October is the hottest and driest period for the region. Conversely, November through March precipitation increases while temperatures decrease for the region. Because the dry period is concurrent with the agricultural growth season, sections of the highway with irrigated fields should maintain the relatively constant water contents year round. During the dry season, soil water lost by evaporation will be replenished by irrigation and during the remaining six months, precipitation.

Based on these climate and irrigation patterns it is suggested that the expansive clays will remain in a state of swell with limited shrinkage as compared to other locations onsite. Figure 76 and Figure 77 depicts a section of AL5 near boring B3.0 with irrigated fields and no trees on both sides of the roadway. Please note the lack of longitudinal cracking and rutting. Pavement damage in this section, and areas like it, was limited to superficial pavement damage and differential heave. The differential heave is due to the expansive clays swelling vertically different amounts due to varying swell potential or availability of water. The lack of longitudinal (shrinkage) cracks, can be attributed to the relatively constant water contents year round. The longitudinal (shrinkage) cracks develop due to positive and negative flexural bending forces applied to the pavement by cyclical shrinking and swelling. The cracks will form at the active zone boundary as indicated by Zornberg et al. in Figure 24.

Figure 76: AL5 Facing South of Boring B3.0 MP 51.85 (Photo Taken 06/15/15)

Figure 77: AL5 Facing North of CR 12 Intersection MP 51.82 (Photo Taken 06/15/15)

Like irrigation, the large fish ponds, located on the east side of AL5 from boring B2.0 to B2.5, is likely to stabilize the water content of subgrade soils underneath the highway. The constant, but slow, infiltration of water from the fish ponds has the potential to partially offset evaporation rates during the dry months so that the subgrade maintains a relatively constant state of swell year round.

Longitudinal Cracking Associated with Trees

Based on visual observation during the reconnaissance phase, it appears that pine trees and trees of any type located 60 feet or more off the roadway have little to no impact on pavement damage. As indicated in Figure 19, trees belonging to the genus Pinus, including loblolly pines, have among the lowest moisture demand of those classified. Pine trees are also expected to have one of the smallest diameter root spread of those classified (Biddle 2001). In the case of deciduous trees, precise and reliable predictors of root spread based on canopy or trunk diameter are unavailable. However, several correlations exist and should be applied with caution when precise, accurate information is required. For the purposes of this discussion an empirical correlation will be sufficient. A ratio of root radius to trunk diameter of 38:1 has been suggested by S. Day (Day and Wiseman 2009). A six-inch diameter tree may have a root mat of 19 feet diameter and a zone of influence, to draw soil water, an unknown distance beyond 19 feet. A 14-inch diameter tree may have a root mat of 44 feet diameter and a large zone of influence. Based on the results from the tree survey, which will be presented later in this chapter, trees 6-inches or greater in diameter were documented as close as 16 to 38 feet from the edge of pavement. On average trees 6-inches or greater in diameter were located between 40.1 and 54.1 from the edge of pavement. Therefore, it is feasible that trees 60 feet or less could influence soils at the edge of or underneath the pavement.

Beyond 60 feet, a tree would have to be greater than 19 inches in diameter to reach the EOP. While this is possible, it is more likely that pavement damage would be driven by factors other than trees more than 60 feet from EOP, such as irrigation, trees closer to the EOP competing for moisture, climate, and variable shear strength due to moisture fluctuation.

Starting at MP 52.82, in the area of boring B5.0 on the west side of the southbound lane, a stretch of large deciduous trees runs along the ROW for approximately 320 feet. The author observed longitudinal shrinkage cracks, distressed or failing slopes, and rutting in this portion of the southbound lane. Figure 78 shows the location of boring B5.0 and the surrounding area.

Figure 78: Google Earth Image of AL5 near Boring B5.0 (Google Earth 2014)

This line of trees predominately consists of Sugarberry Trees, a member of the Elm Family, which has high water demands and large root mats (Biddle 2001). Table 14 presents descriptive statistics on the trees surveyed near Boring B5.0. The average Sugarberry surveyed has a trunk diameter of 10.2 inches. According to the previously discussed empirical correlation, the root mat may be as much as 32.3 feet in diameter on average. Trees surveyed in the section of the roadway, measured as close as 30.9 feet to EOP and averaged 40.2 feet from EOP. As a result, it is possible that root systems of some trees extend directly beneath the pavement, and probable that the zone of influence of many trees extend directly beneath the pavement.

Table 14: Descriptive Statistics on Trees Surveyed near Boring B5.0

Tree Type	Count of Trees per Type	Min of Trunk Diameter (inches)	Average of Trunk Diameter (inches)	Max of Trunk Diameter (inches)
Eastern Red Cedar	1	8.0	8.0	8.0
Sugarberry	65	6.1	10.2	26.7
White Ash	9	7.6	11.6	17.2
Willow Oak	1	41.1	41.1	41.1
	76	**6.1**	**10.8**	**41.1**

The largest tree surveyed at this location was a 41.1-inch diameter willow oak, Figure 79. Oak trees have among the highest water demand and largest root systems (Biddle 2001). The willow oak was located 64.7 feet off the edge of pavement, but due to its large diameter may still be able to influence water contents under the pavement.

Figure 79: Willow Oak, Diameter 41.1 inches

Shrinkage (longitudinal) cracking develops at the moisture fluctuation boundary of an expansive clay subgrade. Figure 80 is an elevation view of the factors driving observed damage. The longitudinal (shrinkage) cracks develop due to positive and negative flexural bending forces applied to the pavement by cyclical shrinking and swelling. The cracks will form at the active zone boundary as indicated by Zornberg et al. in Figure 24. The center section of pavement stays at relatively constant water content as compared with the outer pavement sections and shoulders because of the impermeable nature of the asphalt above it. The amount of pavement subgrade that remains at a stable water content will depend heavily on the soils matric suction, negative pressure capable of drawing water, and the hydraulic conductivity of the soil. The outer sections of pavement and shoulders will gain water through precipitation and loose water through evapotranspiration. With the addition and loss of water the fine grained soils will undergo volumetric change according to the net normal pressure and matric suction.

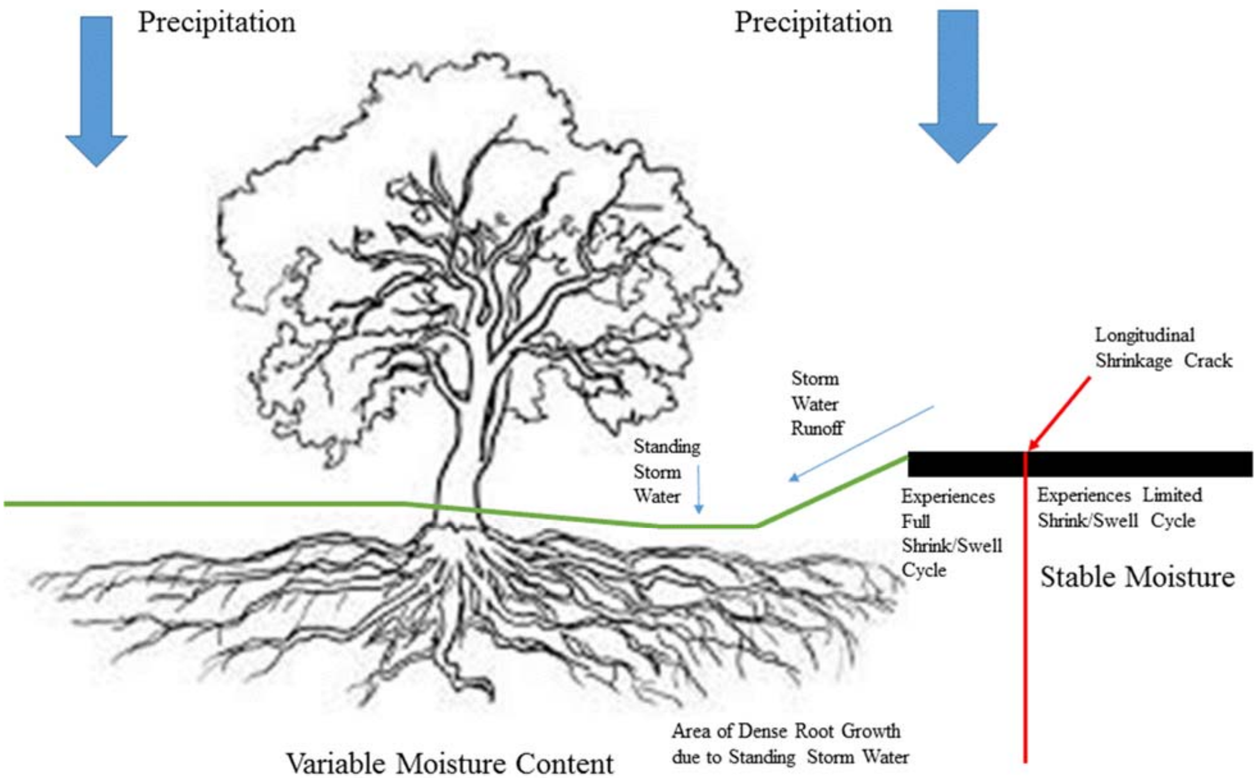

Figure 80: Driving Factors behind Pavement/Slope Damage near Boring B5.0 MP 52.85

This relationship has been described graphically in Figure 9, as the matric suction and net normal stress increase, the volumetric change of the solid and water phases will decrease. Figure 81 depicts the longitudinal shrinkage crack (Zornberg and Gupta 2009), failing shoulder slope, and ditch near boring location B5.0. The basin of the ditch was very moist at the time the photograph was taken due to recent rainfall.

Figure 81: Longitudinal Crack due to Shrink Swell near Boring 5.0 MP 52.85 (Photo Taken 06/02/15)

Slope Distress and Potential Failure

Slope distress and potential failures occurring at this and other locations on site. Based on the triaxial results presented by Al-Mhaidib et al., Table 3, it can be concluded that as the expansive soils swell and matric suction decreases the shear strength will also decrease (2006). The variability of water content and volumetric change in the shoulder lead to a variability of shear strength. When the soils have high water contents and low shear strengths, slope failures are more likely to occur. If the soils subsequently dry, the slope failure may temporarily cease until another wet period. In Figure 81, numerous ruts from mowers are visible. The operation of heavy equipment during periods of high moisture will accelerate the slope failure process and exacerbate/create superficial surface failures. The observed slope stability issues on site provide evidence for low shear strength of subgrade soils.

Standing Water

Standing water was observed in the ditches along the right of way on many occasions throughout 2015 and 2016. Figure 82 and Figure 83 depict two such areas observed in April 2015 and July 2015. The presence of standing water off the shoulders of the roadway provides a reservoir for desiccated soils to draw water from. Recharging of the shoulder slope lead to reduction of shear strength and potential slope failure. Most of the site has at least a 4:1 slope on either side of the roadway, allowing storm water to pool in the low lying areas. The presence of standing water alongside the roadway also promotes root growth in the direction of the roadway itself (Biddle 2001). Biddle indicates that tree roots will grow in the direction of water sources and produce the densest root system at these locations (2001).

Figure 82: Standing Water Observed in Ditch (Photo Taken 4/14/2015)

Figure 83: Standing Water Observed between Borings 1.0 and 1.5 (Photo Taken 7/10/15)

Pavement Rutting

Pavement rutting was observed at many locations throughout the site. At MP 52.85, 1⅜ inches of rutting was observed between EOP and the longitudinal shrinkage crack. Pavement rutting results from permanent vertical strain in the asphalt and subgrade layer over a period of many load repetitions. Deformations occurring within the asphalt may be due to problems with the mix design or compaction during placement. Subgrade rutting occurs as the subgrade soils below each wheel path are consolidated by repeated traffic loads. As the subgrade beings to deform the asphalt layers mirror the deformations so that the ruts translate to the pavement surface. Rutting in the asphalt layers can be repaired by milling and overlaying the surface but subgrade rutting indicates much deeper problems. As shown in the boring logs, AL5 pavements were built directly on top of expansive clays. In a few locations it appeared that a fat clay/sand mixture may have been placed as a base course. The boring logs in the appendix show specific locations. The increase in sand can potentially reduce the swell potential of soils and increase the shear strength of that layer. However, the majority of the site lacks the sand/clay mixture. It has been established that as expansive soils saturate they lose shear strength. The increase in water content and loss of shear strength will promote subgrade rutting. Figures 84 through 86, depict two different locations with sufficiently deep ruts to cause safety hazards on site.

Figure 84: Observed Rutting Near Boring 5.0 MP 52.85 (Rut Depth 1 ⅜ inch)

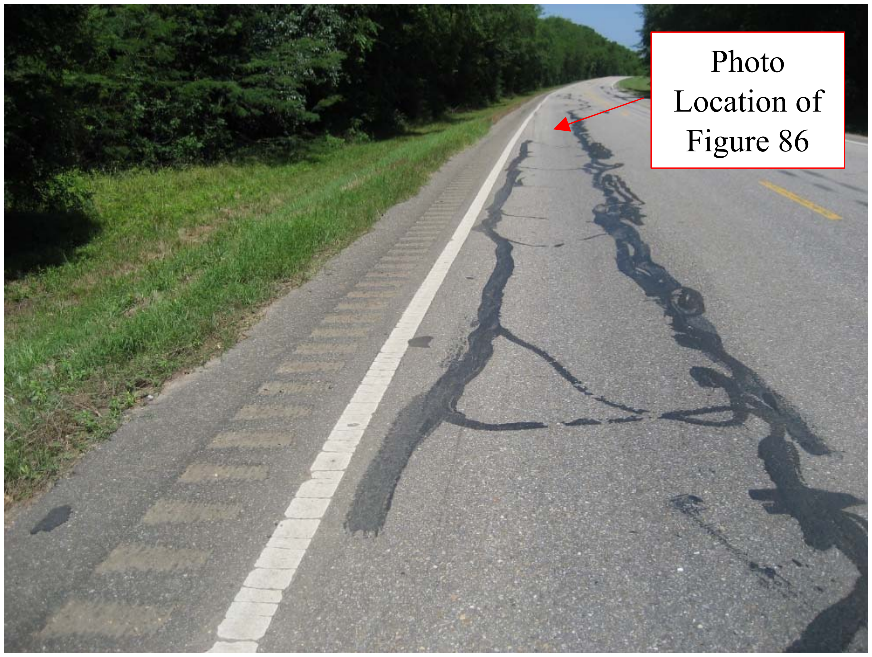

Figure 85: Observed Rutting and Longitudinal Cracking

Figure 86: Observed Rutting

Site Observations by Location

Before construction, detailed site reconnaissance was performed of the entire roadway. Notes were taken on pavement damage, slope stability issues, the general surroundings, and locations. The following information is a summary of those observations according to location. Photographs have been included when available.

Location: Start of Project MP 50.85 to CR12 Intersection at MP 51.82

Observations:

- Roadway leveling occurred sometime between November 2013 and June 2014 before the start of project.
- Detailed site reconnaissance was not performed before the leveling
- Figure 87 and Figure 88 depict the roadway pre-leveling

Photographs:

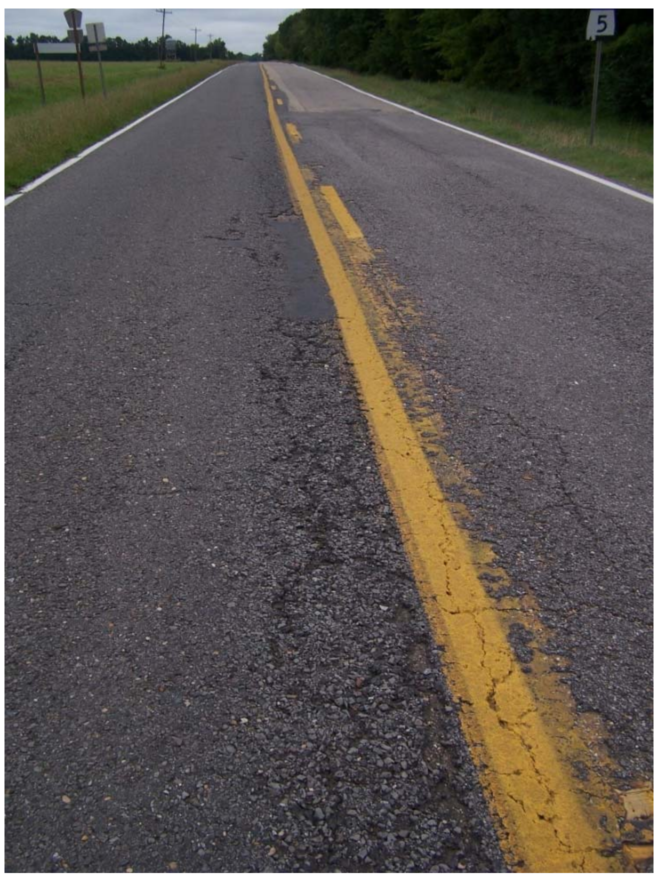

Figure 87: AL5 Facing South MP 51.81 (Photo Taken 11/18/13)

Figure 88: AL5 Facing South MP 51.53 Pre-leveling (Photo Taken 11/18/2013)

Location: MP 50.82 to Start of Project at MP 50.802 (Post Leveling July 2015)

Observations:

- Distressed shoulder slopes with lateral spreading at toe of slope
- Observed rutting and subsidence of pavement
- Northbound lane mild rutting of inside wheel path and raveling

Location: MP 50.82 (Post Leveling July 2015)

Observations:

- Observed fatigue cracking and rutting
- Observed severe shoulder subsidence

Location: MP 50.84 to 50.88 (Post Leveling July 2015)

Observations:

- Observed cracking at pavement edges
- Observed shoulder subsidence
- Northbound lane mild rutting of inside wheel path and raveling

Location: MP 50.93 (Post Leveling July 2015)

Observations:

- Standing water in ditches
- Fatigue cracking at pavement edges
- Toe of slope removed for culvert

Location: MP 50.88 to MP 50.97 (Post Leveling July 2015)

Observations:

- Observed sporadic transverse cracking
- Observed open centerline longitudinal crack
- Subsidence in southbound lane outside wheel path
- Large black willow located 28 feet off EOP with dripline 13 feet of EOP
- Northbound lane mild rutting of inside wheel path and raveling

Location: MP 50.97 to MP 51.00 (Post Leveling July 2015)

Observations:

- Observed cracking with shoulder subsidence extending to middle of southbound lane

Location: MP 51.00 to 51.03 (Post Leveling July 2015)

Observations:

- Observed cracking with shoulder subsidence
- Steep shoulder slopes
- Asphalt patch post-leveling and ongoing raveling at MP 51.00

Location: MP 51.12 to MP 51.18 (Post Leveling July 2015)

Observations:

- Observed cracking with shoulder subsidence
- Pine trees located beyond right of way
- Flat shoulder slopes

Location MP 51.18 to MP 51.21 (Post Leveling July 2015)

Observations (Southbound Lane):

- Observed cracking and shoulder subsidence at pavement edge
- Rutting in both wheel paths
- Steep shoulder slopes
- Distressed slope at MP 51.99
- Pine trees located beyond right of way

Observations (Northbound Lane):

- Damage not observed, may be obscured by previous leveling
- Shallow shoulder slopes
- Pine trees located beyond right of way

Location: CR12 Intersection MP51.82 to Start of Deciduous Trees at MP 52.82

Observations:

- Irrigated fields on the east and west side of AL5 with no trees, Figures 89 through 92
- Asphalt Raveling with pieces of surface layer removed, Figures 91 and 92
- Rutting and longitudinal cracking not observed
- Standing water in ditches
- Ponded water at 4x4 double barrel culvert with algae growth

Photographs:

Figure 89: AL5 Facing South of Boring B3.0 MP 51.85 (Photo Taken 06/16/15)

Figure 90: AL5 Facing North of Boring B3.0 MP 51.85 (Photo Taken 06/16/15)

Figure 91: AL5 Facing South of MP 51.915 (Photo Taken 0616/15)

Figure 92: AL5 Facing South of MP51.915 (Photo Taken 11/18/2013)

Location: MP51.915 to MP 52.055

Observations (Southbound Lane):

- Large deciduous trees present beyond right of way, Figure 93
- Observed Longitudinal Shrinkage Crack, Figure 94
- Observed Rutting and subsidence of pavement section, Figure 93 and 95

Observations (Northbound Lane):

- Irrigated fields planted in row crops beyond right of way, Figure 93
- Observed significant lateral and longitudinal cracking but not a clearly defined longitudinal shrinkage crack

Photographs:

Figure 93: AL5 Facing North MP 51.915 (Photo Taken 06/16/15)

Figure 94: AL5 Facing East MP 51.915 (Photo Taken 06/16/15)

Figure 95: AL5 Facing North MP 52 (Photo Taken 06/16/15)

Location: MP53.11 to MP 53.28

Observations (Southbound Lane):

- Predominately pine trees with a few deciduous trees beyond right of way
- Observed rutting & cracking, Figure 99

Observations (Northbound Lane):

- Mixed deciduous and evergreen trees beyond right of way, Figure 96 and 97
- Observed rutting & cracking, Figure 97 and 98
- Observed slope stability problems

Photographs:

Figure 96: AL5 Northbound Lane and Shoulder Facing South MP 53.19 (Photo Taken 06/16/15)

Figure 97: AL5 Northbound Lane Facing South MP 53.19 (Photo Taken 06/16/15)

Figure 98: AL5 Facing Southwest MP 53.19 (Photo Taken 06/16/15)

Figure 99: AL5 Southbound Lane Facing North MP 53.19 (Photo Taken 06/16/15)

Location: MP 53.28 to CR15 Intersection at MP 53.38

Observations (Northbound Lane):

- Mixed deciduous and evergreen trees beyond the right of way, Figure 100
- Observed rutting and pavement subsidence, Figure 100
- Observed longitudinal shrinkage cracking, Figure 100
- Observed slope stability problems
- A 4x4 single barrel culvert located at creek bed, Figure 101
- Slope subsidence toward creek bed, Figure 101

Observations (Southbound Lane):

- Marsh with standing water and cattail reeds beyond the right of way, Figure 100
- Community center located at the intersection of CR15 and AL5, Figure 100
- Southbound lane was previously patched obscuring any pavement observations

Photographs:

Figure 100: AL5 Northbound Lane Facing South MP 53.38 (Photo Taken 06/16/15)

Figure 101: Northbound Lane Shoulder and Culvert MP 53.30 (Photo Taken 06/16/15)

Location: MP53.52

Observations:

- Localized pavement damage, raveling at edge of pavement, Figure 102
- Pavement leveled both lanes obscuring pavement damage observations, Figure 102
- Mixed deciduous and evergreen trees beyond right of way on both sides of roadway
- Observed grass growing through cracks at pavement edge, Figure 102
- Shallow shoulder slopes
- Desiccated soils with tension cracking in shoulders

Photograph:

Figure 102: AL5 Facing South MP 53.52 (Photo Taken 06/16/15)

Location: Approaches to Bridge at MP 53.68

Observations (Northbound Approach):

- Approaches to bridge leveled both lanes obscuring pavement damage observations
- Steep shoulder slopes

Observations (Southbound Approach):

- Localized pavement raveling at discreet locations with patching, Figure 103 and 104
- No rutting or cracking observed
- Steep shoulder slopes, Figure 104

Photographs:

Figure 103: AL5 Southbound Approach to Bridge Facing South (Photo Taken 06/16/15)

Figure 104: AL5 Southbound Approach to Bridge Facing North (Photo Taken 06/16/15)

Location: MP 54.22

Observations:

- Four large willow oak trees observed beyond right of way with dripline extending across centerline of roadway, Figure 105
- Leveled both lanes obscuring pavement damage observations, Figure 105

Photograph:

Figure 105: AL5 Facing North MP 54.22 (Photo Taken 06/16/15)

Location: MP 54.35 to End of Project MP54.85

Observations:

- Observed mild rutting, fatigue cracking and longitudinal shrinkage cracking, Figure 106 and 107
- Patching at various locations, Figure 107
- Mixed deciduous and evergreen trees beyond the right of way, Figure 107 through 109

Photographs:

Figure 106: AL5 Facing South East MP 54.59 (Photo Taken 06/16/15)

Figure 107: AL5 Facing North MP 54.21 (Photo Taken 06/16/15)

Figure 108: AL5 Facing North MP 54.58 (Photo Taken 06/16/15)

Figure 109: AL 5 Facing South MP 54.58 (Photo Taken 06/16/15)

Tree Survey

A tree survey was performed from CR 15 to the end of project to determine the type, size and location of large trees relative to the edge of pavement. For the purposes of the survey, a large tree is defined as one with a diameter six inches or greater. Table 15 summarizes the size and frequency of common trees surveyed by their common name. Only the most frequently occurring or mostly potentially damaging trees have been included in the summary. A comprehensive list has been included in the Appendices. According to G. Biddle (2001), trees belonging to the oak family have the highest water demand of those listed, with the elm family having the next highest. Please note that Sugarberry trees are a member of the Elm family and the second most frequently occurring tree onsite. The most common tree onsite belong to the Pine family. Pine trees and cedar trees will have among the lowest water demand and potentially damaging effects. Because pine and cedar trees do not lose their leaves and go dormant in the winter time their demand for water remains relatively constant throughout the year. Even low water demand deciduous trees, such as the Sweet Gum, loose their leaves in the winter and reduce their active root zone during dormancy. This encourages soil swelling during the wet winter months and soil shrinkage during the dry summer months when the leaves and root system regrows.

Table 15: Summary of Common Trees Surveyed and Size

Tree Common Name	Count of Trunk Diameter (inches)	Average of Trunk Diameter (inches)	Max of Trunk Diameter (inches)
American Elm	52	12.6	32.0
Black Willow	3	11.7	20.0
Eastern Red Cedar	123	10.2	27.0
Green Ash	93	10.0	27.0
Laurel Oak	51	12.0	40.0
Loblolly Pine	538	10.8	36.0
Pecan Tree	31	12.9	42.0
Post Oak	6	14.2	18.0
Red Oak	30	15.6	32.0
Slippery Elm	130	9.1	24.0
Sugarberry	406	10.2	27.0
Sweet Gum	106	8.4	18.0
Water Oak	108	12.2	52.0
White Ash	119	9.3	24.0
White Oak	8	10.9	22.0
Willow Oak	100	14.6	54.0
Winged Elm	33	8.7	15.0
	1937	10.7	54.0

During the course of the tree survey and soil sampling, tree roots were encountered growing toward the roadway as shown in Figure 110 through Figure 112.

Figure 110: Tree Roots Observed During Installation of Sensors (Photo Taken 06/28/16)

Figure 111 depicts a 4-inch diameter structural root approximately 15 feet from the roadway that was uncovered during silt fence installation. Structural roots provide a foundation for the tree and anchor it in the ground against heavy winds and rain. While the structural roots only have limited participation in the collection and redistribution of water, a network fine feeder roots are likely to be connected to or in the vicinity of the structural root system.

Figure 111: Tree Root (4" Diameter) Approximately 15' from Edge of Pavement

The root shown in Figure 112 was discovered in the bore hole at B4.5 during sampling. The bore hole was located in the center of the northbound lane. At this time there are not any trees near the boring location; however, its presence does indicate that it is possible for tree root systems to extend underneath the pavement. The root was approximately a half inch in diameter.

Figure 112: Tree Root Extracted from Boring Hole 4.5 (Photo Taken 5/23/16)

International Roughness Index (IRI) Surveys on Alabama 5

IRI values for AL 5 were determined using the National Center for Asphalt Technology (NCAT) ARAN inertial profiler on May 30, 2014 and November 11, 2014 to provide pre-construction baseline information. On each date four IRI profiles were developed, one per wheel path, between MP 50.8 and 54.3. Figures 113 through 116 show the calculated IRI values versus distance along project where the origin corresponds to MP 50.8 for each plot. The FHWA threshold for unacceptable pavement surfaces, 170 in/mile, is also shown on the plots as a reference. Based on the IRI data, the pre-construction pavement surface is severely damaged. The majority of the surface exceeds acceptable threshold limits set by the FHWA.

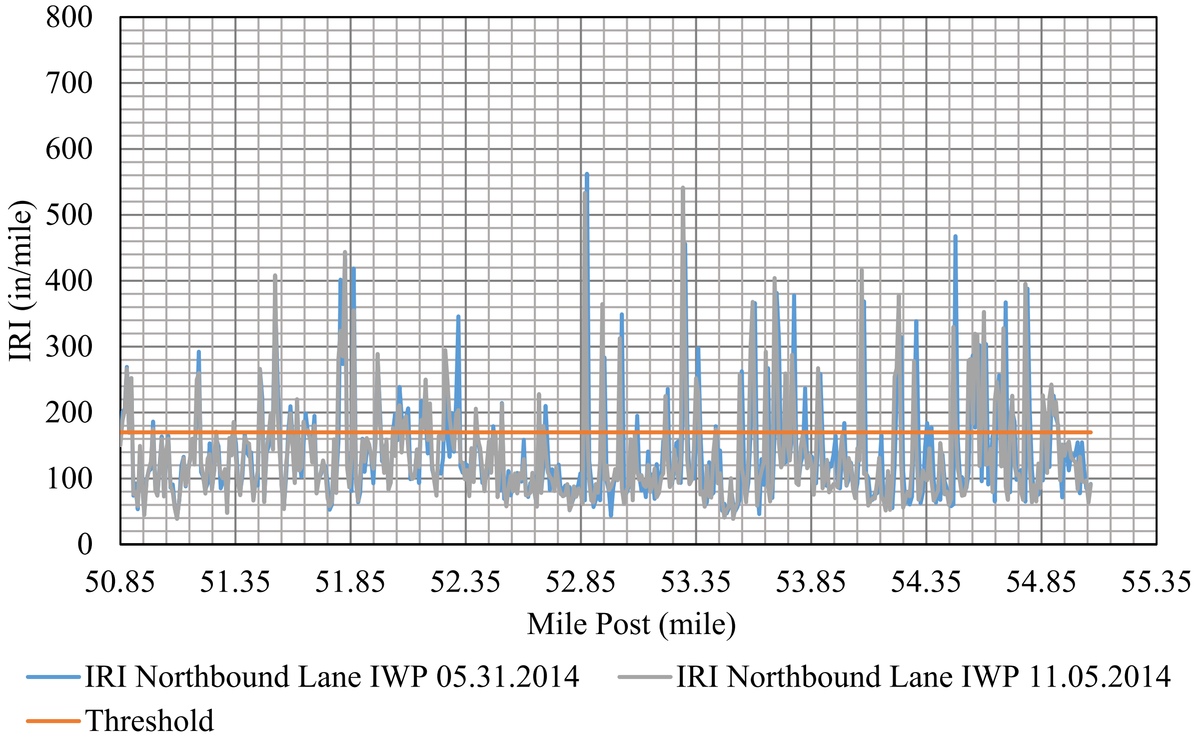

Figure 113: Northbound, Inside Wheel Path IRI Profiles for May and November 2014

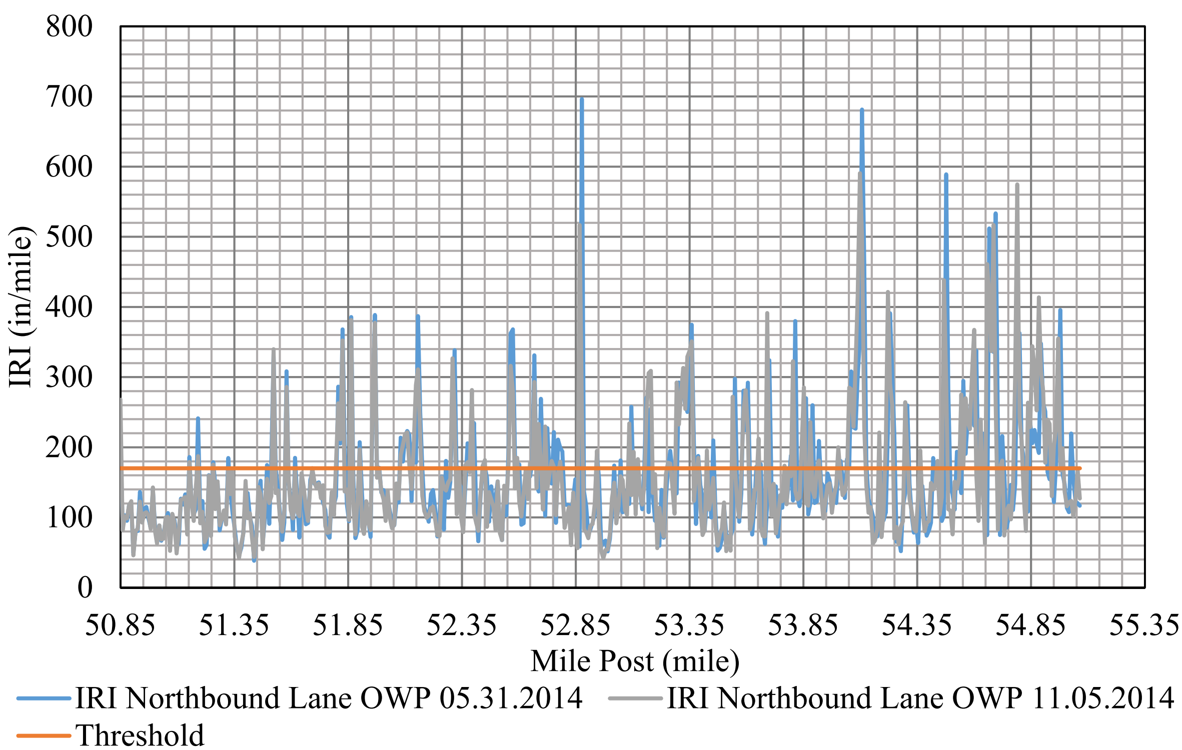

Figure 114: Northbound, Outside Wheel Path IRI Profiles for May and November 2014

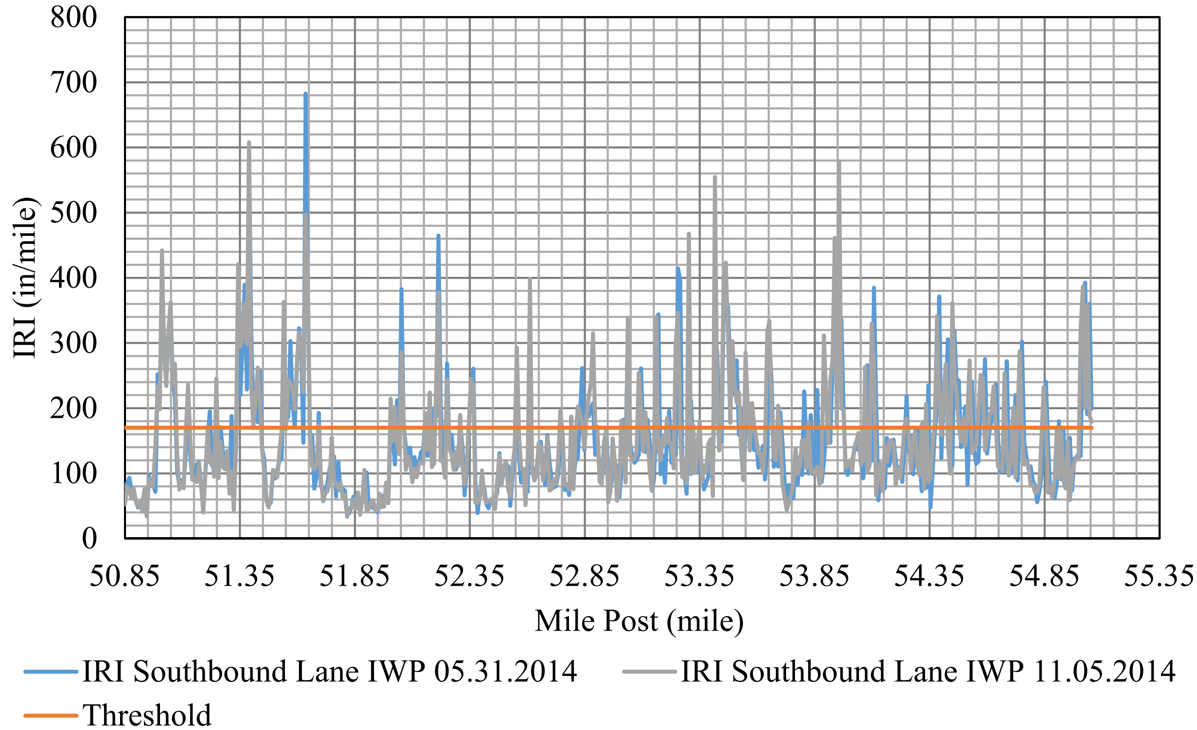

Figure 115: Southbound, Inside Wheel Path IRI Profiles for May and November 2014

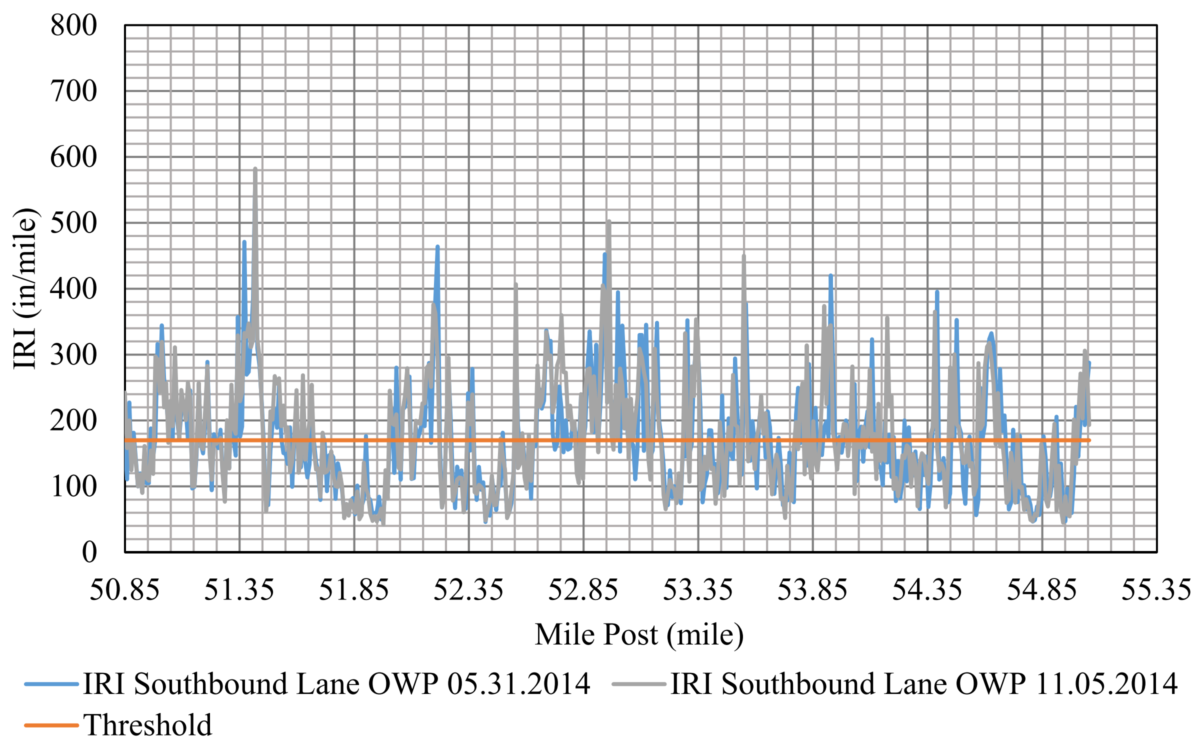

Figure 116: Southbound, Outside Wheel Path IRI Profiles for May and November 2014

LABORATORY RESULTS

Extensive laboratory work was performed to characterize subgrade soils along the Alabama 5 project site and determine their potential for volumetric change. Atterberg limits, *in situ* water contents, specific gravities, dry and moist densities and grain size distributions were determined experimentally for AASHTO and USCS classification and intermediate calculations. The results from one dimensional swell tests and soil water characteristic curves (SWCC) provide valuable information about the soil's capacity to undergo volumetric change and draw water from the surroundings. The SWCCs experimentally correlate volumetric water content to matric suction. Matric suction controls the loss or gain of water, when available, bring to water content of the soil into equilibrium with the relative humidity of the atmosphere and surrounding water sources. The one dimensional swell test indicates the percent strain a soil mass can undergo and the internal pressures created to achieve expansion at a specific water content. Ultimately the potential strains and swell pressure can be determined for a specific matric suction, via volumetric water content, and evaluated on the SWCC spectrum.

Soil Properties

Soil properties such as the Atterberg limits and specific gravities were determined for each boring location and soil layer. Figure 117 shows some of the Atterberg limits for clays on site. A complete summary can be found in the appendices. According to Holtz and Kovacs (1981), clays that plot near the U-line are in the montmorillonite family while soils near the A-line are a part of the illite family, Figure 6. Many of the soil specimens tested fall into this zone. However, a few of them fall closer to the A-line or in the middle. This indicates that the mineral composition of the soils may not be purely montmorillonite but still expansive in nature.

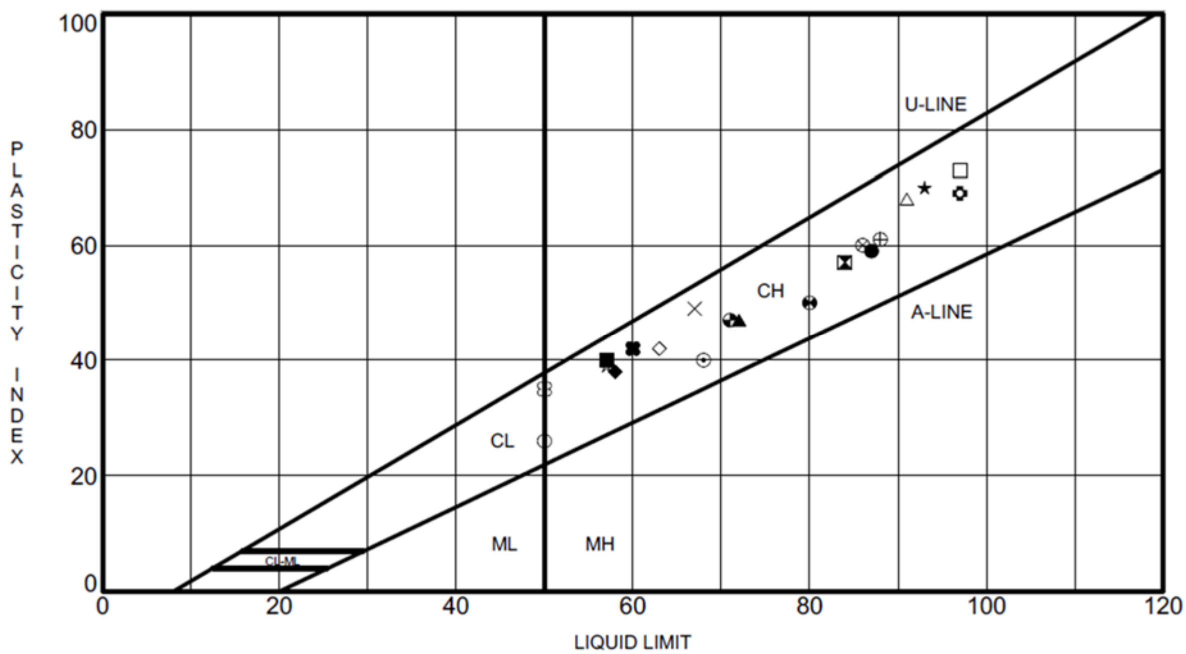

Figure 117: Atterberg Limits

Approximations of shear strength were developed using the Atterberg limits. Table 16 summarizes the estimated shear strength values based on EPRI Manual correlations presented in the Literature Review (Kulhawy and Mayne 1990). The correlations for estimated critical void ratio angle of internal friction and the estimated undrained shear strength are independent of each other and should be considered separately. While these estimates are not definitive and based on saturated conditions, they support the conclusion that the shear strength on site is very low.

Table 16: Summary of Correlated Shear Strength Based on EPRI Manual (Kulhawy and Mayne 1990)

Boring	Layer	Liquid Limit	Plastic Limit	Plasticity Index	Estimated Critical Void Ratio Angle of Internal Friction (deg)	Estimated Undrained Shear Strength (psf)
1.5 MP 51.10	1	66	24	42	26.66	118.9
	2	85	24	61	24.43	300.8
2.5 MP 51.60	1	84	26	58	24.73	145.4
	2	79	32	47	25.98	254.4
3.5 MP 52.10	1	68	28	40	26.95	115.6
	2	84	27	57	24.83	287.5
4.5 MP 52.60	1	68	28	40	26.95	115.6
	2	97	28	69	23.70	327.3
5.5 MP 53.10	1	86	26	60	24.53	148.7
	2	88	27	61	24.43	300.8
6.5 MP 53.60	1	71	24	47	25.98	127.2
	2	50	15	35	27.76	214.6
7.5 MP 54.10	1	67	18	49	25.73	130.5
	2	60	18	42	26.66	237.8

Table 17 summarizes the specific gravity result for each boring location and soil layer. While there are not any specific conclusions drawn from the specific gravity data, the information was frequently required for intermediate calculations.

Table 17: Specific Gravity Results

Boring/MP	Layer	Specific Gravity
1.5 MP 51.10	1	2.754
	2	2.617
2.5 MP 51.60	1	2.749
	2	2.724
3.5 MP 52.10	1	2.701
	2	2.737
4.5 MP 52.60	1	2.722
	2	2.726
5.5 MP 53.10	1	2.747
	2	2.696
Tree / 6.0 MP 53.35	1	2.597
	2	-
6.5 MP 53.60	1	2.686
	2	2.673
7.5 MP 54.10	1	2.720
	2	2.808

One Dimensional Swell

One-dimensional swell tests are performed to determine the percent free swell and swelling pressure of the soil. The free swell value indicates the measured percent strain at the end of primary swell under a 20 psf (1kPa) vertical pressure. If the specimens were allowed to swell for an infinitely long time, additional swell would occur in some specimens during secondary swell. This is partly due to the unequal rate of swelling through the cross-section of the specimen. The clays at AL5 in Perry County have a low hydraulic conductivity, meaning that the top and bottom of the specimen could possibly saturate and reach full swell potential before the center of the specimen. For this reason, swell tests were allowed to run until a fully developed primary swell or collapse curve was developed.

The swell pressure represents the vertical pressure required to produce zero strain when the soils are inundated. Over burden pressures greater than the swell pressure will result in collapse and lower pressures will result in swell if water is added. For each soil layer and location, the moist unit weight was determined from undisturbed samples. Table 18 summarizes the one dimensional swell test results at each boring location and layer.

Table 18: Summary of One-Dimensional Swell Results

Boring	Layer	Free Swell (% Strain)	Swell Pressure (psf)	Moist Unit Weight (pcf)	Approximate Depth to Overburden/Swell Equilibrium (ft)
1.5 MP 51.10	1	1.51	736.0	115.0	6.4
	2	*	1250.8	116.3	10.8
2.5 MP 51.60	1	*	912.5	118.8	7.7
	2	0.98	1588.8	119.4	13.3
3.5 MP 52.10	1	0.75	1015.5	114.4	8.9
	2	0.78	1033.9	110.0	9.4
4.5 MP 52.60	1	1.61	1069.4	113.1	9.5
	2	1.49	832.0	112.5	7.4
5.5 MP 53.10	1	*	511.7	113.1	4.5
	2	1.85	1356.6	116.9	11.6
Tree/6.0 MP 53.35	1	0.9	597.1	110.6	5.4
	2	0.79	1311.4	118.8	11.0
6.5 MP 53.60	1	0.57	570.5	115.6	4.9
	2	0.48	214.8	118.1	1.8
7.5 MP 54.10	1	*	621.2	121.3	5.1
	2	1.30	709.0	121.9	5.8

* Information cannot be determined due to error in volume measurements

At each of the boring locations, the swell pressure of layer 2 is greater than the swell pressure of layer 1, except for B6.5 which classifies as a clayey sand rather than a fat clay. Layer 1 swell pressures ranged from 508. psf to 1081.5 psf, and layer 2 swell pressures ranged from 207.8 psf to 1560.4 psf. In general layer 1 soils were at a higher water content, and therefore lower matric suction, than layer 2 soils, except for B3.5. As the matric suction decreases the corresponding swell pressure should also decrease and as the matric suction increases the corresponding swell pressure should increase (Tu and Vanapalli 2016). According to Fredlund et al. (1980), "the 'corrected' swell pressure, P_s', equals the sum of the *in situ* net normal stress, $(\sigma_y - u_a)_{field}$, and the 'matric suction equivalent,' $(u_a - u_w)_e$, where σ_y is the total overburden pressure, u_a is the pore-air pressure, and u_w is the pore water pressure" (as cited in Tu and Vanapalli 2016). Thus, the reported swell pressures should be viewed as a single point on a spectrum of potential swell pressures according to the soils density, initial water content and matric suction. Figure 118 depicts the stress paths of a given soil mass to help visualize the relationship between matric suction, net normal stress and swell pressure.

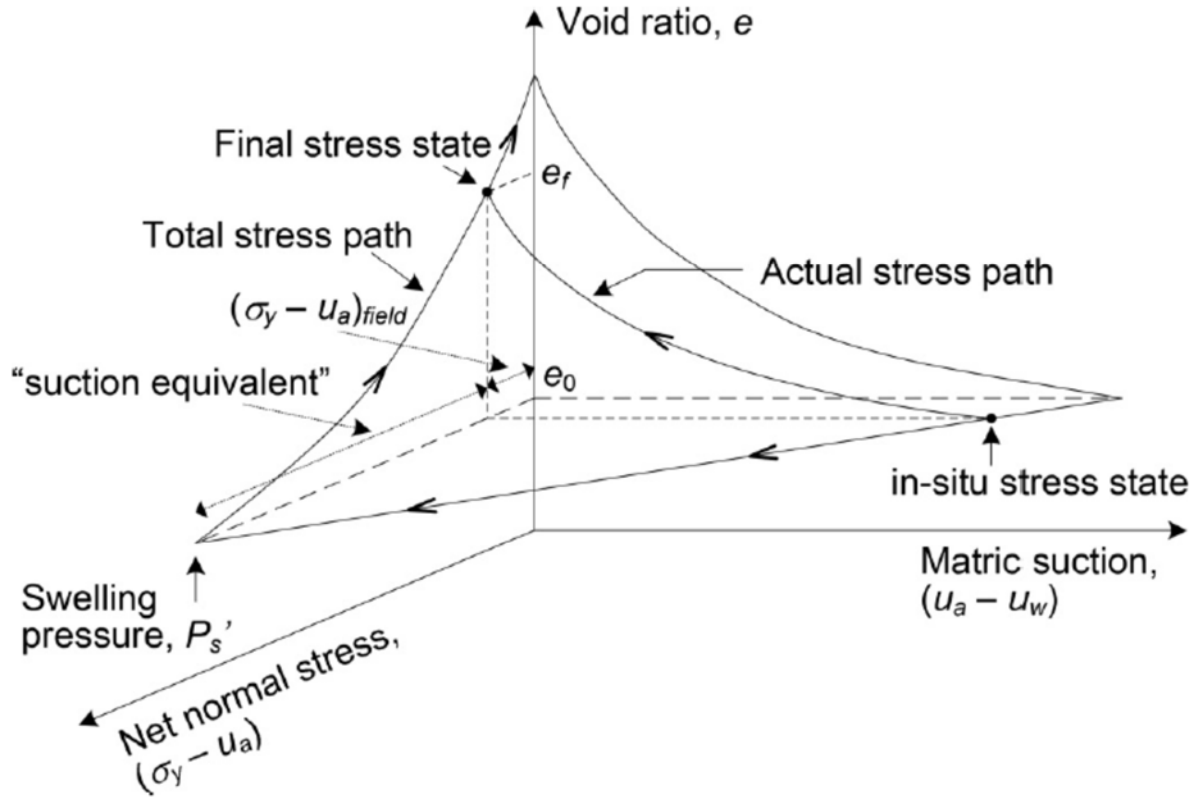

Figure 118: Stress paths of 1-Dimensional Swelling (Tu and Vanapalli 2016)

Using the swell pressure and moist unit weight of undisturbed samples the depth to overburden/swell equilibrium was calculated for each layer with the Equation 20.

$$D_{O/S} = \frac{P_s}{\gamma_m} \tag{20}$$

where:

$D_{O/S}$ is the approximate depth of overburden/swell equilibrium

P_s is the swell pressure

γ_m is the moist unit weight

This depth represents how much soil overburden with the same moist unit weight as the sample would be required to prevent the swelling of lower layers. Table 18 and Table 19 include the approximate depth to overburden swell pressure equilibrium. Soils above the equilibrium depth may be subject to significant swell/shrinkage depending on the loading conditions and availability of water. This region is the active zone. The active zone may be limited to shallower depths depending on the hydraulic conductivity of the soil and availability of water. Potentially compounding this issue is the documented hydraulic lift effects presented by Dawson (1996), which allows large trees to draw water from deep roots and recharge shallower soils for transpiration. Soils below the equilibrium depth will not undergo swell; instead they will consolidate. If the overburden pressures are relieved either through excavation or sampling the soils will undergo some swelling that cannot be accounted for with this laboratory procedure. It is important to recognized that while the *insitu* moisture content of these specimens are close to saturation, the associated swelling pressures and strains are capable of causing significant pavement damage. The moisture content and saturation data has been summarized in Table 19. Except where noted the saturation of specimens is an average of the saturation for four or more swell specimens. In a few cases swell specimens were not trimmed completely flush with the specimen ring. Because a discrepancy in the height measurement as little as 0.01 inch is sufficient to invalidate the percent saturation calculations, data with this error has not been reported.

Table 19: Summary of Water Content and Saturation of Swell Test Specimens

Boring/MP	Layer	Free Swell (% Strain)	Approximate Depth to Overburden/Swell Equilibrium (feet)	Moisture Content of Specimens (%)	Degree of Saturation (%)
1.5 MP 51.10	1	1.51	6.4	36.97	95
	2	*	11.2	32.93	*
2.5 MP 51.60	1	*	7.8	31.92	*
	2	0.98	13.1	29.21	93
3.5 MP 52.10	1	0.75	9.1	38.59	99
	2	0.78	9.8	41.48	96
4.5 MP 52.60	1	1.61	9.6	38.81	97
	2	1.49	7.3	32.68	88
5.5 MP 53.10	1	*	7.7	39.64	94 ***
	2	1.85	11.9	33.25	95
Tree/6.0 MP 53.35	1	0.9	5.6	39.55	94
	2	0.79	11.6	32.24	97 **
6.5 MP 53.60	1	0.57	4.4	28.15	87
	2	0.48	1.8	28.77	90 ***
7.5 MP 54.10	1	*	5.0	29.20	97 **
	2	1.30	5.8	27.84	97

* Information not available
** Average of two data sets
***Average of three data sets

In contrast, the potential for these soils to shrink is equally significant. These specimens are approaching saturation making the maximum potential volumetric change in the negative direction. Further testing in the form of shrinkage limits is recommended to determine the maximum shrinkage possible. Shrinkage is likely to occur during periods of drought such that the moisture losses due to evapotranspiration exceed precipitation. Ultimately, pavement damage due to expansive clays is not the result of swollen or desiccated soils in and of themselves, but rather the cyclic transition between the two states.

Figures 119 through 134 show the one dimensional swell results for each boring location and soil layer. As previously mentioned, the swell results are composed of four or more swell tests performed at different vertical stresses.

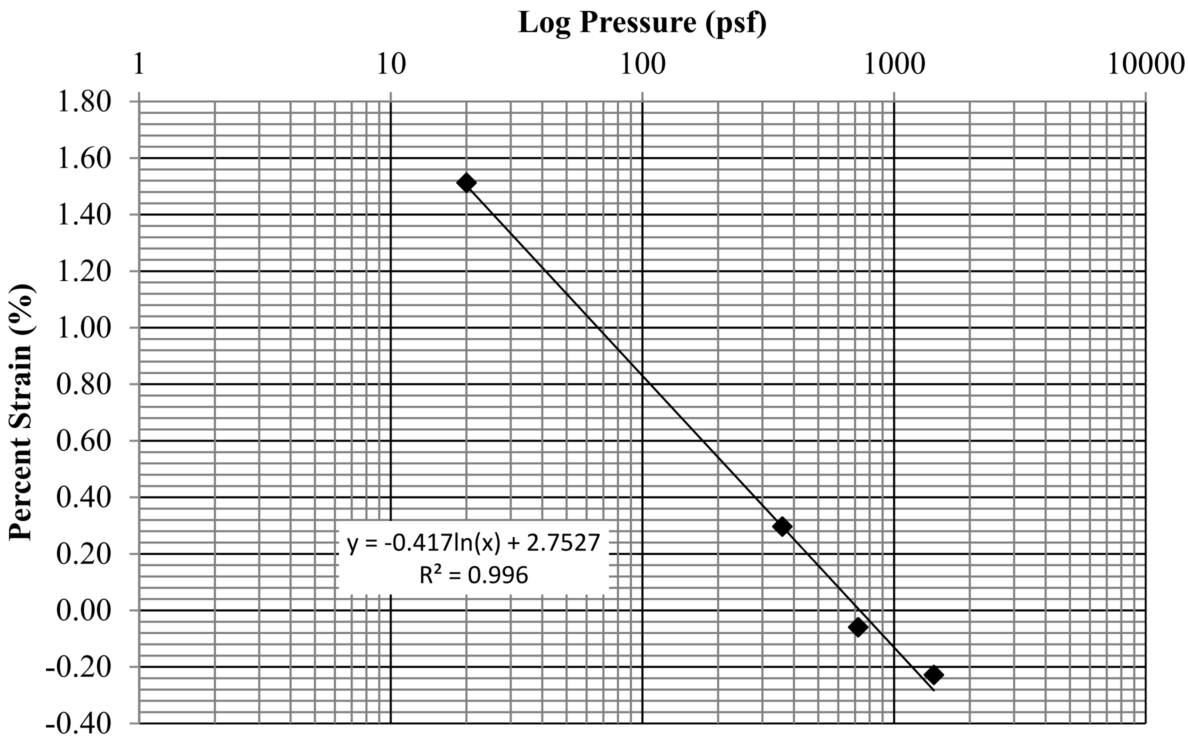

Figure 119: Boring 1.5 Layer 1 Swell Pressure (736.0 psf)

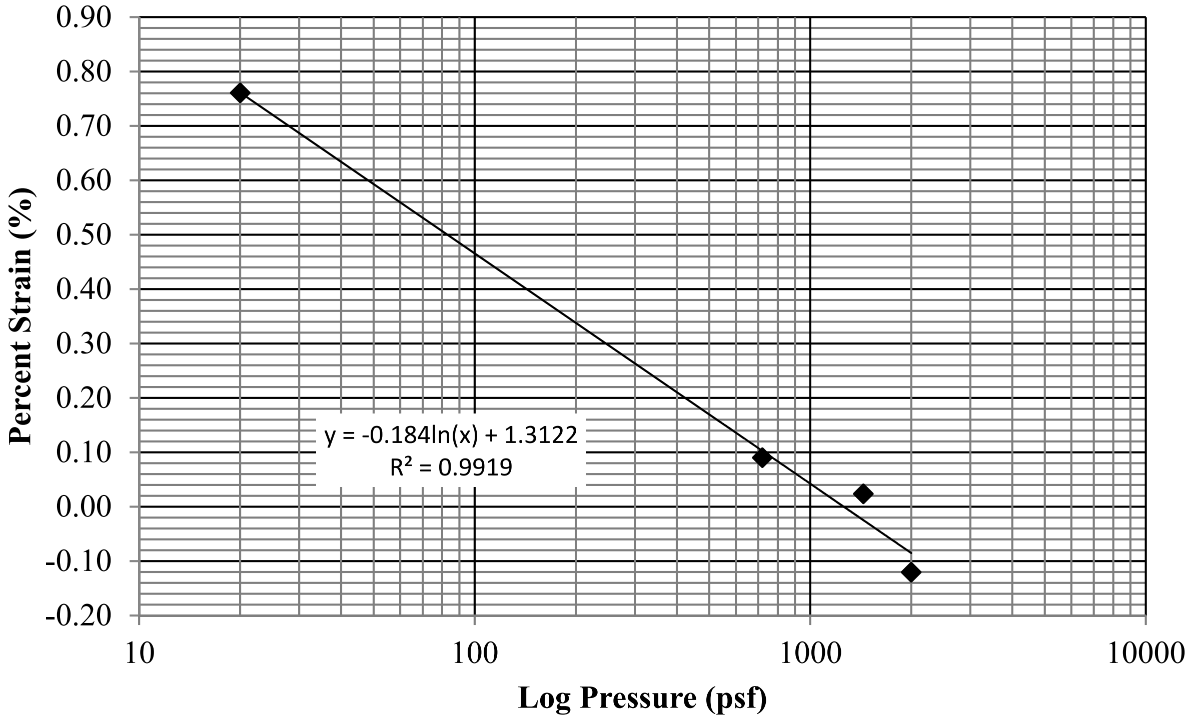

Figure 120: Boring 1.5 Layer 2 Swell Pressure (1250.8 psf)

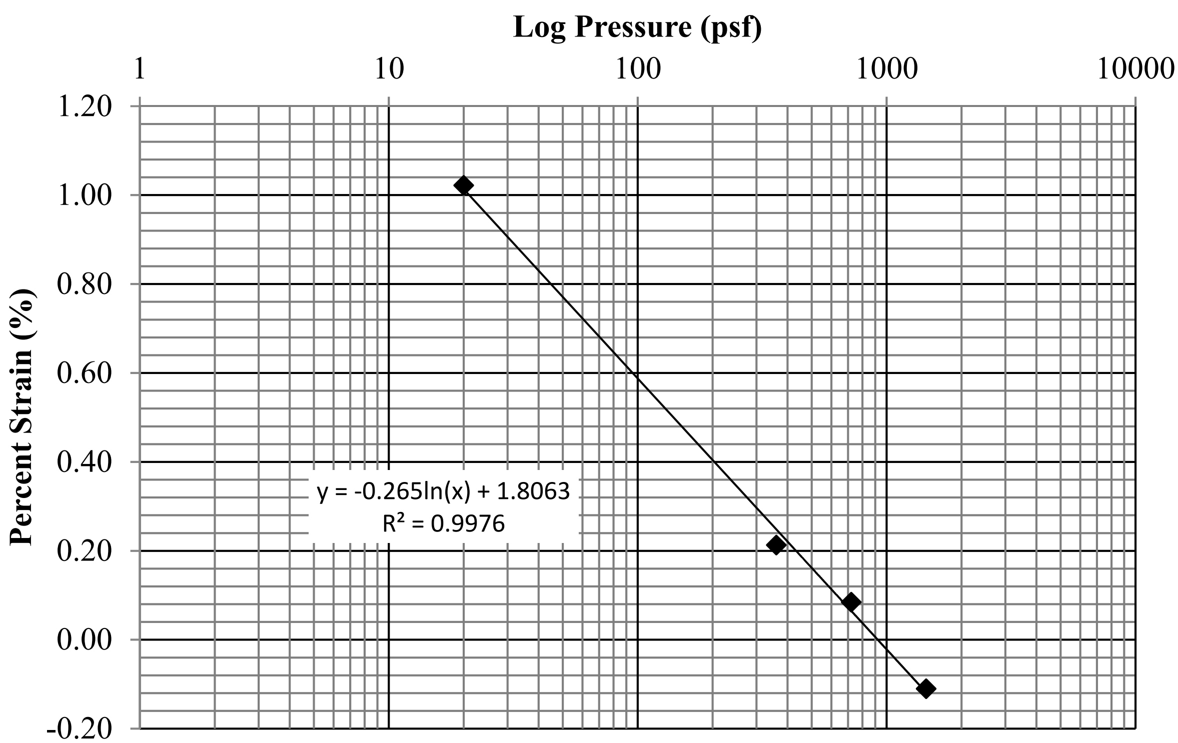

Figure 121: Boring 2.5 Layer 1 Swell Pressure (912.5 psf)

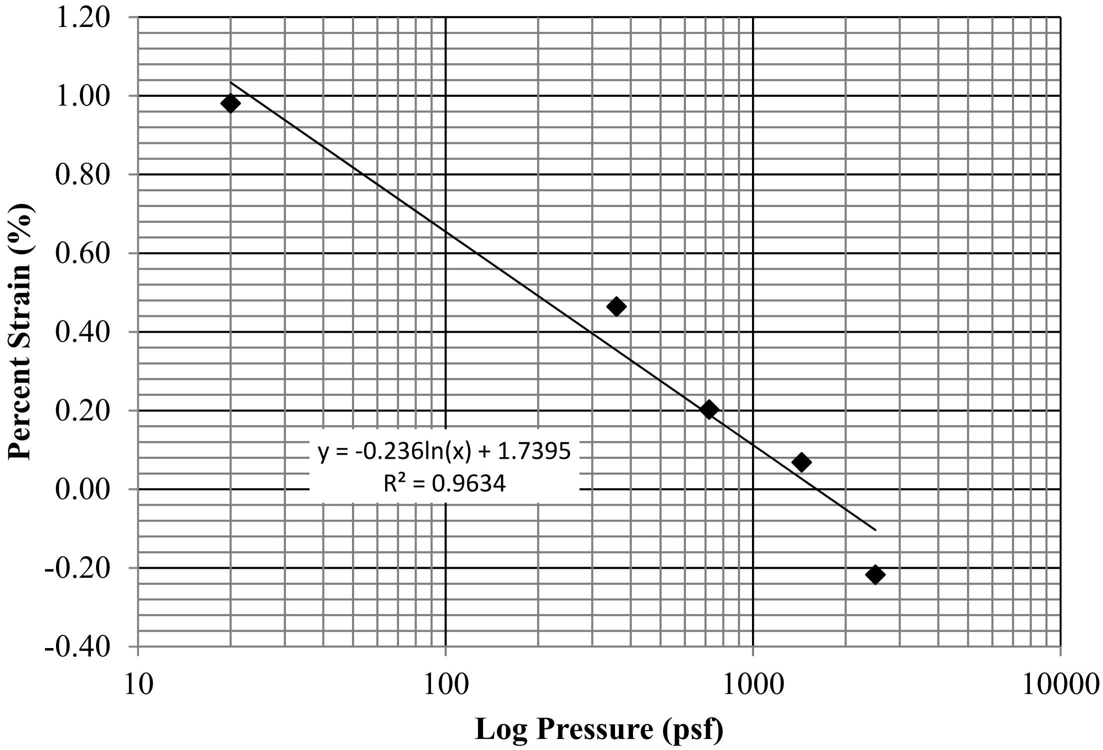

Figure 122: Boring 2.5 Layer 2 Swell Pressure (1588.8 psf)

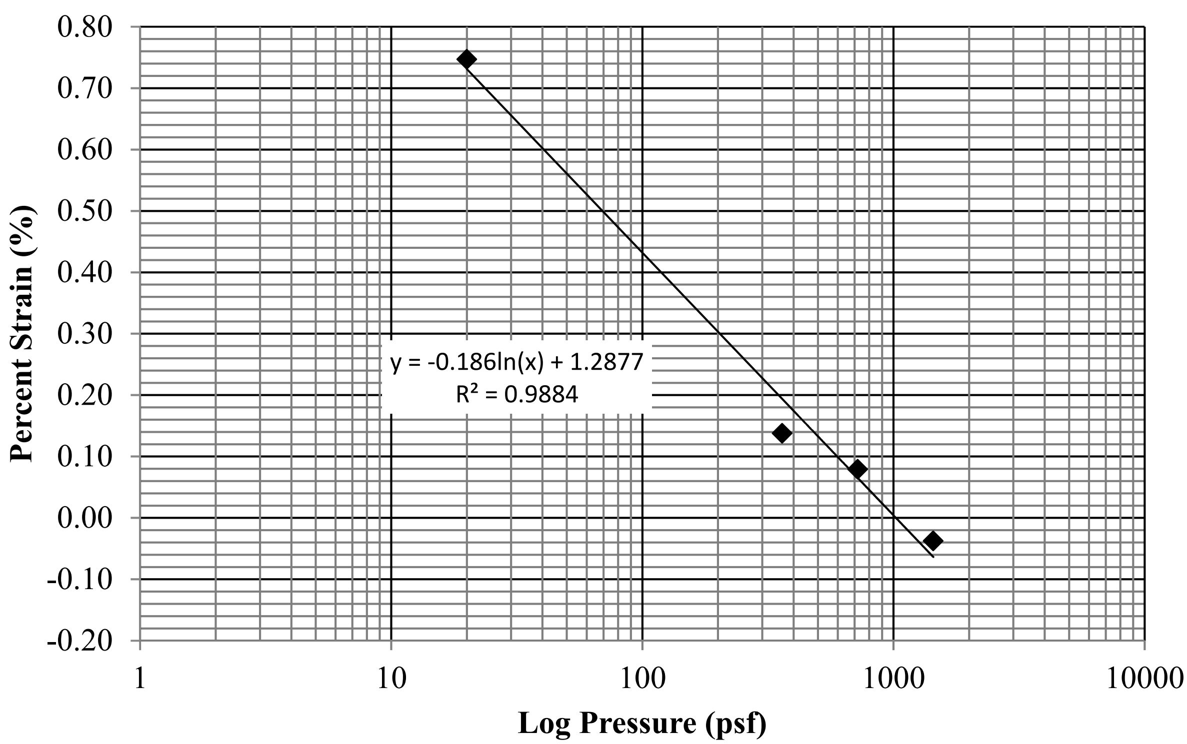

Figure 123: Boring 3.5 Layer 1 Swell Pressure (1015.5 psf)

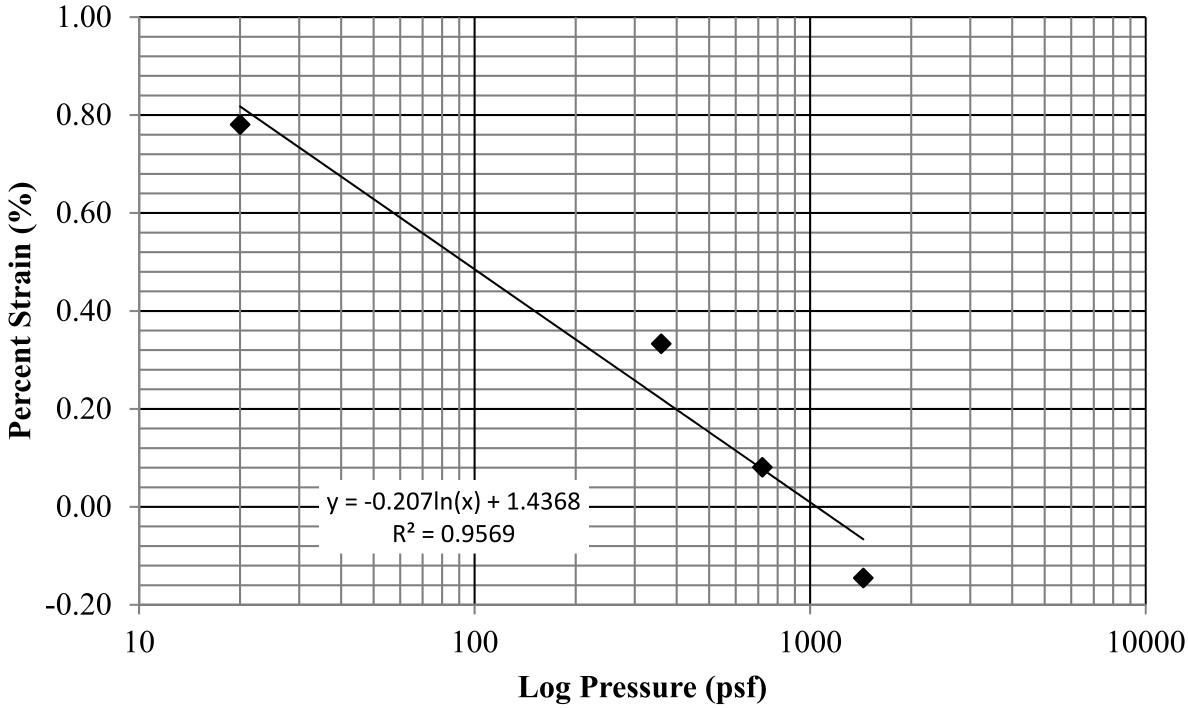

Figure 124: Boring 3.5 Layer 2 Swell Pressure (1033.9 psf)

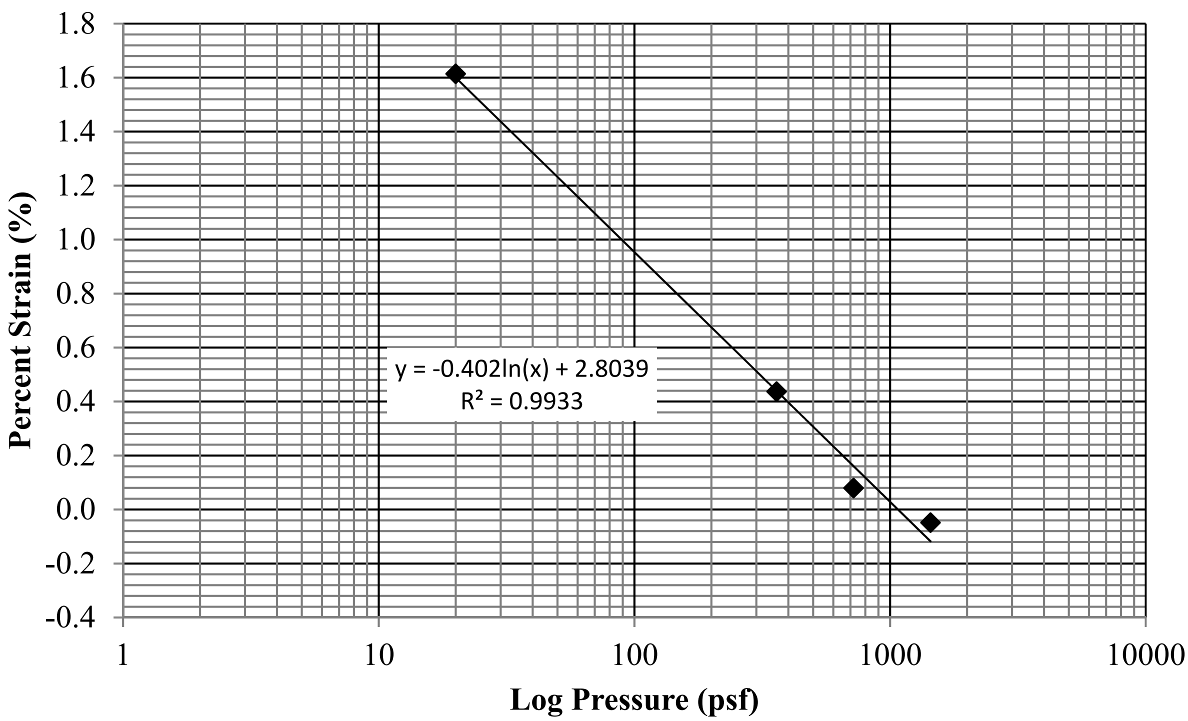

Figure 125: Boring 4.5 Layer 1 Swell Pressure (1069.4 psf)

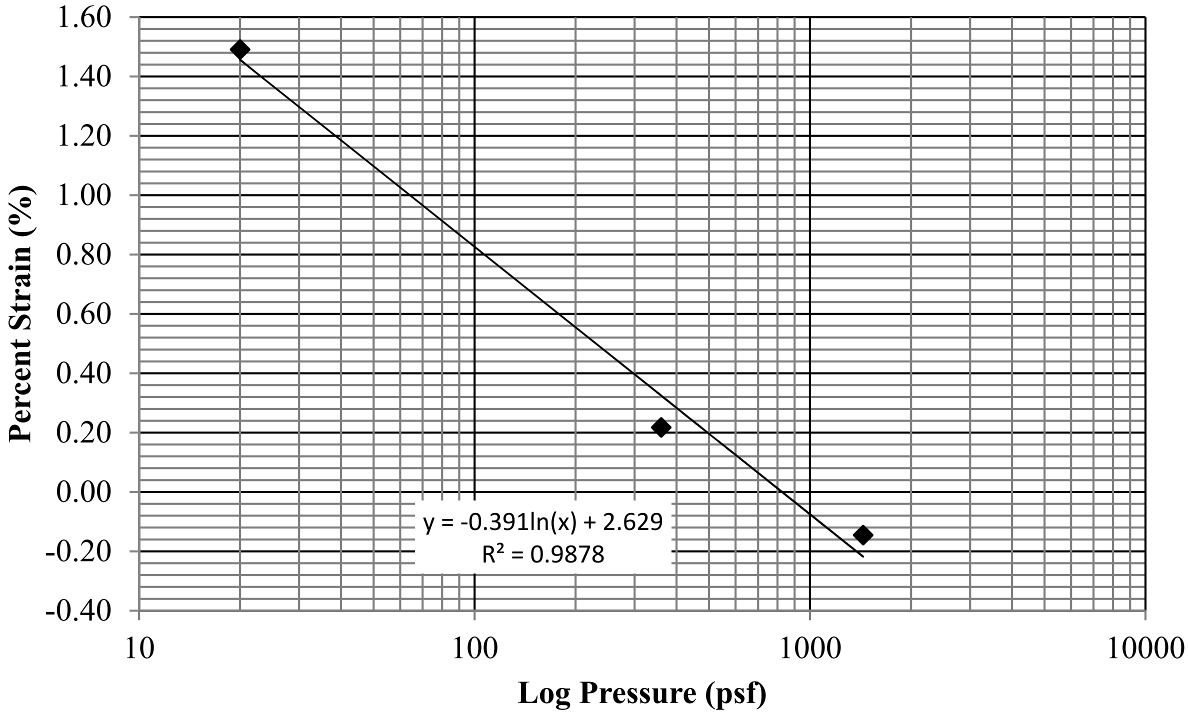

Figure 126: Boring 4.5 Layer 2 Swell Pressure (832.0 psf)

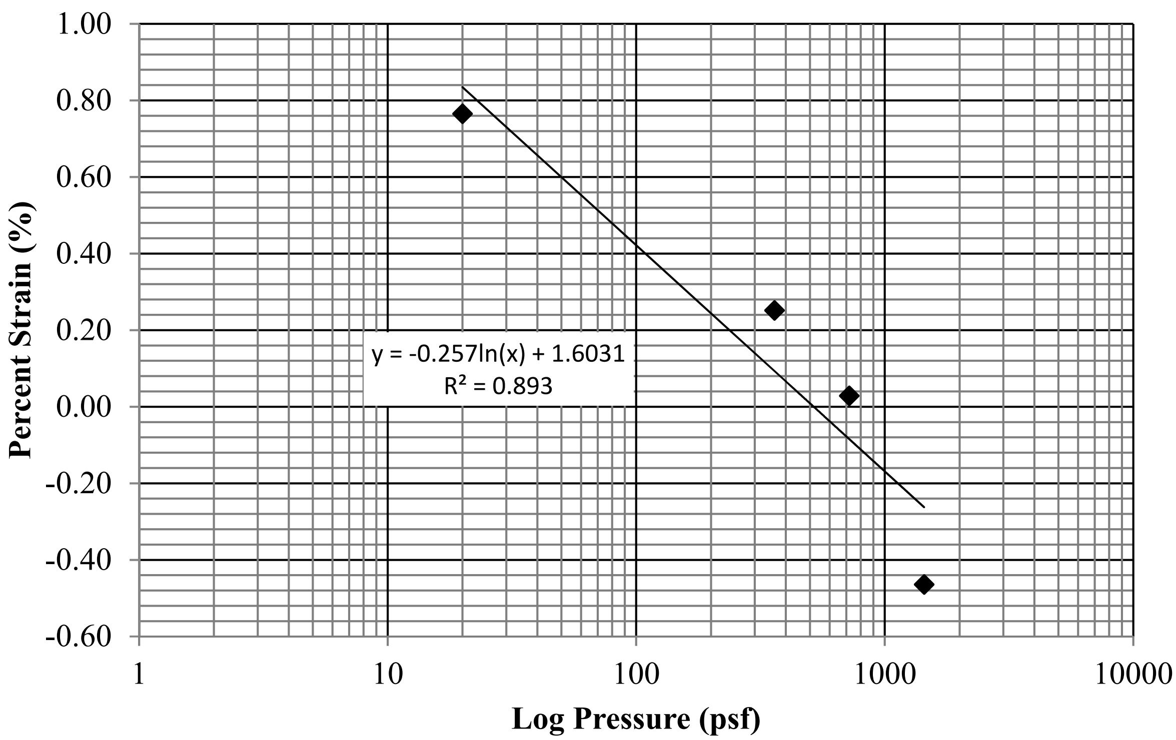

Figure 127: Boring 5.5 Layer 1 Swell Pressure (511.7 psf)

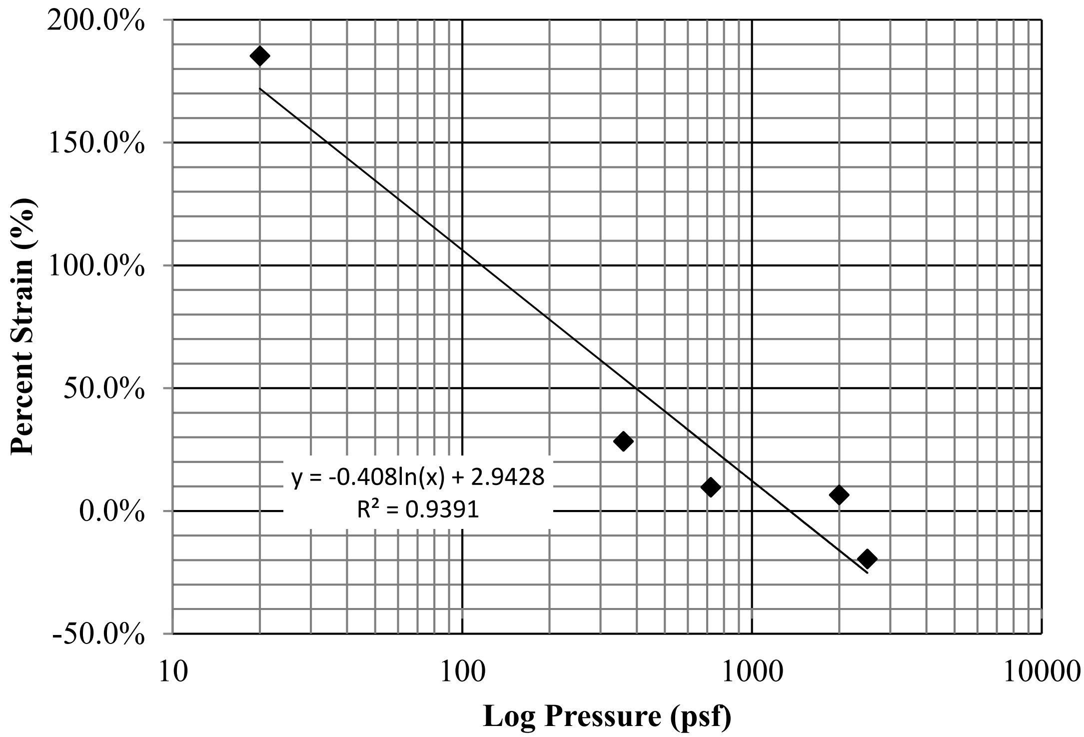

Figure 128: Boring 5.5 Layer 2 Swell Pressure (1356.6 psf)

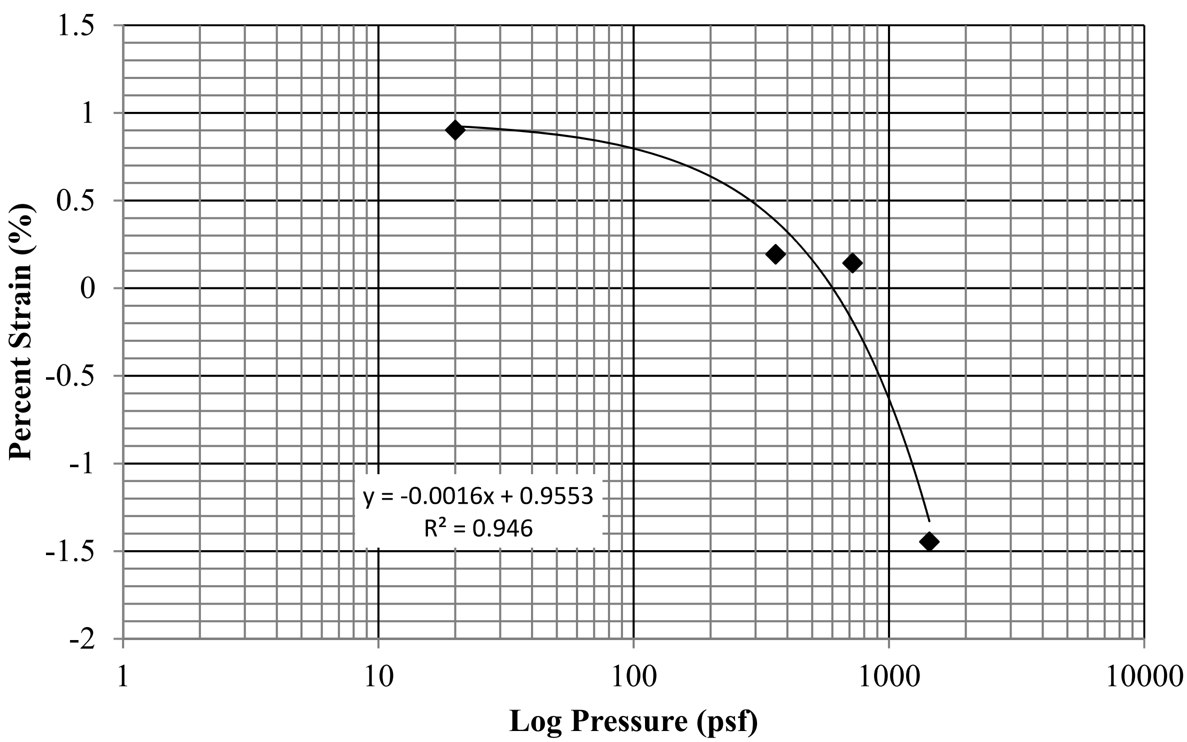

Figure 129: Boring Tree Layer 1 Swell Pressure (597.1 psf)

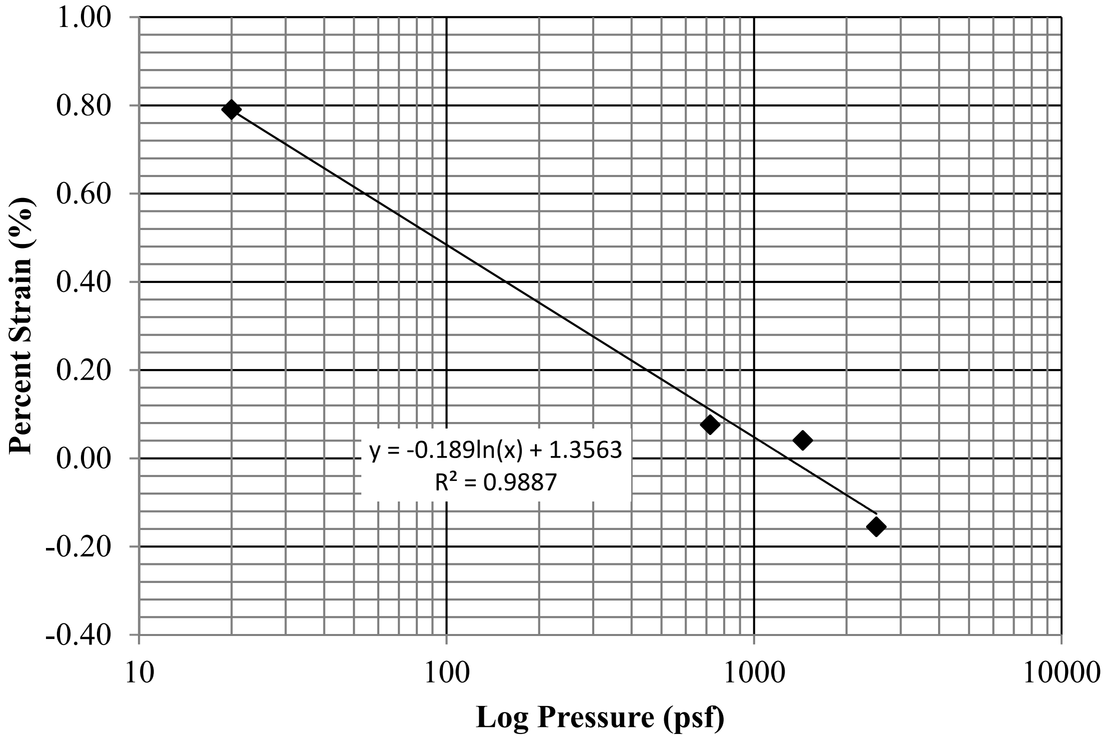

Figure 130: Boring Tree Layer 2 Swell Pressure (1311.4 psf)

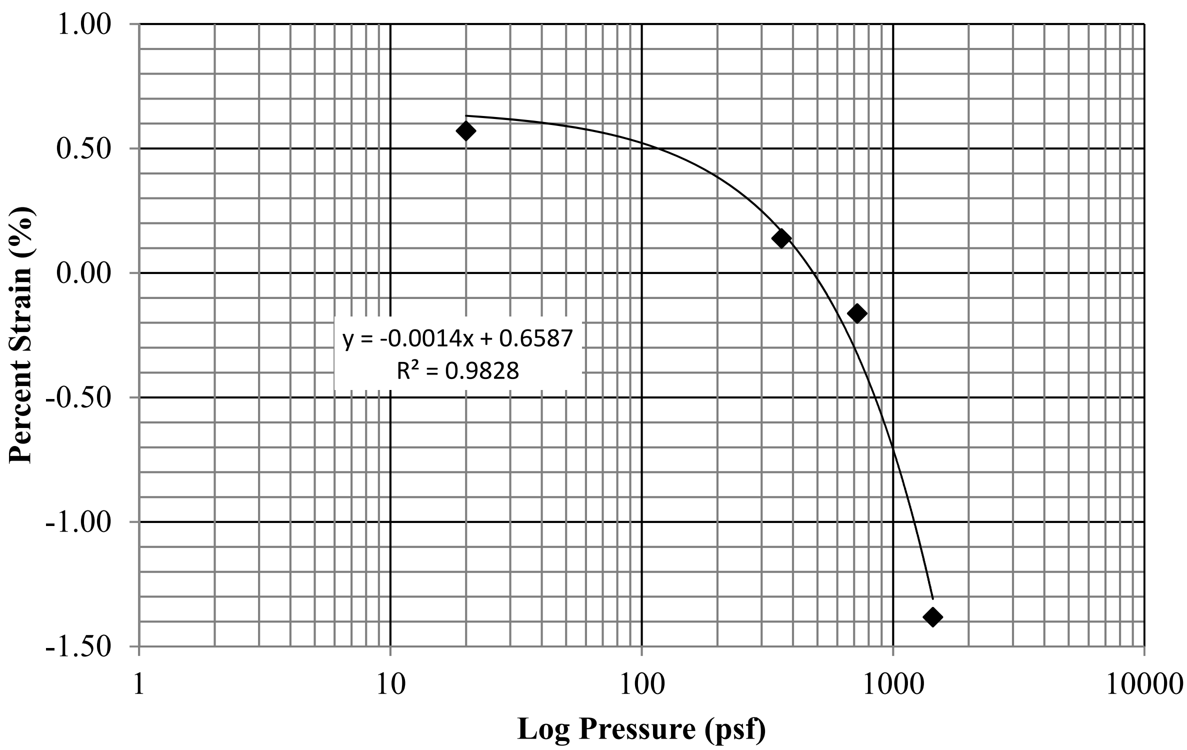

Figure 131: Boring 6.5 Layer 1 Swell Pressure (570.5 psf)

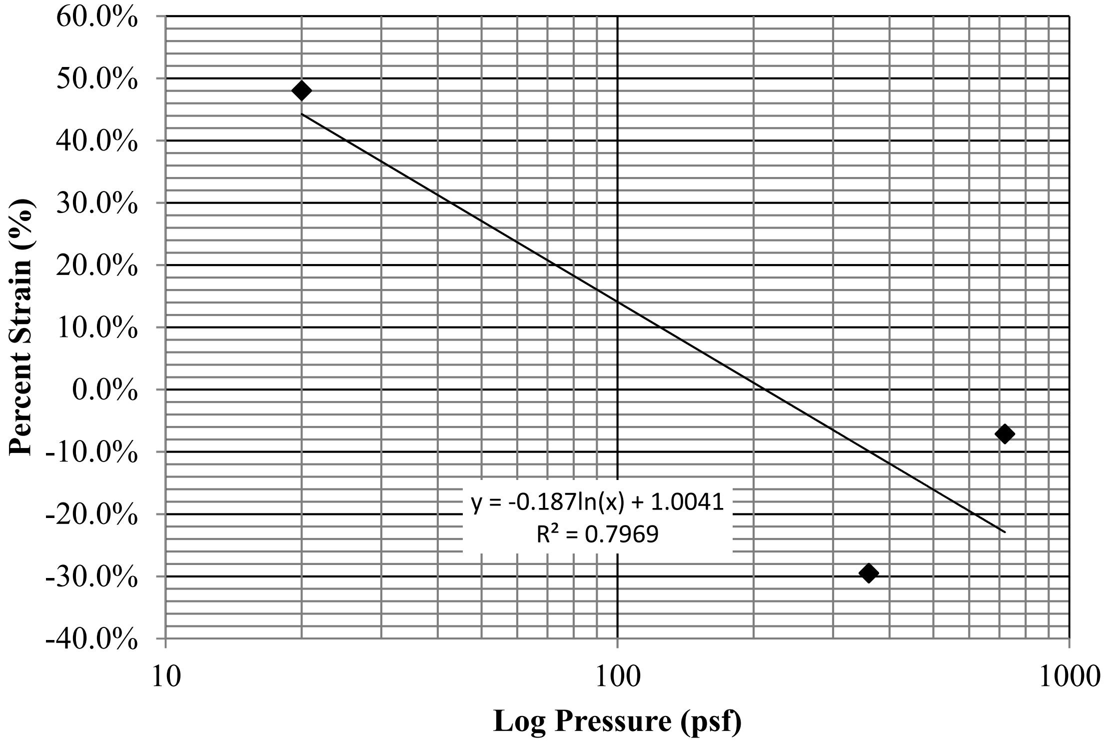

Figure 132: Boring 6.5 Layer 2 Swell Pressure (214.8 psf)

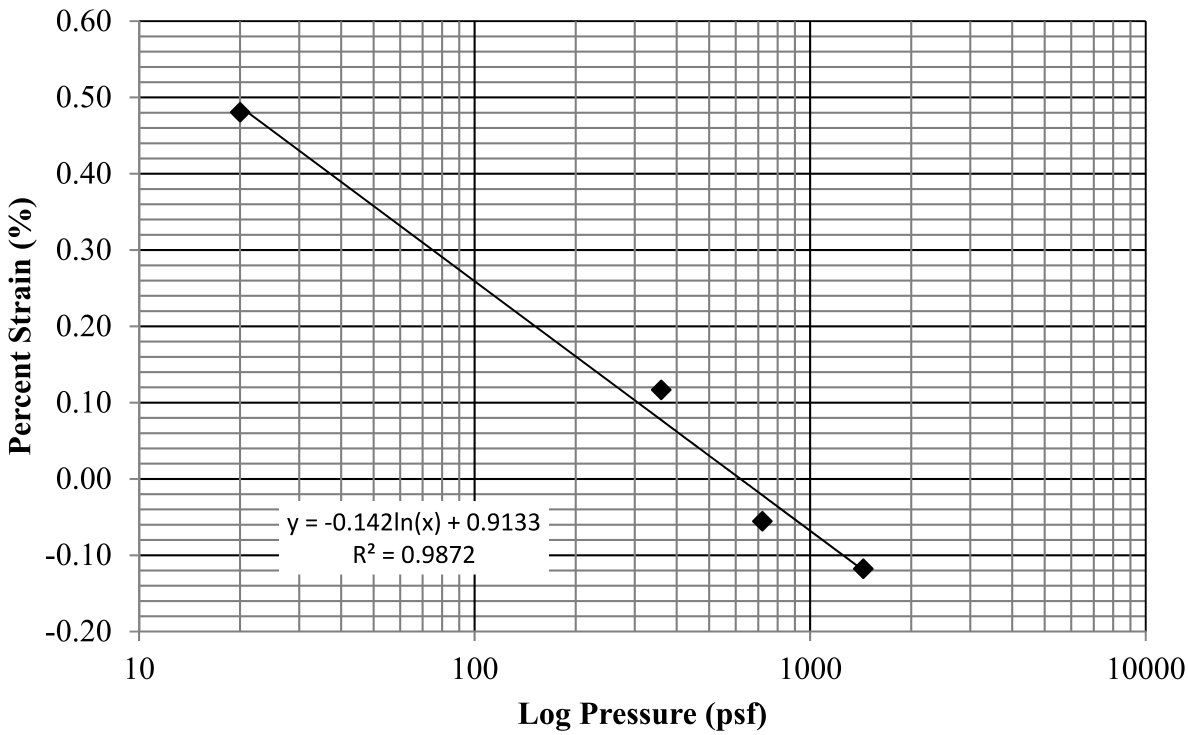

Figure 133: Boring 7.5 Layer 1 Swell Pressure (621.2 psf)

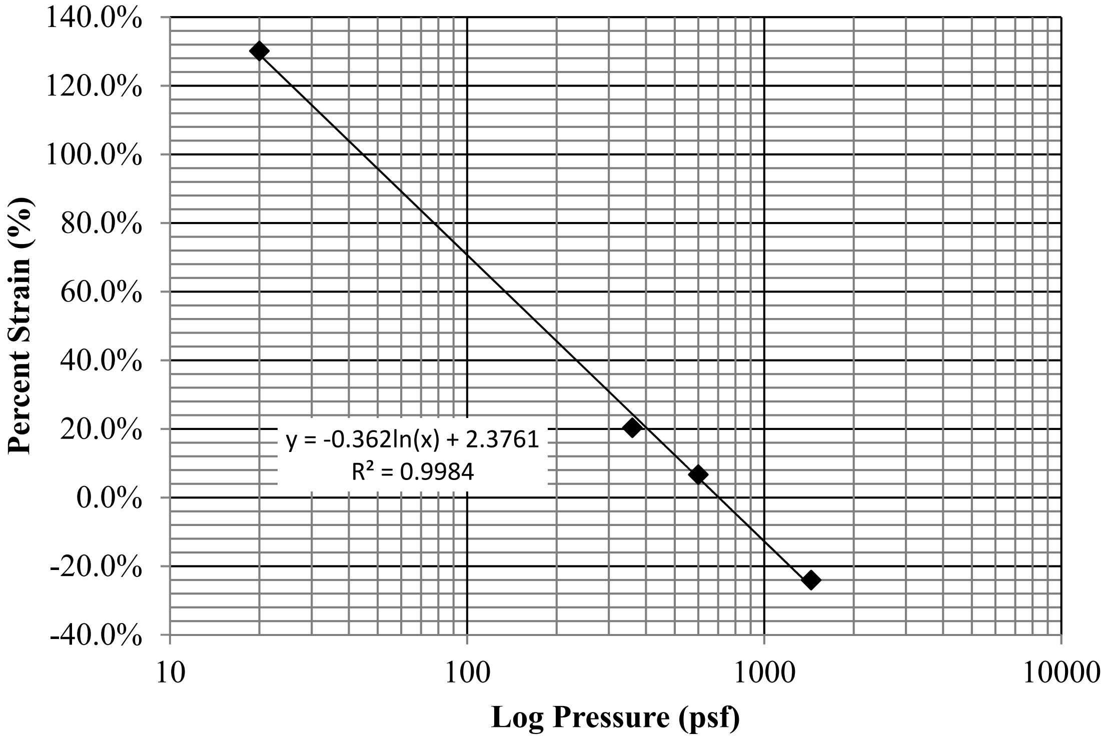

Figure 134: Boring 7.5 Layer 2 Swell Pressure (709.0 psf)

Soil Water Characteristic Curves

Soil water characteristic curves were developed for each boring location and soil layer using remolded samples. Each specimen was prepared at a different water content and allowed to come into equilibrium with filter paper. During the 2015 sample collection, additional undisturbed samples were collected and tested using the filter paper method for a limited number of boring locations and layers. The SWCCs for each boring and soil layer are presented in Figure 135 through Figure 148 at the end of this section. This undisturbed data has been plotted on the SWCC to demonstrate correlation between the remolded soil water characteristic curves and the *in situ* soils. The same filter paper calibration equation was used to calculated total suction for the *in situ* specimens as the remolded specimens. However, the *in situ* data was not considered in the trend line or regression equation.

Table 20 is a summary of all the SWCC regression equations and the corresponding total suction of the trimmed swell specimens. Each boring location and soil layer will have a unique SWCC. However, because of the time and expense required to produce unique curves for a site most researchers and geotechnical practitioners use standard curves such as those presented by Zapata et al. (2000). The primary limitation of the filter paper method is in the extreme water content ranges. Whether the soil is approaching 0% saturation or 100% saturation, the ability of the filter paper to accurately measure suction is greatly reduced. To accurately produce SWCC in these ranges pressure plate testing must be performed. For this reason, standard curves are also useful. If unique curves can be created over a range of expected *in situ* water contents, then a standard curve can be fit to the data to predict the dry or saturated suction values.

Table 20: Summary of SWCC Regression Equations and Total Suction of Swell Specimens

Boring	Layer	SWCC Regression Equation (Power)	R^2	Gravemetric Moisture Content from Trimmed Swell Samples (%)	Volumetric Moisture Content from Trimmed Swell Samples (%)	Total Suction of Trimmed Swell Samples (psf)
1.5	1	$y = 4x10^9(x)^{-3.412}$	0.9844	36.97	54.64	4,716
	2	$y = 7x10^{11}(x)^{-4.894}$	0.9412	32.93	48.67	3,868
2.5	1	$y = 1x10^{11}(x)^{-4.318}$	0.9513	31.92	47.18	5,925
	2	$y = 5x10^9(x)^{-3.694}$	0.9684	29.21	43.17	4,554
3.5	1	$y = 4x10^{11}(x)^{-4.706}$	0.9194	38.59	57.04	2,175
	2	$y = 2x10^{11}(x)^{-4.329}$	0.8998	41.48	61.31	3,654
4.5	1	$y = 8x10^{10}(x)^{-4.211}$	0.9495	38.81	57.36	3,144
	2	$y = 1x10^{10}(x)^{-3.917}$	0.9801	32.68	48.30	2,534
5.5	1	$y = 1x10^9(x)^{-2.971}$	0.8272	39.64	58.59	5,595
	2	$y = 6x10^6(x)^{-1.699}$	0.7525	33.25	49.15	8,022
6.5	1	$y =9x10^8(x)^{-3.457}$	0.8679	28.15	41.61	2,274
	2	$y = 2x10^8(x)^{-3.164}$	0.9108	28.77	42.52	1,406
7.5	1	$y = 2x10^{10}(x)^{-4.006}$	0.9105	29.20	43.16	5,635
	2	$y = 3x10^{10}(x)^{-4.204}$	0.9727	27.84	41.15	4,901

In every case, except for boring B6.5 which has a significant amount of sand, the maximum total suction measured by the filter paper method was greater than 100,000 psf. All of the *in situ* and trimmed swell specimens had suction values less than 15,000 psf due to their high volumetric water contents. This information correlates with the earlier one-dimensional swell discussion in that the *in situ* conditions at the time of sampling was approaching maximum swell potential and had comparatively small suction values. At these volumetric water contents, the soils potential for desiccation, shrinkage, and increasing suction values is very great provided the right climatic conditions.

Vegetation draws water from the surrounding soils by applying an additional suction pressure to the pore water. The SWCCs only describe the pore-water potential of the soils and transpiration suction values must be added to the soil water suction. As a result, the *in situ* suction values within the zone of influence of a large tree have the potential to be extremely high. By applying a suction greater than the soil water potential vegetation is able to draw water towards itself and consequently out from underneath the pavement surface.

Figure 135 through Figure 148 show the unique SWCCs for each boring location and soil layer.

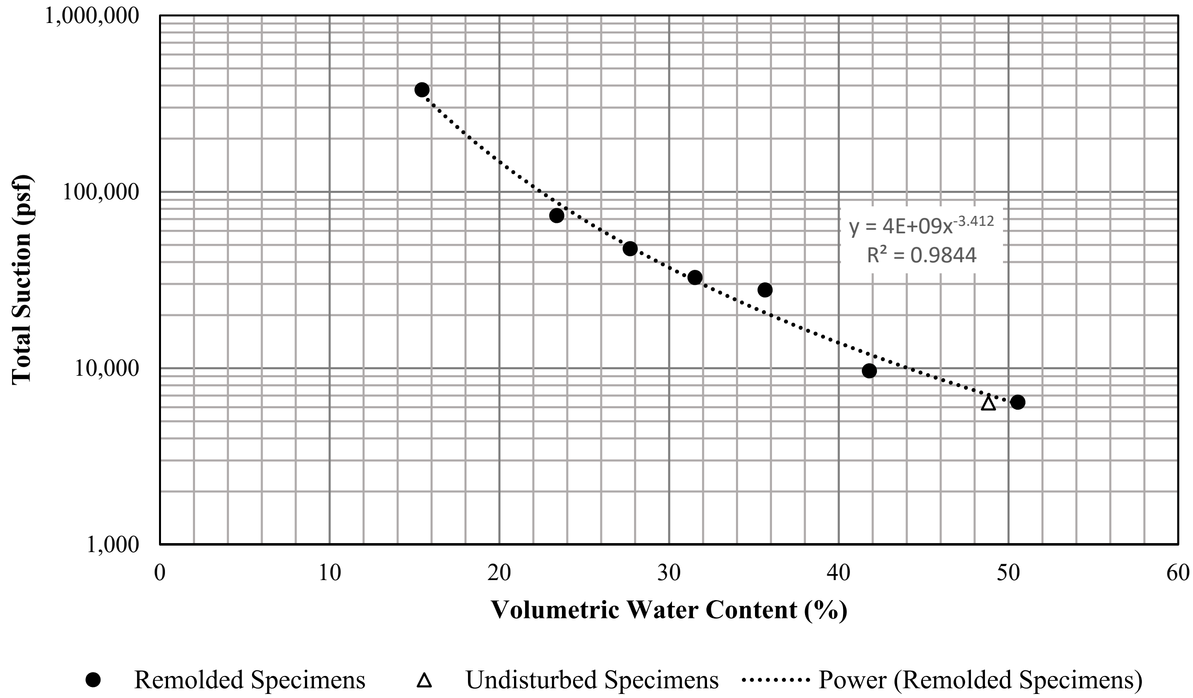

Figure 135: Boring 1.5 Layer 1 SWCC

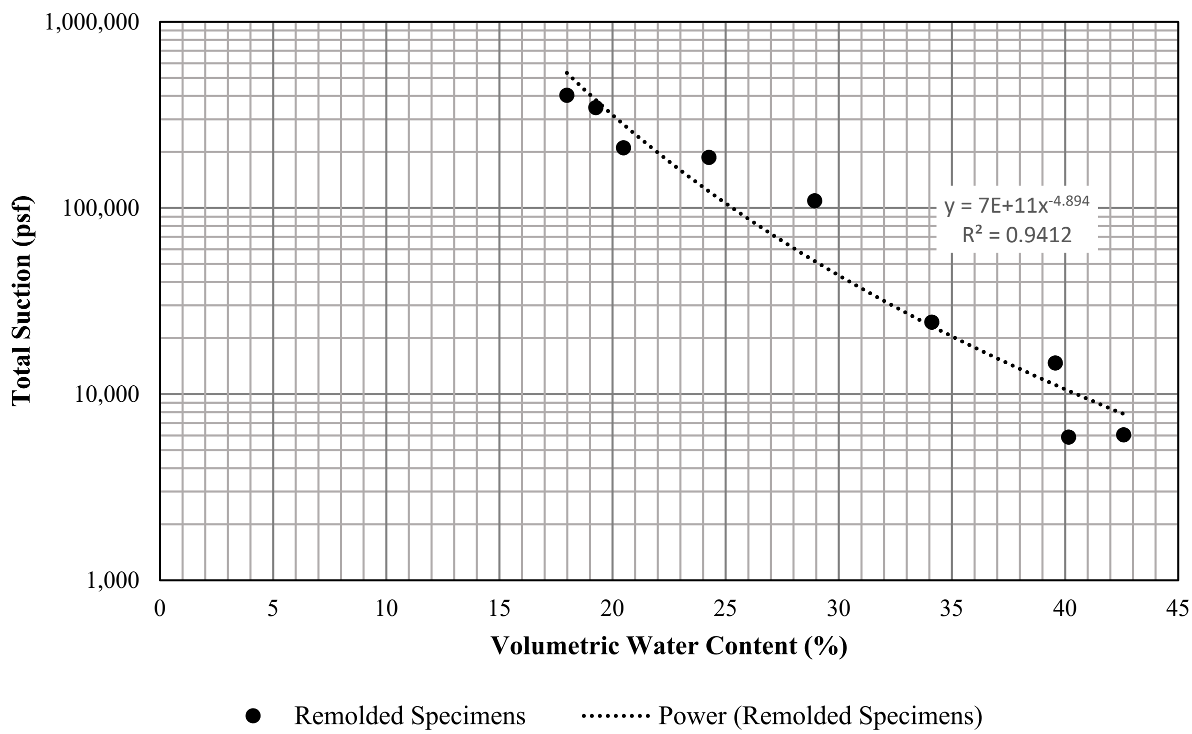

Figure 136: Boring 1.5 Layer 2 SWCC

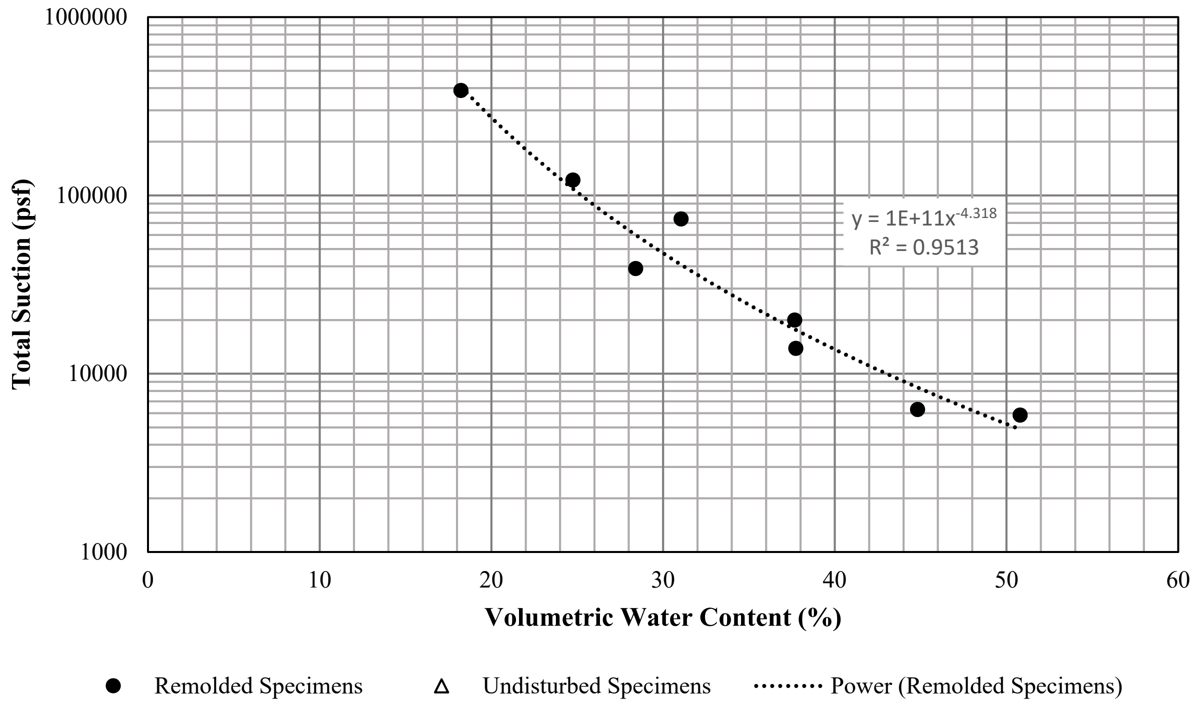

Figure 137: Boring 2.5 Layer 1 SWCC

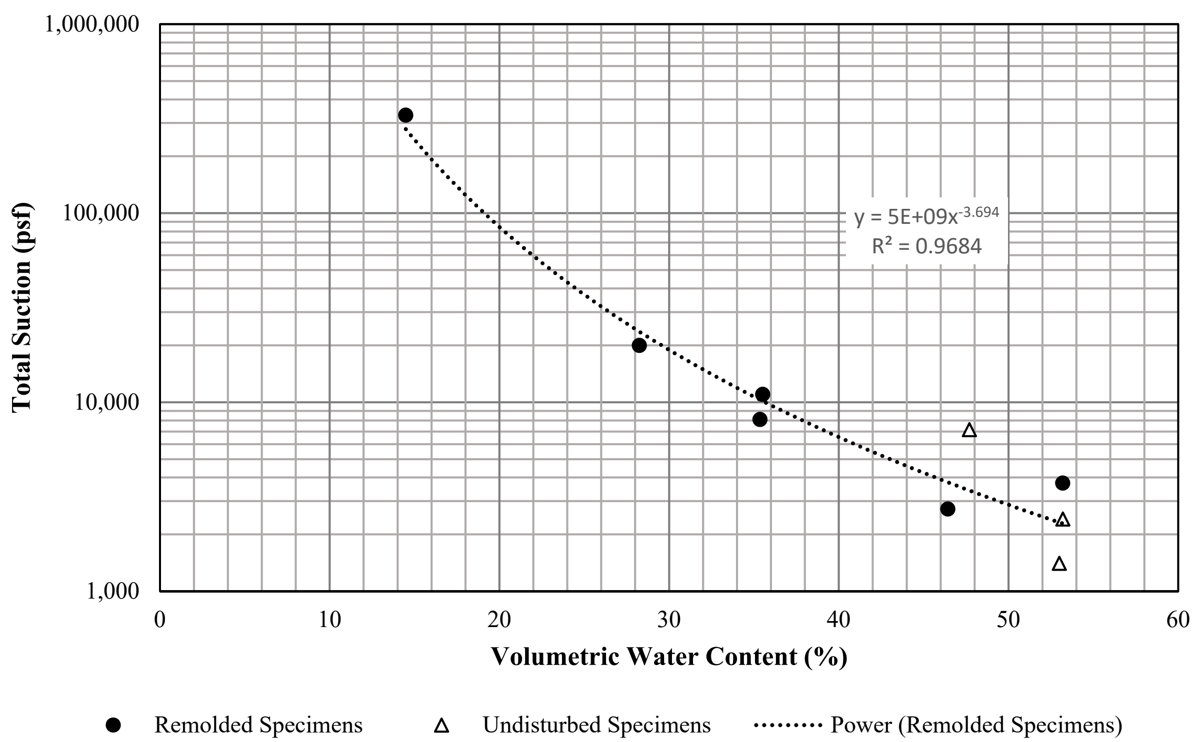

Figure 138: Boring 2.5 Layer 2 SWCC

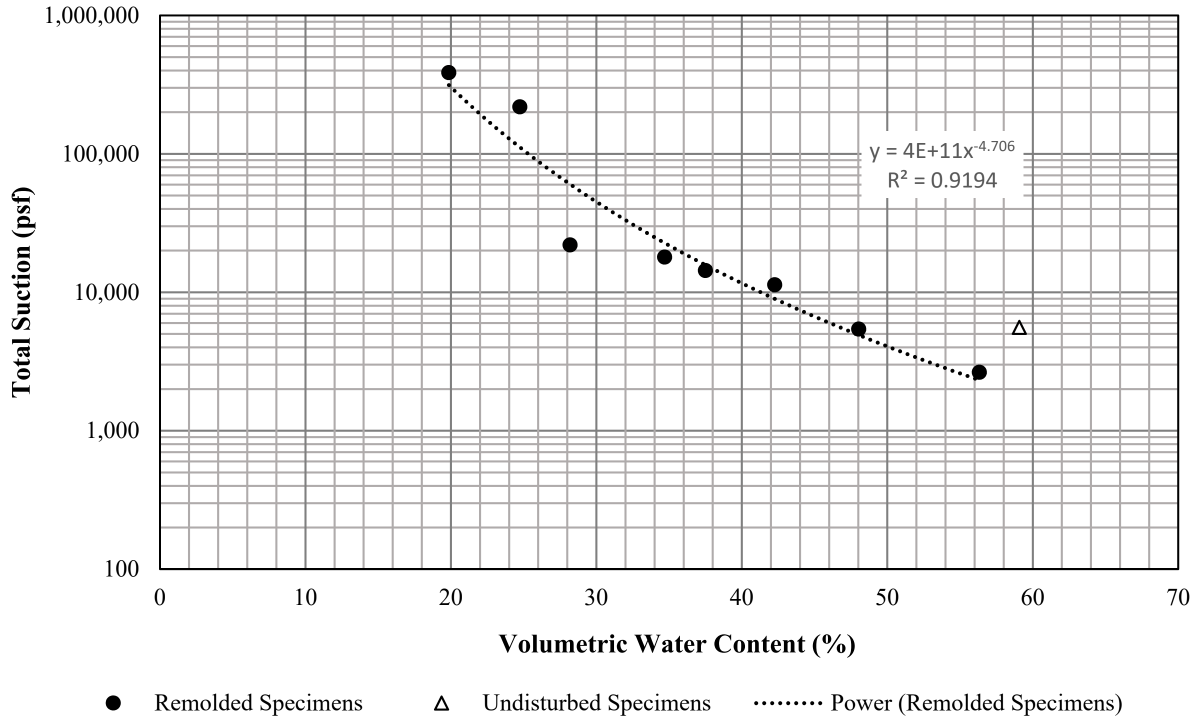

Figure 139: Boring 3.5 Layer 1 SWCC

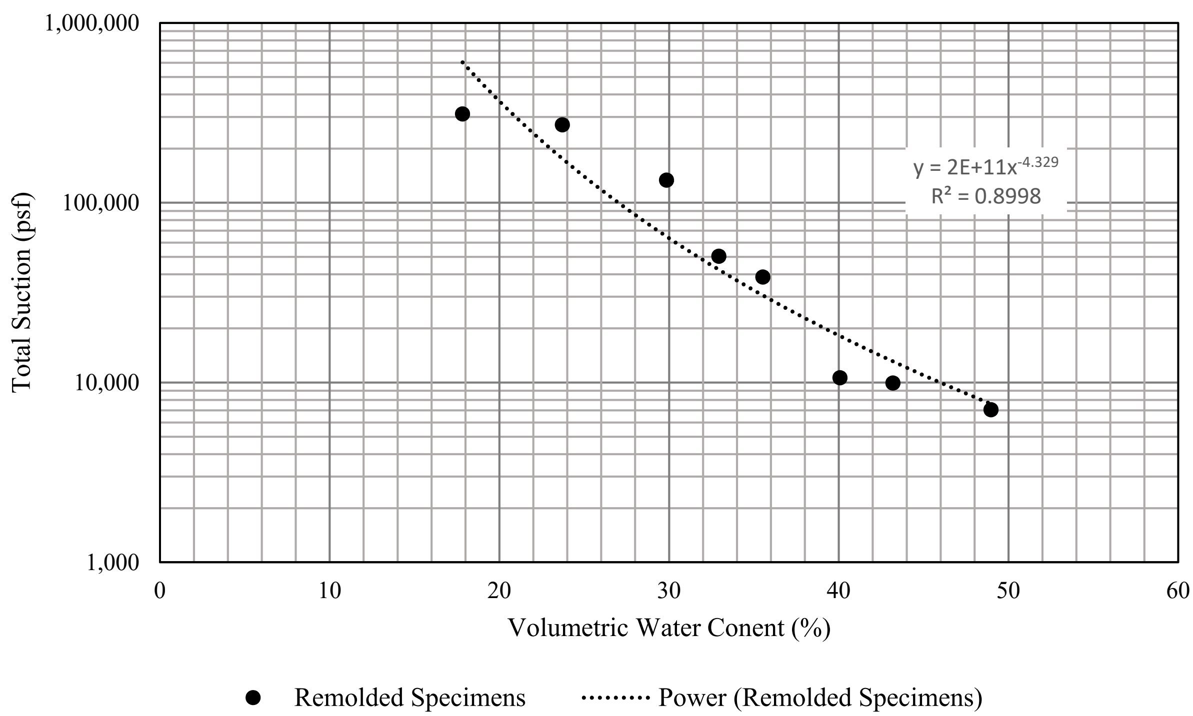

Figure 140: Boring 3.5 Layer 2 SWCC

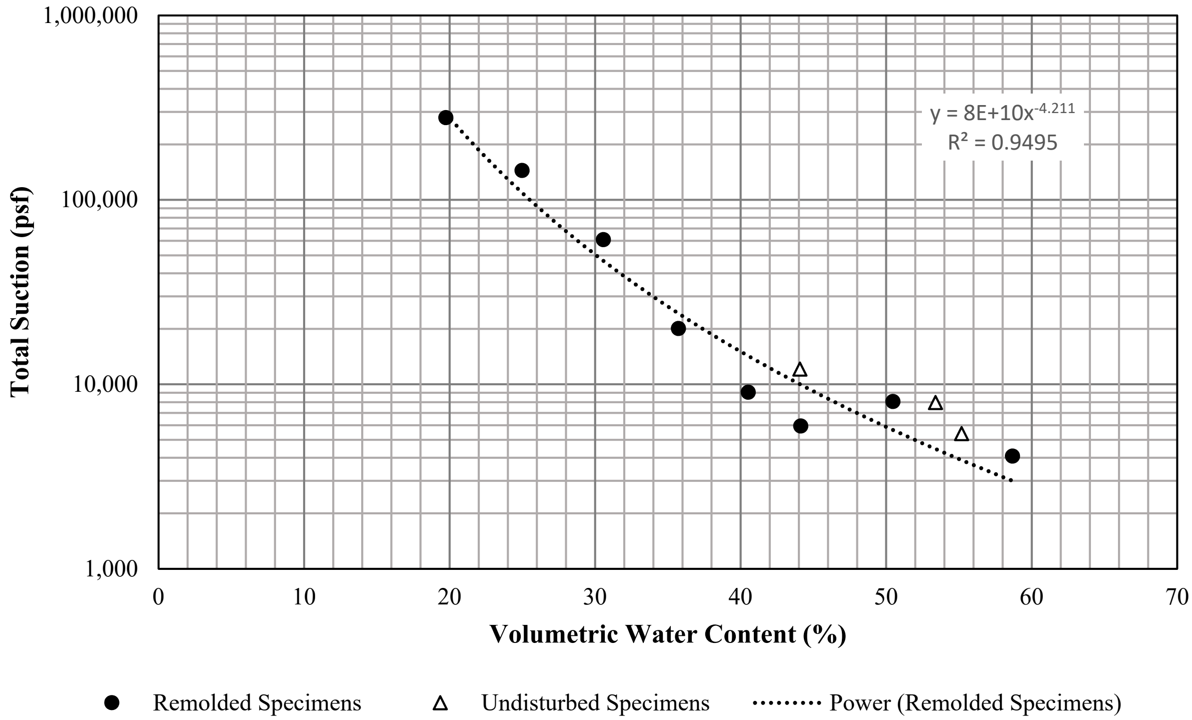

Figure 141: Boring 4.5 Layer 1 SWCC

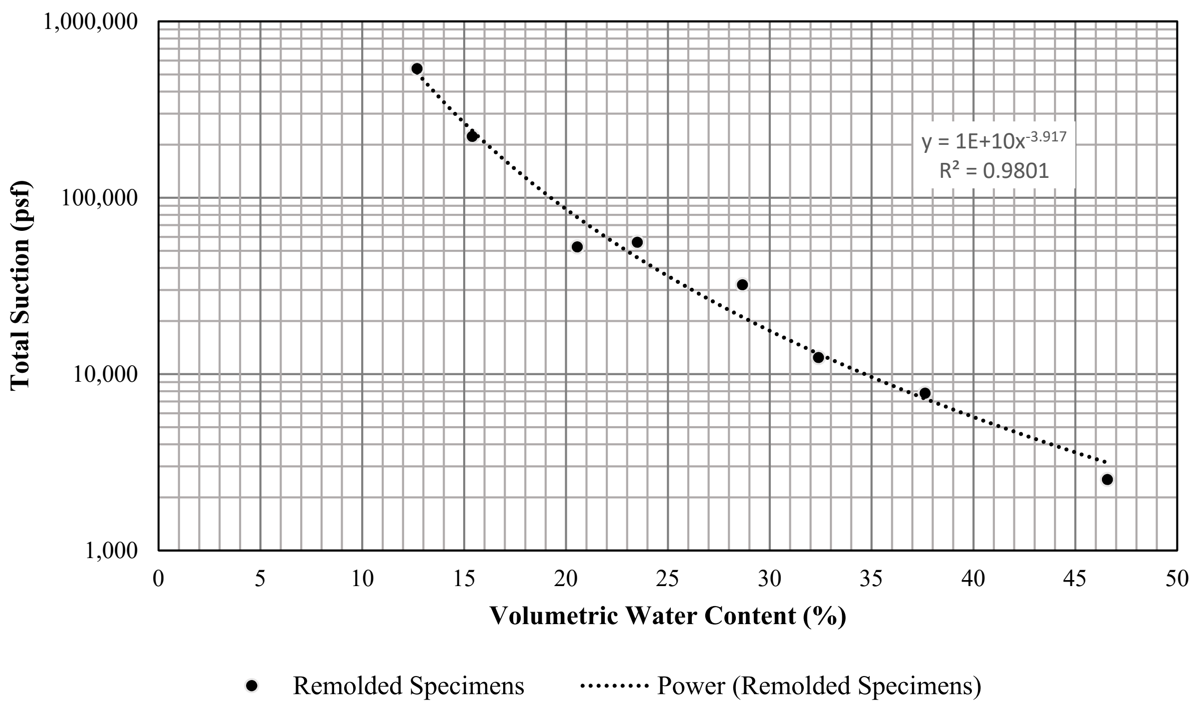

Figure 142: Boring 4.5 Layer 2 SWCC

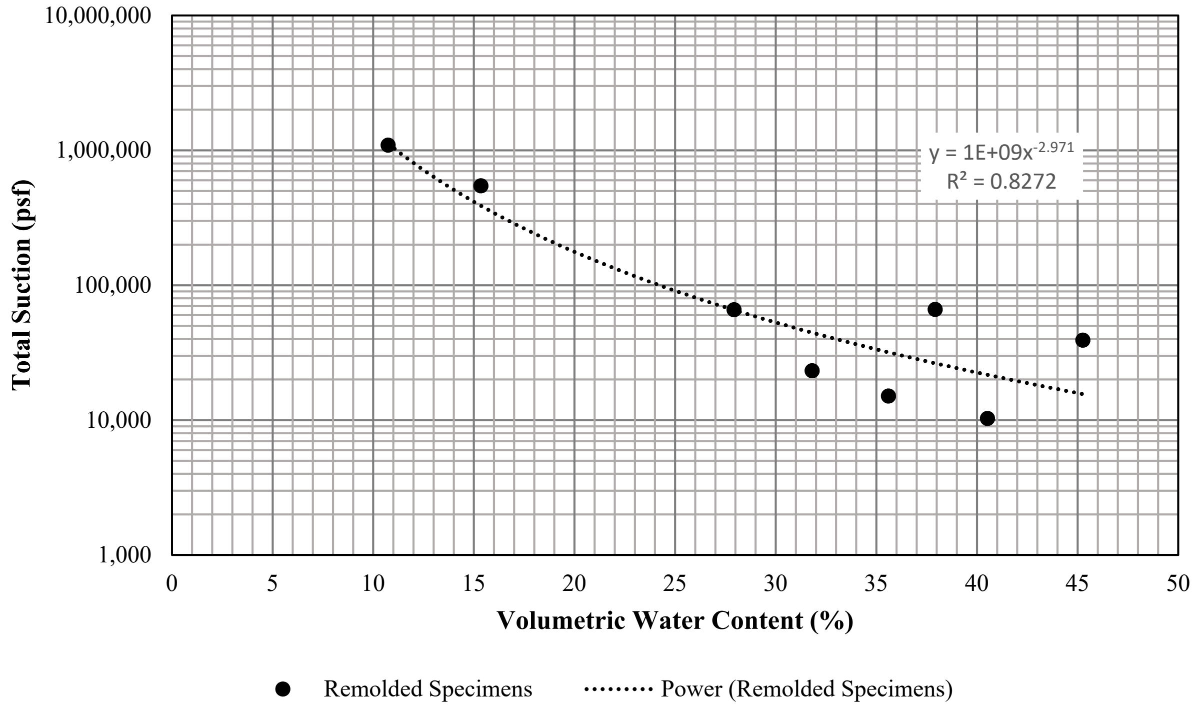

Figure 143: Boring 5.5 Layer 1 SWCC

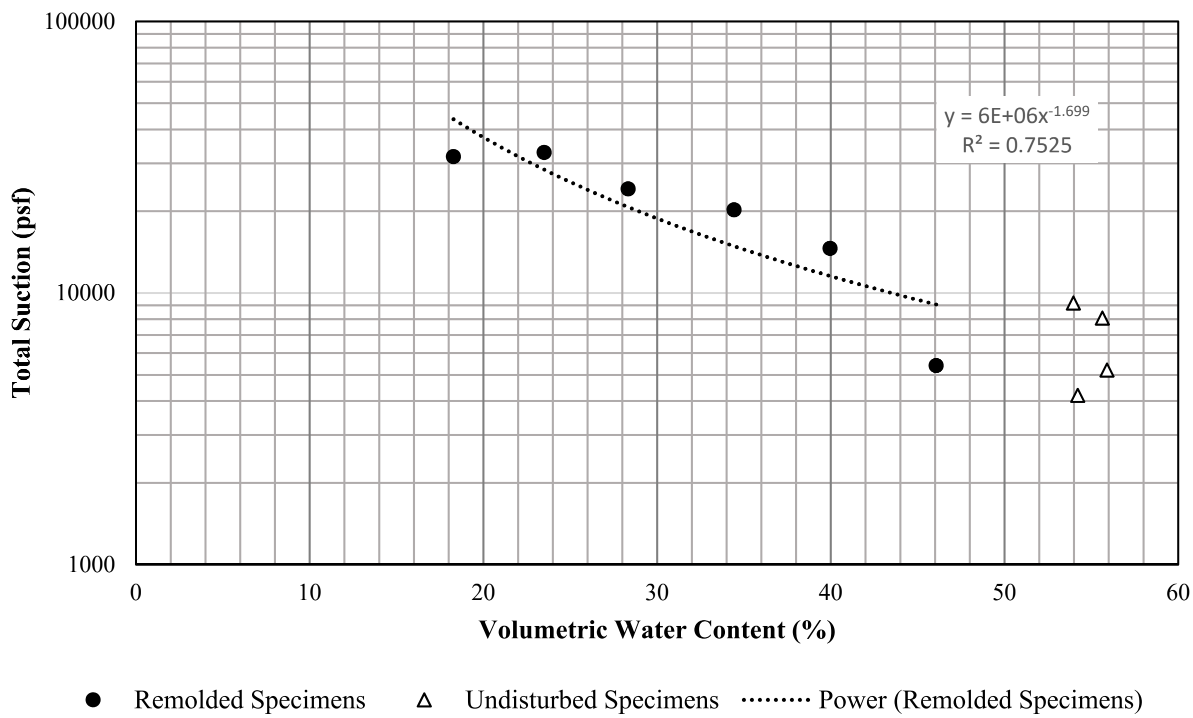

Figure 144: Boring 5.5 Layer 2 SWCC

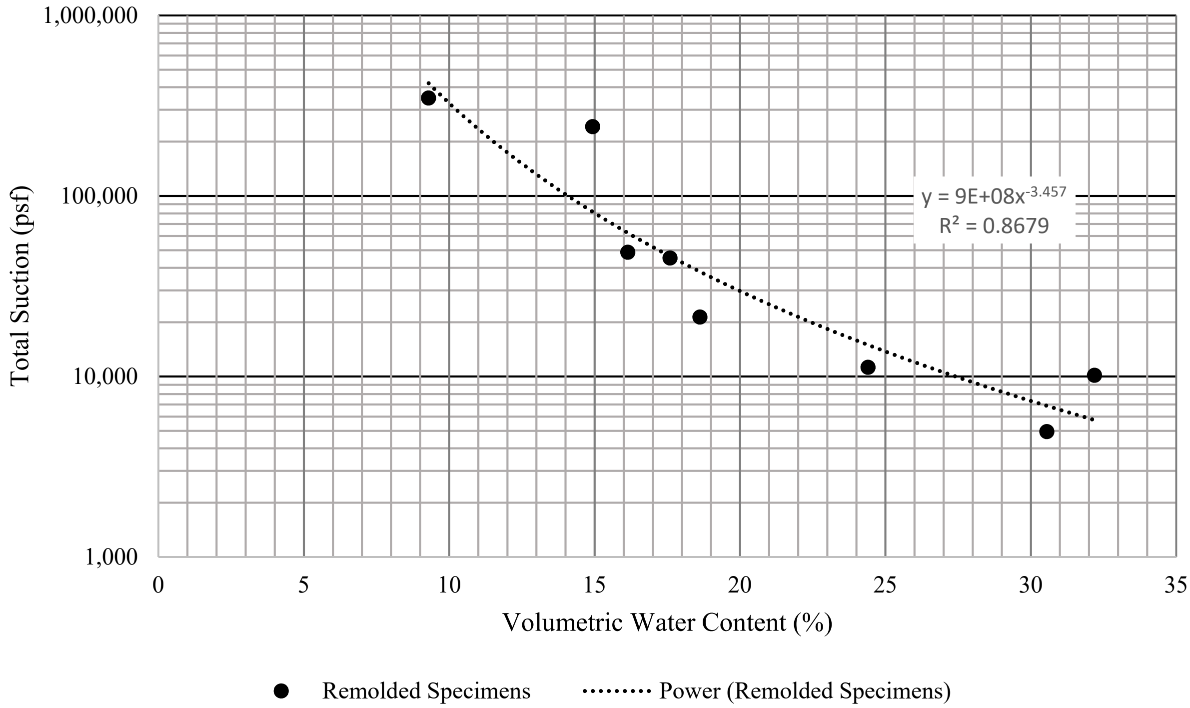

Figure 145: Boring 6.5 Layer 1 SWCC

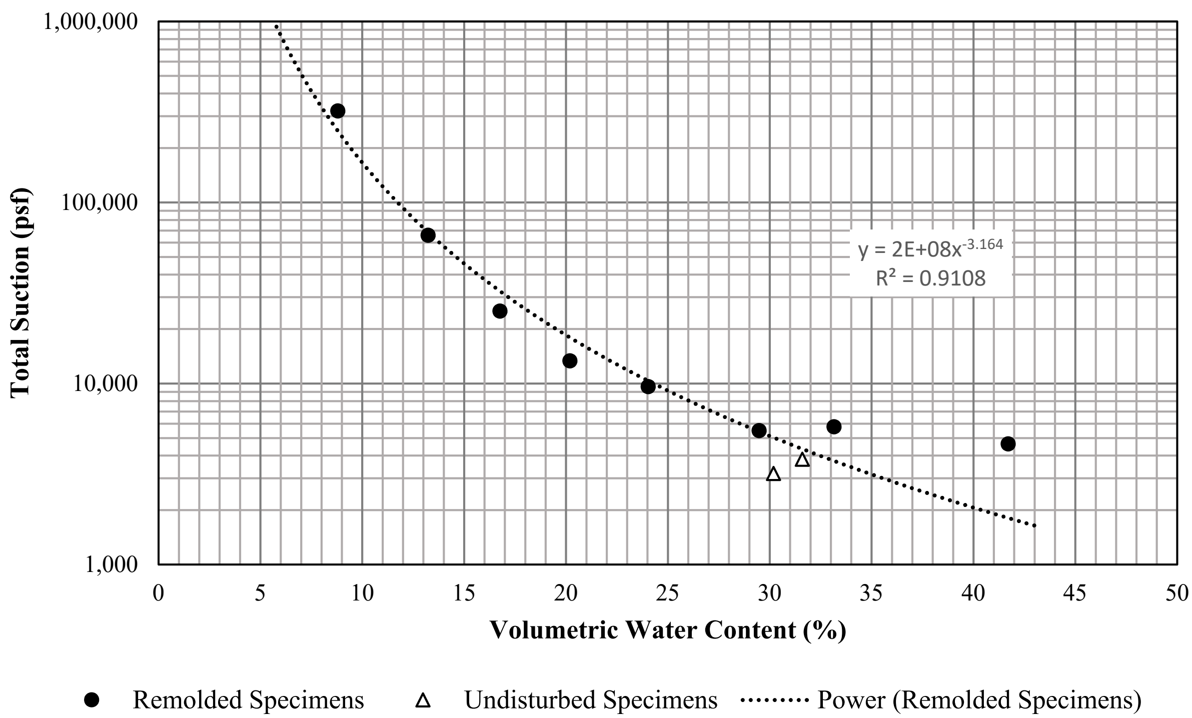

Figure 146: Boring 6.5 Layer 2 SWCC

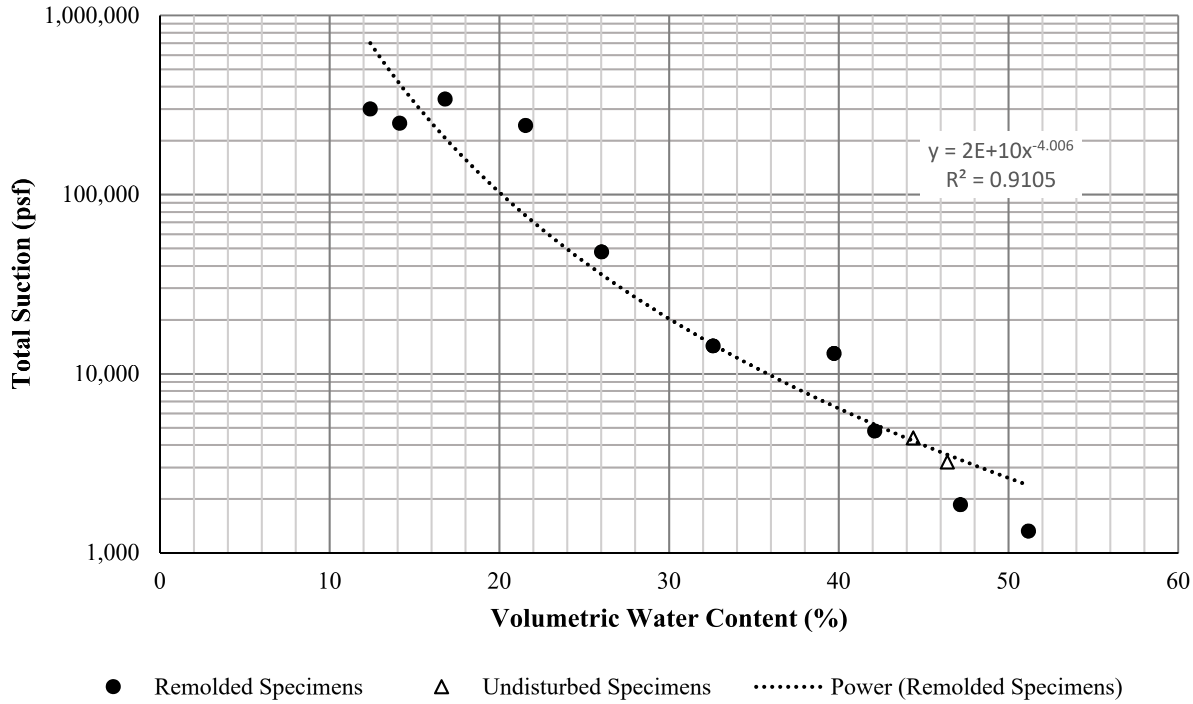

Figure 147: Boring 7.5 Layer 1 SWCC

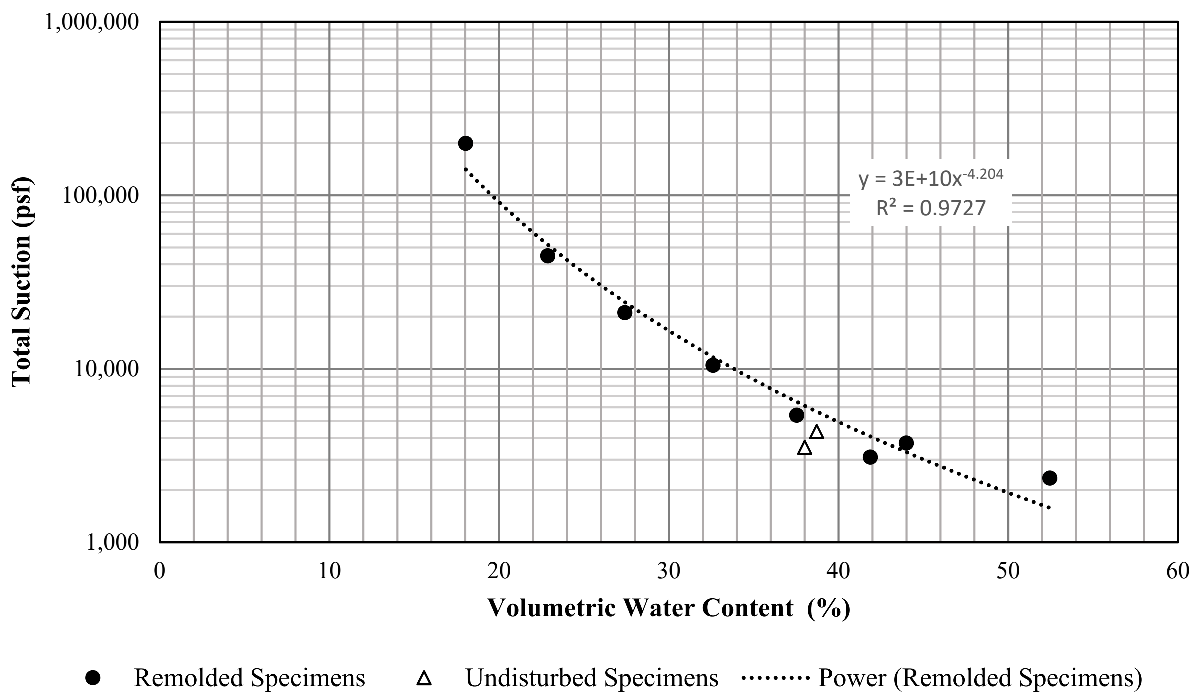

Figure 148: Boring 7.5 Layer 2 SWCC

SYNTHESIS OF RESULTS

The observational, photographic and IRI surveys all point to a highly damaged roadway surface. The tree survey validates the presence, size and type of trees capable of influencing the shrink/swell cycle of subgrade soils underneath the roadway. The laboratory results also confirm the soils capacity for volumetric change and the generation of high swell pressures. The following figures and discussion will bring the results from the different activities together according to location. Figure 149 through Figure 152 show the IRI surveys from 2014 with commentary on general site conditions overlain and corresponding to the mile post locations indicated in the survey. In theory the outside wheel path should be more susceptible to shrink swell damage than the inside wheel path because the outside edges of the pavement will be more susceptible to precipitation infiltration than the inside wheel path. Similarly, areas with large deciduous trees should show more damage than areas without. While the IRI data is suggestive of these trends, it must be recognized that before the IRI surveys were performed the roadway had been patched or leveled at various locations throughout the site and the IRI surveys do not provide an indication of damage type. However, it is clearly established that the roadway was severely damaged before the start of project and outside the range of acceptable FHWA thresholds.

Figure 153 shows the IRI surveys overlain with the experimentally determined swell pressures and the calculated matric suction values from the trimmed swell samples. The swell pressures and matric suction correspond to a specific water content. In general, the swell and matric suction values do not correspond to specific damage observations in the IRI data or visually. However, the figure does validate that the entire site is affected by expansive clays.

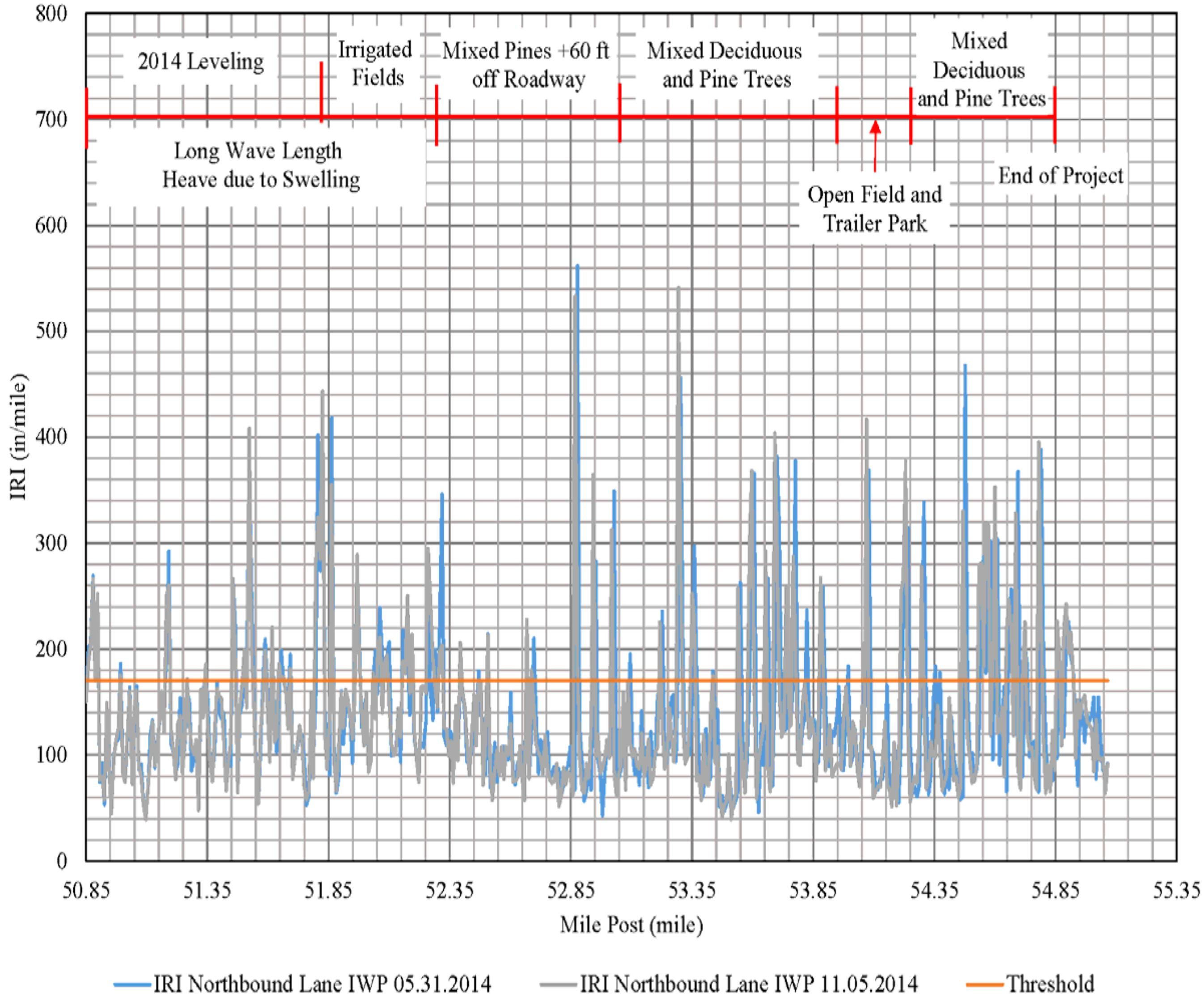

Figure 149: Northbound, Inside Wheel Path IRI Surveys with Site Conditions

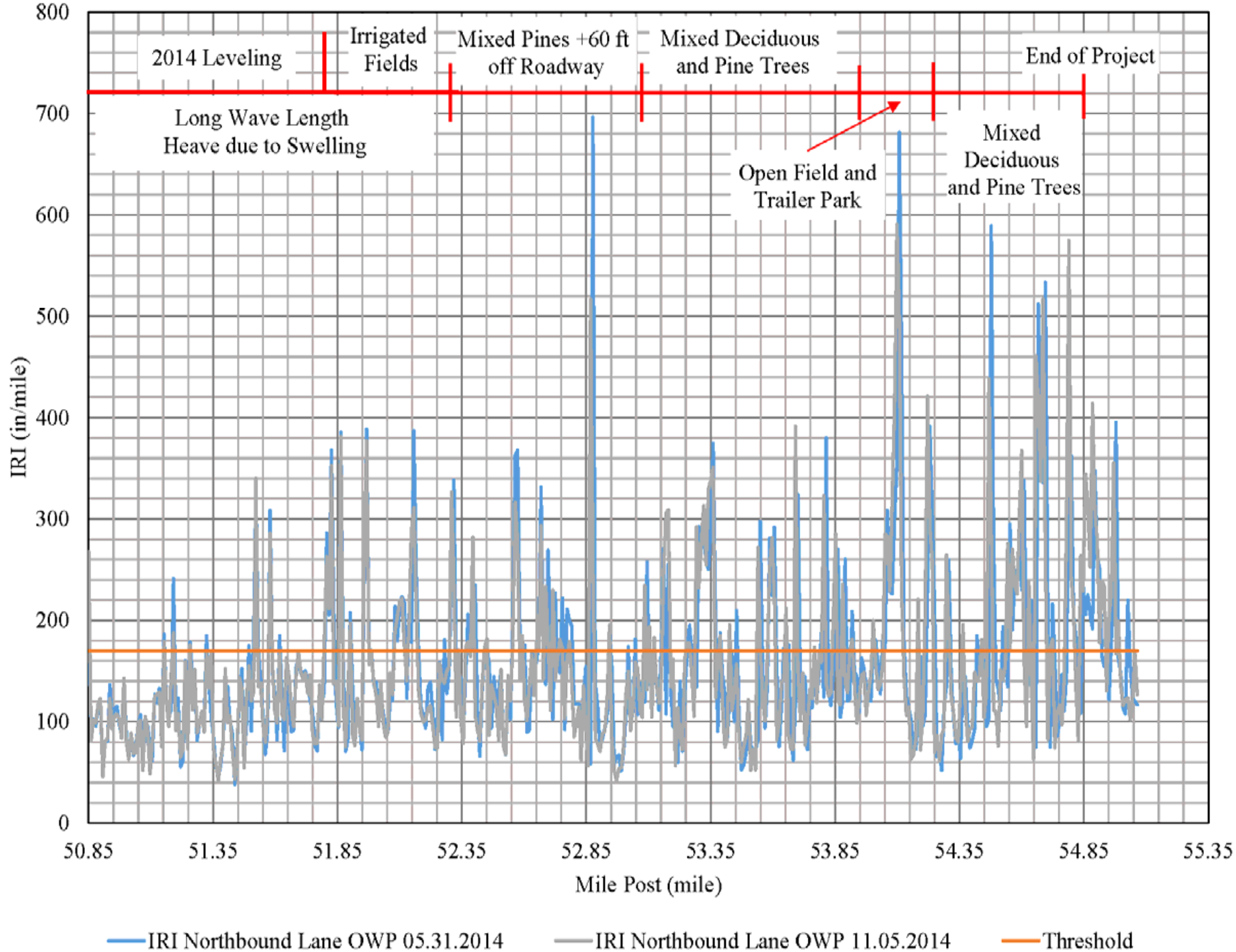

Figure 150: Northbound, Outside Wheel Path IRI Surveys with Site Conditions

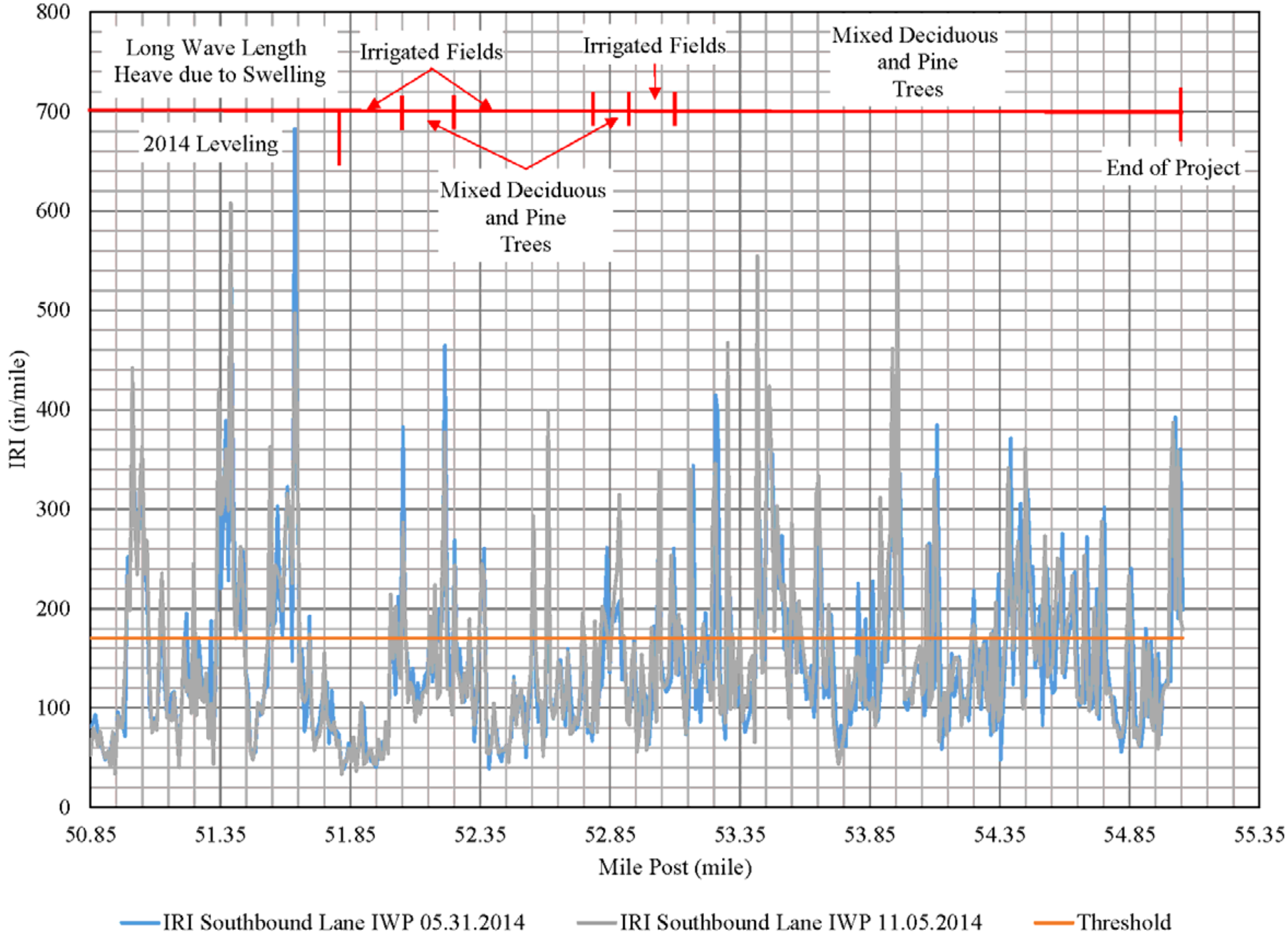

Figure 151: Southbound, Inside Wheel Path IRI Surveys with Site Conditions

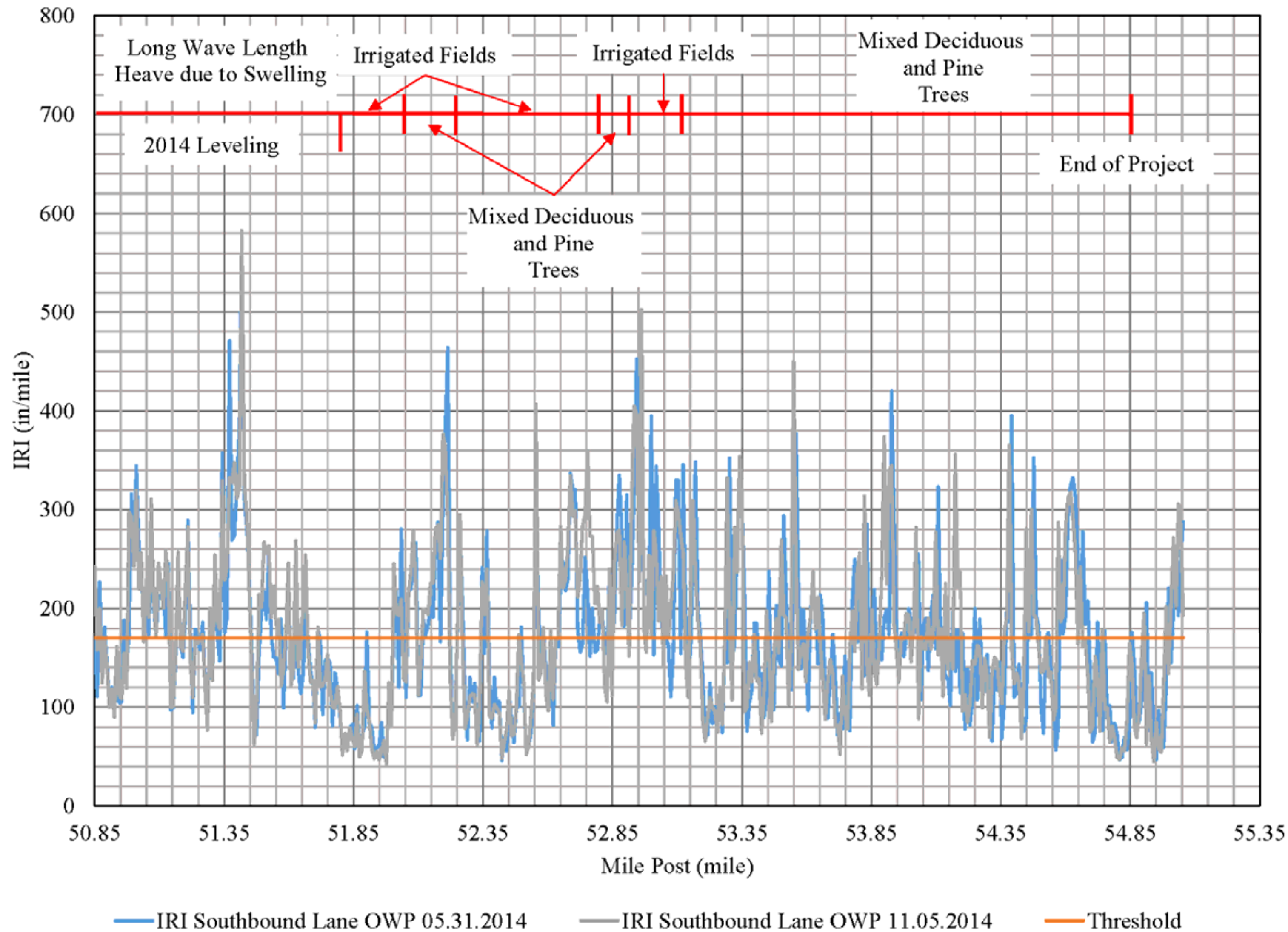

Figure 152: Southbound, Outside Wheel Path IRI Surveys with Site Conditions

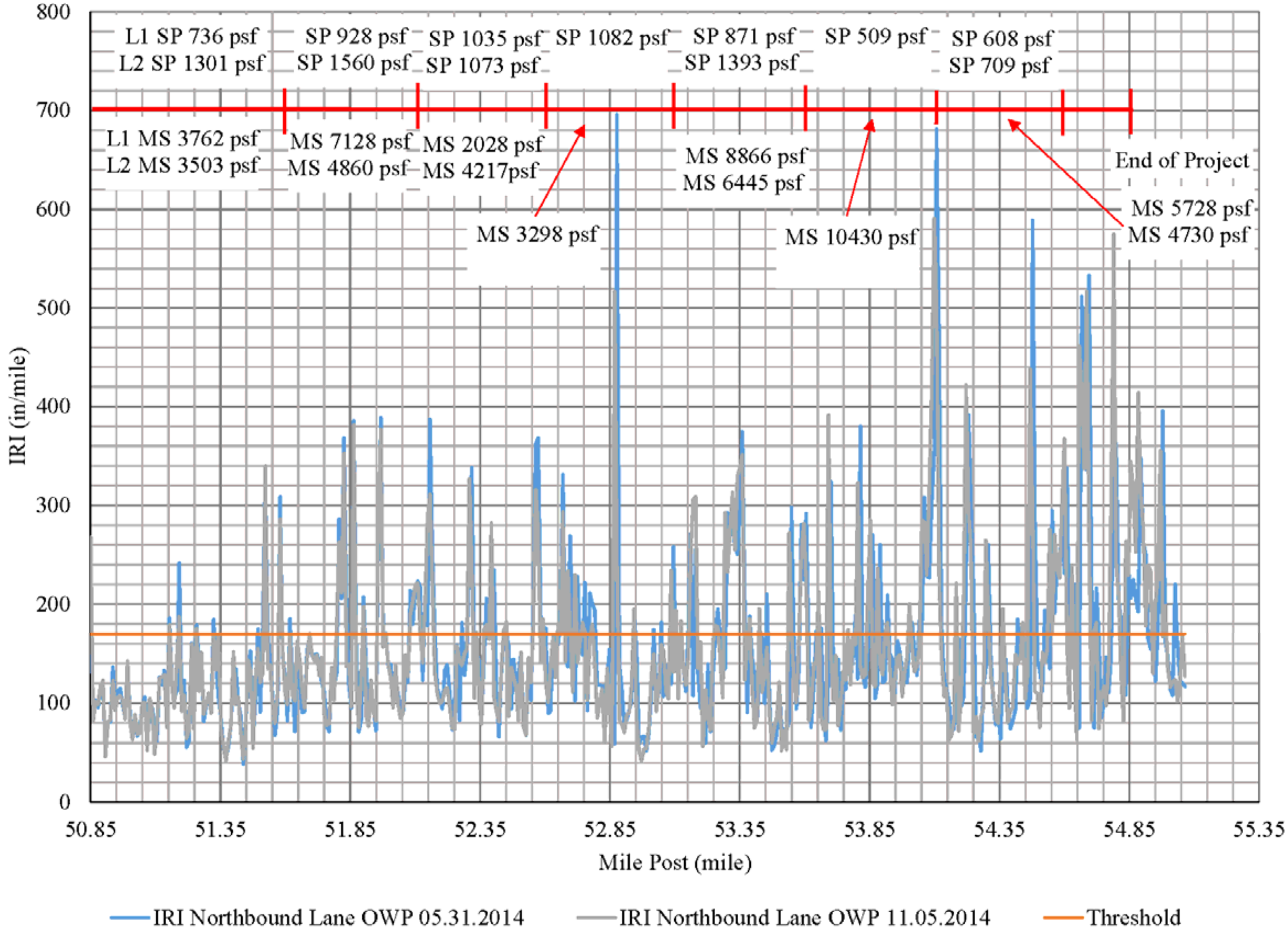

Figure 153: Northbound, Outside Wheel Path IRI Surveys Overlain with Swell Pressures and Matric Suction

CHAPTER SIX: SUMMARY AND CONCLUSIONS

SUMMARY

Alabama Highway 5 is an important route for heavy trucks travelling between Mobile and Birmingham. Originally a part of the farm to market network of roadways, the pavement was not designed to support modern day trucking. The pavement structure was built directly on top of expansive clays without an aggregate base coarse. Rapid deterioration of the pavement structure has led to resurfacing and maintenance work on an almost annual basis. This investigation is primarily focused on the contribution of the subgrade to pavement damage. The expansive nature of the subgrade and surrounding vegetation has resulted in an unsustainable cycle of subgrade shrinkage and swelling. The primary objectives of this study were to determine the root causes for subgrade failure and associated pavement distress along Alabama Highway 5 in Perry County, Alabama.

In order to accomplish these goals, extensive photograph, video, laboratory and field data were collected regarding the preconstruction conditions of the Alabama Highway 5 research site. These tasks were performed in coordination with larger research objectives to evaluate various remediation strategies for existing shrink-swell clays in western Alabama. It was hypothesized that the seasonal variation in moisture demands of large trees growing within a zone of influence of the roadway has a detrimental effect on the subgrade through shrinking and swelling of expansive clays and consequently causes localized pavement distress.

The investigation was approached from an unsaturated soil mechanics perspective. The relationship between water content, matric suction, volumetric change, swell pressure and minerology were explored in the laboratory with undisturbed samples collected from the project. Laboratory testing confirms that that the clays are expansive in nature and are capable of generating large swell pressures (500 – 1500 psf) as the matric suction and water content changes.

The impacts of vegetation were correlated to pavement damage through the tree survey, visual and photographic observations and the IRI profile surveys. A tree survey was performed from CR 15 to the end of project to determine the type, size and location of large trees relative to the edge of pavement. The most common tree encountered onsite was the loblolly pine which has a small diameter root system and low moisture demand. The second most common tree onsite was the Sugarberry, which is a member of the Elm Family. Trees in the Oak and Elm families have large diameter root systems and high moisture demands. Because of the shoulder slope geometries onsite, trees will tend to grow roots in the direction of the roadway and ultimately desiccate subgrade soils during the dry season. The cycle of shrinking and swelling of subgrade soils, exacerbated by large deciduous trees, leads to subgrade rutting and longitudinal shrinkage cracks.

The IRI surveys, visual observations and photographic evidence show a range of pavement distresses throughout the project. These included fatigue cracking, rutting, longitudinal and transverse cracking, and asphalt raveling. Failing and distressed slopes were also observed and attributed to low and variable shear strengths. Shear strength for the onsite clays were predicted using the Atterberg Limits to shear strength correlations found in the EPRI manual (Kulhawy and Mayne 1990).

CONCLUSIONS

The primary objective of this investigation was to determine the causes of pavement damage along Alabama 5. Based on the observations, surveys and laboratory results, the author has concluded the following:

- Pavement damage is due in part to heavy and high traffic volume.
- Pavement damage is also due in part to the bending forces applied to the pavement as subgrade soils shrink and swell.
- As confirmed by the Atterberg Limits and Swell Tests, subgrade soils have and continue to undergo cycles of shrinking and swelling exacerbated by the presence of large deciduous trees and local climate fluctuations in temperature and precipitation.
- As confirmed by the SWCC, the cycles of shrinking and swelling result from loss or gain of pore water, which increase and decrease the soils matric suction respectively.
- Variations in the soils water content may correlate to the loss or gain of mobilized cohesion, which may be responsible for some of the slope stability problems observed onsite.

RECOMMENDATIONS

Future recommended testing includes shrinkage limits, and unsaturated triaxial testing. Ideally the triaxial test should be performed on undisturbed samples at various swell conditions. By performing triaxial tests on undisturbed swelling samples the shear shear strength on AL5 clays can be determined for different water contents and suction values.

Mitigation of the pavement damage due to trees can be achieved by cutting through the root system at the edge of the right of way or pruning. These approaches will have limited success and should be put on a regular maintenance schedule to prevent further damage from new growth. The most effective solution would be to remove all trees from within sixty feet of the pavement edge. However, shrinking and swelling of the subgrade will still occur due to climate changes and slopes will continue to lose shear strength after precipitation events. Ultimately, the moisture variation in the slopes and subgrade must be controlled to prevent further damage by controlling the cycles of volumetric change.

This investigation was performed in coordination with larger research objectives to evaluate various remediation strategies for existing shrink-swell clays in western Alabama. As a part of these larger project objectives long term monitoring of a limited number of deciduous trees should be performed to determine the impacts of the trees on soil suction and water content. Long term monitoring of a large oak tree and sugarberry trees would be particularly advantageous. Long term monitoring of the pavement subgrade throughout the site to determine the water content and suction variations of subgrade soils over time.

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APPENDIX A: BORING LOGS BETWEEN MP 50.8 AND 54.3

BORING NUMBER B-1A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy

PROJECT NAME AL-5 Research Project

PROJECT NUMBER 99-305-635-005-401

PROJECT LOCATION AL 5, Perry County

DATE STARTED 11/19/13 **COMPLETED** 11/19/13

GROUND ELEVATION 182 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR ALDOT

GROUND WATER LEVELS:

DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY **CHECKED BY**

AT END OF DRILLING None Encountered

NOTES

AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Asphalt									
180			FAT CLAY (CH), gray, stiff, moist	ST	100				70	24	46	
	5			ST	100				88	30	58	
			FAT CLAY (CH), gray, medium, moist									
175			FAT CLAY (CH), yellow-brown, gray, stiff, moist	ST	100				110	27	83	
				ST	100				79	29	50	
	10			ST	100				103	29	74	
170				ST	100							
			FAT CLAY (CH), yellow-brown, hard	SS	100	8-13-18 (31)						
	15											
165			FAT CLAY (CH), light gray, hard (CHALK)									
				SS	100	9-16-26 (42)						
	20		Boring was terminated at 19.5 feet.									
160												
	25											
155												
	30											
150												
	35											

BORING NUMBER B-1.5A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/20/13 **COMPLETED** 11/20/13
GROUND ELEVATION 180 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
180	0		Asphalt									
			FAT CLAY (CH) (A-7-6), gray, brown, medium, moist, Layer 1	ST	100				97	29	68	
175	5			ST	100		84.0	37.0	66	24	42	98
				ST	50							
				ST	100				91	25	66	
170	10		FAT CLAY (CH), yellow-brown, stiff, moist, Layer 1	ST	75		87.5	32.9	85	24	61	98
				ST	0							
165	15			ST	100							
			FAT CLAY (CH), light gray, hard (CHALK), Layer 2	SS	100	9-13-23 (36)						
			Boring was terminated at 16.7 feet.									
160	20											
155	25											
150	30											
145	35											

BORING NUMBER B-2A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/19/13 **COMPLETED** 11/20/13
GROUND ELEVATION 180 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
180	0		Asphalt									
			FAT CLAY (CH), gray, moist	ST	100				83	31	52	
175	5			ST	33				73	25	48	
				ST	100				86	27	59	
170	10		FAT CLAY (CH), white, yellow-brown, moist	ST	100				95	27	68	
			FAT CLAY (CH), gray, brown, moist	ST	90							
			FAT CLAY (CH), yellow-brown, gray, very stiff moist, (CHALK)	SS	100	8-12-15 (27)						
165	15											
			FAT CLAY (CH), gray, hard (CHALK)	SS	100	17-26-28 (54)						
160	20		Boring was terminated at 20.0 feet.									
155	25											
150	30											
145	35											

BORING NUMBER B-2.5A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/20/13 **COMPLETED** 11/20/13
GROUND ELEVATION 191 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
190	0		Asphalt									
			FAT CLAY (CH) (A-7-6), gray, stiff, moist, Layer 1	ST	100				70	24	46	
185	5			ST	75		90.1	31.9	84	26	58	93
			FAT CLAY (CH), yellow-brown, stiff, moist, Layer 1	ST	40				79	32	47	
				ST	100		92.4	29.2				98
180	10		FAT CLAY (CH), yellow-brown, very stiff (CHALK), Layer 2	SS	100	9-12-14 (26)						
			Boring was terminated at 11.0 feet.									
175	15											
170	20											
165	25											
160	30											
	35											

BORING NUMBER B-3A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/19/13 **COMPLETED** 11/19/13
GROUND ELEVATION 190 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
190	0		Asphalt									
			FAT CLAY (CH), gray	ST	100				93	26	67	
185	5			ST	100				65	24	41	
				ST	100							
				ST	100				74	25	49	
180	10		FAT CLAY (CH), yellow-brown, gray (CHALK)	ST	100							
				ST	100							
			FAT CLAY (CH), yellow-brown, gray, very stiff moist, (CHALK)	SS	100	8-11-13 (24)						
175	15		Boring was terminated at 14.0 feet.									
170	20											
165	25											
160	30											
155	35											

BORING NUMBER B-3.5A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/19/13 **COMPLETED** 11/19/13
GROUND ELEVATION 200 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
200	0		Asphalt									
			FAT CLAY (CH) (A-7-6), brown, stiff, moist, Layer 1	ST	100		82.5	38.6	68	28	40	99
195	5		FAT CLAY (CH), gray, stiff, moist, Layer 1	ST	70				87	28	59	
			FAT CLAY (CH), yellow-brown, gray, stiff, Layer 1	ST	100				84	27	57	
			FAT CLAY (CH), yellow-brown, stiff moist, (CHALK), Layer 2	ST	65		77.7	41.5				97
190	10			ST	50							
			FAT CLAY (CH), yellow-brown, very stiff (CHALK), Layer 2	SS	100	5-11-15 (26)						
			Boring was terminated at 12.8 feet.									
185	15											
180	20											
175	25											
170	30											
165	35											

BORING NUMBER B-4A

CLIENT Auburn Universtiy

PROJECT NAME AL-5 Research Project

PROJECT NUMBER 99-305-635-005-401

PROJECT LOCATION AL 5, Perry County

DATE STARTED 11/19/13 **COMPLETED** 11/19/13

GROUND ELEVATION 199 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR ALDOT

GROUND WATER LEVELS:

DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY **CHECKED BY**

AT END OF DRILLING None Encountered

NOTES

AFTER DRILLING None Encountered

MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
Asphalt									
CLAYEY SAND with GRAVEL (SC), stiff, moist									
FAT CLAY (CH), gray, moist	ST	(100)				72	25	47	
	ST	(100)							
	ST	(28)				93	23	70	
FAT CLAY (CH), yellow-brown, gray, moist									
FAT CLAY (CH), yellow-brown, gray, very stiff moist, (CHALK)	SS	(100)	5-8-12 (20)						
Boring was terminated at 9.1 feet.									

BORING NUMBER B-4.5A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/19/13 **COMPLETED** 11/19/13
GROUND ELEVATION 206 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
205	0		Asphalt									
			FAT CLAY (CH) (A-7-6), brown, gray, medium, moist, Layer 1	ST	100		81.5	38.8	68	28	40	97
	5			ST	100							
200			FAT CLAY (CH), brown, gray, stiff, moist, Layer 1	ST	50				97	28	69	
			FAT CLAY (CH), yellow-brown, stiff (CHALK), Layer 2	ST	0		84.4	33.3				96
	10		Boring was terminated at 9.2 feet.									
195												
	15											
190												
	20											
185												
	25											
180												
	30											
175												
	35											

BORING NUMBER B-5A

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/19/13 **COMPLETED** 11/19/13
GROUND ELEVATION 211 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
210	0		Asphalt									
			CLAYEY SAND with GRAVEL (SC), stiff, moist									
			FAT CLAY (CH), gray, moist	ST	100				50	24	26	
205	5			ST	100							
				ST	100							
			FAT CLAY (CH), yellow-brown, gray, moist	ST	100				91	23	68	
200	10		FAT CLAY (CH), yellow-brown, gray, very stiff moist, (CHALK)	SS	100	10-9-12 (21)						
			Boring was terminated at 10.7 feet.									
195	15											
190	20											
185	25											
180	30											
	35											

BORING NUMBER B-5.5A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/19/13 **COMPLETED** 11/19/13
GROUND ELEVATION 210 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
210	0		Asphalt									
			FAT CLAY (CH) (A-7-6), yellow-brown, gray, medium, moist, Layer 1	ST	100		81.0	39.6	86	26	60	96
205	5			ST	100							
			FAT CLAY (CH), gray, yellow-brown, stiff, moist, Layer 1	ST	100							
			FAT CLAY (CH) (A-7-6), yellow-brown, stiff (CHALK), Layer 2	ST	100		87.7	33.3	88	27	61	96
200	10			ST	100							
				ST	100							
			FAT CLAY (CH), yellow-brown, hard (CHALK), Layer 2	SS	100	7-13-18 (31)						
195	15		Boring was terminated at 14.1 feet.									
190	20											
185	25											
180	30											
175	35											

BORING NUMBER B-6A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/19/13 **COMPLETED** 11/19/13
GROUND ELEVATION 194 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Asphalt									
			CLAYEY SAND with GRAVEL (SC), stiff, moist									
			FAT CLAY (CH), gray, moist	ST	100				97	24	73	
190	5		FAT CLAY (CH), brown, moist	ST	100							
			FAT CLAY (CH), brown, gray, moist	ST	100							
185				ST	100				80	30	50	
	10		FAT CLAY (CH), gray, yellow-brown moist, (CHALK)	ST	100							
			FAT CLAY (CH), gray, yellow-brown, very stiff moist, (CHALK)	SS	100	9-11-13 (24)						
			Boring was terminated at 12.2 feet.									
180	15											
175	20											
170	25											
165	30											
160	35											

BORING NUMBER B-6.5A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/20/13 **COMPLETED** 11/20/13
GROUND ELEVATION 181 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
180	0		Asphalt									
			CLAYEY SAND with GRAVEL (SC), stiff, moist	ST	100							
175	5		SANDY FAT CLAY (CH) (A-7-6), gray, moist, Layer 1	ST	100		90.2	28.2	71	24	47	60
				ST	100				57	18	39	
			SANDY FAT CLAY (CH), gray, brown, moist, Layer 1	ST	100				50	15	35	
170	10		FAT CLAY with SAND (CH), gray, brown, very stiff moist, (CHALK)	SS	100	8-10-13 (23)						45
			Boring was terminated at 10.3 feet.									
165	15											
160	20											
155	25											
150	30											
	35											

BORING NUMBER B-7A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/20/13 **COMPLETED** 11/20/13
GROUND ELEVATION 181 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0	Asphalt									
	CLAYEY SAND (SC), yellow-brown, red, loose, moist	ST	100							
	FAT CLAY (CH), gray, brown, medium, moist	ST	100				57	17	40	
		ST	100				58	20	38	
		ST	45				63	21	42	
		ST	100							
		ST	40							
		ST	40							
	FAT CLAY (CH), yellow-brown, gray, stiff, moist	ST	100							
	FAT CLAY (CH), yellow-brown, very stiff (CHALK)	SS	100	6-9-13 (22)						
	Boring was terminated at 18.8 feet.									

Elevation scale (ft): 180, 175, 170, 165, 160, 155, 150
Depth scale (ft): 0, 5, 10, 15, 20, 25, 30, 35

BORING NUMBER B-7.5A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/20/13 **COMPLETED** 11/20/13
GROUND ELEVATION 191 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
190	0	Asphalt									
		CLAYEY SAND with GRAVEL (SC), brown, moist									
		FAT CLAY with SAND (CH) (A-7-6), gray, brown, moist, Layer 1	ST	100							
	5		ST	100							
185			ST	100		93.9	29.2	67	18	49	81
		FAT CLAY with SAND (CH) (A-7-6), brown, moist, Layer 2	ST	100		95.4	27.8	60	18	42	78
	10		ST	0							
180		Boring was terminated at 11.0 feet.									
175	15										
170	20										
165	25										
160	30										
	35										

BORING NUMBER B-8A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy

PROJECT NAME AL-5 Research Project

PROJECT NUMBER 99-305-635-005-401

PROJECT LOCATION AL 5, Perry County

DATE STARTED 11/20/13 **COMPLETED** 11/20/13

GROUND ELEVATION 197 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR ALDOT

GROUND WATER LEVELS:

DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY **CHECKED BY**

AT END OF DRILLING None Encountered

NOTES

AFTER DRILLING None Encountered

MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (SHELBY TUBE)	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
Asphalt									
CLAYEY SAND with GRAVEL (SC), brown, moist									
FAT CLAY (CH), brown, moist	ST	100							
	ST	100							
FAT CLAY (CH), gray, brown, moist	ST	100				64	16	48	
	ST	100				50	16	34	
CLAYEY SAND (SC), brown, moist	SS	171							
	ST	0							
	ST	100							
FAT CLAY (CH), gray, yellow-brown moist, (CHALK)									
FAT CLAY (CH), gray, yellow-brown, hard moist, (CHALK)	SS	100	5-19-20 (39)						
Boring was terminated at 16.0 feet.									

FOR ACADEMIC USE ONLY

BORING NUMBER B-8.5A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/20/13 **COMPLETED** 11/20/13
GROUND ELEVATION 200 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
200	0	Asphalt									
		CLAYEY SAND with GRAVEL (SC), brown, moist									
		FAT CLAY (CH), brown, moist	ST	100							90
		FAT CLAY (CH), gray, yellow-brown, moist	ST	100							78
195	5	FAT CLAY (CH), gray, yellow-brown moist, (CHALK)	ST	100							
			ST	100							
		FAT CLAY (CH), gray, yellow-brown, very stiff moist, (CHALK)	SS	100	5-7-11 (18)						
190	10	Boring was terminated at 9.6 feet.									
185	15										
180	20										
175	25										
170	30										
165	35										

BORING NUMBER B-9A

AUBURN UNIVERSITY

CLIENT Auburn Universtiy
PROJECT NAME AL-5 Research Project
PROJECT NUMBER 99-305-635-005-401
PROJECT LOCATION AL 5, Perry County
DATE STARTED 11/20/13 **COMPLETED** 11/20/13
GROUND ELEVATION 198 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR ALDOT
GROUND WATER LEVELS:
DRILLING METHOD CME 55, Auto-Hammer, SFA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY **CHECKED BY**
AT END OF DRILLING None Encountered
NOTES
AFTER DRILLING None Encountered

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % SHELBY TUBE	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Asphalt, hard									
195			FAT CLAY (CH), brown, moist	ST	100							
	5			ST	100							
				ST	100							
190			FAT CLAY (CH), yellow-brown, gray, very stiff moist, (CHALK)	SS	100	5-10-13 (23)						
			Boring was terminated at 8.7 feet.									
	10											
185												
	15											
180												
	20											
175												
	25											
170												
	30											
165												
	35											

APPENDIX B: LABORATORY RESULTS SUMMARY

SUMMARY OF LABORATORY RESULTS

CLIENT Auburn Universtiy **PROJECT NAME** AL-5 Research Project

PROJECT NUMBER 99-305-635-005-401 **PROJECT LOCATION** AL 5, Perry County

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Max. Sieve Size Tested (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Specific Gravity	Swell Pressure (psf)
B-1A	1.5	70	24	46							
B-1A	3.5	88	30	58							
B-1A	5.5	110	27	83							
B-1A	7.5	79	29	50							
B-1A	9.5	103	29	74							
B-1.5A	1.5	97	29	68							
B-1.5A	3.5	66	24	42	0.075	98	A-7-6 (47)	37.0	84.0	2.75	736.0
B-1.5A	7.5	91	25	66							
B-1.5A	9.5	85	24	61	0.075	98	A-7-6 (69)	32.9	87.5	2.62	1301.0
B-2A	3.0	83	31	52							
B-2A	5.0	73	25	48							
B-2A	7.0	86	27	59							
B-2A	9.0	95	27	68							
B-2.5A	1.5	70	24	46							
B-2.5A	3.5	84	26	58	0.075	93	A-7-6 (62)	31.9	90.1	2.75	927.0
B-2.5A	5.5	79	32	47							
B-2.5A	7.5				0.075	98		29.2	92.4	2.72	1560.0
B-3A	1.5	93	26	67							
B-3A	3.5	65	24	41							
B-3A	7.5	74	25	49							
B-3.5A	1.3	68	28	40	0.075	99	A-7-6 (47)	38.6	82.5	2.70	1035.0
B-3.5A	3.3	87	28	59							
B-3.5A	5.3	84	27	57							
B-3.5A	7.3				0.075	97		41.5	77.7	2.74	1073.0
B-4A	1.8	72	25	47							
B-4A	5.8	93	23	70							
B-4.5A	1.2	68	28	40	0.075	97	A-7-6 (46)	38.8	81.5	2.72	1082.0
B-4.5A	5.2	97	28	69							
B-4.5A	7.2				0.075	96		33.3	84.4	2.73	
B-5A	1.5	50	24	26							
B-5A	7.5	91	23	68							
B-5.5A	1.0	86	26	60	0.075	96	A-7-6 (67)	39.6	81.0	2.75	871.0
B-5.5A	7.0	88	27	61	0.075	96	A-7-6 (68)	33.3	87.7	2.70	1393.0
B-Tree C	3.0				0.075	94		39.6	79.3		622.0
B-Tree C	7.0				0.075	94		32.2	89.8		1374.0
B-6A	1.5	97	24	73							
B-6A	7.5	80	30	50							
B-6.5A	1.5									2.69	
B-6.5A	3.5	71	24	47	0.075	60	A-7-6 (26)	28.2	90.2		509.0
B-6.5A	5.5	57	18	39							
B-6.5A	7.5	50	15	35							
B-6.5A	8.8				0.075	45					
B-7A	3.5	57	17	40							

SUMMARY OF LABORATORY RESULTS

CLIENT Auburn Universtiy **PROJECT NAME** AL-5 Research Project

PROJECT NUMBER 99-305-635-005-401 **PROJECT LOCATION** AL 5, Perry County

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Max. Sieve Size Tested (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Specific Gravity	Swell Pressure (psf)
B-7A	5.5	58	20	38							
B-7A	7.5	63	21	42							
B-7.5A	5.0	67	18	49	0.075	81	A-7-6 (41)	29.2	93.9	2.72	608.0
B-7.5A	7.0	60	18	42	0.075	78	A-7-6 (33)	27.8	95.4	2.81	709.0
B-8A	5.0	64	16	48							
B-8A	7.0	50	16	34							
B-8.5A	1.0				0.075	90					
B-8.5A	3.0				0.075	78					

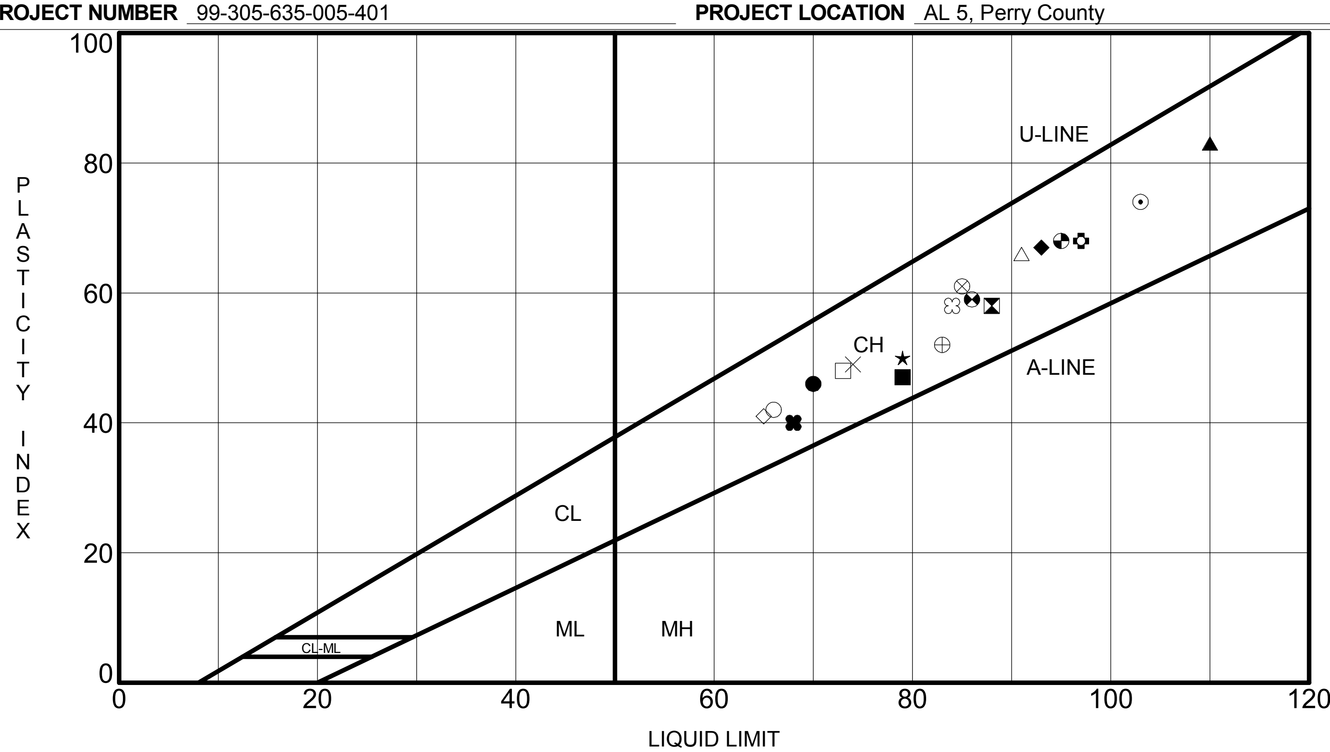
APPENDIX: ATTERBERG LIMITS RESULTS PLOTTED

ATTERBERG LIMITS' RESULTS

AUBURN UNIVERSITY

CLIENT Auburn Universtiy **PROJECT NAME** AL-5 Research Project

PROJECT NUMBER 99-305-635-005-401 **PROJECT LOCATION** AL 5, Perry County



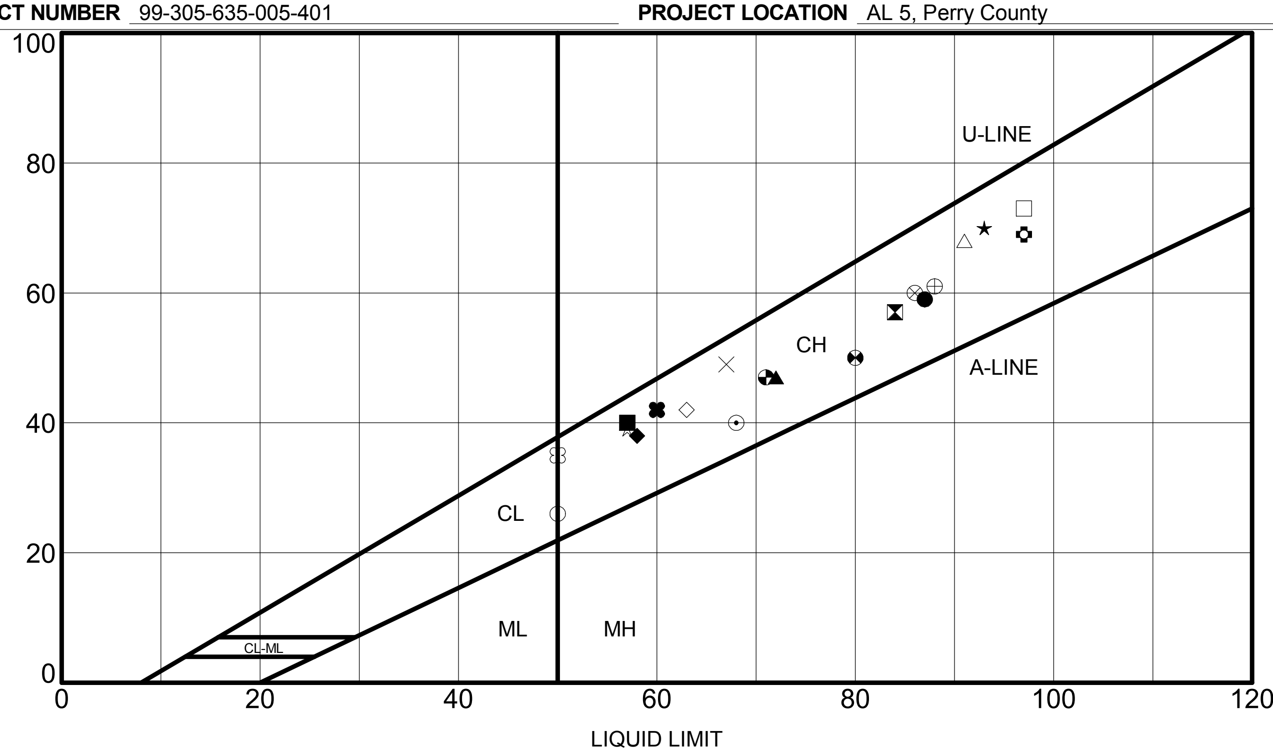
	Specimen Identification		LL	PL	PI	Fines	Classification
●	B-1A	1.5-3.5	70	24	46		
⧗	B-1A	3.5-5.5	88	30	58		
▲	B-1A	5.5-7.5	110	27	83		
★	B-1A	7.5-9.5	79	29	50		
⊙	B-1A	9.5-11.5	103	29	74		
✪	B-1.5A	1.5-3.5	97	29	68		
○	B-1.5A	3.5-5.5	66	24	42	98	FAT CLAY(CH)
△	B-1.5A	7.5-9.5	91	25	66		
⊗	B-1.5A	9.5-11.5	85	24	61	98	FAT CLAY(CH)
⊕	B-2A	3.0-5.0	83	31	52		
□	B-2A	5.0-7.0	73	25	48		
◒	B-2A	7.0-9.0	86	27	59		
◕	B-2A	9.0-11.0	95	27	68		
☆	B-2.5A	1.5-3.5	70	24	46		
✿	B-2.5A	3.5-5.5	84	26	58	93	FAT CLAY(CH)
■	B-2.5A	5.5-7.5	79	32	47		
◆	B-3A	1.5-3.5	93	26	67		
◇	B-3A	3.5-5.5	65	24	41		
×	B-3A	7.5-9.5	74	25	49		
✖	B-3.5A	1.3-3.3	68	28	40	99	FAT CLAY(CH)

ATTERBERG LIMITS' RESULTS

AUBURN UNIVERSITY

CLIENT Auburn Universtiy **PROJECT NAME** AL-5 Research Project

PROJECT NUMBER 99-305-635-005-401 **PROJECT LOCATION** AL 5, Perry County



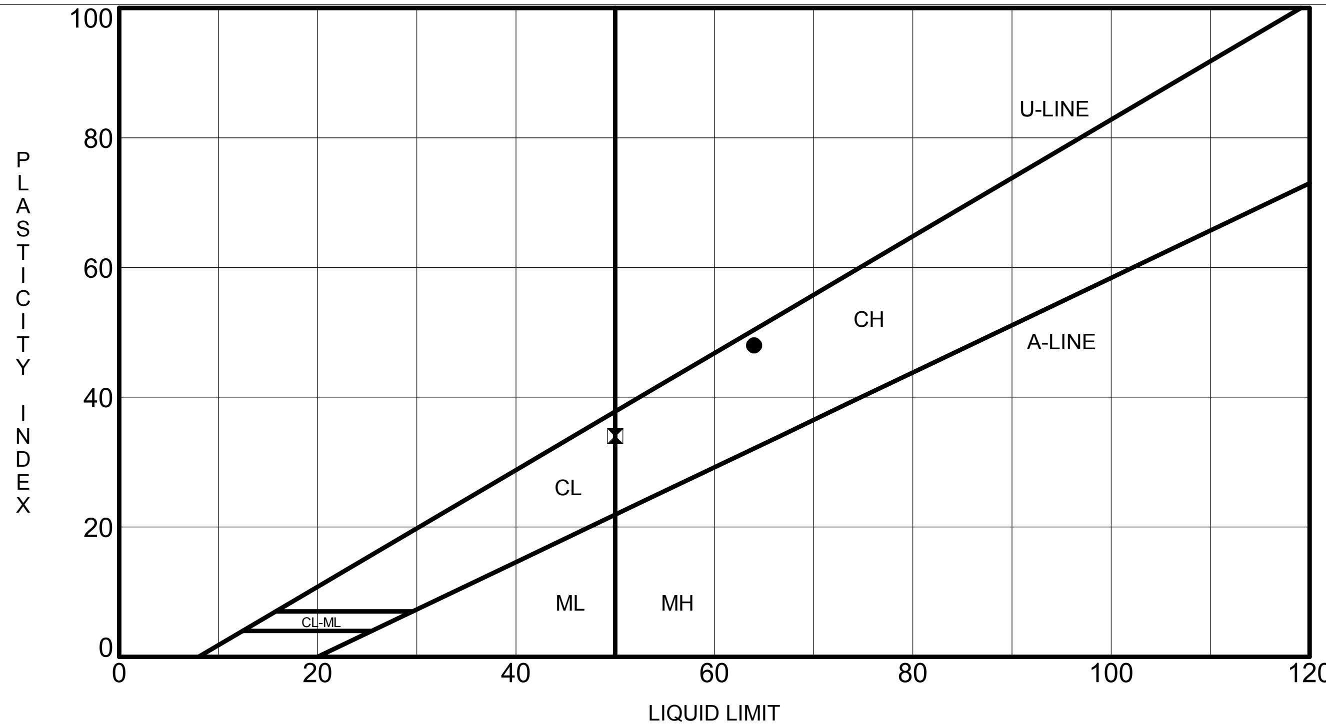
	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-3.5A**	**3.3-5.3**	**87**	**28**	**59**		
⧗	**B-3.5A**	**5.3-7.3**	**84**	**27**	**57**		
▲	**B-4A**	**1.8-3.8**	**72**	**25**	**47**		
★	**B-4A**	**5.8-7.6**	**93**	**23**	**70**		
⊙	**B-4.5A**	**1.2-3.2**	**68**	**28**	**40**	**97**	**FAT CLAY(CH)**
✪	**B-4.5A**	**5.2-7.2**	**97**	**28**	**69**		
○	**B-5A**	**1.5-3.5**	**50**	**24**	**26**		
△	**B-5A**	**7.5-9.2**	**91**	**23**	**68**		
⊗	**B-5.5A**	**1.0-3.0**	**86**	**26**	**60**	**96**	**FAT CLAY(CH)**
⊕	**B-5.5A**	**7.0-9.0**	**88**	**27**	**61**	**96**	**FAT CLAY(CH)**
□	**B-6A**	**1.5-3.5**	**97**	**24**	**73**		
◉	**B-6A**	**7.5-9.5**	**80**	**30**	**50**		
◕	**B-6.5A**	**3.5-5.5**	**71**	**24**	**47**	**60**	**SANDY FAT CLAY(CH)**
☆	**B-6.5A**	**5.5-7.5**	**57**	**18**	**39**		
⚘	**B-6.5A**	**7.5-8.8**	**50**	**15**	**35**		
■	**B-7A**	**3.5-5.5**	**57**	**17**	**40**		
◆	**B-7A**	**5.5-7.5**	**58**	**20**	**38**		
◇	**B-7A**	**7.5-9.5**	**63**	**21**	**42**		
×	**B-7.5A**	**5.0-7.0**	**67**	**18**	**49**	**81**	**FAT CLAY with SAND(CH)**
✖	**B-7.5A**	**7.0-9.0**	**60**	**18**	**42**	**78**	**FAT CLAY with SAND(CH)**

ATTERBERG LIMITS' RESULTS

AUBURN UNIVERSITY

CLIENT Auburn Universtiy **PROJECT NAME** AL-5 Research Project

PROJECT NUMBER 99-305-635-005-401 **PROJECT LOCATION** AL 5, Perry County



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-8A**	**5.0-7.0**	**64**	**16**	**48**		
⧗	**B-8A**	**7.0-9.0**	**50**	**16**	**34**		

FOR ACADEMIC USE ONLY

APPENDIX D: UNFILTERED TREE MEASUREMENTS FOR ALL TREE TYPES

Row Labels	Count of Trunk Diameter (inches)	Max of Trunk Diameter (inches)	Average of Trunk Diameter (inches)	Min of Trunk Diameter (inches)
American Elm	53	32.0	12.4	5.0
Basswood	7	48.0	21.1	6.0
Black Gum	2	9.0	8.5	8.0
Black Willow	3	20.0	11.7	6.0
Bradford Pear	1	8.0	8.0	8.0
Crab Apple	1	6.5	6.5	6.5
Eastern Red Cedar	129	27.0	9.9	4.6
Eastern Redbud	1	9.0	9.0	9.0
Green Ash	93	27.0	10.0	6.0
Laurel Oak	53	40.0	11.7	5.0
Loblolly Pine	542	36.0	10.7	4.0
Mimosa	1	7.0	7.0	7.0
Osage Orange	13	11.0	7.4	5.0
Osage Orange	8	18.0	10.6	6.0
Pecan Tree	32	42.0	12.6	4.0
Persimmon	7	8.5	6.6	6.0
Post Oak	6	18.0	14.2	8.0
Red Oak	30	32.0	15.6	6.0
Sassafras	12	7.0	5.2	4.0
Slippery Elm	131	24.0	9.1	5.7
Sugarberry	436	27.0	9.8	2.7
Sweet Gum	112	18.0	8.2	3.0
Water Oak	113	52.0	11.8	1.0
White Ash	128	24.0	9.0	4.5
White Basswood	1	10.5	10.5	10.5
White Oak	9	22.0	10.2	5.0
Willow Oak	104	54.0	14.3	4.0
Winged Elm	34	15.0	8.6	5.0
	2062	54.0	10.4	1.0

APPENDIX E: TREE SURVEY DATA (NORTHBOUND LANE)

Tree Survey: Northbound

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBS	1	Willow Oak	Broadleaf	Deciduous	1	4.5	53.3788	39.5
BNBS	2	Crab Apple	Broadleaf	Deciduous	1	6.5	53.3786	40.5
BNBS	3	Loblolly Pine	Conifer	Evergreen	1	20	53.3771	38
BNBS	4	Loblolly Pine	Conifer	Evergreen	1	14	53.3758	38
BNBS	5	Loblolly Pine	Conifer	Evergreen	1	16	53.3727	38.5
BNBS	6	Loblolly Pine	Conifer	Evergreen	1	20	53.3714	38
BNBS	7	Willow Oak	Broadleaf	Deciduous	1	7	53.3707	36.5
BNBS	8	Loblolly Pine	Conifer	Evergreen	1	18	53.3693	38.5
BNBS	9	Loblolly Pine	Conifer	Evergreen	1	24	53.3670	38.5
BNBS	10	Loblolly Pine	Conifer	Evergreen	1	15	53.3652	39
BNBS	11	Loblolly Pine	Conifer	Evergreen	1	24	53.3636	38.75
BNBS	12	Sassafras	Broadleaf	Deciduous	1	5	53.3568	40.5
BNBS	13	Sassafras	Broadleaf	Deciduous	3	4.5	53.3561	39
BNBS	14					4.5	53.3561	39
BNBS	15					5.5	53.3561	39
BNBS	16	Sassafras	Broadleaf	Deciduous	1	5.5	53.3563	41
BNBS	17	Sassafras	Broadleaf	Deciduous	1	5	53.3557	39.5
BNBS	18	Sassafras	Broadleaf	Deciduous	3	4.5	53.3555	41.5
BNBS	19					5	53.3555	41.5
BNBS	20					5	53.3555	41.5
BNBS	21	Sassafras	Broadleaf	Deciduous	1	4	53.3551	40.5
BNBS	22	Willow Oak	Broadleaf	Deciduous	1	44	53.3513	37.75
BNBS	23	Sassafras	Broadleaf	Deciduous	1	6.5	53.3475	39
BNBS	24	Sassafras	Broadleaf	Deciduous	1	7	53.3460	40.75
BNBS	25	Willow Oak	Broadleaf	Deciduous	1	9	53.3434	37.5
BNBS	26	Slippery Elm	Broadleaf	Deciduous	3	10	53.3379	38.5
BNBS	27					6.5	53.3379	38.5
BNBS	28					6	53.3379	38.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBS	29	Pecan Tree	Broadleaf	Deciduous	2	9	53.3371	59.5
BNBS	30					9	53.3371	59.5
BNBS	31	Willow Oak	Broadleaf	Deciduous	1	9.5	53.3359	44
BNBS	32	Willow Oak	Broadleaf	Deciduous	1	6.5	53.3355	38
BNBS	33	Willow Oak	Broadleaf	Deciduous	1	9.5	53.3348	38
BNBS	34	Loblolly Pine	Conifer	Evergreen	1	21	53.3330	39.5
BNBS	35	Loblolly Pine	Conifer	Evergreen	1	25	53.3288	40.75
BNBS	36	Loblolly Pine	Conifer	Evergreen	1	21	53.3271	39.75
BNBS	37	Loblolly Pine	Conifer	Evergreen	1	21	53.3254	40
BNBS	38	Sugarberry	Broadleaf	Deciduous	1	8	53.3241	50
BNBS	39	Loblolly Pine	Conifer	Evergreen	1	17	53.3236	40
BNBS	40	Sugarberry	Broadleaf	Deciduous	1	5	53.3176	39.25
BNBS	41	Sugarberry	Broadleaf	Deciduous	5	14	53.3144	41.5
BNBS	42					14	53.3144	41.5
BNBS	43					8	53.3144	41.5
BNBS	44					9	53.3144	41.5
BNBS	45					10	53.3144	41.5
BNBS	46	Sugarberry	Broadleaf	Deciduous	1	7	53.3117	37
BNBS	47	Sugarberry	Broadleaf	Deciduous	1	8	53.3114	36.5
BNBS	48	Sugarberry	Broadleaf	Deciduous	2	9	53.3096	53
BNBS	49					8	53.3096	53
BNBS	50	Sugarberry	Broadleaf	Deciduous	1	6	53.3095	53
BNBS	51	Sugarberry	Broadleaf	Deciduous	2	10	53.3067	40
BNBS	52					7	53.3067	40
BNBS	53	Loblolly Pine	Conifer	Evergreen	1	12	53.3032	54.25
BNBS	54	Eastern Red Cedar	Conifer	Evergreen	1	7	53.3027	39.75
BNBS	55	Sugarberry	Broadleaf	Deciduous	1	8	53.3000	44
BNBS	56	Loblolly Pine	Conifer	Evergreen	1	8	53.2981	49.5
BNBS	57	Loblolly Pine	Conifer	Evergreen	1	10	53.2951	57

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBS	58	Loblolly Pine	Conifer	Evergreen	1	7	53.2951	48.75
BNBS	59	Sugarberry	Broadleaf	Deciduous	1	6	53.2951	44
BNBS	60	Sugarberry	Broadleaf	Deciduous	1	13	53.2922	40.5
BNBS	61	Loblolly Pine	Conifer	Evergreen	1	13	53.2915	48
BNBS	62	Loblolly Pine	Conifer	Evergreen	1	9	53.2892	52.5
BNBS	63	Loblolly Pine	Conifer	Evergreen	1	7	53.2884	44.5
BNBS	64	Loblolly Pine	Conifer	Evergreen	1	8	53.2876	54
BNBS	65	Sugarberry	Broadleaf	Deciduous	1	12	53.2852	40.5
BNBS	66	Loblolly Pine	Conifer	Evergreen	1	6	53.2839	55
BNBS	67	Loblolly Pine	Conifer	Evergreen	1	10.5	53.2816	60.5
BNBS	68	Sugarberry	Broadleaf	Deciduous	1	15	53.2809	39.75
BNBS	69	Sugarberry	Broadleaf	Deciduous	1	6	53.2772	38
BNBS	70	Loblolly Pine	Conifer	Evergreen	1	11.5	53.2761	57.5
BNBS	71	Sugarberry	Broadleaf	Deciduous	1	7	53.2745	20.25
BNBS	72	Loblolly Pine	Conifer	Evergreen	1	7	53.2716	59
BNBS	73	Sugarberry	Broadleaf	Deciduous	1	12	53.2706	39.75
BNBS	74	Sugarberry	Broadleaf	Deciduous	1	10	53.2688	40
BNBS	75	Loblolly Pine	Conifer	Evergreen	1	7	53.2684	56.75
BNBS	76	Loblolly Pine	Conifer	Evergreen	1	6	53.2683	50.75
BNBS	77	Sugarberry	Broadleaf	Deciduous	1	12	53.2670	39.75
BNBS	78	Sugarberry	Broadleaf	Deciduous	1	10	53.2661	39.5
BNBS	79	Sugarberry	Broadleaf	Deciduous	1	6	53.2657	41.5
BNBS	80	Loblolly Pine	Conifer	Evergreen	1	8	53.2638	54.5
BNBS	81	Sugarberry	Broadleaf	Deciduous	1	13	53.2598	40.5
BNBS	82	Osage Orange	Broadleaf	Deciduous	4	7	53.2593	37.75
BNBS	83					7	53.2593	37.75
BNBS	84					5	53.2593	37.75
BNBS	85					10	53.2593	37.75
BNBS	86	Eastern Red Cedar	Conifer	Evergreen	1	8	53.2589	48.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBS	87	Osage Orange	Broadleaf	Deciduous	4	8	53.2564	39.5
BNBS	88					9	53.2564	39.5
BNBS	89					5.5	53.2564	39.5
BNBS	90					5.5	53.2564	39.5
BNBS	91	Osage Orange	Broadleaf	Deciduous	2	6.5	53.2547	39.5
BNBS	92					9.5	53.2547	39.5
BNBS	93	Sugarberry	Broadleaf	Deciduous	1	6.5	53.2519	40.5
BNBS	94	Sugarberry	Broadleaf	Deciduous	1	8	53.2506	40.5
BNBS	95	Slippery Elm	Broadleaf	Deciduous	1	6	53.2470	39.75
BNBS	96	Eastern Red Cedar	Conifer	Evergreen	1	10	53.2456	66.75
BNBS	97	Eastern Red Cedar	Conifer	Evergreen	1	7	53.2435	58.25
BNBS	98	Sugarberry	Broadleaf	Deciduous	1	6	53.2442	41.25
BNBS	99	Eastern Red Cedar	Conifer	Evergreen	1	8.5	53.2411	57.5
BNBS	100	Winged Elm	Broadleaf	Deciduous	1	6	53.2402	44.5
BNBS	101	Eastern Red Cedar	Conifer	Evergreen	2	9.5	53.2387	42.5
BNBS	102					9.5	53.2387	42.5
BNBS	103	Winged Elm	Broadleaf	Deciduous	1	7	53.2367	42.5
BNBS	104	Eastern Red Cedar	Conifer	Evergreen	1	11	53.2324	45
BNBS	105	Eastern Red Cedar	Conifer	Evergreen	1	6	53.2227	44.5
BNBS	106	Eastern Red Cedar	Conifer	Evergreen	1	9.5	53.2189	47
BNBS	107	Loblolly Pine	Conifer	Evergreen	1	14	53.2153	38.75
BNBS	108	Loblolly Pine	Conifer	Evergreen	1	6.5	53.2148	38.5
BNBS	109	Loblolly Pine	Conifer	Evergreen	1	18	53.2127	40.25
BNBS	110	Loblolly Pine	Conifer	Evergreen	1	15	53.2100	39.5
BNBS	111	Loblolly Pine	Conifer	Evergreen	1	9	53.2087	39
BNBS	112	Loblolly Pine	Conifer	Evergreen	1	7	53.2064	37.5
BNBS	113	Loblolly Pine	Conifer	Evergreen	1	9.5	53.2063	39.5
BNBS	114	Loblolly Pine	Conifer	Evergreen	1	11	53.2045	39

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBS	115	Loblolly Pine	Conifer	Evergreen	2	7	53.2042	39
BNBS	116		Broadleaf	Deciduous		7.5	53.2042	39
BNBS	117	Loblolly Pine	Conifer	Evergreen	2	5.5	53.2036	38
BNBS	118		Broadleaf	Deciduous		10	53.2036	38
BNBS	119	Loblolly Pine	Conifer	Evergreen	1	9.5	53.2025	38
BNBS	120	Sugarberry	Broadleaf	Deciduous	1	6.5	53.2002	40.75
BNBS	121	Loblolly Pine	Conifer	Evergreen	2	9.5	53.1991	39.25
BNBS	122					5.5	53.1991	39.25
BNBS	123	Loblolly Pine	Conifer	Evergreen	1	11.5	53.1979	39.25
BNBS	124	Loblolly Pine	Conifer	Evergreen	1	16	53.1972	40.25
BNBS	125	Loblolly Pine	Conifer	Evergreen	1	14	53.1947	37.5
BNBS	126	Loblolly Pine	Conifer	Evergreen	1	19	53.1933	39.5
BNBS	127	Loblolly Pine	Conifer	Evergreen	1	6	53.1922	36.75
BNBS	128	Loblolly Pine	Conifer	Evergreen	1	16	53.1907	37.25
BNBS	129	Loblolly Pine	Conifer	Evergreen	1	17	53.1879	38
BNBS	130	Loblolly Pine	Conifer	Evergreen	1	6	53.1879	37
BNBS	131	Loblolly Pine	Conifer	Evergreen	1	19	53.1868	41
BNBS	132	Loblolly Pine	Conifer	Evergreen	1	6	53.1852	40.5
BNBS	133	Loblolly Pine	Conifer	Evergreen	1	6	53.1842	39.5
BNBS	134	Loblolly Pine	Conifer	Evergreen	1	11	53.1831	39.75
BNBS	135	Loblolly Pine	Conifer	Evergreen	1	7	53.1828	37.25
BNBS	136	Loblolly Pine	Conifer	Evergreen	3	10	53.1804	40
	137					8.5	53.1804	40
	138					8	53.1804	40
BNBS	139	Loblolly Pine	Conifer	Evergreen	1	17	53.1777	40.25
BNBS	140	Loblolly Pine	Conifer	Evergreen	1	13.5	53.1769	41.5
BNBS	141	Loblolly Pine	Conifer	Evergreen	1	11.5	53.1759	39
BNBS	142	Loblolly Pine	Conifer	Evergreen	1	9.5	53.1754	38.5
BNBS	143	Loblolly Pine	Conifer	Evergreen	1	17	53.1725	40.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
ey	144	Loblolly Pine	Conifer	Evergreen	1	18	53.1716	39.25
BNBS	145	Loblolly Pine	Conifer	Evergreen	1	7	53.1683	58
BNBS	146	Loblolly Pine	Conifer	Evergreen	1	21	53.1633	41
BNBS	147	Loblolly Pine	Conifer	Evergreen	1	16	53.1608	39
BNBS	148	Loblolly Pine	Conifer	Evergreen	1	7	53.3484	50.5
BNBS	149	Loblolly Pine	Conifer	Evergreen	1	9	53.1582	51
BNBS	150	Loblolly Pine	Conifer	Evergreen	1	6	53.1557	58
BNBS	151	Loblolly Pine	Conifer	Evergreen	1	10	53.1542	49
BNBS	152	Eastern Red Cedar	Conifer	Evergreen	1	14	53.1544	38.75
BNBS	153	Loblolly Pine	Conifer	Evergreen	1	7	53.1520	58
BNBS	154	Loblolly Pine	Conifer	Evergreen	1	6.5	53.1491	64.5
BNBS	155	Loblolly Pine	Conifer	Evergreen	1	6	53.1474	51.5
BNBS	156	Loblolly Pine	Conifer	Evergreen	1	7	53.1459	51.5
BNBS	157	Sugarberry	Broadleaf	Deciduous	1	10	53.1449	38
BNBS	158	Sugarberry	Broadleaf	Deciduous	1	11	53.1426	38.5
BNBS	159	Loblolly Pine	Conifer	Evergreen	1	8.5	53.1420	52.5
BNBS	160	Sugarberry	Broadleaf	Deciduous	1	15	53.1396	42.5
BNBS	161	Sugarberry	Broadleaf	Deciduous	1	6	53.1373	43.75
BNBS	162	Loblolly Pine	Conifer	Evergreen	1	6	53.1342	51.5
BNBS	163	Sugarberry	Broadleaf	Deciduous	2	7	53.1322	44.5
BNBS	164					6	53.1322	44.5
BNBS	165	Sugarberry	Broadleaf	Deciduous	2	7	53.1268	44
BNBS	166					8	53.1268	44
BNBS	167	Sugarberry	Broadleaf	Deciduous	1	6	53.1244	41.5
BNBS	168	Sugarberry	Broadleaf	Deciduous	1	9	53.1238	44
BNBS	169	Sugarberry	Broadleaf	Deciduous	1	15	53.1198	40
BNBS	170	Slippery Elm	Broadleaf	Deciduous	1	6	53.1182	55.5
BNBS	171	Sugarberry	Broadleaf	Deciduous	2	10	53.1123	42
BNBS	172					13	53.1123	42

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBS	173	Sugarberry	Broadleaf	Deciduous	1	7	53.1085	40.5
BNBS	174	Sugarberry	Broadleaf	Deciduous	1	7	53.1076	44.5
BNBS	175	Sugarberry	Broadleaf	Deciduous	1	8	53.1070	41.5
BNBS	176	Sugarberry	Broadleaf	Deciduous	1	6.5	53.1041	39.75
BNBS	177	White Ash	Broadleaf	Deciduous	1	11	53.1041	41.5
BNBS	178	Loblolly Pine	Conifer	Evergreen	1	15	53.1023	39.5
BNBS	179	Sugarberry	Broadleaf	Deciduous	1	9	53.0991	42
BNBS	180	Loblolly Pine	Conifer	Evergreen	1	19	53.0945	40
BNBS	181	Sugarberry	Broadleaf	Deciduous	1	10	53.0939	40
BNBS	182	Sugarberry	Broadleaf	Deciduous	1	20	53.0884	39.75
BNBS	183	Loblolly Pine	Conifer	Evergreen	1	7	53.0858	52.5
BNBS	184	Loblolly Pine	Conifer	Evergreen	1	9	53.0801	69
BNBS	185	Loblolly Pine	Conifer	Evergreen	1	10	53.0794	55
BNBS	186	Loblolly Pine	Conifer	Evergreen	1	10.5	53.0786	48
BNBS	187	Sugarberry	Broadleaf	Deciduous	1	6	53.0782	40.5
BNBS	188	Eastern Red Cedar	Conifer	Evergreen	1	10	53.0754	45.5
BNBS	189	Loblolly Pine	Conifer	Evergreen	1	10	53.0748	55
BNBS	190	Sugarberry	Broadleaf	Deciduous	1	5.5	53.0742	41
BNBS	191	Loblolly Pine	Conifer	Evergreen	1	6	53.0736	52.5
BNBS	192	Sugarberry	Broadleaf	Deciduous	1	11	53.0723	39.5
BNBS	193	Loblolly Pine	Conifer	Evergreen	1	8	53.0709	52
BNBS	194	Loblolly Pine	Conifer	Evergreen	1	14	53.0697	49.5
BNBS	195	Sugarberry	Broadleaf	Deciduous	1	9	53.0695	37.5
BNBS	196	Loblolly Pine	Conifer	Evergreen	1	9.5	53.0670	55.5
BNBS	197	Sugarberry	Broadleaf	Deciduous	1	8	53.0661	40
BNBS	198	Loblolly Pine	Conifer	Evergreen	1	6.5	53.0655	53.5
BNBS	199	Sugarberry	Broadleaf	Deciduous	1	8	53.0621	48.25
BNBS	200	Sugarberry	Broadleaf	Deciduous	1	8	53.0614	41.5
BNBS	201	Sugarberry	Broadleaf	Deciduous	1	6	53.0587	44

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBS	202	Sugarberry	Broadleaf	Deciduous	1	16	53.0541	38.75
BNBS	203	Eastern Red Cedar	Conifer	Evergreen	1	6.5	53.0525	39.25
BNBS	204	Sugarberry	Broadleaf	Deciduous	1	8	53.0523	37.75
BNBS	205	Eastern Red Cedar	Conifer	Evergreen	1	9	53.0509	40.25
BNBS	206	Sugarberry	Broadleaf	Deciduous	1	6	53.0497	40.25
BNBS	207	Sugarberry	Broadleaf	Deciduous	1	13	53.0473	38.5
BNBS	208	Eastern Red Cedar	Conifer	Evergreen	1	7.5	53.0468	39.5
BNBS	209	Loblolly Pine	Conifer	Evergreen	1	6	53.0470	61
BNBS	210	Loblolly Pine	Conifer	Evergreen	1	7.5	53.0460	59
BNBS	211	Sugarberry	Broadleaf	Deciduous	1	16	53.0422	39
BNBS	212	Sugarberry	Broadleaf	Deciduous	1	13	53.0394	39
BNBS	213	Loblolly Pine	Conifer	Evergreen	1	7.5	53.0403	58
BNBS	214	Loblolly Pine	Conifer	Evergreen	1	7	53.0348	53
BNBS	215	Loblolly Pine	Conifer	Evergreen	1	7	53.0345	61
BNBS	216	Sugarberry	Broadleaf	Deciduous	1	16	53.0335	38.25
BNBS	217	Loblolly Pine	Conifer	Evergreen	1	9	53.0326	51.5
BNBS	218	Sugarberry	Broadleaf	Deciduous	1	12	53.0322	39.5
BNBS	219	Loblolly Pine	Conifer	Evergreen	1	8	53.0313	68
BNBS	220	Loblolly Pine	Conifer	Evergreen	1	8	53.0294	50.5
BNBS	221	Sugarberry	Broadleaf	Deciduous	1	7	53.0295	40
BNBS	222	White Ash	Broadleaf	Deciduous	1	9	53.0292	38.25
BNBS	223	Sugarberry	Broadleaf	Deciduous	1	7	53.0286	39.25
BNBS	224	Loblolly Pine	Conifer	Evergreen	1	9.5	53.0280	65.5
BNBS	225	Loblolly Pine	Conifer	Evergreen	1	9	53.0256	49
BNBS	226	Sugarberry	Broadleaf	Deciduous	1	11	53.0250	38.25
BNBS	227	Sugarberry	Broadleaf	Deciduous	1	6	53.0245	38.25
BNBS	228	Loblolly Pine	Conifer	Evergreen	1	7	53.0231	48.5
BNBS	229	Loblolly Pine	Conifer	Evergreen	1	7.5	53.0227	56.5
BNBS	230	Eastern Red Cedar	Conifer	Evergreen	1	9.5	53.0223	42.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBS	231	Sugarberry	Broadleaf	Deciduous	1	13	53.0203	38.75
BNBS	232	Loblolly Pine	Conifer	Evergreen	1	8	53.0193	45.5
BNBS	233	Loblolly Pine	Conifer	Evergreen	1	10	53.0191	63
BNBS	234	Loblolly Pine	Conifer	Evergreen	1	11	53.0180	46
BNBS	235	Eastern Red Cedar	Conifer	Evergreen	1	12	53.0146	40.25
BNBS	236	Loblolly Pine	Conifer	Evergreen	1	11	53.0140	46.5
BNBS	237	Loblolly Pine	Conifer	Evergreen	1	7	53.0114	46.5
BNBS	238	Sugarberry	Broadleaf	Deciduous	1	8	53.0114	46
BNBS	239	Sugarberry	Broadleaf	Deciduous	1	8	53.0087	39.75
BNBS	240	Loblolly Pine	Conifer	Evergreen	1	10	53.0059	46.25
BNBS	241	Loblolly Pine	Conifer	Evergreen	1	7.5	53.0057	53.5
BNBS	242	Loblolly Pine	Conifer	Evergreen	1	10	53.0036	67
BNBS	243	Loblolly Pine	Conifer	Evergreen	1	7.5	53.0011	53
BNBS	244	Sugarberry	Broadleaf	Deciduous	1	16	53.0004	39
BNBS	245	Eastern Red Cedar	Conifer	Evergreen	1	5.5	52.9979	64.5
BNBS	246	Loblolly Pine	Conifer	Evergreen	1	9.5	52.9979	63
BNBS	247	Loblolly Pine	Conifer	Evergreen	1	9.5	52.9943	49.5
BNBS	248	Loblolly Pine	Conifer	Evergreen	1	9	52.9941	65.5
BNBS	249	Loblolly Pine	Conifer	Evergreen	1	7	52.9923	61.5
BNBS	250	Loblolly Pine	Conifer	Evergreen	1	10	52.9912	61
BNBS	251	Loblolly Pine	Conifer	Evergreen	1	10.5	52.9892	51.5
BNBS	252	Loblolly Pine	Conifer	Evergreen	1	7	52.9873	52
BNBS	253	Loblolly Pine	Conifer	Evergreen	1	9	52.9862	51
BNBS	254	Eastern Red Cedar	Conifer	Evergreen	1	7.5	52.9816	55
BNBN	255	Sugarberry	Broadleaf	Deciduous	1	23	53.39413	38
BNBN	256	Bradford Pear	Broadleaf	Deciduous	1	8	53.39564	44.25
BNBN	257	Loblolly Pine	Conifer	Evergreen	1	14.5	53.40114	55.5
BNBN	258	Sugarberry	Broadleaf	Deciduous	1	7	53.40109	37.5
BNBN	259	Sugarberry	Broadleaf	Deciduous	1	10	53.40663	50.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBN	260	Sugarberry	Broadleaf	Deciduous	1	8	53.41269	35.5
BNBN	261	Loblolly Pine	Conifer	Evergreen	1	16	53.41458	52
BNBN	262	Loblolly Pine	Conifer	Evergreen	1	15	53.41458	79
BNBN	263	Loblolly Pine	Conifer	Evergreen	1	12	53.41686	61
BNBN	264	Loblolly Pine	Conifer	Evergreen	1	12	53.41686	79.5
BNBN	265	Loblolly Pine	Conifer	Evergreen	1	9	53.41875	61.5
BNBN	266	Loblolly Pine	Conifer	Evergreen	1	10	53.42216	53.5
BNBN	267	Loblolly Pine	Conifer	Evergreen	1	11	53.42330	60
BNBN	268	Loblolly Pine	Conifer	Evergreen	1	13	53.42462	51
BNBN	269	Loblolly Pine	Conifer	Evergreen	1	14	53.42576	61
BNBN	270	Sugarberry	Broadleaf	Deciduous	1	9.5	53.42727	37.5
BNBN	271	Loblolly Pine	Conifer	Evergreen	1	9	53.42784	51.5
BNBN	272	Loblolly Pine	Conifer	Evergreen	1	10	53.42869	60
BNBN	273	Loblolly Pine	Conifer	Evergreen	1	13.5	53.43163	54
BNBN	274	Sugarberry	Broadleaf	Deciduous	1	6	53.43163	38.25
BNBN	275	Loblolly Pine	Conifer	Evergreen	1	11	53.43371	64
BNBN	276	Loblolly Pine	Conifer	Evergreen	1	9	53.43466	55
BNBN	277	Sugarberry	Broadleaf	Deciduous	1	6	53.43523	40
BNBN	278	Sugarberry	Broadleaf	Deciduous	1	16	53.43542	38
BNBN	279	Loblolly Pine	Conifer	Evergreen	1	12	53.43750	56.5
BNBN	280	Loblolly Pine	Conifer	Evergreen	1	8	53.43902	56.5
BNBN	281	Green Ash	Broadleaf	Deciduous	1	11	53.43996	39.5
BNBN	282	Loblolly Pine	Conifer	Evergreen	1	8	53.44091	56.5
BNBN	283	Sugarberry	Broadleaf	Deciduous	1	11	53.44242	42
BNBN	284	Loblolly Pine	Conifer	Evergreen	1	10	53.44375	42.5
BNBN	285	Loblolly Pine	Conifer	Evergreen	1	9	53.44375	66
BNBN	286	Loblolly Pine	Conifer	Evergreen	1	21	53.44508	47.5
BNBN	287	Green Ash	Broadleaf	Deciduous	1	8	53.44659	37.75
BNBN	288	Loblolly Pine	Conifer	Evergreen	1	6	53.44754	47.75

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBN	289	Loblolly Pine	Conifer	Evergreen	1	12	53.44905	54.25
BNBN	290	Loblolly Pine	Conifer	Evergreen	1	8	53.45038	58
BNBN	291	Loblolly Pine	Conifer	Evergreen	1	10	53.45322	54.5
BNBN	292	Sugarberry	Broadleaf	Deciduous	1	11	53.45398	42.5
BNBN	293	Loblolly Pine	Conifer	Evergreen	1	11	53.45511	52.75
BNBN	294	Loblolly Pine	Conifer	Evergreen	1	12	53.45739	48.5
BNBN	295	Loblolly Pine	Conifer	Evergreen	1	9	53.45890	50.5
BNBN	296	Laurel Oak	Broadleaf	Deciduous	1	9	53.46127	38.25
BNBN	297	Loblolly Pine	Conifer	Evergreen	1	11	53.46212	50
BNBN	298	Loblolly Pine	Conifer	Evergreen	1	14	53.46307	66
BNBN	299	Loblolly Pine	Conifer	Evergreen	1	10	53.46482	54
BNBN	300	Loblolly Pine	Conifer	Evergreen	1	7.5	53.46648	51
BNBN	301	Loblolly Pine	Conifer	Evergreen	1	7	53.46686	55.25
BNBN	302	Sugarberry	Broadleaf	Deciduous	1	6	53.46837	40.5
BNBN	303	Loblolly Pine	Conifer	Evergreen	1	6.5	53.46856	56
BNBN	304	Loblolly Pine	Conifer	Evergreen	1	9	53.47121	61
BNBN	305	Loblolly Pine	Conifer	Evergreen	1	12	53.47140	52
BNBN	306	Loblolly Pine	Conifer	Evergreen	1	22	53.47254	38.75
BNBN	307	Loblolly Pine	Conifer	Evergreen	1	9	53.47462	55
BNBN	308	Loblolly Pine	Conifer	Evergreen	1	23	53.47595	37.5
BNBN	309	Water Oak	Broadleaf	Deciduous	1	6	53.47595	35.5
BNBN	310	Sugarberry	Broadleaf	Deciduous	1	6	53.47860	41.5
BNBN	311	Loblolly Pine	Conifer	Evergreen	1	8.5	53.47917	53.5
BNBN	312	Sugarberry	Broadleaf	Deciduous	1	9	53.47992	36.75
BNBN	313	Loblolly Pine	Conifer	Evergreen	1	9	53.48106	47.5
BNBN	314	Eastern Red Cedar	Conifer	Evergreen	1	9	53.48144	44
BNBN	315	Loblolly Pine	Conifer	Evergreen	1	8	53.48314	49.5
BNBN	316	Loblolly Pine	Conifer	Evergreen	1	11	53.48561	52.5
BNBN	317	Loblolly Pine	Conifer	Evergreen	1	13	53.48826	51.5

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Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBN	318	White Ash	Broadleaf	Deciduous	1	6	53.49110	41
BNBN	319	Sugarberry	Broadleaf	Deciduous	1	10	53.49176	38.25
BNBN	320	White Ash	Broadleaf	Deciduous	1	10	53.49223	40.5
BNBN	321	Loblolly Pine	Conifer	Evergreen	1	7	53.49375	48.5
BNBN	322	Loblolly Pine	Conifer	Evergreen	1	24	53.49678	39
BNBN	323	Red Oak	Broadleaf	Deciduous	1	18	53.50038	41
BNBN	324	Red Oak	Broadleaf	Deciduous	1	30	53.50133	37
BNBN	325	Loblolly Pine	Conifer	Evergreen	1	8	53.50587	57.5
BNBN	326	Sugarberry	Broadleaf	Deciduous	3	7	53.50578	38
	327					6	53.50578	38
	328					7	53.50578	38
BNBN	329	Loblolly Pine	Conifer	Evergreen	1	11	53.50833	52.5
BNBN	330	Loblolly Pine	Conifer	Evergreen	1	8	53.51004	56.5
BNBN	331	Loblolly Pine	Conifer	Evergreen	1	10	53.51193	64.5
BNBN	332	Sugarberry	Broadleaf	Deciduous	2	9	53.51269	37.75
	333					7	53.51269	37.75
BNBN	334	Loblolly Pine	Conifer	Evergreen	1	12.5	53.51402	57
BNBN	335	Loblolly Pine	Conifer	Evergreen	1	8	53.51420	51
BNBN	336	Sugarberry	Broadleaf	Deciduous	1	8	53.51610	49
BNBN	337	Loblolly Pine	Conifer	Evergreen	1	11	53.51648	37.25
BNBN	338	Loblolly Pine	Conifer	Evergreen	1	13	53.51742	54.25
BNBN	339	Loblolly Pine	Conifer	Evergreen	1	10	53.51856	61
BNBN	340	Sugarberry	Broadleaf	Deciduous	1	6	53.51913	35
BNBN	341	Loblolly Pine	Conifer	Evergreen	1	11	53.52159	60.5
BNBN	342	Water Oak	Broadleaf	Deciduous	1	12	53.52358	36.5
BNBN	343	Loblolly Pine	Conifer	Evergreen	1	12	53.52358	55
BNBN	344	Sugarberry	Broadleaf	Deciduous	1	8	53.52614	38.5
BNBN	345	Loblolly Pine	Conifer	Evergreen	1	12	53.52670	61.75
BNBN	346	Loblolly Pine	Conifer	Evergreen	1	11	53.52955	63.75

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBN	347	Loblolly Pine	Conifer	Evergreen	1	11	53.53220	56.25
BNBN	348	Eastern Red Cedar	Conifer	Evergreen	1	9	53.53504	46
BNBN	349	Loblolly Pine	Conifer	Evergreen	1	10	53.53523	57.5
BNBN	350	Loblolly Pine	Conifer	Evergreen	1	12	53.53580	66
BNBN	351	Sugarberry	Broadleaf	Deciduous	1	21	53.53958	39.5
BNBN	352	Red Oak	Broadleaf	Deciduous	1	10	53.54223	35.25
BNBN	353	Sugarberry	Broadleaf	Deciduous	1	10	53.54309	37.5
BNBN	354	Pecan Tree	Broadleaf	Deciduous	1	12	53.54413	35.75
BNBN	355	Loblolly Pine	Conifer	Evergreen	1	10	53.54413	59
BNBN	356	Sugarberry	Broadleaf	Deciduous	1	15	53.54801	38.5
BNBN	357	Sugarberry	Broadleaf	Deciduous	1	15	53.54943	40
BNBN	358	Sugarberry	Broadleaf	Deciduous	1	11	53.55133	38.5
BNBN	359	Sugarberry	Broadleaf	Deciduous	1	18	53.55208	39.25
BNBN	360	Sugarberry	Broadleaf	Deciduous	1	7	53.55417	37
BNBN	361	Sugarberry	Broadleaf	Deciduous	1	10	53.55492	38
BNBN	362	Pecan Tree	Broadleaf	Deciduous	1	11.5	53.55578	43
BNBN	363	Sugarberry	Broadleaf	Deciduous	2	7	53.55767	38
	364					10.5	53.55767	38
BNBN	365	Sugarberry	Broadleaf	Deciduous	1	6	53.55682	52
BNBN	366	Sugarberry	Broadleaf	Deciduous	1	8	53.56080	39.25
BNBN	367	Sugarberry	Broadleaf	Deciduous	1	8	53.56098	38
BNBN	368	Sugarberry	Broadleaf	Deciduous	1	6	53.56212	38
BNBN	369	Sugarberry	Broadleaf	Deciduous	1	12	53.56269	40.5
BNBN	370	Sugarberry	Broadleaf	Deciduous	1	12	53.56307	40.5
BNBN	371	Sugarberry	Broadleaf	Deciduous	1	12	53.56364	39
BNBN	372	Sugarberry	Broadleaf	Deciduous	1	6.5	53.56553	39.5
BNBN	373	White Ash	Broadleaf	Deciduous	2	10	53.56648	39.5
	374					11	53.56648	39.5
BNBN	375	Sugarberry	Broadleaf	Deciduous	1	13	53.56932	38.75

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
BNBN	376	Sugarberry	Broadleaf	Deciduous	1	10	53.57083	39.5
BNBN	377	Sugarberry	Broadleaf	Deciduous	1	8	53.57235	39.5
BNBN	378	Slippery Elm	Broadleaf	Deciduous	1	7	53.57273	44.5
BNBN	379	Basswood	Broadleaf	Deciduous	1	14	53.57519	63
BNBN	380	Sugarberry	Broadleaf	Deciduous	2	6	53.57547	39
	381					7	53.57547	39
BNBN	382	Slippery Elm	Broadleaf	Deciduous	1	6	53.57557	34.5
BNBN	383	Sugarberry	Broadleaf	Deciduous	1	13	53.57898	38
BNBN	384	Sugarberry	Broadleaf	Deciduous	1	12	53.58049	38
BNBN	385	Slippery Elm	Broadleaf	Deciduous	1	12.5	53.58106	40
BNBN	386	Sugarberry	Broadleaf	Deciduous	2	6	53.58428	42
	387					6	53.58428	42
BNBN	388	Sugarberry	Broadleaf	Deciduous	1	16	53.58589	40
BNBN	389	Pecan Tree	Broadleaf	Deciduous	1	12.5	53.58598	45
BNBN	390	Green Ash	Broadleaf	Deciduous	5	10	53.59261	40.5
	391					10	53.59261	40.5
	392					12	53.59261	40.5
	393					12	53.59261	40.5
	394					13	53.59261	40.5
BNBN	395	Sugarberry	Broadleaf	Deciduous	1	8	53.59593	43.5
BNBN	396	Sugarberry	Broadleaf	Deciduous	1	8	53.59631	39.5
BNBN	397	Sugarberry	Broadleaf	Deciduous	1	21	53.59905	39
BNBN	398	Sugarberry	Broadleaf	Deciduous	1	6	53.60057	44
BNBN	399	Sugarberry	Broadleaf	Deciduous	1	12	53.60095	39
BNBN	400	American Elm	Broadleaf	Deciduous	1	15	53.60455	39.5
BNBN	401	Sugarberry	Broadleaf	Deciduous	1	13	53.60587	39.5
BNBN	402	Sugarberry	Broadleaf	Deciduous	1	11	53.60625	37.25
BNBN	403	Sugarberry	Broadleaf	Deciduous	1	17	53.60758	37.5
BNBN	404	Slippery Elm	Broadleaf	Deciduous	1	6	53.60758	43.5

<table>
<tr><th>Tree Section No.</th><th>Number</th><th>Tree Name</th><th>Conifer, Broadleaf or Palm</th><th>Deciduous or Evergreen</th><th>No. Trunks in a Cluster</th><th>Trunk Diameter (inches)</th><th>Mile Post</th><th>Distance from EOP (feet)</th></tr>
<tr><td>BNBN</td><td>405</td><td>Slippery Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>6.5</td><td>53.61136</td><td>44.5</td></tr>
<tr><td>BNBN</td><td>406</td><td>Sugarberry</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>11</td><td>53.61250</td><td>37</td></tr>
<tr><td>BNBN</td><td>407</td><td>Slippery Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>10</td><td>53.61241</td><td>36.5</td></tr>
<tr><td>BNBN</td><td>408</td><td>Green Ash</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>17</td><td>53.61269</td><td>40.5</td></tr>
<tr><td>BNBN</td><td>409</td><td>Winged Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>7.5</td><td>53.61307</td><td>41</td></tr>
<tr><td>BNBN</td><td>410</td><td>Slippery Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>10</td><td>53.61402</td><td>40.5</td></tr>
<tr><td>BNBN</td><td>411</td><td>Sugarberry</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>13</td><td>53.61402</td><td>41</td></tr>
<tr><td>BNBN</td><td>412</td><td>American Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>7</td><td>53.61657</td><td>38.5</td></tr>
<tr><td rowspan="2">BNBN</td><td>413</td><td rowspan="2">Sugarberry</td><td rowspan="2">Broadleaf</td><td rowspan="2">Deciduous</td><td rowspan="2">2</td><td>7</td><td>53.61894</td><td>36.75</td></tr>
<tr><td>414</td><td>12</td><td>53.61894</td><td>36.75</td></tr>
<tr><td>BNBN</td><td>415</td><td>Slippery Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>24</td><td>53.62386</td><td>41.25</td></tr>
<tr><td>BNBN</td><td>416</td><td>Sugarberry</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>6</td><td>53.62557</td><td>38</td></tr>
<tr><td>BNBN</td><td>417</td><td>Slippery Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>10.5</td><td>53.62798</td><td>42</td></tr>
<tr><td>BNBN</td><td>418</td><td>Sugarberry</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>18</td><td>53.63220</td><td>37.5</td></tr>
<tr><td>BNBN</td><td>419</td><td>Green Ash</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>13</td><td>53.63636</td><td>34.75</td></tr>
<tr><td>BNBN</td><td>420</td><td>Slippery Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>13</td><td>53.63996</td><td>41.25</td></tr>
<tr><td>BNBN</td><td>421</td><td>Loblolly Pine</td><td>Conifer</td><td>Evergreen</td><td>1</td><td>13</td><td>53.64053</td><td>70</td></tr>
<tr><td>BNBN</td><td>422</td><td>Water Oak</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>11</td><td>53.64167</td><td>66</td></tr>
<tr><td>BNBN</td><td>423</td><td>Slippery Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>8</td><td>53.64242</td><td>37</td></tr>
<tr><td>BNBN</td><td>424</td><td>Slippery Elm</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>6</td><td>53.64432</td><td>37</td></tr>
<tr><td>BNBN</td><td>425</td><td>Sugarberry</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>8</td><td>53.64773</td><td>56.5</td></tr>
<tr><td>BNBN</td><td>426</td><td>Basswood</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>36</td><td>53.64981</td><td>64.5</td></tr>
<tr><td>BNBN</td><td>427</td><td>Basswood</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>15</td><td>53.65076</td><td>54</td></tr>
<tr><td>BNBN</td><td>428</td><td>Pecan Tree</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>20</td><td>53.65114</td><td>39</td></tr>
<tr><td rowspan="2">BNBN</td><td>429</td><td rowspan="2">Pecan Tree</td><td rowspan="2">Broadleaf</td><td rowspan="2">Deciduous</td><td rowspan="2">2</td><td>10</td><td>53.65398</td><td>39</td></tr>
<tr><td>430</td><td>12</td><td>53.65398</td><td>39</td></tr>
<tr><td>BNBN</td><td>431</td><td>Pecan Tree</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>14</td><td>53.66098</td><td>41</td></tr>
<tr><td>BNBN</td><td>432</td><td>Sugarberry</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>22</td><td>53.66269</td><td>34</td></tr>
<tr><td>CNBN</td><td>433</td><td>Willow Oak</td><td>Broadleaf</td><td>Deciduous</td><td>1</td><td>48</td><td>54.23706</td><td>25.3</td></tr>
</table>

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	434	Willow Oak	Broadleaf	Deciduous	1	16	54.26212	51
CNBN	435	Water Oak	Broadleaf	Deciduous	7	15	54.26629	39
CNBN	436					12	54.26629	39
CNBN	437					7	54.26629	39
CNBN	438					6.5	54.26629	39
CNBN	439					1	54.26629	39
CNBN	440					6	54.26629	39
CNBN	441					7.5	54.26629	39
CNBN	442	Willow Oak	Broadleaf	Deciduous	1	8	54.27110	38.5
CNBN	443	Sweet Gum	Broadleaf	Deciduous	1	5.5	54.27392	40.5
CNBN	444	Willow Oak	Broadleaf	Deciduous	2	7	54.27534	42.5
CNBN	445					8	54.27534	42.5
CNBN	446	Loblolly Pine	Conifer	Evergreen	1	9	54.27909	44.25
CNBN	447	Loblolly Pine	Conifer	Evergreen	1	8	54.28006	49.25
CNBN	448	Loblolly Pine	Conifer	Evergreen	1	11	54.28206	43.5
CNBN	449	Loblolly Pine	Conifer	Evergreen	1	7	54.28409	42.75
CNBN	450	Sweet Gum	Broadleaf	Deciduous	2	4	54.28426	47.75
CNBN	451					6	54.28426	47.75
CNBN	452	Loblolly Pine	Conifer	Evergreen	1	8	54.28631	41
CNBN	453	White Ash	Broadleaf	Deciduous	3	6	54.28867	43.75
CNBN	454					7	54.28867	43.75
CNBN	455					7	54.28867	43.75
CNBN	456	Sweet Gum	Broadleaf	Deciduous	1	6	54.29078	43
CNBN	457	Loblolly Pine	Conifer	Evergreen	1	10	54.29519	48
CNBN	458	Loblolly Pine	Conifer	Evergreen	1	8	54.29665	42.5
CNBN	459	Loblolly Pine	Conifer	Evergreen	1	9	54.29648	50.25
CNBN	460	Loblolly Pine	Conifer	Evergreen	1	7.5	54.29790	44
CNBN	461	Loblolly Pine	Conifer	Evergreen	1	8.5	54.29765	52.5
CNBN	462	Loblolly Pine	Conifer	Evergreen	1	7.5	54.29841	52.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	463	Loblolly Pine	Conifer	Evergreen	1	9	54.30013	52
CNBN	464	Loblolly Pine	Conifer	Evergreen	1	8	54.30087	42
CNBN	465	Loblolly Pine	Conifer	Evergreen	1	8	54.30180	46
CNBN	466	Loblolly Pine	Conifer	Evergreen	1	8	54.30337	41.75
CNBN	467	Loblolly Pine	Conifer	Evergreen	1	8	54.30436	46
CNBN	468	Loblolly Pine	Conifer	Evergreen	1	7.5	54.30763	44.5
CNBN	469	Loblolly Pine	Conifer	Evergreen	1	8.5	54.30953	41.75
CNBN	470	Loblolly Pine	Conifer	Evergreen	1	8	54.31201	47.75
CNBN	471	Loblolly Pine	Conifer	Evergreen	1	9	54.31492	51.25
CNBN	472	Loblolly Pine	Conifer	Evergreen	1	7	54.31869	45
CNBN	473	Loblolly Pine	Conifer	Evergreen	1	8	54.32059	56.25
CNBN	474	Loblolly Pine	Conifer	Evergreen	1	8	54.32237	53.25
CNBN	475	Loblolly Pine	Conifer	Evergreen	1	5.5	54.32447	43
CNBN	476	Loblolly Pine	Conifer	Evergreen	1	11	54.32604	60
CNBN	477	Loblolly Pine	Conifer	Evergreen	1	7.5	54.32710	53
CNBN	478	Loblolly Pine	Conifer	Evergreen	1	10	54.32883	47.75
CNBN	479	Loblolly Pine	Conifer	Evergreen	1	10.5	54.32972	52.75
CNBN	480	Loblolly Pine	Conifer	Evergreen	1	8	54.33167	48.75
CNBN	481	Loblolly Pine	Conifer	Evergreen	1	6.5	54.33472	50.25
CNBN	482	Loblolly Pine	Conifer	Evergreen	1	8	54.34091	51.25
CNBN	483	Loblolly Pine	Conifer	Evergreen	1	10	54.34373	53.75
CNBN	484	Loblolly Pine	Conifer	Evergreen	1	9	54.34602	49.5
CNBN	485	Loblolly Pine	Conifer	Evergreen	1	9	54.34691	43
CNBN	486	Loblolly Pine	Conifer	Evergreen	1	7.5	54.34866	46.5
CNBN	487	Loblolly Pine	Conifer	Evergreen	1	6	54.34920	53.75
CNBN	488	Loblolly Pine	Conifer	Evergreen	1	9	54.35070	45.75
CNBN	489	Loblolly Pine	Conifer	Evergreen	1	6	54.35089	52.25
CNBN	490	Loblolly Pine	Conifer	Evergreen	1	10	54.35451	48.75
CNBN	491	Loblolly Pine	Conifer	Evergreen	1	7	54.35623	47

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	492	Loblolly Pine	Conifer	Evergreen	1	6	54.35670	51.25
CNBN	493	Loblolly Pine	Conifer	Evergreen	1	8	54.35777	46.75
CNBN	494	Loblolly Pine	Conifer	Evergreen	1	8	54.35801	52.5
CNBN	495	Loblolly Pine	Conifer	Evergreen	1	10	54.35898	46
CNBN	496	Loblolly Pine	Conifer	Evergreen	1	7	54.35898	53
CNBN	497	Loblolly Pine	Conifer	Evergreen	1	8	54.36059	46.25
CNBN	498	Loblolly Pine	Conifer	Evergreen	1	8.5	54.36189	46.25
CNBN	499	Loblolly Pine	Conifer	Evergreen	1	10	54.36311	46.5
CNBN	500	Loblolly Pine	Conifer	Evergreen	1	9	54.36587	46.25
CNBN	501	Loblolly Pine	Conifer	Evergreen	1	12	54.36877	46
CNBN	502	Loblolly Pine	Conifer	Evergreen	1	8	54.36877	55
CNBN	503	Loblolly Pine	Conifer	Evergreen	1	9	54.36987	54
CNBN	504	Loblolly Pine	Conifer	Evergreen	1	8	54.37138	56.25
CNBN	505	Loblolly Pine	Conifer	Evergreen	1	10	54.37254	56
CNBN	506	Loblolly Pine	Conifer	Evergreen	1	8	54.37364	56
CNBN	507	Loblolly Pine	Conifer	Evergreen	1	9	54.37403	44.5
CNBN	508	Sweet Gum	Broadleaf	Deciduous	1	5	54.37468	49.25
CNBN	509	Loblolly Pine	Conifer	Evergreen	1	4	54.37468	35
CNBN	510	Loblolly Pine	Conifer	Evergreen	1	9	54.37563	45
CNBN	511	Loblolly Pine	Conifer	Evergreen	1	10	54.37576	55
CNBN	512	Loblolly Pine	Conifer	Evergreen	1	7	54.37686	55
CNBN	513	Loblolly Pine	Conifer	Evergreen	1	7	54.37790	55
CNBN	514	Loblolly Pine	Conifer	Evergreen	1	9	54.37826	44
CNBN	515	Loblolly Pine	Conifer	Evergreen	1	8	54.37977	44
CNBN	516	Loblolly Pine	Conifer	Evergreen	1	8	54.38100	49.5
CNBN	517	Loblolly Pine	Conifer	Evergreen	1	8	54.38150	55.75
CNBN	518	Loblolly Pine	Conifer	Evergreen	1	8	54.38227	55.5
CNBN	519	Loblolly Pine	Conifer	Evergreen	1	9	54.38227	44.5
CNBN	520	Loblolly Pine	Conifer	Evergreen	1	8	54.38352	56.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	521	American Elm	Broadleaf	Deciduous	1	8	54.38455	48.5
CNBN	522	Loblolly Pine	Conifer	Evergreen	1	12	54.38455	53.5
CNBN	523	Loblolly Pine	Conifer	Evergreen	1	7	54.38570	53.5
CNBN	524	Loblolly Pine	Conifer	Evergreen	1	6	54.38665	46
CNBN	525	Loblolly Pine	Conifer	Evergreen	1	8	54.38684	53.5
CNBN	526	Willow Oak	Broadleaf	Deciduous	1	6	54.39093	40
CNBN	527	Loblolly Pine	Conifer	Evergreen	1	9	54.39108	55.25
CNBN	528	Loblolly Pine	Conifer	Evergreen	1	9	54.39157	43
CNBN	529	Loblolly Pine	Conifer	Evergreen	1	9	54.39212	55.5
CNBN	530	Loblolly Pine	Conifer	Evergreen	1	7.5	54.39311	42.5
CNBN	531	Loblolly Pine	Conifer	Evergreen	1	8	54.39330	55
CNBN	532	Willow Oak	Broadleaf	Deciduous	1	7	54.39352	41
CNBN	533	Loblolly Pine	Conifer	Evergreen	1	10	54.39545	53.5
CNBN	534	Loblolly Pine	Conifer	Evergreen	1	8.5	54.39595	41.5
CNBN	535	Loblolly Pine	Conifer	Evergreen	1	7	54.39735	41.5
CNBN	536	Loblolly Pine	Conifer	Evergreen	1	8	54.39767	51.5
CNBN	537	Loblolly Pine	Conifer	Evergreen	1	7	54.39894	51.5
CNBN	538	Loblolly Pine	Conifer	Evergreen	1	6	54.40011	42
CNBN	539	Loblolly Pine	Conifer	Evergreen	1	10	54.40023	52
CNBN	540	Loblolly Pine	Conifer	Evergreen	1	7	54.40237	52
CNBN	541	Loblolly Pine	Conifer	Evergreen	1	7.5	54.40246	51
CNBN	542	Loblolly Pine	Conifer	Evergreen	1	6.5	54.40341	52
CNBN	543	Loblolly Pine	Conifer	Evergreen	1	8.5	54.40402	40.5
CNBN	544	Loblolly Pine	Conifer	Evergreen	1	9	54.40473	52.5
CNBN	545	Loblolly Pine	Conifer	Evergreen	1	8	54.40549	52
CNBN	546	Loblolly Pine	Conifer	Evergreen	1	8	54.40682	52
CNBN	547	Loblolly Pine	Conifer	Evergreen	1	10	54.40682	40.5
CNBN	548	Loblolly Pine	Conifer	Evergreen	1	7	54.40961	40.75
CNBN	549	Loblolly Pine	Conifer	Evergreen	1	10	54.41250	52

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	550	Loblolly Pine	Conifer	Evergreen	1	7	54.41345	52
CNBN	551	Loblolly Pine	Conifer	Evergreen	1	8.5	54.41387	41.5
CNBN	552	Sweet Gum	Broadleaf	Deciduous	1	6	54.41402	38.5
CNBN	553	Loblolly Pine	Conifer	Evergreen	1	10	54.41458	52
CNBN	554	Loblolly Pine	Conifer	Evergreen	1	11	54.41667	41
CNBN	555	Loblolly Pine	Conifer	Evergreen	1	9	54.41799	41.75
CNBN	556	Loblolly Pine	Conifer	Evergreen	1	7	54.41913	53.5
CNBN	557	Willow Oak	Broadleaf	Deciduous	1	6.5	54.41932	37.75
CNBN	558	Loblolly Pine	Conifer	Evergreen	1	7	54.42140	54.25
CNBN	559	Loblolly Pine	Conifer	Evergreen	1	9	54.42211	42
CNBN	560	Loblolly Pine	Conifer	Evergreen	1	8	54.42367	52.25
CNBN	561	Red Oak	Broadleaf	Deciduous	1	6	54.42453	38
CNBN	562	Loblolly Pine	Conifer	Evergreen	1	6	54.42595	52
CNBN	563	Loblolly Pine	Conifer	Evergreen	1	8.5	54.42633	41.5
CNBN	564	Red Oak	Broadleaf	Deciduous	1	6	54.42689	36.5
CNBN	565	Loblolly Pine	Conifer	Evergreen	1	9	54.42727	51.5
CNBN	566	Sweet Gum	Broadleaf	Deciduous	3	7	54.42860	39
	567					3	54.42860	39
	568					6.5	54.42860	39
CNBN	569	Loblolly Pine	Conifer	Evergreen	1	9	54.42936	53
CNBN	570	Loblolly Pine	Conifer	Evergreen	1	6.5	54.43068	52.5
CNBN	571	Loblolly Pine	Conifer	Evergreen	1	8	54.43258	53.5
CNBN	572	Loblolly Pine	Conifer	Evergreen	1	10	54.43447	46
CNBN	573	Loblolly Pine	Conifer	Evergreen	1	6	54.43598	46.25
CNBN	574	Willow Oak	Broadleaf	Deciduous	1	7	54.43655	50.5
CNBN	575	Laurel Oak	Broadleaf	Deciduous	3	10	54.47424	38.5
	576					7	54.47424	38.5
	577					8.5	54.47424	38.5
CNBN	578	Loblolly Pine	Conifer	Evergreen	1	6	54.47746	39

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	579	Loblolly Pine	Conifer	Evergreen	1	10.5	54.47784	39.5
CNBN	580	Loblolly Pine	Conifer	Evergreen	1	6	54.48087	40.5
CNBN	581	Loblolly Pine	Conifer	Evergreen	1	9	54.48163	38
CNBN	582	Loblolly Pine	Conifer	Evergreen	1	9	54.48201	39.5
CNBN	583	Loblolly Pine	Conifer	Evergreen	1	8.5	54.48258	40
CNBN	584	Loblolly Pine	Conifer	Evergreen	1	6	54.48636	36
CNBN	585	Loblolly Pine	Conifer	Evergreen	1	7	54.48769	35.5
CNBN	586	Loblolly Pine	Conifer	Evergreen	1	9	54.48920	38
CNBN	587	Loblolly Pine	Conifer	Evergreen	1	8.5	54.48958	35.25
CNBN	588	Loblolly Pine	Conifer	Evergreen	1	6.5	54.52614	37.25
CNBN	589	Loblolly Pine	Conifer	Evergreen	1	8.5	54.52936	46.25
CNBN	590	Loblolly Pine	Conifer	Evergreen	1	7	54.53068	46
CNBN	591	Loblolly Pine	Conifer	Evergreen	1	8	54.53068	39
CNBN	592	Loblolly Pine	Conifer	Evergreen	1	8	54.53333	46
CNBN	593	Loblolly Pine	Conifer	Evergreen	1	12	54.53485	46.5
CNBN	594	Loblolly Pine	Conifer	Evergreen	1	6	54.53693	48
CNBN	595	Loblolly Pine	Conifer	Evergreen	1	6.5	54.53712	54.25
CNBN	596	Loblolly Pine	Conifer	Evergreen	1	12	54.53788	55.75
CNBN	597	Loblolly Pine	Conifer	Evergreen	1	8	54.53958	56.5
CNBN	598	Loblolly Pine	Conifer	Evergreen	1	10	54.54091	55.5
CNBN	599	Loblolly Pine	Conifer	Evergreen	1	11	54.54138	36.5
CNBN	600	Sweet Gum	Broadleaf	Deciduous	1	6	54.54470	35
CNBN	601	Sweet Gum	Broadleaf	Deciduous	1	7	54.54545	35
CNBN	602	Sweet Gum	Broadleaf	Deciduous	1	7	54.54583	36.75
CNBN	603	Loblolly Pine	Conifer	Evergreen	1	9.5	54.54564	47
CNBN	604	Sweet Gum	Broadleaf	Deciduous	5	6	54.54678	46
	605					4	54.54678	46
	606					7	54.54678	46
	607					7.5	54.54678	46
	608					10	54.54678	46

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	609	Loblolly Pine	Conifer	Evergreen	1	10	54.54830	58.5
CNBN	610	Loblolly Pine	Conifer	Evergreen	1	9	54.55019	48.25
CNBN	611	Loblolly Pine	Conifer	Evergreen	1	8	54.55152	49
CNBN	612	Loblolly Pine	Conifer	Evergreen	1	8	54.55152	38.25
CNBN	613	Loblolly Pine	Conifer	Evergreen	1	9	54.55303	49
CNBN	614	Loblolly Pine	Conifer	Evergreen	1	10	54.55284	38
CNBN	615	Loblolly Pine	Conifer	Evergreen	1	7	54.55417	49.25
CNBN	616	Loblolly Pine	Conifer	Evergreen	1	8	54.55398	37.25
CNBN	617	Loblolly Pine	Conifer	Evergreen	1	6	54.55758	59
CNBN	618	Loblolly Pine	Conifer	Evergreen	1	10	54.55833	48.5
CNBN	619	Loblolly Pine	Conifer	Evergreen	1	8	54.55928	59
CNBN	620	Loblolly Pine	Conifer	Evergreen	1	9	54.56042	59
CNBN	621	Loblolly Pine	Conifer	Evergreen	1	10	54.56117	48
CNBN	622	Loblolly Pine	Conifer	Evergreen	1	6	54.56193	58
CNBN	623	Water Oak	Broadleaf	Deciduous	1	9	54.56496	54.25
CNBN	624	Loblolly Pine	Conifer	Evergreen	1	8	54.56496	60
CNBN	625	Loblolly Pine	Conifer	Evergreen	1	7	54.56591	60
CNBN	626	Sweet Gum	Broadleaf	Deciduous	1	6	54.56591	44
CNBN	627	Loblolly Pine	Conifer	Evergreen	1	9	54.56705	60
CNBN	628	Loblolly Pine	Conifer	Evergreen	1	8	54.56799	51
CNBN	629	Loblolly Pine	Conifer	Evergreen	1	6	54.56913	48.75
CNBN	630	Loblolly Pine	Conifer	Evergreen	1	6	54.56913	53.5
CNBN	631	Loblolly Pine	Conifer	Evergreen	1	7	54.57102	53.5
CNBN	632	Loblolly Pine	Conifer	Evergreen	1	10	54.57159	60
CNBN	633	Laurel Oak	Broadleaf	Deciduous	3	8	54.57576	43.5
	634					10	54.57576	43.5
	635					5	54.57576	43.5
CNBN	636	Sweet Gum	Broadleaf	Deciduous	1	10	54.57633	58

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	637	Laurel Oak	Broadleaf	Deciduous	1	7	54.57917	41.5
CNBN	638	Laurel Oak	Broadleaf	Deciduous	1	15	54.58087	45.5
CNBN	639	Eastern Red Cedar	Conifer	Evergreen	1	9	54.58295	45.5
CNBN	640	Loblolly Pine	Conifer	Evergreen	1	20	54.58352	45
CNBN	641	Loblolly Pine	Conifer	Evergreen	1	30	54.58561	45.5
CNBN	642	Eastern Red Cedar	Conifer	Evergreen	1	8	54.58693	46
CNBN	643	Water Oak	Broadleaf	Deciduous	1	34	54.58939	45.5
CNBN	644	Eastern Red Cedar	Conifer	Evergreen	1	9.5	54.59186	45.25
CNBN	645	Loblolly Pine	Conifer	Evergreen	1	8	54.59432	56.75
CNBN	646	Eastern Red Cedar	Conifer	Evergreen	1	15	54.59545	44.5
CNBN	647	Loblolly Pine	Conifer	Evergreen	1	10	54.59640	53.5
CNBN	648	Eastern Red Cedar	Conifer	Evergreen	3	6	54.59697	45
	649					6	54.59697	45
	650					6	54.59697	45
CNBN	651	Slippery Elm	Broadleaf	Deciduous	2	6	54.59792	46
	652					9	54.59792	46
CNBN	653	Eastern Red Cedar	Conifer	Evergreen	2	7	54.60000	46
	654					14	54.60000	46
CNBN	655	Laurel Oak	Broadleaf	Deciduous	1	14	54.60057	58
CNBN	656	Water Oak	Broadleaf	Deciduous	1	9	54.60189	51.5
CNBN	657	Loblolly Pine	Conifer	Evergreen	1	17	54.60189	46.25
CNBN	658	Loblolly Pine	Conifer	Evergreen	1	16	54.60246	47.5
CNBN	659	Slippery Elm	Broadleaf	Deciduous	1	6.5	54.60246	45.5
CNBN	660	Water Oak	Broadleaf	Deciduous	1	12	54.60379	41
CNBN	661	Laurel Oak	Broadleaf	Deciduous	1	9	54.60417	56
CNBN	662	Loblolly Pine	Conifer	Evergreen	1	8.5	54.60511	53.5
CNBN	663	Laurel Oak	Broadleaf	Deciduous	1	20	54.60568	47.5
CNBN	664	Willow Oak	Broadleaf	Deciduous	1	19	54.60682	41.5
CNBN	665	Eastern Red Cedar	Conifer	Evergreen	1	8	54.60985	54.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	666	Eastern Red Cedar	Conifer	Evergreen	1	10	54.61042	56
CNBN	667	Eastern Red Cedar	Conifer	Evergreen	1	16	54.61496	47.5
CNBN	668	Eastern Red Cedar	Conifer	Evergreen	1	6	54.61629	49
CNBN	669	Eastern Red Cedar	Conifer	Evergreen	1	14	54.61799	42.5
CNBN	670	Water Oak	Broadleaf	Deciduous	1	12	54.61875	55.5
CNBN	671	Eastern Red Cedar	Conifer	Evergreen	1	8	54.61951	52.5
CNBN	672	Laurel Oak	Broadleaf	Deciduous	1	8.5	54.62178	62
CNBN	673	Loblolly Pine	Conifer	Evergreen	1	20	54.62367	55
CNBN	674	Eastern Red Cedar	Conifer	Evergreen	1	8	54.62311	44.5
CNBN	675	Eastern Red Cedar	Conifer	Evergreen	1	12	54.62481	45.5
CNBN	676	Eastern Red Cedar	Conifer	Evergreen	1	10	54.62576	46
CNBN	677	Eastern Red Cedar	Conifer	Evergreen	1	7	54.62765	49
CNBN	678	White Ash	Broadleaf	Deciduous	1	9	54.62803	47
CNBN	679	Laurel Oak	Broadleaf	Deciduous	1	10	54.62822	55
CNBN	680	Loblolly Pine	Conifer	Evergreen	1	15	54.63106	40
CNBN	681	Laurel Oak	Broadleaf	Deciduous	1	6	54.63466	53.5
CNBN	682	Eastern Red Cedar	Conifer	Evergreen	1	18	54.63561	46
CNBN	683	Laurel Oak	Broadleaf	Deciduous	1	8	54.63580	50
CNBN	684	Water Oak	Broadleaf	Deciduous	1	10	54.63864	34
CNBN	685	White Ash	Broadleaf	Deciduous	1	6	54.63902	38
CNBN	686	Red Oak	Broadleaf	Deciduous	1	32	54.64564	46
CNBN	687	Sweet Gum	Broadleaf	Deciduous	1	7.5	54.64640	45
CNBN	688	Sweet Gum	Broadleaf	Deciduous	1	6.5	54.64811	57.5
CNBN	689	Eastern Red Cedar	Conifer	Evergreen	1	10	54.64924	45
CNBN	690	Sweet Gum	Broadleaf	Deciduous	1	8	54.64981	45.5
CNBN	691	Sweet Gum	Broadleaf	Deciduous	1	14	54.65019	47
CNBN	692	Sweet Gum	Broadleaf	Deciduous	2	6	54.65095	56
	693					12	54.65095	56
CNBN	694	Sweet Gum	Broadleaf	Deciduous	1	10	54.65265	43

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	695	Eastern Red Cedar	Conifer	Evergreen	1	15	54.65341	57
CNBN	696	Water Oak	Broadleaf	Deciduous	1	20	54.65568	59
CNBN	697	Water Oak	Broadleaf	Deciduous	1	8	54.65701	43
CNBN	698	Eastern Red Cedar	Conifer	Evergreen	1	16	54.65852	54
CNBN	699	Water Oak	Broadleaf	Deciduous	1	6	54.65890	54
CNBN	700	Loblolly Pine	Conifer	Evergreen	1	17	54.66383	55
CNBN	701	Loblolly Pine	Conifer	Evergreen	1	6	54.66420	53
CNBN	702	Loblolly Pine	Conifer	Evergreen	1	6	54.66496	57
CNBN	703	Eastern Red Cedar	Conifer	Evergreen	1	10	54.66572	45
CNBN	704	Eastern Red Cedar	Conifer	Evergreen	1	7	54.66629	47
CNBN	705	Laurel Oak	Broadleaf	Deciduous	1	12	54.66875	57
CNBN	706	Eastern Red Cedar	Conifer	Evergreen	1	6	54.66875	46
CNBN	707	Laurel Oak	Broadleaf	Deciduous	1	9	54.67045	55
CNBN	708	Eastern Red Cedar	Conifer	Evergreen	1	9	54.67405	48
CNBN	709	Water Oak	Broadleaf	Deciduous	1	52	54.67481	48
CNBN	710	Eastern Red Cedar	Conifer	Evergreen	3	5	54.67765	48
	711					5	54.67765	48
	712					9	54.67765	48
CNBN	713	Loblolly Pine	Conifer	Evergreen	1	6	54.68125	55
CNBN	714	Persimmon	Broadleaf	Deciduous	1	8.5	54.68333	48
CNBN	715	Water Oak	Broadleaf	Deciduous	1	6	54.68333	57
CNBN	716	Eastern Red Cedar	Conifer	Evergreen	3	15	54.68523	48
	717					12	54.68523	48
	718					10	54.68523	48
CNBN	719	Eastern Red Cedar	Conifer	Evergreen	1	12	54.68939	48
CNBN	720	American Elm	Broadleaf	Deciduous	1	20	54.69015	45
CNBN	721	Eastern Red Cedar	Conifer	Evergreen	1	16	54.69167	47.5
CNBN	722	Eastern Red Cedar	Conifer	Evergreen	1	8	54.69527	47.5
CNBN	723	White Ash	Broadleaf	Deciduous	1	10	54.69583	60

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	724	White Ash	Broadleaf	Deciduous	1	12	54.69640	54
CNBN	725	White Ash	Broadleaf	Deciduous	2	9	54.69867	58
	726					7.5	54.69867	58
CNBN	727	White Ash	Broadleaf	Deciduous	1	8	54.69924	44
CNBN	728	Eastern Red Cedar	Conifer	Evergreen	1	26	54.70170	50
CNBN	729	Sugarberry	Broadleaf	Deciduous	1	20	54.70227	49
CNBN	730	Eastern Red Cedar	Conifer	Evergreen	1	17	54.70814	49
CNBN	731	Eastern Red Cedar	Conifer	Evergreen	1	8	54.70966	46
CNBN	732	Loblolly Pine	Conifer	Evergreen	1	10	54.71193	56
CNBN	733	Loblolly Pine	Conifer	Evergreen	1	7	54.71307	56
CNBN	734	Sugarberry	Broadleaf	Deciduous	1	6	54.71496	49
CNBN	735	Loblolly Pine	Conifer	Evergreen	1	8	54.71553	56
CNBN	736	American Elm	Broadleaf	Deciduous	1	7	54.71648	54
CNBN	737	American Elm	Broadleaf	Deciduous	1	8	54.72083	49
CNBN	738	Loblolly Pine	Conifer	Evergreen	1	8	54.72652	57
CNBN	739	Loblolly Pine	Conifer	Evergreen	1	6.5	54.72822	57
CNBN	740	Loblolly Pine	Conifer	Evergreen	1	8	54.72841	57
CNBN	741	Loblolly Pine	Conifer	Evergreen	1	12	54.73163	54
CNBN	742	Sweet Gum	Broadleaf	Deciduous	1	7	54.73504	54
CNBN	743	Loblolly Pine	Conifer	Evergreen	1	10	54.73712	55
CNBN	744	Loblolly Pine	Conifer	Evergreen	1	9	54.74015	57.5
CNBN	745	Sweet Gum	Broadleaf	Deciduous	1	8	54.74110	39.5
CNBN	746	Laurel Oak	Broadleaf	Deciduous	1	6	54.74413	48.5
CNBN	747	Green Ash	Broadleaf	Deciduous	1	13	54.74413	41.5
CNBN	748	Loblolly Pine	Conifer	Evergreen	1	14	54.74650	62
CNBN	749	Loblolly Pine	Conifer	Evergreen	1	20	54.75322	57.75
CNBN	750	Laurel Oak	Broadleaf	Deciduous	1	38	54.76515	79
CNBN	751	Laurel Oak	Broadleaf	Deciduous	1	40	54.77405	97
CNBN	752	Willow Oak	Broadleaf	Deciduous	1	6	54.77936	40

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	753	Loblolly Pine	Conifer	Evergreen	1	24	54.78011	42
CNBN	754	Loblolly Pine	Conifer	Evergreen	1	20	54.78011	44
CNBN	755	Loblolly Pine	Conifer	Evergreen	1	12	54.78295	46
CNBN	756	Loblolly Pine	Conifer	Evergreen	1	29	54.78352	46
CNBN	757	Laurel Oak	Broadleaf	Deciduous	1	10	54.79337	58
CNBN	758	White Oak	Broadleaf	Deciduous	1	10	54.79375	66
CNBN	759	White Oak	Broadleaf	Deciduous	1	22	54.79867	46.75
CNBN	760	White Oak	Broadleaf	Deciduous	1	6	54.79981	38
CNBN	761	Loblolly Pine	Conifer	Evergreen	1	24	54.80000	36
CNBN	762	Laurel Oak	Broadleaf	Deciduous	1	9	54.80218	34.25
CNBN	763	Water Oak	Broadleaf	Deciduous	1	13	54.80303	70
CNBN	764	Red Oak	Broadleaf	Deciduous	1	13	54.80379	37
CNBN	765	American Elm	Broadleaf	Deciduous	1	16	54.80445	35.5
CNBN	766	Water Oak	Broadleaf	Deciduous	1	7	54.80530	38
CNBN	767	Water Oak	Broadleaf	Deciduous	1	9	54.80492	41
CNBN	768	Laurel Oak	Broadleaf	Deciduous	1	15	54.80606	66
CNBN	769	Water Oak	Broadleaf	Deciduous	1	12	54.80777	44
CNBN	770	Willow Oak	Broadleaf	Deciduous	1	24	54.80890	51
CNBN	771	Eastern Red Cedar	Conifer	Evergreen	1	7	54.81004	37
CNBN	772	Eastern Red Cedar	Conifer	Evergreen	1	6	54.81023	41
CNBN	773	Loblolly Pine	Conifer	Evergreen	1	18	54.81155	36
CNBN	774	Slippery Elm	Broadleaf	Deciduous	1	14	54.81155	48
CNBN	775	Loblolly Pine	Conifer	Evergreen	1	9	54.81383	35
CNBN	776	Laurel Oak	Broadleaf	Deciduous	1	7	54.81591	31
CNBN	777	Slippery Elm	Broadleaf	Deciduous	1	8	54.81705	51
CNBN	778	Laurel Oak	Broadleaf	Deciduous	1	6.5	54.81761	41
CNBN	779	Laurel Oak	Broadleaf	Deciduous	1	9.5	54.81799	41.5
CNBN	780	White Oak	Broadleaf	Deciduous	1	10	54.81894	41.5
CNBN	781	White Oak	Broadleaf	Deciduous	1	15	54.82127	55

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	782	White Ash	Broadleaf	Deciduous	1	15	54.82614	34
CNBN	783	Water Oak	Broadleaf	Deciduous	2	6	54.82576	58
	784					6.5	54.82576	58
CNBN	785	Slippery Elm	Broadleaf	Deciduous	1	16	54.82803	36.5
CNBN	786	American Elm	Broadleaf	Deciduous	1	7	54.82822	36.5
CNBN	787	Eastern Red Cedar	Conifer	Evergreen	1	12	54.83314	34
CNBN	788	Eastern Red Cedar	Conifer	Evergreen	1	9	54.83447	37
CNBN	789	American Elm	Broadleaf	Deciduous	1	14	54.83617	52
CNBN	790	Eastern Red Cedar	Conifer	Evergreen	1	9	54.83769	40.5
CNBN	791	Eastern Red Cedar	Conifer	Evergreen	1	16	54.83902	32.5
CNBN	792	Slippery Elm	Broadleaf	Deciduous	1	6	54.83958	44.75
CNBN	793	Green Ash	Broadleaf	Deciduous	1	13.5	54.84034	30.5
CNBN	794	Green Ash	Broadleaf	Deciduous	1	6.5	54.84280	30
CNBN	795	Green Ash	Broadleaf	Deciduous	1	11	54.84356	33
CNBN	796	White Ash	Broadleaf	Deciduous	1	8.5	54.84375	30.5
CNBN	797	Green Ash	Broadleaf	Deciduous	1	11	54.84489	30
CNBN	798	American Elm	Broadleaf	Deciduous	1	7	54.84555	43.25
CNBN	799	Sugarberry	Broadleaf	Deciduous	1	13	54.84527	36.25
CNBN	800	Slippery Elm	Broadleaf	Deciduous	1	7	54.84659	30.75
CNBN	801	American Elm	Broadleaf	Deciduous	1	14	54.84697	32
CNBN	802	Slippery Elm	Broadleaf	Deciduous	1	6	54.84640	47
CNBN	803	Sugarberry	Broadleaf	Deciduous	1	7	54.84820	29
CNBN	804	American Elm	Broadleaf	Deciduous	1	9	54.84830	34
CNBN	805	Sugarberry	Broadleaf	Deciduous	1	6.5	54.84867	29.5
CNBN	806	American Elm	Broadleaf	Deciduous	1	12	54.84905	32.5
CNBN	807	Green Ash	Broadleaf	Deciduous	1	16	54.85038	34.5
CNBN	808	Sugarberry	Broadleaf	Deciduous	1	9.5	54.85142	30.5
CNBN	809	Slippery Elm	Broadleaf	Deciduous	1	10	54.85284	31
CNBN	810	Sweet Gum	Broadleaf	Deciduous	1	9	54.85341	35

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	811	Laurel Oak	Broadleaf	Deciduous	1	6	54.85341	48.25
CNBN	812	Green Ash	Broadleaf	Deciduous	1	6	54.85644	30.5
CNBN	813	American Elm	Broadleaf	Deciduous	1	7	54.85663	56
CNBN	814	American Elm	Broadleaf	Deciduous	1	7	54.85928	58
CNBN	815	Sugarberry	Broadleaf	Deciduous	1	9	54.85985	53
CNBN	816	American Elm	Broadleaf	Deciduous	1	13	54.86080	39
CNBN	817	Sugarberry	Broadleaf	Deciduous	3	9	54.86174	52
	818					10	54.86174	52
	819					9	54.86174	52
CNBN	820	Slippery Elm	Broadleaf	Deciduous	1	6	54.86155	31.5
CNBN	821	Slippery Elm	Broadleaf	Deciduous	1	6	54.86155	32.5
CNBN	822	American Elm	Broadleaf	Deciduous	1	6	54.86193	43
CNBN	823	Green Ash	Broadleaf	Deciduous	2	13	54.86307	32.5
	824					21	54.86307	32.5
CNBN	825	American Elm	Broadleaf	Deciduous	1	11.5	54.86383	51
CNBN	826	Slippery Elm	Broadleaf	Deciduous	1	8	54.86553	35.5
CNBN	827	Green Ash	Broadleaf	Deciduous	1	11	54.86629	30.5
CNBN	828	Green Ash	Broadleaf	Deciduous	2	9	54.86742	29.5
	829					10	54.86742	29.5
CNBN	830	Red Oak	Broadleaf	Deciduous	1	20	54.86818	42
CNBN	831	Sweet Gum	Broadleaf	Deciduous	2	9.5	54.86989	30.25
	832					5	54.86989	30.25
CNBN	833	Willow Oak	Broadleaf	Deciduous	1	16	54.87008	30
CNBN	834	Sweet Gum	Broadleaf	Deciduous	1	17	54.87140	31.5
CNBN	835	Sweet Gum	Broadleaf	Deciduous	1	7	54.87159	36.25
CNBN	836	Loblolly Pine	Conifer	Evergreen	1	10	54.87292	30
CNBN	837	Green Ash	Broadleaf	Deciduous	1	6	54.87348	30
CNBN	838	Green Ash	Broadleaf	Deciduous	2	7	54.87443	36.75
	839					6	54.87443	36.75

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	840	Sweet Gum	Broadleaf	Deciduous	3	8	54.87595	31.75
	841					6	54.87595	31.75
	842					6	54.87595	31.75
CNBN	843	Water Oak	Broadleaf	Deciduous	1	6	54.87595	51
CNBN	844	Red Oak	Broadleaf	Deciduous	1	8	54.87689	28.5
CNBN	845	Willow Oak	Broadleaf	Deciduous	1	13	54.87822	32
CNBN	846	Willow Oak	Broadleaf	Deciduous	1	8	54.87879	26.5
CNBN	847	Sweet Gum	Broadleaf	Deciduous	2	8	54.87917	31.5
	848					6	54.87917	31.5
CNBN	849	Green Ash	Broadleaf	Deciduous	1	6	54.87973	38
CNBN	850	Sweet Gum	Broadleaf	Deciduous	1	15	54.87879	60
CNBN	851	Slippery Elm	Broadleaf	Deciduous	1	15	54.88030	49
CNBN	852	Laurel Oak	Broadleaf	Deciduous	1	8	54.88068	29.5
CNBN	853	Sweet Gum	Broadleaf	Deciduous	1	9	54.88182	31.75
	854				1	8	54.88182	31.75
CNBN	855	Water Oak	Broadleaf	Deciduous	1	7	54.88201	37.5
CNBN	856	American Elm	Broadleaf	Deciduous	1	8	54.88295	26
CNBN	857	American Elm	Broadleaf	Deciduous	1	12	54.88447	28.5
CNBN	858	Slippery Elm	Broadleaf	Deciduous	1	9	54.88447	57.5
CNBN	859	White Oak	Broadleaf	Deciduous	1	6	54.88523	54
CNBN	860	Red Oak	Broadleaf	Deciduous	1	6	54.88580	26
CNBN	861	Sweet Gum	Broadleaf	Deciduous	2	6	54.88636	36.5
	862					7	54.88636	36.5
CNBN	863	Sweet Gum	Broadleaf	Deciduous	1	15	54.88731	31.75
CNBN	864	Loblolly Pine	Conifer	Evergreen	1	11	54.88920	40.5
CNBN	865	Slippery Elm	Broadleaf	Deciduous	1	8	54.88902	56
CNBN	866	Laurel Oak	Broadleaf	Deciduous	1	6	54.88939	57.5
CNBN	867	Loblolly Pine	Conifer	Evergreen	1	7	54.88939	60
CNBN	868	American Elm	Broadleaf	Deciduous	1	7	54.89072	38.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
CNBN	869	American Elm	Broadleaf	Deciduous	1	8	54.89205	26.5
CNBN	870	American Elm	Broadleaf	Deciduous	1	7	54.89205	38.5
CNBN	871	Green Ash	Broadleaf	Deciduous	1	6	54.89205	50.75
CNBN	872	Water Oak	Broadleaf	Deciduous	1	11	54.89451	27.25
CNBN	873	Sweet Gum	Broadleaf	Deciduous	1	6	54.89489	52
CNBN	874	Laurel Oak	Broadleaf	Deciduous	1	11	54.91591	31
CNBN	875	Sweet Gum	Broadleaf	Deciduous	1	6.5	54.91591	48
CNBN	876	Loblolly Pine	Conifer	Evergreen	1	8	54.91591	60
CNBN	877	Green Ash	Broadleaf	Deciduous	1	11	54.91610	54.5
CNBN	878	Sweet Gum	Broadleaf	Deciduous	1	9	54.91667	28.25
CNBN	879	Slippery Elm	Broadleaf	Deciduous	1	7.5	54.91686	33
CNBN	880	Sweet Gum	Broadleaf	Deciduous	1	15	54.91742	30.75
CNBN	881	Green Ash	Broadleaf	Deciduous	1	6	54.91818	30.5
CNBN	882	Eastern Red Cedar	Conifer	Evergreen	1	14	54.91989	53
CNBN	883	Loblolly Pine	Conifer	Evergreen	1	16	54.92093	31.5
CNBN	884	Willow Oak	Broadleaf	Deciduous	1	11	54.92121	30
CNBN	885	Water Oak	Broadleaf	Deciduous	1	19	54.92292	31
CNBN	886	Water Oak	Broadleaf	Deciduous	1	11	54.92367	32.25
CNBN	887	Slippery Elm	Broadleaf	Deciduous	1	10	54.92348	53
CNBN	888	Sweet Gum	Broadleaf	Deciduous	1	9	54.92500	36.75
CNBN	889	Willow Oak	Broadleaf	Deciduous	1	7	54.92538	33.75
CNBN	890	Willow Oak	Broadleaf	Deciduous	1	10	54.92576	56
CNBN	891	Red Oak	Broadleaf	Deciduous	1	27	54.92614	53
CNBN	892	Water Oak	Broadleaf	Deciduous	1	22	54.92699	35.5
DNBN	893	Black Willow	Broadleaf	Deciduous	1	20	53.6975	32.5
DNBN	894	Sugarberry	Broadleaf	Deciduous	1	13	53.6982	36.75
DNBN	895	Winged Elm	Broadleaf	Deciduous	1	6	53.6994	28
DNBN	896	Slippery Elm	Broadleaf	Deciduous	1	10	53.7011	33.75
DNBN	897	White Ash	Broadleaf	Deciduous	1	15	53.7023	33.75

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	898	White Ash	Broadleaf	Deciduous	1	16	53.7059	45.5
DNBN	899	Winged Elm	Broadleaf	Deciduous	1	8	53.7068	37.25
DNBN	900	Sugarberry	Broadleaf	Deciduous	1	8	53.7079	48
DNBN	901	Green Ash	Broadleaf	Deciduous	1	22	53.7088	45.25
DNBN	902	Osage Orange	Broadleaf	Deciduous	1	11	53.7097	39.5
DNBN	903	Sugarberry	Broadleaf	Deciduous	1	10	53.7103	50
DNBN	904	Slippery Elm	Broadleaf	Deciduous	1	7	53.7114	46.25
DNBN	905	Sugarberry	Broadleaf	Deciduous	1	6	53.7123	50.25
DNBN	906	Slippery Elm	Broadleaf	Deciduous	1	10	53.7124	41
DNBN	907	Slippery Elm	Broadleaf	Deciduous	1	8.5	53.7130	47
DNBN	908	Slippery Elm	Broadleaf	Deciduous	1	8	53.7134	41
DNBN	909	White Ash	Broadleaf	Deciduous	1	7	53.7150	46.25
DNBN	910	Sugarberry	Broadleaf	Deciduous	1	17	53.7163	44
DNBN	911	Sugarberry	Broadleaf	Deciduous	1	17	53.7180	43.5
DNBN	912	White Ash	Broadleaf	Deciduous	2	10	53.7204	48.5
DNBN	913					8.5	53.7204	48.5
DNBN	914	White Ash	Broadleaf	Deciduous	3	10	53.7237	47.75
DNBN	915					10	53.7237	47.75
DNBN	916					10	53.7237	47.75
DNBN	917	Slippery Elm	Broadleaf	Deciduous	2	6	53.7242	36.5
DNBN	918					7	53.7242	36.5
DNBN	919	Sugarberry	Broadleaf	Deciduous	1	21	53.7266	46.25
DNBN	920	White Ash	Broadleaf	Deciduous	2	10	53.7277	37
DNBN	921					12	53.7277	37
DNBN	922	Slippery Elm	Broadleaf	Deciduous	1	6	53.7320	37.75
DNBN	923	Sugarberry	Broadleaf	Deciduous	1	7.5	53.7322	38
DNBN	924	Sugarberry	Broadleaf	Deciduous	1	6	53.7322	42.75
DNBN	925	Slippery Elm	Broadleaf	Deciduous	1	9	53.7326	44
DNBN	926	Sugarberry	Broadleaf	Deciduous	1	16	53.7337	43.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	927	Slippery Elm	Broadleaf	Deciduous	1	8	53.7341	48
DNBN	928	White Ash	Broadleaf	Deciduous	1	7	53.7366	52
DNBN	929	American Elm	Broadleaf	Deciduous	1	25	53.7392	39.5
DNBN	930	Sugarberry	Broadleaf	Deciduous	1	27	53.7439	41
DNBN	931	Slippery Elm	Broadleaf	Deciduous	1	8	53.7445	36.5
DNBN	932	Slippery Elm	Broadleaf	Deciduous	1	11	53.7480	41.75
DNBN	933	Slippery Elm	Broadleaf	Deciduous	1	9.5	53.7487	46.5
DNBN	934	Sugarberry	Broadleaf	Deciduous	2	8	53.7496	37
DNBN	935					8	53.7496	37
DNBN	936	Sugarberry	Broadleaf	Deciduous	1	6	53.7500	39.5
DNBN	937	Sugarberry	Broadleaf	Deciduous	1	21	53.7502	41.75
DNBN	938	Slippery Elm	Broadleaf	Deciduous	1	6	53.7521	48
DNBN	939	Sugarberry	Broadleaf	Deciduous	1	7.5	53.7534	50.75
DNBN	940	Green Ash	Broadleaf	Deciduous	1	6	53.7542	46.5
DNBN	941	Willow Oak	Broadleaf	Deciduous	1	6	53.7542	49.5
DNBN	942	Slippery Elm	Broadleaf	Deciduous	2	6	53.7548	37.5
DNBN	943					8	53.7548	37.5
DNBN	944	Sugarberry	Broadleaf	Deciduous	1	11.5	53.7608	43.25
DNBN	945	Sugarberry	Broadleaf	Deciduous	1	15	53.7616	43.75
DNBN	946	Slippery Elm	Broadleaf	Deciduous	1	8.5	53.7616	38
DNBN	947	Sugarberry	Broadleaf	Deciduous	1	18	53.7621	38
DNBN	948	Slippery Elm	Broadleaf	Deciduous	1	6	53.7650	47.75
DNBN	949	Slippery Elm	Broadleaf	Deciduous	1	6	53.7653	44
DNBN	950	Sugarberry	Broadleaf	Deciduous	1	8	53.7653	38.24
DNBN	951	White Ash	Broadleaf	Deciduous	1	9	53.7670	47.5
DNBN	952	Slippery Elm	Broadleaf	Deciduous	1	6	53.7674	47.5
DNBN	953	Osage Orange	Broadleaf	Deciduous	2	6	53.7688	43.5
DNBN	954					6	53.7688	43.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	955	Slippery Elm	Broadleaf	Deciduous	2	6	53.7711	37.5
DNBN	956					8	53.7711	37.5
DNBN	957	Slippery Elm	Broadleaf	Deciduous	1	8	53.7711	44.75
DNBN	958	Slippery Elm	Broadleaf	Deciduous	2	13	53.7735	38.5
DNBN	959					8.5	53.7735	38.5
DNBN	960	Sugarberry	Broadleaf	Deciduous	1	13	53.7752	41.5
DNBN	961	White Ash	Broadleaf	Deciduous	3	10.5	53.7777	39
DNBN	962					10	53.7777	39
DNBN	963					9	53.7777	39
DNBN	964	Sugarberry	Broadleaf	Deciduous	1	12.5	53.7788	39
DNBN	965	Sugarberry	Broadleaf	Deciduous	1	15	53.7792	43.5
DNBN	966	Sugarberry	Broadleaf	Deciduous	1	10	53.7826	49.5
DNBN	967	Sugarberry	Broadleaf	Deciduous	1	6	53.7835	47.5
DNBN	968	Sugarberry	Broadleaf	Deciduous	1	10	53.7856	45
DNBN	969	Sugarberry	Broadleaf	Deciduous	1	10.5	53.7879	45.75
DNBN	970	Slippery Elm	Broadleaf	Deciduous	1	9	53.7881	41
DNBN	971	White Ash	Broadleaf	Deciduous	1	12	53.7894	46.5
DNBN	972	Sugarberry	Broadleaf	Deciduous	1	9	53.7905	44
DNBN	973	Sugarberry	Broadleaf	Deciduous	1	18	53.7919	36.5
DNBN	974	White Ash	Broadleaf	Deciduous	1	8	53.7938	50
DNBN	975	Slippery Elm	Broadleaf	Deciduous	1	6	53.7949	45
DNBN	976	American Elm	Broadleaf	Deciduous	1	15	53.7956	38.5
DNBN	977	Slippery Elm	Broadleaf	Deciduous	1	6	53.7973	42.5
DNBN	978	Sugarberry	Broadleaf	Deciduous	1	13	53.7987	42
DNBN	979	American Elm	Broadleaf	Deciduous	2	6	53.7998	45.5
DNBN	980					5	53.7998	45.5
DNBN	981	Sugarberry	Broadleaf	Deciduous	1	7.5	53.8002	43.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	982	Green Ash	Broadleaf	Deciduous	2	7.5	53.8025	46
DNBN	983					7.5	53.8025	46
DNBN	984	Green Ash	Broadleaf	Deciduous	1	11	53.8025	40.5
DNBN	985	Green Ash	Broadleaf	Deciduous	3	9.5	53.8040	46
DNBN	986					6.5	53.8040	46
DNBN	987					12	53.8040	46
DNBN	988	Sugarberry	Broadleaf	Deciduous	1	16	53.8045	46
DNBN	989	American Elm	Broadleaf	Deciduous	1	24	53.8170	46.5
DNBN	990	Sugarberry	Broadleaf	Deciduous	1	9	53.8176	41.75
DNBN	991	Slippery Elm	Broadleaf	Deciduous	1	6	53.8196	38.5
DNBN	992	Sugarberry	Broadleaf	Deciduous	1	7	53.8206	38.75
DNBN	993	Sugarberry	Broadleaf	Deciduous	1	8	53.8211	41
DNBN	994	Black Willow	Broadleaf	Deciduous	1	6	53.8225	38
DNBN	995	Basswood	Broadleaf	Deciduous	1	6	53.8227	54.75
DNBN	996	Sugarberry	Broadleaf	Deciduous	1	6	53.8240	39
DNBN	997	Slippery Elm	Broadleaf	Deciduous	1	7.5	53.8243	43
DNBN	998	American Elm	Broadleaf	Deciduous	1	6	53.8243	47
DNBN	999	Sugarberry	Broadleaf	Deciduous	1	6.5	53.8245	46.75
DNBN	1000	White Ash	Broadleaf	Deciduous	1	6	53.8256	49
DNBN	1001	White Basswood	Broadleaf	Deciduous	1	10.5	53.8261	51.5
DNBN	1002	Sugarberry	Broadleaf	Deciduous	1	14	53.8301	58.5
DNBN	1003	Basswood	Broadleaf	Deciduous	1	21	53.8307	64.5
DNBN	1004	Sugarberry	Broadleaf	Deciduous	1	12	53.8313	49.5
DNBN	1005	Sugarberry	Broadleaf	Deciduous	1	15	53.8322	56.5
DNBN	1006	Sugarberry	Broadleaf	Deciduous	2	8	53.8330	54.5
DNBN	1007					8	53.8330	54.5
DNBN	1008	Sugarberry	Broadleaf	Deciduous	2	5	53.8330	38
DNBN	1009					7	53.8330	38
DNBN	1010	Sugarberry	Broadleaf	Deciduous	1	7.5	53.8362	50

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	1011	White Ash	Broadleaf	Deciduous	3	8	53.8383	41
DNBN	1012					8	53.8383	41
DNBN	1013					7	53.8383	41
DNBN	1014	Sugarberry	Broadleaf	Deciduous	1	11	53.8430	44
DNBN	1015	Green Ash	Broadleaf	Deciduous	2	6	53.8475	56
DNBN	1016					6	53.8475	56
DNBN	1017	White Ash	Broadleaf	Deciduous	2	6	53.8492	54
DNBN	1018					6	53.8492	54
DNBN	1019	Sugarberry	Broadleaf	Deciduous	1	20	53.8511	40.5
DNBN	1020	Pecan Tree	Broadleaf	Deciduous	1	6	53.8542	47
DNBN	1021	Green Ash	Broadleaf	Deciduous	1	7	53.8551	50
DNBN	1022	Green Ash	Broadleaf	Deciduous	1	6	53.8564	54.5
DNBN	1023	White Ash	Broadleaf	Deciduous	1	7	53.8593	38
DNBN	1024	Green Ash	Broadleaf	Deciduous	1	8	53.8593	51
DNBN	1025	White Ash	Broadleaf	Deciduous	1	8	53.8602	41
DNBN	1026	White Ash	Broadleaf	Deciduous	1	6	53.8610	40.5
DNBN	1027	Eastern Red Cedar	Conifer	Evergreen	1	6	53.8623	59.5
DNBN	1028	Sugarberry	Broadleaf	Deciduous	1	8	53.8626	51.25
DNBN	1029	Eastern Red Cedar	Conifer	Evergreen	1	9	53.8644	52.5
DNBN	1030	Sugarberry	Broadleaf	Deciduous	1	6	53.8644	54
DNBN	1031	Sugarberry	Broadleaf	Deciduous	1	6	53.8652	46
DNBN	1032	White Ash	Broadleaf	Deciduous	1	6	53.8720	41
DNBN	1033	Water Oak	Broadleaf	Deciduous	1	12	53.8777	63
DNBN	1034	Sugarberry	Broadleaf	Deciduous	2	6	53.8778	36
DNBN	1035					6	53.8778	36
DNBN	1036	Sugarberry	Broadleaf	Deciduous	1	20	53.8778	40
DNBN	1037	Pecan Tree	Broadleaf	Deciduous	1	6	53.8780	46.5
DNBN	1038	Sugarberry	Broadleaf	Deciduous	2	8	53.8790	39.5
DNBN	1039					10	53.8790	39.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	1040	Slippery Elm	Broadleaf	Deciduous	1	12	53.8809	39.5
DNBN	1041	Water Oak	Broadleaf	Deciduous	1	8	53.8809	50
DNBN	1042	Sugarberry	Broadleaf	Deciduous	1	8	53.8833	38.25
DNBN	1043	Basswood	Broadleaf	Deciduous	1	48	53.8871	70.75
DNBN	1044	Water Oak	Broadleaf	Deciduous	1	12	53.8892	36.5
DNBN	1045	Sugarberry	Broadleaf	Deciduous	1	9	53.8920	39.25
DNBN	1046	Red Oak	Broadleaf	Deciduous	1	12	53.8964	59.25
DNBN	1047	Willow Oak	Broadleaf	Deciduous	1	8	53.8977	56.25
DNBN	1048	Sugarberry	Broadleaf	Deciduous	1	16	53.8941	70
DNBN	1049	Sugarberry	Broadleaf	Deciduous	1	17	53.8983	39
DNBN	1050	Sugarberry	Broadleaf	Deciduous	2	6	53.9009	38.5
DNBN	1051					15	53.9009	38.5
DNBN	1052	Sugarberry	Broadleaf	Deciduous	1	7	53.9081	39
DNBN	1053	Green Ash	Broadleaf	Deciduous	1	6	53.9098	40
DNBN	1054	Water Oak	Broadleaf	Deciduous	1	6	53.9121	34.5
DNBN	1055	Water Oak	Broadleaf	Deciduous	1	10	53.9127	45
DNBN	1056	Water Oak	Broadleaf	Deciduous	1	16	53.9136	44.5
DNBN	1057	Willow Oak	Broadleaf	Deciduous	1	8	53.9155	50
DNBN	1058	Water Oak	Broadleaf	Deciduous	1	15.5	53.9169	37.5
DNBN	1059	Green Ash	Broadleaf	Deciduous	1	11.5	53.9188	37.5
DNBN	1060	Water Oak	Broadleaf	Deciduous	1	15	53.9214	45.25
DNBN	1061	Water Oak	Broadleaf	Deciduous	1	7	53.9227	52.25
DNBN	1062	White Ash	Broadleaf	Deciduous	2	6	53.9256	54.5
DNBN	1063					7	53.9256	54.5
DNBN	1064	Water Oak	Broadleaf	Deciduous	1	14	53.9269	55
DNBN	1065	Eastern Red Cedar	Conifer	Evergreen	1	7	53.9294	45.75
DNBN	1066	Willow Oak	Broadleaf	Deciduous	1	7	53.9309	36
DNBN	1067	Water Oak	Broadleaf	Deciduous	1	19	53.9318	47.5
DNBN	1068	Water Oak	Broadleaf	Deciduous	1	8	53.9318	48.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	1069	American Elm	Broadleaf	Deciduous	1	7	53.9330	60
DNBN	1070	White Ash	Broadleaf	Deciduous	1	8	53.9331	55.5
DNBN	1071	Sugarberry	Broadleaf	Deciduous	1	12	53.9335	40.5
DNBN	1072	White Ash	Broadleaf	Deciduous	1	7	53.9347	59
DNBN	1073	Willow Oak	Broadleaf	Deciduous	1	6	53.9347	70
DNBN	1074	Water Oak	Broadleaf	Deciduous	1	11	53.9388	52
DNBN	1075	Water Oak	Broadleaf	Deciduous	1	7.5	53.9390	36
DNBN	1076	Water Oak	Broadleaf	Deciduous	1	26	53.9419	38
DNBN	1077	Water Oak	Broadleaf	Deciduous	4	10	53.9460	42.25
DNBN	1078					7	53.9460	42.25
DNBN	1079					6	53.9460	42.25
DNBN	1080					6	53.9460	42.25
DNBN	1081	Sugarberry	Broadleaf	Deciduous	1	12	53.9485	31.5
DNBN	1082	Sugarberry	Broadleaf	Deciduous	1	7	53.9496	29.75
DNBN	1083	Water Oak	Broadleaf	Deciduous	2	9.5	53.9604	36
DNBN	1084					10	53.9604	36
DNBN	1085	Winged Elm	Broadleaf	Deciduous	1	8	53.9669	34.5
DNBN	1086	Water Oak	Broadleaf	Deciduous	1	11	53.9669	49.75
DNBN	1087	American Elm	Broadleaf	Deciduous	1	6	53.9686	40
DNBN	1088	Persimmon	Broadleaf	Deciduous	1	6	53.9688	53.5
DNBN	1089	Green Ash	Broadleaf	Deciduous	1	10	53.9705	43.75
DNBN	1090	Pecan Tree	Broadleaf	Deciduous	2	7	53.9716	36
DNBN	1091					6	53.9716	36
DNBN	1092	Water Oak	Broadleaf	Deciduous	1	9.5	53.9729	59.5
DNBN	1093	Water Oak	Broadleaf	Deciduous	1	18	53.9733	66.5
DNBN	1094	Water Oak	Broadleaf	Deciduous	1	14	53.9734	74
DNBN	1095	Water Oak	Broadleaf	Deciduous	1	7	53.9735	41.5
DNBN	1096	White Ash	Broadleaf	Deciduous	1	10	53.9735	40
DNBN	1097	American Elm	Broadleaf	Deciduous	1	9.5	53.9737	38.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	1098	Water Oak	Broadleaf	Deciduous	1	13	53.9739	54.5
DNBN	1099	Water Oak	Broadleaf	Deciduous	1	20	53.9742	83.5
DNBN	1100	Water Oak	Broadleaf	Deciduous	1	15	53.9742	59
DNBN	1101	Willow Oak	Broadleaf	Deciduous	1	14	53.9754	74
DNBN	1102	Willow Oak	Broadleaf	Deciduous	1	9	53.9754	66
DNBN	1103	Willow Oak	Broadleaf	Deciduous	1	11	53.9761	66.5
DNBN	1104	Water Oak	Broadleaf	Deciduous	1	18	53.9775	41
DNBN	1105	Water Oak	Broadleaf	Deciduous	1	16	53.9782	43.5
DNBN	1106	Water Oak	Broadleaf	Deciduous	1	24	53.9797	81
DNBN	1107	Water Oak	Broadleaf	Deciduous	1	15	53.9801	41.5
DNBN	1108	White Ash	Broadleaf	Deciduous	3	8.5	53.9807	22
DNBN	1109					9	53.9807	22
DNBN	1110					8.5	53.9807	22
DNBN	1111	Water Oak	Broadleaf	Deciduous	1	14	53.9831	65.5
DNBN	1112	Sweet Gum	Broadleaf	Deciduous	1	8	53.9841	55
DNBN	1113	Water Oak	Broadleaf	Deciduous	1	20	53.9852	61
DNBN	1114	Sweet Gum	Broadleaf	Deciduous	1	7	53.9858	42
DNBN	1115	Sweet Gum	Broadleaf	Deciduous	2	12	53.9875	40
DNBN	1116					7	53.9875	40
DNBN	1117	Water Oak	Broadleaf	Deciduous	1	18	53.9909	78.5
DNBN	1118	Sweet Gum	Broadleaf	Deciduous	1	6	54.0667	51
DNBN	1119	Loblolly Pine	Conifer	Evergreen	1	7	53.9989	53.5
DNBN	1120	Loblolly Pine	Conifer	Evergreen	1	8.5	54.0009	51
DNBN	1121	Loblolly Pine	Conifer	Evergreen	1	9.5	54.0114	45.5
DNBN	1122	Loblolly Pine	Conifer	Evergreen	1	7	54.0136	48
DNBN	1123	Sweet Gum	Broadleaf	Deciduous	1	6	54.0564	40
DNBN	1124	Green Ash	Broadleaf	Deciduous	1	9	54.0576	41.25
DNBN	1125	Sweet Gum	Broadleaf	Deciduous	2	7	54.0610	24.5
DNBN	1126					7.5	54.0610	24.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	1127	Sweet Gum	Broadleaf	Deciduous	1	7.5	54.0631	40
DNBN	1128	Willow Oak	Broadleaf	Deciduous	1	16	54.0644	53
DNBN	1129	Willow Oak	Broadleaf	Deciduous	1	14	54.0650	61
DNBN	1130	Sweet Gum	Broadleaf	Deciduous	1	6	54.0648	39
DNBN	1131	Willow Oak	Broadleaf	Deciduous	1	12	54.0659	51
DNBN	1132	Sweet Gum	Broadleaf	Deciduous	2	7	54.0667	41.5
DNBN	1133					8	54.0667	41.5
DNBN	1134	Pecan Tree	Broadleaf	Deciduous	1	7.5	54.0708	40
DNBN	1135	Green Ash	Broadleaf	Deciduous	1	6	54.0708	45.5
DNBN	1136	Willow Oak	Broadleaf	Deciduous	1	6.5	54.0713	40
DNBN	1137	American Elm	Broadleaf	Deciduous	1	12	54.0715	55
DNBN	1138	Sweet Gum	Broadleaf	Deciduous	1	11	54.0729	42.5
DNBN	1139	Winged Elm	Broadleaf	Deciduous	1	12	54.0731	46.5
DNBN	1140	American Elm	Broadleaf	Deciduous	1	16	54.0739	42
DNBN	1141	Eastern Red Cedar	Conifer	Evergreen	1	6	54.0775	49
DNBN	1142	Eastern Red Cedar	Conifer	Evergreen	1	9	54.0775	40
DNBN	1143	Eastern Red Cedar	Conifer	Evergreen	1	12	54.0788	40.25
DNBN	1144	White Ash	Broadleaf	Deciduous	1	10.5	54.0792	39
DNBN	1145	Black Gum	Broadleaf	Deciduous	1	9	54.0813	36
DNBN	1146	White Ash	Broadleaf	Deciduous	1	6	54.0814	36
DNBN	1147	Eastern Red Cedar	Conifer	Evergreen	1	11	54.0852	36
DNBN	1148	Eastern Red Cedar	Conifer	Evergreen	1	7	54.0862	37
DNBN	1149	Sweet Gum	Broadleaf	Deciduous	1	6.5	54.0873	36.25
DNBN	1150	Green Ash	Broadleaf	Deciduous	1	7	54.0894	37
DNBN	1151	White Ash	Broadleaf	Deciduous	1	18	54.0922	37.5
DNBN	1152	White Ash	Broadleaf	Deciduous	1	6.5	54.0939	34
DNBN	1153	Sweet Gum	Broadleaf	Deciduous	1	18	54.0956	36.75
DNBN	1154	Sugarberry	Broadleaf	Deciduous	1	7	54.0962	37.75
DNBN	1155	Loblolly Pine	Conifer	Evergreen	1	30	54.0985	38

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Mile Post	Distance from EOP (feet)
DNBN	1156	Black Gum	Broadleaf	Deciduous	1	8	54.1006	37.25
DNBN	1157	Sugarberry	Broadleaf	Deciduous	1	12	54.1013	37.25
DNBN	1158	White Ash	Broadleaf	Deciduous	1	6	54.1023	35
DNBN	1159	Willow Oak	Broadleaf	Deciduous	1	9	54.1051	32.5
DNBN	1160	Willow Oak	Broadleaf	Deciduous	1	14	54.1081	35
DNBN	1161	Sugarberry	Broadleaf	Deciduous	1	9	54.1116	37.25
DNBN	1162	Willow Oak	Broadleaf	Deciduous	1	9	54.1133	34.75
DNBN	1163	Sugarberry	Broadleaf	Deciduous	4	6	54.1168	36
DNBN	1164					5	54.1168	36
DNBN	1165					10	54.1168	36
DNBN	1166					6	54.1168	36
DNBN	1167	Sugarberry	Broadleaf	Deciduous	1	12	54.1161	38.25
DNBN	1168	Sugarberry	Broadleaf	Deciduous	1	17	54.1189	38
DNBN	1169	Willow Oak	Broadleaf	Deciduous	2	10	54.1208	34
DNBN	1170					6	54.1208	34
DNBN	1171	Sugarberry	Broadleaf	Deciduous	1	8	54.1227	39
DNBN	1172	Pecan Tree	Broadleaf	Deciduous	3	6	54.1259	36.25
DNBN	1173					6	54.1259	36.25
DNBN	1174					8	54.1259	36.25
DNBN	1175	Sugarberry	Broadleaf	Deciduous	1	11	54.1299	41
DNBN	1176	Sugarberry	Broadleaf	Deciduous	1	16	54.1307	39.25
DNBN	1177	Eastern Red Cedar	Conifer	Evergreen	1	13	54.1544	38.5
DNBN	1178	Willow Oak	Broadleaf	Deciduous	1	54	54.1947	40
DNBN	1179	Willow Oak	Broadleaf	Deciduous	1	48	54.1987	39.5
DNBN	1180	Willow Oak	Broadleaf	Deciduous	1	41	54.2100	40

APPENDIX F: TREE SURVEY DATA (SOUTHBOUND LANE)

Tree Survey: Southbound

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
ASBN	1	Willow Oak	Broadleaf	Deciduous	1	41.1	37	52.818	64.7
ASBN	2	Sugarberry	Broadleaf	Deciduous	1	13.0	27	52.82	43.9
ASBN	3	Sugarberry	Broadleaf	Deciduous	1	11.5	22	52.82	40.5
ASBN	4	Sugarberry	Broadleaf	Deciduous	1	6.5	20	52.821	38.6
ASBN	5	Sugarberry	Broadleaf	Deciduous	1	9.5	35	52.821	38.3
ASBN	6	Sugarberry	Broadleaf	Deciduous	1	17.6	10	52.822	39.4
ASBN	7	Sugarberry	Broadleaf	Deciduous	4	7.3	26	52.823	39.4
ASBN	8					7.3		52.823	39.4
ASBN	9					7.3		52.823	39.4
ASBN	10					7.3		52.823	39.4
ASBN	11	White Ash	Broadleaf	Deciduous	3	10.3	23	52.825	35.8
ASBN	12					10.3		52.825	35.8
ASBN	13					10.3		52.825	35.8
ASBN	14	White Ash	Broadleaf	Deciduous	3	13.4	21	52.827	36.8
ASBN	15					9.5		52.827	36.8
ASBN	16					9.5		52.827	36.8
ASBN	17	Sugarberry	Broadleaf	Deciduous	4	11.5	21	52.829	37.9
ASBN	18					11.5		52.829	37.9
ASBN	19					15.7		52.829	37.9
ASBN	20					15.7		52.829	37.9
ASBN	21	Sugarberry	Broadleaf	Deciduous	5	9.9	23	52.833	39.5
ASBN	22					4.2		52.833	39.5
ASBN	23					4.2		52.833	39.5
ASBN	24					4.2		52.833	39.5
ASBN	25					4.2		52.833	39.5
ASBN	26	Sugarberry	Broadleaf	Deciduous	1	10.3	24	52.834	40.2
ASBN	27	Eastern Red Cedar	Conifer	Evergreen	1	8.0	13	52.835	38.6
ASBN	28	Sugarberry	Broadleaf	Deciduous	2	12.6	21.5	52.835	39.7
ASBN	29					12.6		52.835	39.7

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
ASBN	30	Sugarberry	Broadleaf	Deciduous	2	5.7	10	52.836	40.2
ASBN	31					3.8		52.836	40.2
ASBN	32	Sugarberry	Broadleaf	Deciduous	4	6.1	18	52.837	39.7
ASBN	33					6.1		52.837	39.7
ASBN	34					6.1		52.837	39.7
ASBN	35					6.1		52.837	39.7
ASBN	36	Sugarberry	Broadleaf	Deciduous	1	13.4	17	52.838	41.6
ASBN	37	Sugarberry	Broadleaf	Deciduous	1	9.5	17	52.839	39.6
ASBN	38	Sugarberry	Broadleaf	Deciduous	3	12.2	19.5	52.842	38.6
ASBN	39					12.2		52.842	38.6
ASBN	40					3.8		52.842	38.6
ASBN	41	Sugarberry	Broadleaf	Deciduous	5	12.6	27	52.846	39.3
ASBN	42					9.2		52.846	39.3
ASBN	43					11.1		52.846	39.3
ASBN	44					11.5		52.846	39.3
ASBN	45					11.8		52.846	39.3
ASBN	46	Sugarberry	Broadleaf	Deciduous	3	6.1	14	52.848	39.8
ASBN	47					2.7		52.848	39.8
ASBN	48					2.7		52.848	39.8
ASBN	49	Sugarberry	Broadleaf	Deciduous	1	10.7	22	52.849	40.4
ASBN	50	Eastern Red Cedar	Conifer	Evergreen	1	4.6	8	52.849	37.8
ASBN	51	Sugarberry	Broadleaf	Deciduous	1	7.6	20	52.849	38.6
ASBN	52	Sugarberry	Broadleaf	Deciduous	2	26.7	25	52.854	39.3
ASBN	53					4.6		52.854	39.3
ASBN	54	Sugarberry	Broadleaf	Deciduous	1	8.4	20	52.856	39.2
ASBN	55	Sugarberry	Broadleaf	Deciduous	2	14.5	18	52.857	39.7
ASBN	56					10.3		52.857	39.7
ASBN	57	Sugarberry	Broadleaf	Deciduous	1	8.8	16	52.858	30.9
ASBN	58	Slippery Elm	Broadleaf	Deciduous	1	5.7	17	52.86	36.2

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
ASBN	59	White Ash	Broadleaf	Deciduous	1	7.6	0	52.86	49.1
ASBN	60	Sugarberry	Broadleaf	Deciduous	1	11.1	11	52.86	40.2
ASBN	61	Sugarberry	Broadleaf	Deciduous	1	12.2	15	52.862	43.5
ASBN	62	Sugarberry	Broadleaf	Deciduous	1	8.8	19	52.862	45.9
ASBN	63	Sugarberry	Broadleaf	Deciduous	1	7.3	20	52.862	40.1
ASBN	64	Sugarberry	Broadleaf	Deciduous	1	13.0	15	52.864	32.6
ASBN	65	Sugarberry	Broadleaf	Deciduous	10	11.5	26	52.865	40.1
ASBN	66					6.5		52.865	40.1
ASBN	67					10.7		52.865	40.1
ASBN	68					9.5		52.865	40.1
ASBN	69					8.4		52.865	40.1
ASBN	70					6.9		52.865	40.1
ASBN	71					11.5		52.865	40.1
ASBN	72					8.8		52.865	40.1
ASBN	73					10.3		52.865	40.1
ASBN	74					7.6		52.865	40.1
ASBN	75	Sugarberry	Broadleaf	Deciduous	1	9.2	0	52.867	44.2
ASBN	76	Sugarberry	Broadleaf	Deciduous	1	6.1	26	52.868	39
ASBN	77	Sugarberry	Broadleaf	Deciduous	1	10.3	0	52.868	40.6
ASBN	78	White Ash	Broadleaf	Deciduous	1	5.3	13	52.868	37.7
ASBN	79	Sugarberry	Broadleaf	Deciduous	3	3.8	28	52.869	40.1
ASBN	80					7.6		52.869	40.1
ASBN	81					5.3		52.869	40.1
ASBN	82	Sugarberry	Broadleaf	Deciduous	1	22.9	28	52.87	40.3
ASBN	83	Sugarberry	Broadleaf	Deciduous	2	5.7	19	52.871	39.4
ASBN	84					3.8		52.871	39.4
ASBN	85	Sugarberry	Broadleaf	Deciduous	1	5.3	11	52.871	40
ASBN	86	Sugarberry	Broadleaf	Deciduous	1	9.2	0	52.871	39.8

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
ASBN	87	Sugarberry	Broadleaf	Deciduous	2	9.2	27	52.872	40.2
ASBN	88					6.5		52.872	40.2
ASBN	89	Sugarberry	Broadleaf	Deciduous	3	6.1	17	52.873	40.3
ASBN	90					7.6		52.873	40.3
ASBN	91					7.3		52.873	40.3
ASBN	92	White Ash	Broadleaf	Deciduous	2	16.0	30	52.874	39.6
ASBN	93					17.2		52.874	39.6
ASBN	94	Sugarberry	Broadleaf	Deciduous	2	5.0	27	52.876	41
ASBN	95					11.8		52.876	41
BSBS	96	Winged Elm	Broadleaf	Deciduous	1	8		53.2883	46.75
BSBS	97	Loblolly Pine	Conifer	Evergreen	1	14		53.2879	45.75
BSBS	98	Loblolly Pine	Conifer	Evergreen	1	13.5		53.2862	52.5
BSBS	99	Loblolly Pine	Conifer	Evergreen	1	14		53.2827	60.5
BSBS	100	Loblolly Pine	Conifer	Evergreen	1	14.5		53.2826	54
BSBS	101	Loblolly Pine	Conifer	Evergreen	1	13		53.2813	62
BSBS	102	Loblolly Pine	Conifer	Evergreen	1	12		53.2811	48.5
BSBS	103	Loblolly Pine	Conifer	Evergreen	1	13.5		53.2792	45
BSBS	104	Loblolly Pine	Conifer	Evergreen	1	9		53.2792	52
BSBS	105	Loblolly Pine	Conifer	Evergreen	1	8.5		53.2792	59.5
BSBS	106	Loblolly Pine	Conifer	Evergreen	1	13		53.2773	42
BSBS	107	Loblolly Pine	Conifer	Evergreen	1	11		53.2773	51.75
BSBS	108	Loblolly Pine	Conifer	Evergreen	1	9.5		53.2773	59
BSBS	109	Loblolly Pine	Conifer	Evergreen	1	12		53.2758	46.75
BSBS	110	Loblolly Pine	Conifer	Evergreen	1	13		53.2756	63
BSBS	111	Loblolly Pine	Conifer	Evergreen	1	16.5		53.2739	41.75
BSBS	112	Loblolly Pine	Conifer	Evergreen	1	10		53.2721	55
BSBS	113	Sugarberry	Broadleaf	Deciduous	1	6		53.2716	55
BSBS	114	Loblolly Pine	Conifer	Evergreen	1	12		53.2699	53
BSBS	115	Sugarberry	Broadleaf	Deciduous	1	8		53.2690	47.5

Tree Survey: Southbound

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
BSBS	116	Sugarberry	Broadleaf	Deciduous	1	16		53.2680	43
BSBS	117	Loblolly Pine	Conifer	Evergreen	1	16		53.2679	47
BSBS	118	Slippery Elm	Broadleaf	Deciduous	1	15		53.2602	43
BSBS	119	Sugarberry	Broadleaf	Deciduous	1	16		53.2555	59.5
BSBS	120	Sugarberry	Broadleaf	Deciduous	1	20		53.2540	69
BSBS	121	Sugarberry	Broadleaf	Deciduous	1	14		53.2519	50
BSBS	122	Sugarberry	Broadleaf	Deciduous	1	12		53.2506	63
BSBS	123	Loblolly Pine	Conifer	Evergreen	1	13.3		53.2460	73
BSBS	124	Loblolly Pine	Conifer	Evergreen	1	16		53.2453	73
BSBS	125	Loblolly Pine	Conifer	Evergreen	1	12		53.2453	61
BSBS	126	Loblolly Pine	Conifer	Evergreen	1	18		53.2453	53
BSBS	127	Loblolly Pine	Conifer	Evergreen	1	12		53.2453	44
BSBS	128	Slippery Elm	Broadleaf	Deciduous	1	12		53.2422	47
BSBS	129	Sugarberry	Broadleaf	Deciduous	1	15		53.2345	53
BSBS	130	Sugarberry	Broadleaf	Deciduous	1	20		53.2322	61
BSBS	131	Slippery Elm	Broadleaf	Deciduous	1	9		53.2294	56.5
BSBS	132	Loblolly Pine	Conifer	Evergreen	1	14		53.2254	37
BSBS	133	Sugarberry	Broadleaf	Deciduous	1	24		53.2203	36
BSBS	134	Loblolly Pine	Conifer	Evergreen	1	15		53.2110	41
BSBS	135	Sugarberry	Broadleaf	Deciduous	1	15		53.2078	74
BSBS	136	Sugarberry	Broadleaf	Deciduous	1	15		53.2040	64
BSBS	137	Sugarberry	Broadleaf	Deciduous	1	10		53.2009	39.5
BSBS	138	Slippery Elm	Broadleaf	Deciduous	1	8		53.1998	39.5
BSBS	139	Sugarberry	Broadleaf	Deciduous	1	14		53.1998	62
BSBS	140	Green Ash	Broadleaf	Deciduous	1	9		53.2002	62
BSBS	141	Pecan Tree	Broadleaf	Deciduous	1	10		53.1958	42
BSBS	142	Willow Oak	Broadleaf	Deciduous	1	11		53.1898	69
BSBS	143	Slippery Elm	Broadleaf	Deciduous	1	8		53.1895	36
BSBS	144	Willow Oak	Broadleaf	Deciduous	1	11		53.1871	68.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
BSBS	145	Willow Oak	Broadleaf	Deciduous	1	8		53.1873	70
BSBS	146	Sugarberry	Broadleaf	Deciduous	1	8		53.1843	35.5
BSBS	147	Sugarberry	Broadleaf	Deciduous	2	9.5		53.1835	34.5
	148					11.5		53.1835	34.5
BSBS	149	Sugarberry	Broadleaf	Deciduous	1	12.5		53.1830	75
BSBS	150	Sugarberry	Broadleaf	Deciduous	1	25		53.1828	102.5
BSBS	151	Sugarberry	Broadleaf	Deciduous	1	10.5		53.1814	56
BSBS	152	Sugarberry	Broadleaf	Deciduous	2	10		53.1754	35.5
	153					11		53.1754	35.5
BSBS	154	Loblolly Pine	Conifer	Evergreen	1	13.5		53.1754	47
BSBS	155	Loblolly Pine	Conifer	Evergreen	1	13		53.1733	38
BSBS	156	Loblolly Pine	Conifer	Evergreen	1	13		53.1729	48
BSBS	157	Sugarberry	Broadleaf	Deciduous	1	6		53.1729	47
BSBS	158	Loblolly Pine	Conifer	Evergreen	1	18		53.1712	86
BSBS	159	Loblolly Pine	Conifer	Evergreen	1	13		53.1693	66.5
BSBS	160	Loblolly Pine	Conifer	Evergreen	1	16		53.1691	86
BSBS	161	Sugarberry	Broadleaf	Deciduous	2	8		53.1672	36.75
	162					8		53.1672	36.75
BSBS	163	Loblolly Pine	Conifer	Evergreen	1	15		53.1653	49
BSBS	164	Loblolly Pine	Conifer	Evergreen	1	11		53.1636	39
BSBS	165	Loblolly Pine	Conifer	Evergreen	1	7		53.1636	47
BSBS	166	Loblolly Pine	Conifer	Evergreen	1	11		53.1636	55
BSBS	167	Sugarberry	Broadleaf	Deciduous	1	6.5		53.1622	37.5
BSBS	168	Sugarberry	Broadleaf	Deciduous	2	11		53.1622	60
	169					7		53.1622	60
BSBS	170	Loblolly Pine	Conifer	Evergreen	1	15		53.1610	73
BSBS	171	Loblolly Pine	Conifer	Evergreen	1	12		53.1610	40
BSBS	172	Winged Elm	Broadleaf	Deciduous	2	6		53.1610	36.5
	173					5		53.1610	36.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
BSBS	174	Sugarberry	Broadleaf	Deciduous	1	5		53.1585	36.5
BSBS	175	Loblolly Pine	Conifer	Evergreen	1	12		53.1585	38.5
BSBS	176	Loblolly Pine	Conifer	Evergreen	1	12		53.1585	47
BSBS	177	Loblolly Pine	Conifer	Evergreen	1	6		53.1585	55
BSBS	178	Loblolly Pine	Conifer	Evergreen	1	12		53.1585	65
BSBS	179	Loblolly Pine	Conifer	Evergreen	1	11		53.1585	72.5
BSBS	180	Loblolly Pine	Conifer	Evergreen	1	12		53.1566	62
BSBS	181	Loblolly Pine	Conifer	Evergreen	1	13		53.1566	71.5
BSBS	182	Sugarberry	Broadleaf	Deciduous	2	5		53.1566	36
	183					5		53.1566	36
BSBS	184	Loblolly Pine	Conifer	Evergreen	1	13		53.1547	38
BSBS	185	Loblolly Pine	Conifer	Evergreen	1	14		53.1547	46
BSBS	186	Loblolly Pine	Conifer	Evergreen	1	12		53.1547	60
BSBS	187	Sugarberry	Broadleaf	Deciduous	1	5		53.1536	41.5
BSBS	188	Loblolly Pine	Conifer	Evergreen	1	9		53.1523	37.25
BSBS	189	Loblolly Pine	Conifer	Evergreen	1	13		53.1519	63
BSBS	190	Loblolly Pine	Conifer	Evergreen	1	11		53.1502	39
BSBS	191	Loblolly Pine	Conifer	Evergreen	1	11		53.1476	37.5
BSBS	192	Loblolly Pine	Conifer	Evergreen	1	8.5		53.1476	43.5
BSBS	193	Loblolly Pine	Conifer	Evergreen	1	11		53.1476	49.5
BSBS	194	Loblolly Pine	Conifer	Evergreen	1	14		53.1476	57
BSBS	195	Sugarberry	Broadleaf	Deciduous	1	12.5		53.1472	36
BSBS	196	Loblolly Pine	Conifer	Evergreen	1	9		53.1453	55
BSBS	197	Loblolly Pine	Conifer	Evergreen	1	12		53.1451	61.5
BSBS	198	Loblolly Pine	Conifer	Evergreen	1	13		53.1430	68
BSBS	199	Loblolly Pine	Conifer	Evergreen	1	14		53.1430	45.25
BSBS	200	Loblolly Pine	Conifer	Evergreen	1	11		53.1430	37
BSBS	201	Loblolly Pine	Conifer	Evergreen	1	12		53.1409	38
BSBS	202	Loblolly Pine	Conifer	Evergreen	1	14		53.1394	36.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
BSBS	203	Sugarberry	Broadleaf	Deciduous	1	8		53.1383	54.25
BSBS	204	Sugarberry	Broadleaf	Deciduous	1	6		53.1371	53
BSBS	205	Sugarberry	Broadleaf	Deciduous	1	12		53.1362	44.25
BSBS	206	Loblolly Pine	Conifer	Evergreen	1	7		53.1345	45
BSBS	207	Eastern Red Cedar	Conifer	Evergreen	1	6		53.1316	44.5
BSBS	208	Sugarberry	Broadleaf	Deciduous	1	8		53.1320	54.5
BSBS	209	Loblolly Pine	Conifer	Evergreen	1	14		53.1309	43.75
BSBS	210	Sugarberry	Broadleaf	Deciduous	1	9		53.1301	44
BSBS	211	Sugarberry	Broadleaf	Deciduous	1	9		53.1256	40.75
BSBS	212	Sugarberry	Broadleaf	Deciduous	3	6		53.1246	43.5
	213					6		53.1246	43.5
	214					7		53.1246	43.5
BSBS	215	Sugarberry	Broadleaf	Deciduous	4	18		53.1148	35.5
	216					11		53.1148	35.5
	217					14		53.1148	35.5
	218					18		53.1148	35.5
BSBS	219	Slippery Elm	Broadleaf	Deciduous	1	8		53.1153	40
BSBN	220	Sugarberry	Broadleaf	Deciduous	1	25		53.3964	79
BSBN	221	Pecan Tree	Broadleaf	Deciduous	1	9		53.3989	65
BSBN	222	White Ash	Broadleaf	Deciduous	1	8		53.3998	65
BSBN	223	White Ash	Broadleaf	Deciduous	9	5		53.4000	65
	224					6.5		53.4000	65
	225					7		53.4000	65
	226					6		53.4000	65
	227					6		53.4000	65
	228					8		53.4000	65
	229					5		53.4000	65
	230					5		53.4000	65
	231					7		53.4000	65

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
BSBN	232	White Ash	Broadleaf	Deciduous	1	7		53.4006	60
BSBN	233	White Ash	Broadleaf	Deciduous	2	9		53.4017	52.5
	234					8.5		53.4017	52.5
BSBN	235	White Ash	Broadleaf	Deciduous	2	9		53.4034	52
	236					8		53.4034	52
BSBN	237	White Ash	Broadleaf	Deciduous	1	8		53.4034	49
BSBN	238	White Ash	Broadleaf	Deciduous	1	9		53.4034	46
BSBN	239	White Ash	Broadleaf	Deciduous	1	9		53.4053	53
BSBN	240	White Ash	Broadleaf	Deciduous	1	6.5		53.4066	57.5
BSBN	241	White Ash	Broadleaf	Deciduous	2	5.5		53.4068	57
	242					5		53.4068	57
BSBN	243	White Ash	Broadleaf	Deciduous	2	4.5		53.4081	57
	244					6.5		53.4081	57
BSBN	245	Sugarberry	Broadleaf	Deciduous	2	8		53.4110	47
	246					7.5		53.4110	47
BSBN	247	White Ash	Broadleaf	Deciduous	1	7		53.4110	49
BSBN	248	White Ash	Broadleaf	Deciduous	1	7		53.4110	50
BSBN	249	White Ash	Broadleaf	Deciduous	2	7		53.4120	47
	250					4.5		53.3831	47
BSBN	251	White Ash	Broadleaf	Deciduous	4	7.5		53.4153	50
	252					8.5		53.4153	50
	253					7		53.4153	50
	254					8		53.4153	50
BSBN	255	Sugarberry	Broadleaf	Deciduous	1	9		53.4163	50
BSBN	256	White Ash	Broadleaf	Deciduous	4	7		53.4182	61.5
	257					6		53.4182	61.5
	258					7		53.4182	61.5
	259					8		53.4182	61.5
BSBN	260	Sugarberry	Broadleaf	Deciduous	1	8		53.4231	57

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
BSBN	261	White Ash	Broadleaf	Deciduous	4	7		53.4231	60
	262					8		53.4231	60
	263					6		53.4231	60
	264					8		53.4231	60
BSBN	265	White Ash	Broadleaf	Deciduous	1	9		53.4237	61
BSBN	266	White Ash	Broadleaf	Deciduous	1	8		53.4237	62
BSBN	267	Sugarberry	Broadleaf	Deciduous	2	7		53.4389	47
	268					7		53.4389	47
BSBN	269	Sugarberry	Broadleaf	Deciduous	1	12		53.4521	38.75
BSBN	270	Pecan Tree	Broadleaf	Deciduous	1	6		53.4578	36.5
BSBN	271	White Ash	Broadleaf	Deciduous	4	6		53.4697	40
	272					7		53.4697	40
	273					6		53.4697	40
	274					5		53.4697	40
BSBN	275	Laurel Oak	Broadleaf	Deciduous	4	11		53.4732	55.5
	276					7		53.4732	55.5
	277					5		53.4732	55.5
	278					13		53.4732	55.5
CSBN	279	Mimosa	Broadleaf	Deciduous	1	7		54.2345	38
CSBN	280	Willow Oak	Broadleaf	Deciduous	1	8.5		54.2368	44
CSBN	281	Willow Oak	Broadleaf	Deciduous	1	6.5		54.2377	36
CSBN	282	Willow Oak	Broadleaf	Deciduous	1	7		54.2383	38.5
CSBN	283	Willow Oak	Broadleaf	Deciduous	1	5		54.2403	35
CSBN	284	Willow Oak	Broadleaf	Deciduous	1	4		54.2404	40.5
CSBN	285	Willow Oak	Broadleaf	Deciduous	1	7		54.2440	35
CSBN	286	American Elm	Broadleaf	Deciduous	1	20		54.2430	58
	287					4		54.2487	36
	288					5		54.2487	36
	289					6		54.2487	36

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	290	Water Oak	Broadleaf	Deciduous	7	7		54.2487	36
	291					8		54.2487	36
	292					4		54.2487	36
	293					5		54.2487	36
CSBN	294	Willow Oak	Broadleaf	Deciduous	2	5		54.2502	39.5
	295					9		54.2502	39.5
CSBN	296	Willow Oak	Broadleaf	Deciduous	1	7		54.2509	39.5
CSBN	297	Willow Oak	Broadleaf	Deciduous	1	12		54.2553	46.5
CSBN	298	Willow Oak	Broadleaf	Deciduous	1	12		54.2555	47
CSBN	299	Green Ash	Broadleaf	Deciduous	1	6		54.2559	37
CSBN	300	Eastern Red Cedar	Conifer	Evergreen	1	12		54.2581	38
CSBN	301	Loblolly Pine	Broadleaf	Deciduous	1	14		54.2598	51
CSBN	302	Green Ash	Broadleaf	Deciduous	1	6		54.2606	40.5
CSBN	303	Sugarberry	Broadleaf	Deciduous	1	13		54.2617	40.5
CSBN	304	Pecan	Broadleaf	Deciduous	2	18		54.2667	40
	305					20		54.2667	40
CSBN	306	Sugarberry	Broadleaf	Deciduous	1	7		54.2669	37
CSBN	307	Sugarberry	Broadleaf	Deciduous	1	7		54.2672	39
CSBN	308	Sugarberry	Broadleaf	Deciduous	1	10		54.2699	37
CSBN	309	Sugarberry	Broadleaf	Deciduous	1	8		54.2701	39
CSBN	310	Sugarberry	Broadleaf	Deciduous	1	8		54.2722	39
CSBN	311	Pecan	Broadleaf	Deciduous	1	31		54.2730	44.5
CSBN	312	Pecan	Broadleaf	Deciduous	1	42		54.2773	48
CSBN	313	Sugarberry	Broadleaf	Deciduous	1	5		54.2790	39
CSBN	314	Sugarberry	Broadleaf	Deciduous	1	7		54.2814	38
CSBN	315	Basswood	Broadleaf	Deciduous	1	8		54.2816	37
CSBN	316	Sugarberry	Broadleaf	Deciduous	1	9		54.2816	36
CSBN	317	Sugarberry	Broadleaf	Deciduous	1	17		54.2839	38.5
CSBN	318	Sugarberry	Broadleaf	Deciduous	1	7		54.2864	37.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	319	Sugarberry	Broadleaf	Deciduous	1	9		54.2868	38.5
CSBN	320	Sugarberry	Broadleaf	Deciduous	1	6		54.2877	39.5
CSBN	321	Sugarberry	Broadleaf	Deciduous	1	13		54.2881	38
CSBN	322	White Oak	Broadleaf	Deciduous	1	5		54.2884	32
CSBN	323	Sugarberry	Broadleaf	Deciduous	1	6		54.2884	38.5
CSBN	324	Sugarberry	Broadleaf	Deciduous	1	11		54.2888	38.5
CSBN	325	Willow Oak	Broadleaf	Deciduous	1	12		54.2894	31
CSBN	326	Willow Oak	Broadleaf	Deciduous	1	24		54.2941	44.5
CSBN	327	White Ash	Broadleaf	Deciduous	1	15		54.2945	38
CSBN	328	Red Oak	Broadleaf	Evergreen	1	21		54.2973	40
CSBN	329	Loblolly Pine	Conifer	Evergreen	1	15		54.2983	44
CSBN	330	American Elm	Broadleaf	Deciduous	1	11		54.3030	40
CSBN	331	White Ash	Broadleaf	Deciduous	1	12		54.3055	38
CSBN	332	Sugarberry	Broadleaf	Deciduous	1	7		54.3059	41.5
CSBN	333	Sugarberry	Broadleaf	Deciduous	1	4		54.3059	39
CSBN	334	Sugarberry	Broadleaf	Deciduous	1	8		54.3061	41
CSBN	335	Sugarberry	Broadleaf	Deciduous	1	10		54.3061	39
CSBN	336	Willow Oak	Broadleaf	Deciduous	1	8		54.3064	43
CSBN	337	White Ash	Broadleaf	Deciduous	1	17		54.3091	16
CSBN	338	Sugarberry	Broadleaf	Deciduous	1	6		54.3089	36
CSBN	339	Sugarberry	Broadleaf	Deciduous	1	6		54.3097	38
CSBN	340	American Elm	Broadleaf	Deciduous	1	15		54.3104	39
CSBN	341	White Ash	Broadleaf	Deciduous	1	7		54.3142	39
CSBN	342	Sweet Gum	Broadleaf	Deciduous	3	10		54.3165	39
	343					10		54.3165	39
	344					8		54.3165	39
CSBN	345	Willow Oak	Broadleaf	Deciduous	1	12		54.3195	38.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	346	Sugarberry	Broadleaf	Deciduous	3	3		54.3197	38.5
	347					6		54.3197	38.5
	348					6		54.3197	38.5
CSBN	349	American Elm	Broadleaf	Deciduous	1	8		54.3201	41.5
CSBN	350	Willow Oak	Broadleaf	Deciduous	1	23		54.3206	39.5
CSBN	351	Loblolly Pine	Conifer	Evergreen	1	9		54.3241	43.75
CSBN	352	Laurel Oak	Broadleaf	Deciduous	1	6.5		54.3256	43.75
CSBN	353	Pecan	Broadleaf	Deciduous	1	7		54.3276	43
CSBN	354	Green Ash	Broadleaf	Deciduous	1	8.5		54.3279	38
CSBN	355	Sugarberry	Broadleaf	Deciduous	1	16		54.3290	39.75
CSBN	356	Persimmon	Broadleaf	Deciduous	1	7		54.3314	39.5
CSBN	357	Winged Elm	Broadleaf	Deciduous	1	8.5		54.3323	39.5
CSBN	358	Willow Oak	Broadleaf	Deciduous	1	9		54.3334	46.5
CSBN	359	Loblolly Pine	Conifer	Evergreen	1	11		54.3334	37.25
CSBN	360	Willow Oak	Broadleaf	Deciduous	1	11		54.3362	45
CSBN	361	Winged Elm	Broadleaf	Deciduous	1	9		54.3364	38.5
CSBN	362	Willow Oak	Broadleaf	Deciduous	1	11		54.3369	37.75
CSBN	363	Willow Oak	Broadleaf	Deciduous	1	12		54.3383	51
CSBN	364	Willow Oak	Broadleaf	Deciduous	1	7		54.3383	49.5
CSBN	365	Eastern Red Cedar	Conifer	Evergreen	1	7.5		54.3420	44
CSBN	366	Sugarberry	Broadleaf	Deciduous	1	6		54.3438	54
CSBN	367	Winged Elm	Broadleaf	Deciduous	1	13		54.3438	61.5
CSBN	368	Eastern Red Cedar	Conifer	Evergreen	1	6		54.3426	63
CSBN	369	Willow Oak	Broadleaf	Deciduous	1	11		54.3445	68
CSBN	370	Willow Oak	Broadleaf	Deciduous	1	29		54.3455	57.5
CSBN	371	Eastern Red Cedar	Conifer	Evergreen	1	5.5		54.3456	38.5
CSBN	372	Eastern Red Cedar	Conifer	Evergreen	1	5		54.3475	49
CSBN	373	Willow Oak	Broadleaf	Deciduous	1	27		54.3494	39
CSBN	374	Laurel Oak	Broadleaf	Deciduous	1	11		54.3492	72.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	375	Willow Oak	Broadleaf	Deciduous	1	29		54.3506	74
CSBN	376	Willow Oak	Broadleaf	Deciduous	1	20		54.3525	37.75
CSBN	377	Eastern Red Cedar	Conifer	Evergreen	1	22		54.3536	39.5
CSBN	378	Post Oak	Broadleaf	Deciduous	2	17		54.3551	70
	379					18		54.3551	70
CSBN	380	Laurel Oak	Broadleaf	Deciduous	1	6.5		54.3555	67
CSBN	381	Sugarberry	Broadleaf	Deciduous	1	10		54.3550	39
CSBN	382	Eastern Red Cedar	Conifer	Evergreen	1	21		54.3606	39.75
CSBN	383	Eastern Red Cedar	Conifer	Evergreen	1	27		54.3620	41.25
CSBN	384	Willow Oak	Broadleaf	Deciduous	1	23		54.3634	42
CSBN	385	Sweet Gum	Broadleaf	Deciduous	1	8.5		54.3638	42
CSBN	386	Post Oak	Broadleaf	Deciduous	3	16		54.3708	43.5
	387					15		54.3708	43.5
	388					11		54.3708	43.5
CSBN	389	Willow Oak	Broadleaf	Deciduous	1	16		54.3741	45.5
CSBN	390	Green Ash	Broadleaf	Deciduous	1	8.5		54.3761	39
CSBN	391	Willow Oak	Broadleaf	Deciduous	1	25		54.3777	50
CSBN	392	Willow Oak	Broadleaf	Deciduous	1	48		54.3809	50
CSBN	393	Sweet Gum	Broadleaf	Deciduous	1	9		54.3824	52
CSBN	394	Green Ash	Broadleaf	Deciduous	2	11		54.3854	36
	395					12		54.3854	36
CSBN	396	Willow Oak	Broadleaf	Deciduous	1	32		54.3877	60
CSBN	397	Water Oak	Broadleaf	Deciduous	1	6		54.3892	38
CSBN	398	Winged Elm	Broadleaf	Deciduous	1	6		54.3915	40.5
CSBN	399	Sweet Gum	Broadleaf	Deciduous	1	6		54.3919	35.75
CSBN	400	Water Oak	Broadleaf	Deciduous	1	15		54.3938	38
CSBN	401	Water Oak	Broadleaf	Deciduous	1	8		54.3977	37.75
CSBN	402	Water Oak	Broadleaf	Deciduous	1	20		54.3987	40.5
CSBN	403	Loblolly Pine	Conifer	Evergreen	1	9.5		54.3992	57

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	404	Winged Elm	Broadleaf	Deciduous	1	13.5		54.4005	41.5
CSBN	405	Green Ash	Broadleaf	Deciduous	1	12		54.4008	38
CSBN	406	Loblolly Pine	Conifer	Evergreen	1	6		54.4027	49
CSBN	407	Loblolly Pine	Conifer	Evergreen	1	9.5		54.4028	50.5
CSBN	408	Loblolly Pine	Conifer	Evergreen	1	9		54.4055	47
CSBN	409	Loblolly Pine	Conifer	Evergreen	1	16		54.4061	35
CSBN	410	Sweet Gum	Broadleaf	Deciduous	1	6		54.4076	38.75
CSBN	411	Sweet Gum	Broadleaf	Deciduous	1	7.5		54.4077	37
CSBN	412	Sweet Gum	Broadleaf	Deciduous	1	8		54.4094	38.5
CSBN	413	Loblolly Pine	Conifer	Evergreen	1	6		54.4108	45.25
CSBN	414	Loblolly Pine	Conifer	Evergreen	1	8.5		54.4117	46.5
CSBN	415	Green Ash	Broadleaf	Deciduous	1	27		54.4144	40.5
CSBN	416	Sugarberry	Broadleaf	Deciduous	1	8		54.4165	39.5
CSBN	417	Green Ash	Broadleaf	Deciduous	1	7		54.4172	40.5
CSBN	418	Green Ash	Broadleaf	Deciduous	1	9.5		54.4186	35.5
CSBN	419	Sweet Gum	Broadleaf	Deciduous	1	10		54.4198	37.5
CSBN	420	Willow Oak	Broadleaf	Deciduous	1	6		54.4214	34.25
CSBN	421	Loblolly Pine	Conifer	Evergreen	1	6		54.4212	47.5
CSBN	422	Green Ash	Broadleaf	Deciduous	1	10.5		54.4229	39.5
CSBN	423	Water Oak	Broadleaf	Deciduous	2	21		54.4241	38.5
	424					21		54.4241	38.5
CSBN	425	Laurel Oak	Broadleaf	Deciduous	1	7		54.4265	45.75
CSBN	426	Red Oak	Broadleaf	Deciduous	1	19		54.4273	45.25
CSBN	427	Red Oak	Broadleaf	Deciduous	1	10		54.4283	27.75
CSBN	428	Laurel Oak	Broadleaf	Deciduous	1	8		54.4290	36.5
CSBN	429	Water Oak	Broadleaf	Deciduous	2	12		54.4303	44.25
	430					16		54.4303	44.25
CSBN	431	Red Oak	Broadleaf	Deciduous	1	10		54.4322	34.5
CSBN	432	Red Oak	Broadleaf	Deciduous	1	8		54.4331	31.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	433	Green Ash	Broadleaf	Deciduous	1	10.5		54.4337	39.5
CSBN	434	Loblolly Pine	Conifer	Evergreen	1	6		54.4371	45.5
CSBN	435	Loblolly Pine	Conifer	Evergreen	1	6		54.4377	42
CSBN	436	Loblolly Pine	Conifer	Evergreen	1	6		54.4383	45.5
CSBN	437	Loblolly Pine	Conifer	Evergreen	1	6		54.4384	49
CSBN	438	Sweet Gum	Broadleaf	Deciduous	1	8		54.4388	37.5
CSBN	439	Loblolly Pine	Conifer	Evergreen	1	11.5		54.4388	35.5
CSBN	440	Loblolly Pine	Conifer	Evergreen	1	6		54.4403	55.5
CSBN	441	Loblolly Pine	Conifer	Evergreen	1	6		54.4436	46.5
CSBN	442	Loblolly Pine	Conifer	Evergreen	1	6		54.4438	48
CSBN	443	Loblolly Pine	Conifer	Evergreen	1	18		54.4445	37
CSBN	444	Loblolly Pine	Conifer	Evergreen	1	6		54.4449	46
CSBN	445	Winged Elm	Broadleaf	Deciduous	1	11.5		54.4483	35.25
CSBN	446	Loblolly Pine	Conifer	Evergreen	1	9		54.4491	35.5
CSBN	447	Loblolly Pine	Conifer	Evergreen	1	6		54.4517	35.5
CSBN	448	Loblolly Pine	Conifer	Evergreen	1	6		54.4527	50
CSBN	449	Loblolly Pine	Conifer	Evergreen	1	7		54.4545	51
CSBN	450	Loblolly Pine	Conifer	Evergreen	1	7.5		54.4568	40
CSBN	451	Loblolly Pine	Conifer	Evergreen	1	7		54.4574	58.5
CSBN	452	Loblolly Pine	Conifer	Evergreen	1	6		54.4587	55
CSBN	453	Loblolly Pine	Conifer	Evergreen	1	7		54.4585	67.5
CSBN	454	White Ash	Broadleaf	Deciduous	1	8		54.4595	37.25
CSBN	455	Sweet Gum	Broadleaf	Deciduous	1	6		54.4601	38.25
CSBN	456	Red Cedar	Broadleaf	Deciduous	1	6		54.4606	57.5
CSBN	457	White Ash	Broadleaf	Deciduous	3	24		54.4614	78.5
	458					22		54.4614	78.5
	459					23		54.4614	78.5
CSBN	460	Sweet Gum	Broadleaf	Deciduous	1	7		54.4664	39.5
CSBN	461	Water Oak	Broadleaf	Deciduous	1	12		54.4682	66

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Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	462	Laurel Oak	Broadleaf	Deciduous	1	6		54.4695	48.5
CSBN	463	Loblolly Pine	Conifer	Evergreen	1	9		54.4705	43
CSBN	464	Water Oak	Broadleaf	Deciduous	1	6		54.4720	50
CSBN	465	White Ash	Broadleaf	Deciduous	1	13		54.4727	69.5
CSBN	466	Willow Oak	Broadleaf	Deciduous	1	6.5		54.4741	43.5
CSBN	467	Winged Elm	Broadleaf	Deciduous	1	6		54.4748	37.5
CSBN	468	Willow Oak	Broadleaf	Deciduous	1	8		54.4758	36
CSBN	469	Winged Elm	Broadleaf	Deciduous	1	9		54.4763	36.5
CSBN	470	Water Oak	Broadleaf	Deciduous	1	6.5		54.4765	48
CSBN	471	White Ash	Broadleaf	Deciduous	2	13.5		54.4765	63.5
	472					16		54.4765	63.5
CSBN	473	Winged Elm	Broadleaf	Deciduous	1	11		54.4807	63.5
CSBN	474	Laurel Oak	Broadleaf	Deciduous	1	38		54.4816	54
CSBN	475	Winged Elm	Broadleaf	Deciduous	1	6		54.4830	37.25
CSBN	476	Red Cedar	Broadleaf	Deciduous	1	10		54.4843	52.5
CSBN	477	Red Oak	Broadleaf	Deciduous	1	21		54.4848	56.5
CSBN	478	Green Ash	Broadleaf	Deciduous	2	12		54.3206	52
	479					9		54.3206	52
CSBN	480	Willow Oak	Broadleaf	Deciduous	1	27		54.4873	85.5
CSBN	481	Green Ash	Broadleaf	Deciduous	1	9		54.4875	55
CSBN	482	Green Ash	Broadleaf	Deciduous	1	10		54.4881	53
CSBN	483	Red Cedar	Broadleaf	Deciduous	1	7.5		54.4886	54
CSBN	484	Red Oak	Broadleaf	Deciduous	1	17		54.4890	60.5
CSBN	485	Green Ash	Broadleaf	Deciduous	1	10		54.3206	53
	486					10		54.3206	53
CSBN	487	Red Oak	Broadleaf	Deciduous	1	26		54.4915	50.5
CSBN	488	Willow Oak	Broadleaf	Deciduous	1	22		54.4928	52
CSBN	489	Willow Oak	Broadleaf	Deciduous	1	32		54.4924	73
CSBN	490	Sweet Gum	Broadleaf	Deciduous	1	7		54.4947	51

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	491	Winged Elm	Broadleaf	Deciduous	1	9		54.4966	52.75
CSBN	492	Willow Oak	Broadleaf	Deciduous	1	30		54.4968	76
CSBN	493	Persimmon	Broadleaf	Deciduous	1	6		54.4970	38.75
CSBN	494	Post Oak	Broadleaf	Deciduous	1	8		54.4985	38.75
CSBN	495	Willow Oak	Broadleaf	Deciduous	1	9		54.4992	55.5
CSBN	496	Winged Elm	Broadleaf	Deciduous	1	9		54.5002	40.25
CSBN	497	Winged Elm	Broadleaf	Deciduous	1	6		54.5021	37.5
CSBN	498	Laurel Oak	Broadleaf	Deciduous	1	22		54.5040	52
CSBN	499	Laurel Oak	Broadleaf	Deciduous	1	34		54.5066	62
CSBN	500	Water Oak	Broadleaf	Deciduous	1	6		54.5076	39.5
CSBN	501	Red Oak	Broadleaf	Deciduous	1	7		54.5093	41.5
CSBN	502	Water Oak	Broadleaf	Deciduous	1	18		54.5100	51
CSBN	503	Water Oak	Broadleaf	Deciduous	1	9.5		54.5333	57
CSBN	504	Red Oak	Broadleaf	Deciduous	1	21		54.5341	38
CSBN	505	White Oak	Broadleaf	Deciduous	1	12		54.5354	49
CSBN	506	Green Ash	Broadleaf	Deciduous	1	9.5		54.5388	38
CSBN	507	Water Oak	Broadleaf	Deciduous	1	20		54.5395	38
CSBN	508	Sweet Gum	Broadleaf	Deciduous	1	7		54.5398	59.5
CSBN	509	Willow Oak	Broadleaf	Deciduous	1	8		54.5406	62
CSBN	510	Loblolly Pine	Conifer	Evergreen	1	23		54.5409	51.5
CSBN	511	Water Oak	Broadleaf	Deciduous	1	7		54.5409	45.5
CSBN	512	Water Oak	Broadleaf	Deciduous	1	12		54.5413	39
CSBN	513	Water Oak	Broadleaf	Deciduous	1	10		54.5424	63
CSBN	514	Water Oak	Broadleaf	Deciduous	1	6.5		54.5438	52.5
CSBN	515	Willow Oak	Broadleaf	Deciduous	1	10		54.5438	39.25
CSBN	516	Willow Oak	Broadleaf	Deciduous	1	7		54.5447	46
CSBN	517	Loblolly Pine	Conifer	Evergreen	1	21		54.5445	57.5
CSBN	518	Water Oak	Broadleaf	Deciduous	1	8.5		54.5451	48
CSBN	519	Sweet Gum	Broadleaf	Deciduous	1	8.5		54.5470	51.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	520	Sweet Gum	Broadleaf	Deciduous	1	6		54.5473	39
CSBN	521	Loblolly Pine	Conifer	Evergreen	1	26		54.5477	49.5
CSBN	522	Water Oak	Broadleaf	Deciduous	1	6		54.5487	53.5
CSBN	523	Sweet Gum	Broadleaf	Deciduous	1	7		54.5487	61.5
CSBN	524	Water Oak	Broadleaf	Deciduous	1	8.5		54.5551	39.75
CSBN	525	Water Oak	Broadleaf	Deciduous	1	6		54.5549	43.25
CSBN	526	Water Oak	Broadleaf	Deciduous	1	18		54.5574	35.5
CSBN	527	Water Oak	Broadleaf	Deciduous	1	6.5		54.5574	56
CSBN	528	Sweet Gum	Broadleaf	Deciduous	1	7		54.5595	52.5
CSBN	529	Sweet Gum	Broadleaf	Deciduous	1	10		54.5597	38.75
CSBN	530	Loblolly Pine	Conifer	Evergreen	1	16		54.5604	66.5
CSBN	531	Loblolly Pine	Conifer	Evergreen	1	18		54.5608	69.5
CSBN	532	Water Oak	Broadleaf	Deciduous	1	11		54.5610	44
CSBN	533	Red Cedar	Broadleaf	Deciduous	1	13.5		54.5623	61
CSBN	534	Laurel Oak	Broadleaf	Deciduous	1	15		54.5623	48.5
CSBN	535	Water Oak	Broadleaf	Deciduous	1	12		54.5624	38
CSBN	536	Loblolly Pine	Conifer	Evergreen	1	21		54.5642	62
CSBN	537	Willow Oak	Broadleaf	Deciduous	1	7		54.5642	39.5
CSBN	538	Red Oak	Broadleaf	Deciduous	1	24		54.5669	44.5
CSBN	539	Sugarberry	Broadleaf	Deciduous	1	8.5		54.5699	39.5
CSBN	540	White Ash	Broadleaf	Deciduous	1	13		54.5706	40.25
CSBN	541	Sugarberry	Broadleaf	Deciduous	1	6		54.5712	49.25
CSBN	542	Green Ash	Broadleaf	Deciduous	1	11		54.5731	39.25
CSBN	543	White Ash	Broadleaf	Deciduous	1	10		54.5731	39
CSBN	544	Water Oak	Broadleaf	Deciduous	1	6		54.5742	35.5
CSBN	545	Red Oak	Broadleaf	Deciduous	1	22		54.5759	40.25
CSBN	546	Red Oak	Broadleaf	Deciduous	1	9.5		54.5775	60
CSBN	547	Red Oak	Broadleaf	Deciduous	2	11		54.5794	41
	548					15		54.5794	41

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	549	Red Oak	Broadleaf	Deciduous	2	18		54.5803	41
	550					13		54.5803	41
CSBN	551	Winged Elm	Broadleaf	Deciduous	1	9		54.5809	39.5
CSBN	552	Loblolly Pine	Conifer	Evergreen	1	9.5		54.5833	60
CSBN	553	Loblolly Pine	Conifer	Evergreen	1	11		54.5837	63
CSBN	554	Winged Elm	Broadleaf	Deciduous	1	6.5		54.5845	44
CSBN	555	Loblolly Pine	Conifer	Evergreen	1	20		54.5850	43.5
CSBN	556	Loblolly Pine	Conifer	Evergreen	1	12		54.5858	62
CSBN	557	Laurel Oak	Broadleaf	Deciduous	1	16		54.5869	37
CSBN	558	Laurel Oak	Broadleaf	Deciduous	1	18		54.5894	39
CSBN	559	Sweet Gum	Broadleaf	Deciduous	2	9		54.5907	40.5
	560					7.5		54.5907	40.5
CSBN	561	Loblolly Pine	Conifer	Evergreen	1	12		54.5922	57.5
CSBN	562	Sugarberry	Broadleaf	Deciduous	2	10.5		54.5950	52
	563					10		54.5950	52
CSBN	564	Sweet Gum	Broadleaf	Deciduous	1	9		54.5960	45.5
CSBN	565	Green Ash	Broadleaf	Deciduous	3	12		54.5953	34.25
	566					10		54.5953	34.25
	567					13		54.5953	34.25
CSBN	568	Red Cedar	Broadleaf	Deciduous	1	10		54.5964	44.25
CSBN	569	Loblolly Pine	Conifer	Evergreen	1	9.5		54.5987	53
CSBN	570	Red Cedar	Conifer	Evergreen	2	8		54.5987	42
	571					6		54.5987	42
CSBN	572	Winged Elm	Broadleaf	Deciduous	1	10		54.6000	41
CSBN	573	Loblolly Pine	Conifer	Evergreen	1	25		54.6021	40.75
CSBN	574	Willow Oak	Broadleaf	Deciduous	1	6		54.6041	45.5
CSBN	575	Loblolly Pine	Conifer	Evergreen	1	6.5		54.6047	46.25
CSBN	576	Loblolly Pine	Conifer	Evergreen	1	10		54.6057	60
CSBN	577	Loblolly Pine	Conifer	Evergreen	1	10		54.6064	60

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	578	Persimmon	Broadleaf	Deciduous	1	6.5		54.6072	41.25
CSBN	579	Persimmon	Broadleaf	Deciduous	2	6		54.6091	40.25
	580					6		54.6091	40.25
CSBN	581	Loblolly Pine	Conifer	Evergreen	1	10		54.6106	38
CSBN	582	Loblolly Pine	Conifer	Evergreen	1	16		54.6148	43
CSBN	583	Loblolly Pine	Conifer	Evergreen	1	11.5		54.6150	63.5
CSBN	584	Winged Elm	Broadleaf	Deciduous	1	15		54.6159	39.5
CSBN	585	Red Cedar	Broadleaf	Deciduous	1	6		54.6174	37
CSBN	586	Winged Elm	Broadleaf	Deciduous	1	7		54.6182	40
CSBN	587	Winged Elm	Broadleaf	Deciduous	1	8		54.6199	39.5
CSBN	588	Winged Elm	Broadleaf	Deciduous	1	6		54.6216	38
CSBN	589	Winged Elm	Broadleaf	Deciduous	1	7		54.6218	40.5
CSBN	590	Winged Elm	Broadleaf	Deciduous	1	10		54.6231	39
CSBN	591	Winged Elm	Broadleaf	Deciduous	1	12		54.6235	39.25
CSBN	592	Slippery Elm	Broadleaf	Deciduous	1	6		54.6239	39.75
CSBN	593	Loblolly Pine	Conifer	Deciduous	2	9		54.6244	57
	594					6		54.6244	57
CSBN	595	Loblolly Pine	Conifer	Evergreen	1	11		54.6248	65.5
CSBN	596	Slippery Elm	Broadleaf	Deciduous	1	9		54.6257	38.25
CSBN	597	Slippery Elm	Broadleaf	Deciduous	1	7.5		54.6259	38.5
CSBN	598	Slippery Elm	Broadleaf	Deciduous	1	7		54.6262	38.25
CSBN	599	Loblolly Pine	Conifer	Evergreen	1	6		54.6275	56
CSBN	600	Loblolly Pine	Conifer	Evergreen	1	11		54.6273	64
CSBN	601	Slippery Elm	Broadleaf	Deciduous	1	9		54.6276	37.25
CSBN	602	Slippery Elm	Broadleaf	Deciduous	1	6		54.6273	31.25
CSBN	603	Slippery Elm	Broadleaf	Deciduous	1	12		54.6303	38.75
CSBN	604	Loblolly Pine	Conifer	Evergreen	1	14		54.6306	55.5
CSBN	605	Slippery Elm	Broadleaf	Deciduous	1	9		54.6314	38.75
CSBN	606	Slippery Elm	Broadleaf	Deciduous	1	10		54.6305	48

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	607	Loblolly Pine	Conifer	Evergreen	1	13.5		54.6333	53
CSBN	608	Eastern Red Cedar	Conifer	Evergreen	1	12		54.6347	37.75
CSBN	609	Eastern Red Cedar	Conifer	Evergreen	1	10		54.6362	36
CSBN	610	Loblolly Pine	Conifer	Evergreen	1	10		54.6376	51.5
CSBN	611	Slippery Elm	Broadleaf	Deciduous	1	11		54.6388	36.5
CSBN	612	Eastern Red Cedar	Conifer	Evergreen	1	12		54.6402	36.25
CSBN	613	Loblolly Pine	Conifer	Evergreen	1	12		54.6409	52.75
CSBN	614	Slippery Elm	Broadleaf	Deciduous	1	12		54.6432	36.5
CSBN	615	Eastern Red Cedar	Conifer	Evergreen	1	14		54.6438	36.5
CSBN	616	Loblolly Pine	Conifer	Evergreen	1	10		54.6443	63
CSBN	617	Eastern Red Cedar	Conifer	Evergreen	1	6		54.6457	36.75
CSBN	618	Loblolly Pine	Conifer	Evergreen	1	10		54.6468	63
CSBN	619	Slippery Elm	Broadleaf	Deciduous	1	7		54.6470	36.75
CSBN	620	Eastern Red Cedar	Conifer	Evergreen	1	6		54.6472	36.75
CSBN	621	Slippery Elm	Broadleaf	Deciduous	1	14		54.6485	37
CSBN	622	Loblolly Pine	Conifer	Evergreen	1	8.5		54.6487	54.25
CSBN	623	Loblolly Pine	Conifer	Evergreen	1	8		54.6508	54.25
CSBN	624	Loblolly Pine	Conifer	Evergreen	1	21		54.6515	38
CSBN	625	Eastern Red Cedar	Conifer	Evergreen	1	7.5		54.6528	36.75
CSBN	626	Winged Elm	Broadleaf	Deciduous	1	10		54.6528	37.5
CSBN	627	Loblolly Pine	Conifer	Evergreen	1	10.5		54.6536	54.25
CSBN	628	Slippery Elm	Broadleaf	Deciduous	1	8.5		54.6542	36
CSBN	629	Slippery Elm	Broadleaf	Deciduous	1	7		54.6571	35.5
CSBN	630	Loblolly Pine	Conifer	Evergreen	1	11		54.6572	53.5
CSBN	631	Eastern Red Cedar	Conifer	Evergreen	1	8		54.6576	37.75
CSBN	632	Slippery Elm	Broadleaf	Deciduous	1	7		54.6586	36.25
CSBN	633	Loblolly Pine	Conifer	Evergreen	1	7.5		54.6587	53.5
CSBN	634	Eastern Red Cedar	Conifer	Evergreen	1	14		54.6600	35.75
CSBN	635	Slippery Elm	Broadleaf	Deciduous	1	20		54.6609	35.75

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	636	Loblolly Pine	Conifer	Evergreen	1	8		54.6614	52.75
CSBN	637	Slippery Elm	Broadleaf	Deciduous	2	11		54.6624	34
	638					6.5		54.6624	34
CSBN	639	Loblolly Pine	Conifer	Evergreen	1	8.5		54.6650	52.25
CSBN	640	Eastern Red Cedar	Conifer	Evergreen	1	16.5		54.6655	34.75
CSBN	641	Loblolly Pine	Conifer	Evergreen	1	8.5		54.6663	52
CSBN	642	Laurel Oak	Broadleaf	Deciduous	1	6		54.6665	52
CSBN	643	Green Ash	Broadleaf	Deciduous	1	8		54.6666	34
CSBN	644	Green Ash	Broadleaf	Deciduous	1	9		54.6676	33.25
CSBN	645	Eastern Red Cedar	Conifer	Evergreen	2	7		54.6680	33.75
	646					13		54.6680	33.75
CSBN	647	Laurel Oak	Broadleaf	Deciduous	1	17		54.6688	37.25
CSBN	648	Red Oak	Broadleaf	Deciduous	1	8		54.6694	30
CSBN	649	Slippery Elm	Broadleaf	Deciduous	1	10		54.6704	34.5
CSBN	650	Loblolly Pine	Conifer	Evergreen	1	14		54.6722	56
CSBN	651	Slippery Elm	Broadleaf	Deciduous	1	9		54.6731	35
CSBN	652	Eastern Red Cedar	Conifer	Evergreen	1	15		54.6731	33.75
CSBN	653	Loblolly Pine	Conifer	Evergreen	1	12		54.6750	56
CSBN	654	Loblolly Pine	Conifer	Evergreen	1	11		54.6752	49.5
CSBN	655	Slippery Elm	Broadleaf	Deciduous	1	7		54.6752	37
CSBN	656	Eastern Red Cedar	Conifer	Evergreen	1	16		54.6791	33
CSBN	657	Loblolly Pine	Conifer	Evergreen	1	10		54.6796	53
CSBN	658	Loblolly Pine	Conifer	Evergreen	1	14		54.6805	53.5
CSBN	659	Eastern Red Cedar	Conifer	Evergreen	4	8		54.6808	34.5
	660					10		54.6808	34.5
	661					6		54.6808	34.5
	662					6		54.6808	34.5
CSBN	663	Eastern Red Cedar	Conifer	Evergreen	1	10		54.6819	34.25
CSBN	664	Willow Oak	Broadleaf	Deciduous	1	13		54.6826	31.75

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	665	Water Oak	Broadleaf	Deciduous	1	11		54.6843	30
CSBN	666	Slippery Elm	Broadleaf	Deciduous	1	8		54.6845	33.25
CSBN	667	Loblolly Pine	Conifer	Evergreen	1	13		54.6851	52.75
CSBN	668	Slippery Elm	Broadleaf	Deciduous	1	14		54.6858	33.75
CSBN	669	Water Oak	Broadleaf	Deciduous	1	8		54.6860	29
CSBN	670	Loblolly Pine	Conifer	Evergreen	1	12		54.6863	53
CSBN	671	Eastern Red Cedar	Conifer	Evergreen	1	19		54.6886	35.25
CSBN	672	Water Oak	Broadleaf	Deciduous	1	10		54.6886	38.5
CSBN	673	Water Oak	Broadleaf	Deciduous	1	8.5		54.6888	30
CSBN	674	White Ash	Broadleaf	Deciduous	1	6		54.6903	33.75
CSBN	675	American Elm	Broadleaf	Deciduous	1	23		54.6939	34
CSBN	676	Sugarberry	Broadleaf	Deciduous	3	11		54.6950	34
	677					8		54.6950	34
	678					7		54.6950	34
CSBN	679	American Elm	Broadleaf	Deciduous	1	23		54.6955	34.5
CSBN	680	Loblolly Pine	Conifer	Evergreen	1	7		54.6979	57
CSBN	681	American Elm	Broadleaf	Deciduous	1	8.5		54.7009	35.75
CSBN	682	Green Ash	Broadleaf	Deciduous	1	12		54.7013	34
CSBN	683	Loblolly Pine	Conifer	Evergreen	1	11		54.7011	59.5
CSBN	684	Water Oak	Broadleaf	Deciduous	1	6		54.7023	26.5
CSBN	685	Slippery Elm	Broadleaf	Deciduous	1	12		54.7032	34.75
CSBN	686	Loblolly Pine	Conifer	Evergreen	1	10		54.7046	60
CSBN	687	Slippery Elm			2	11		54.7070	35.75
	688					16		54.7070	35.75
CSBN	689	Green Ash	Broadleaf	Deciduous	1	14		54.7078	33
CSBN	690	Sugarberry	Broadleaf	Deciduous	1	13		54.7144	40.5
CSBN	691	Green Ash	Broadleaf	Deciduous	1	16		54.7161	34.75
CSBN	692	Slippery Elm	Broadleaf	Deciduous	1	12		54.7173	36.75
CSBN	693	Sugarberry	Broadleaf	Deciduous	1	14		54.7189	33.75

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	694	Slippery Elm	Broadleaf	Deciduous	1	10		54.7221	34.5
CSBN	695	Osage-Orange	Broadleaf	Deciduous	3	10		54.7227	35.25
	696					9.5		54.7227	35.25
	697					6		54.7227	35.25
CSBN	698	Sugarberry	Broadleaf	Deciduous	1	13.5		54.7226	34.5
CSBN	699	Slippery Elm	Broadleaf	Deciduous	1	6.5		54.7235	34.5
CSBN	700	Sugarberry	Broadleaf	Deciduous	1	9		54.7258	40.5
CSBN	701	Osage-Orange	Broadleaf	Deciduous	1	18		54.7280	35
CSBN	702	American Elm	Broadleaf	Deciduous	1	32		54.7297	35.5
CSBN	703	Sugarberry	Broadleaf	Deciduous	4	6		54.7313	34.75
	704					9		54.7313	34.75
	705					6		54.7313	34.75
	706					11		54.7313	34.75
CSBN	707	Slippery Elm	Broadleaf	Deciduous	4	13		54.7356	34.25
	708					11		54.7356	34.25
	709					6		54.7356	34.25
	710					6		54.7356	34.25
CSBN	711	Loblolly Pine	Conifer	Evergreen	1	10		54.7366	58
CSBN	712	Loblolly Pine	Conifer	Evergreen	1	20.5		54.7396	38.5
CSBN	713	Sugarberry	Broadleaf	Deciduous	1	7		54.7403	38.25
CSBN	714	Loblolly Pine	Conifer	Evergreen	1	12		54.7405	40.5
CSBN	715	Sugarberry	Broadleaf	Deciduous	1	10.5		54.7430	35
CSBN	716	Eastern Red Cedar	Conifer	Evergreen	1	6		54.7436	27.5
CSBN	717	Loblolly Pine	Conifer	Evergreen	1	6		54.7438	59
CSBN	718	Loblolly Pine	Conifer	Evergreen	1	7		54.7439	59
CSBN	719	Loblolly Pine	Conifer	Evergreen	1	7		54.7443	59
CSBN	720	Green Ash	Broadleaf	Deciduous	1	6.5		54.7462	40.5
CSBN	721	Eastern Red Cedar	Conifer	Evergreen	1	9		54.7483	36.5
CSBN	722	Sugarberry	Broadleaf	Deciduous	1	8.5		54.7494	38.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	723	Loblolly Pine	Conifer	Evergreen	1	7		54.7496	60
CSBN	724	Slippery Elm	Broadleaf	Deciduous	1	11		54.7498	36.75
CSBN	725	American Elm	Broadleaf	Deciduous	1	32		54.7502	41
CSBN	726	Sugarberry	Broadleaf	Deciduous	1	8		54.7523	41
CSBN	727	Loblolly Pine	Conifer	Evergreen	1	13		54.7525	62
CSBN	728	Green Ash	Broadleaf	Deciduous	1	14		54.7533	39.25
CSBN	729	Loblolly Pine	Conifer	Evergreen	1	13		54.7547	63
CSBN	730	Sweet Gum	Broadleaf	Deciduous	1	16		54.7610	38.25
CSBN	731	Loblolly Pine	Conifer	Evergreen	1	28		54.7620	39.5
CSBN	732	Sweet Gum	Broadleaf	Deciduous	1	8		54.7660	37.5
CSBN	733	Loblolly Pine	Conifer	Evergreen	1	22		54.7666	40
CSBN	734	Sweet Gum	Broadleaf	Deciduous	2	11		54.7668	37.5
	735					9		54.7668	37.5
CSBN	736	Slippery Elm	Broadleaf	Deciduous	1	6		54.7678	38.5
CSBN	737	Loblolly Pine	Conifer	Evergreen	1	19		54.7687	40.5
CSBN	738	Sweet Gum	Broadleaf	Deciduous	1	8.5		54.7685	37.25
CSBN	739	Sweet Gum	Broadleaf	Deciduous	1	6		54.7702	38.75
CSBN	740	Slippery Elm	Broadleaf	Deciduous	1	7		54.7708	42.75
CSBN	741	American Elm	Broadleaf	Deciduous	1	12		54.7758	39
CSBN	742	Sweet Gum	Broadleaf	Deciduous	1	10.5		54.7767	39
CSBN	743	Water Oak	Broadleaf	Deciduous	1	21		54.7822	38.75
CSBN	744	Slippery Elm	Broadleaf	Deciduous	1	12		54.7837	38.75
CSBN	745	American Elm	Broadleaf	Deciduous	1	27		54.7869	39
CSBN	746	Osage-Orange	Broadleaf	Deciduous	1	9		54.7875	40
CSBN	747	Osage-Orange	Broadleaf	Deciduous	3	12		54.7889	39.75
	748					8		54.7889	39.75
	749					12		54.7889	39.75
CSBN	750	Slippery Elm	Broadleaf	Deciduous	1	12		54.7945	39.5
CSBN	751	Slippery Elm	Broadleaf	Deciduous	1	9.5		54.7957	40

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	752	Slippery Elm	Broadleaf	Deciduous	1	9		54.7984	37.5
CSBN	753	Eastern Red Cedar	Conifer	Evergreen	1	9.5		54.7995	40
CSBN	754	Eastern Red Cedar	Conifer	Evergreen	1	8		54.7996	42.5
CSBN	755	Slippery Elm	Broadleaf	Deciduous	1	9.5		54.8013	38
CSBN	756	Willow Oak	Broadleaf	Deciduous	1	14		54.8023	45.5
CSBN	757	American Elm	Broadleaf	Deciduous	1	8		54.8040	38.25
CSBN	758	Eastern Red Cedar	Conifer	Evergreen	1	10		54.8045	37.25
CSBN	759	Loblolly Pine	Conifer	Evergreen	1	15		54.8053	39.75
CSBN	760	Willow Oak	Broadleaf	Deciduous	1	17		54.8057	45.25
CSBN	761	Willow Oak	Broadleaf	Deciduous	1	28		54.8087	29.25
CSBN	762	Green Ash	Broadleaf	Deciduous	1	7		54.8119	28
CSBN	763	Loblolly Pine	Conifer	Evergreen	1	12		54.8121	38
CSBN	764	Sugarberry	Broadleaf	Deciduous	1	14		54.8129	62.5
CSBN	765	Loblolly Pine	Conifer	Evergreen	1	36		54.8324	63
CSBN	766	Eastern Red Cedar	Conifer	Evergreen	1	14		54.8191	47.5
CSBN	767	American Elm	Broadleaf	Deciduous	1	11		54.8205	39
CSBN	768	Eastern Red Cedar	Conifer	Evergreen	1	6.5		54.8226	36.5
CSBN	769	Willow Oak	Broadleaf	Deciduous	1	10		54.8226	37.75
CSBN	770	Willow Oak	Broadleaf	Deciduous	1	8		54.8226	39.25
CSBN	771	Loblolly Pine	Conifer	Evergreen	1	23		54.8236	36
CSBN	772	Sugarberry	Broadleaf	Deciduous	1	10		54.8264	28.25
CSBN	773	Eastern Red Cedar	Conifer	Evergreen	1	6		54.8276	38
CSBN	774	Eastern Red Cedar	Conifer	Evergreen	1	6		54.8282	38
CSBN	775	Slippery Elm	Broadleaf	Deciduous	1	8		54.8303	36.75
CSBN	776	Loblolly Pine	Conifer	Evergreen	1	28.5		54.8307	36.75
CSBN	777	Eastern Red Cedar	Conifer	Evergreen	2	15		54.8326	38.25
	778					9		54.8326	38.25
CSBN	779	Sugarberry	Broadleaf	Deciduous	1	6		54.8335	30.5
CSBN	780	Slippery Elm	Broadleaf	Deciduous	1	10		54.8364	37

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	781	White Ash	Broadleaf	Deciduous	1	11		54.8373	29.25
CSBN	782	Laurel Oak	Broadleaf	Deciduous	1	8		54.8398	60
CSBN	783	Laurel Oak	Broadleaf	Deciduous	1	6		54.8438	45.75
CSBN	784	Laurel Oak	Broadleaf	Deciduous	1	6		54.8439	50.75
CSBN	785	Sugarberry	Broadleaf	Deciduous	1	6		54.8456	44
CSBN	786	Slippery Elm	Broadleaf	Deciduous	1	19		54.8495	36.25
CSBN	787	Green Ash	Broadleaf	Deciduous	1	6		54.8489	31.25
CSBN	788	Green Ash	Broadleaf	Deciduous	1	6		54.8521	29
CSBN	789	Slippery Elm	Broadleaf	Deciduous	1	13		54.8564	37
CSBN	790	Sugarberry	Broadleaf	Deciduous	1	12		54.8583	41.25
CSBN	791	Slippery Elm	Broadleaf	Deciduous	1	14		54.8583	33.25
CSBN	792	American Elm	Broadleaf	Deciduous	1	13		54.8592	35.5
CSBN	793	Sweet Gum	Broadleaf	Deciduous	1	6.5		54.8594	32
CSBN	794	American Elm	Broadleaf	Deciduous	1	15		54.8614	33.25
CSBN	795	Slippery Elm	Broadleaf	Deciduous	1	14		54.8621	36.75
CSBN	796	Slippery Elm	Broadleaf	Deciduous	1	12		54.8626	37
CSBN	797	Eastern Red Cedar	Conifer	Evergreen	1	6		54.8665	43
CSBN	798	Slippery Elm	Broadleaf	Deciduous	1	6		54.8686	35.75
CSBN	799	Sugarberry	Broadleaf	Deciduous	2	10		54.8697	40.25
	800					23		54.8697	40.25
CSBN	801	Green Ash	Broadleaf	Deciduous	1	7		54.8710	47
CSBN	802	Black Willow	Broadleaf	Deciduous	1	9		54.8723	44
CSBN	803	Slippery Elm	Broadleaf	Deciduous	1	8		54.8803	37.75
CSBN	804	Sugarberry	Broadleaf	Deciduous	1	12		54.8821	36.75
CSBN	805	Slippery Elm	Broadleaf	Deciduous	1	11		54.8831	36.25
CSBN	806	American Elm	Broadleaf	Deciduous	1	12		54.8841	41
CSBN	807	Winged Elm	Broadleaf	Deciduous	1	7		54.8873	34.5
CSBN	808	Sweet Gum	Broadleaf	Deciduous	1	9		54.8877	36
CSBN	809	Slippery Elm	Broadleaf	Deciduous	1	7		54.8877	42

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Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	810	Willow Oak	Broadleaf	Deciduous	1	7		54.8902	30.25
CSBN	811	Green Ash	Broadleaf	Deciduous	1	9.5		54.8902	37
CSBN	812	Green Ash	Broadleaf	Deciduous	1	17		54.8905	37
CSBN	813	Green Ash	Broadleaf	Deciduous	1	13		54.8913	37.25
CSBN	814	White Oak	Broadleaf	Deciduous	1	6		54.8919	40.75
CSBN	815	Willow Oak	Broadleaf	Deciduous	1	7		54.8926	31.25
CSBN	816	Green Ash	Broadleaf	Deciduous	3	8		54.8938	38
	817					13		54.8938	38
	818					9		54.8938	38
CSBN	819	Laurel Oak	Broadleaf	Deciduous	1	7		54.8945	40
CSBN	820	Green Ash	Broadleaf	Deciduous	1	12		54.8950	36
CSBN	821	Green Ash	Broadleaf	Deciduous	1	6		54.8962	37
CSBN	822	Loblolly Pine	Conifer	Evergreen	1	22		54.8966	37
CSBN	823	Slippery Elm	Broadleaf	Deciduous	1	6		54.8977	35
CSBN	824	American Elm	Broadleaf	Deciduous	1	11		54.8983	38.25
CSBN	825	Willow Oak	Broadleaf	Deciduous	1	8.5		54.8983	44.75
CSBN	826	Green Ash	Broadleaf	Deciduous	1	6		54.9004	39
CSBN	827	Willow Oak	Broadleaf	Deciduous	1	16		54.9011	43.5
CSBN	828	Slippery Elm	Broadleaf	Deciduous	1	7.5		54.9045	42
CSBN	829	Slippery Elm	Broadleaf	Deciduous	1	9		54.9045	40.25
CSBN	830	Green Ash	Broadleaf	Deciduous	1	12		54.9053	40.25
CSBN	831	Green Ash	Broadleaf	Deciduous	1	11		54.9072	39.5
CSBN	832	Slippery Elm	Broadleaf	Deciduous	1	9		54.9072	43
CSBN	833	Sweet Gum	Broadleaf	Deciduous	1	12		54.9074	41.5
CSBN	834	Loblolly Pine	Conifer	Evergreen	1	19		54.9080	41.5
CSBN	835	Sweet Gum	Broadleaf	Deciduous	1	12		54.9085	38.5
CSBN	836	Slippery Elm	Broadleaf	Deciduous	1	7		54.9090	40.75
CSBN	837	Sweet Gum	Broadleaf	Deciduous	1	8		54.9098	37.25
CSBN	838	American Elm	Broadleaf	Deciduous	1	7		54.9110	42.5

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
CSBN	839	Sweet Gum	Broadleaf	Deciduous	1	13		54.9108	40.25
CSBN	840	Water Oak	Broadleaf	Deciduous	1	19		54.9118	44.5
CSBN	841	Willow Oak	Broadleaf	Deciduous	1	7		54.9155	44.5
CSBN	842	Sweet Gum	Broadleaf	Deciduous	3	8		54.9159	40
	843					8		54.9159	40
	844					7.5		54.9159	40
CSBN	845	Sweet Gum	Broadleaf	Deciduous	1	9		54.9188	38.5
CSBN	846	Sweet Gum	Broadleaf	Deciduous	2	10		54.9212	34.75
	847					6		54.9212	34.75
CSBN	848	Sweet Gum	Broadleaf	Deciduous	1	6		54.9214	38
CSBN	849	Sweet Gum	Broadleaf	Deciduous	2	8		54.9218	41.5
	850					9		54.9218	41.5
CSBN	851	Water Oak	Broadleaf	Deciduous	1	6		54.9222	43
CSBN	852	Sweet Gum	Broadleaf	Deciduous	1	14		54.9233	37.25
CSBN	853	Sweet Gum	Broadleaf	Deciduous	1	7		54.9242	40.25
CSBN	854	Sweet Gum	Broadleaf	Deciduous	1	8		54.9263	46.75
ESBN	855	Pecan Tree	Broadleaf	Deciduous	1	30		51.9872	21
ESBN	856	Pecan Tree	Broadleaf	Deciduous	1	24		51.9813	74.5
ESBN	857	Sugarberry	Broadleaf	Deciduous	1	7		51.9864	122
ESBN	858	Pecan Tree	Broadleaf	Deciduous	1	7		51.9816	136
ESBN	859	Sugarberry	Broadleaf	Deciduous	1	9		51.9845	149
ESBN	860	Sugarberry	Broadleaf	Deciduous	1	8		51.9843	180.25
ESBN	861	Sugarberry	Broadleaf	Deciduous	1	7		51.9837	189.5
ESBN	862	Sugarberry	Broadleaf	Deciduous	3	6.5		51.9837	200
ESBN	863					5		51.9837	200
ESBN	864					4		51.9837	200
ESBN	865	Sugarberry	Broadleaf	Deciduous	1	8		51.9848	200
ESBN	866	Sugarberry	Broadleaf	Deciduous	1	12		51.9845	212.75
ESBN	867	Sugarberry	Broadleaf	Deciduous	1	8		51.9844	238

Tree Section No.	Number	Tree Name	Conifer, Broadleaf or Palm	Deciduous or Evergreen	No. Trunks in a Cluster	Trunk Diameter (inches)	Measured Drip Line Radius (feet)	Mile Post	Distance from EOP (feet)
ESBN	868	Sugarberry	Broadleaf	Deciduous	1	9		51.9833	242
ESBN	869	Pecan Tree	Broadleaf	Deciduous	1	6		51.9825	246.5
ESBN	870	Pecan Tree	Broadleaf	Deciduous	2	4		51.9813	273
ESBN	871					6		51.9813	273
ESBN	872	American Elm	Broadleaf	Deciduous	1	9		51.9849	288
ESBN	873	Sugarberry	Broadleaf	Deciduous	1	7		51.9830	308.5
ESBN	874	Sugarberry	Broadleaf	Deciduous	1	7		51.9839	319.25
ESBN	875	Sugarberry	Broadleaf	Deciduous	1	7		51.9830	335
ESBN	876	Sugarberry	Broadleaf	Deciduous	1	6		51.9835	362.5
ESBN	877	Sugarberry	Broadleaf	Deciduous	2	6		51.9831	384
ESBN	878					5		51.9831	384
ESBN	879	Eastern Redbud	Broadleaf	Deciduous	1	9		51.9843	400
ESBN	880	Eastern Red Cedar	Conifer	Evergreen	2	9		51.9813	463
ESBN	881					9		51.9813	463
ESBN	882	Water Oak	Broadleaf	Deciduous	1	29		51.9843	464
ESBN	883	Pecan Tree	Broadleaf	Deciduous	1	22		51.9824	518