GEOTECHNICAL ENGINEERING REPORT

Pine Valley Estates
Roadway and Drainage Improvement Project
Escambia County, Florida

PREPARED FOR:
Sigma Consulting Group, Inc.
3298 Summit Boulevard, Suite 32
Pensacola, Florida 32503

NOVA Project Number: 10116-2020120

August 5, 2020

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August 5, 2020

SIGMA CONSULTING GROUP, INC.
3298 Summit Boulevard, Suite 21
Pensacola, Florida 32503

Attention: Mr. Jason Lashley, P.E.

Subject: **Geotechnical Engineering Report**
PINE VALLEY ESTATES ROADWAY AND DRAINAGE IMPROVEMENT PROJECT
Escambia County, Florida
NOVA Project Number 10116-2020120

Dear Mr. Lashley:

NOVA Engineering and Environmental LLC (NOVA) has completed the authorized Geotechnical Engineering Report for the planned improvements to the Pine Valley Estates subdivision in Escambia, Florida. The work was performed in general accordance with NOVA Proposal Number 016-20205813r1, dated May 8, 2020. This report briefly discusses our understanding of the project at the time of the subsurface exploration, describes the consulting services provided by NOVA, and presents our findings.

We appreciate your selection of NOVA and the opportunity to be of service on this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,

NOVA Engineering and Environmental LLC

Jesse A. James E.I.
Assistant Branch Manager
Florida Certificate No. 1100019359

Copies Submitted: via electronic mail service

WILLIAM LEE LAWRENCE JR
No. 60147

William L. Lawrence, P.E.
Senior Regional Engineer
STATE OF FLORIDA
Professional Engineer No. 60147

This item has been electronically signed and sealed by William L. Lawrence, P.E., using a Digital Signature. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Digital Signer:IGC CA 1
DN:CN=William L Lawrence, OU=A01410C000001712B660A02000182B6, O=Unaffiliated, C=US
Date:2020.08.05 15:36:37 -05:00

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1.0 INTRODUCTION

1.1 PROJECT INFORMATION

Our understanding of the project is based on recent conversations and email exchanges with the Client, review of supporting conceptual drawings provided by the Client; review of aerial photography of the site via internet-based GIS software; and our experience with similar geotechnical conditions in the near vicinity to this project site.

1.1.1 Site Plans and Documents

We were furnished with the following plans and documents:

- Document: Pine Valley Estates – Drainage Improvements Conceptual Design
  Prepared by: Sigma Consulting Group, Inc.
  Dated: April 2020

1.1.2 Proposed Improvements

The proposed improvements to the Pine Valley Estates subdivision will include rehabilitating approximately 7,000 linear feet of 2-lane asphalt paved roadways and upgrading a nearby regional stormwater management system (SMS) that will reportedly include the additions of shallow swales and drainage conduits.

1.1.3 Site Grading

We assume that finish site grades will closely match existing grades along the existing roadway alignments. The new swales have been assumed to have invert elevations on the order of 3 feet to 5 feet below existing grade (BEG) and the drainage conduits are assumed to have an invert elevation of less than 10 feet BEG.

1.2 SCOPE OF WORK

Sigma Consulting Group, Inc., engaged NOVA to provide Geotechnical Engineering consulting services for the planned **Pine Valley Estates – Roadway and Drainage Improvements** project in Escambia County, Florida. This report briefly discusses describes our exploratory procedures, and presents our findings, conclusions, and recommendations.

The primary objective of this study was to evaluate the conditions of the existing roadway alignments and to assess the site's subsurface conditions as they pertain to the presence of organic materials, loose or otherwise unsuitable soils, presence of permeable soils, and groundwater. The authorized geotechnical engineering services included a site reconnaissance, twenty (20) soil test borings and sampling, laboratory testing, engineering evaluation of the field and laboratory data, and the preparation of this report. These services were provided in general accordance with industry standards.

As authorized by the client, this completed geotechnical report includes:

- A description of the site, fieldwork, laboratory testing and general soil conditions encountered, as well as a Boring Location Plan, and individual Test Boring Records.
- Commentary regarding the condition of the existing roadway pavement sections, and recommendations pertaining to required removal and replacement or rehabilitation (typically by milling and overlaying) of the pavements present with the alignments of study.
- Site preparation considerations that include geotechnical discussions regarding site stripping and subgrade preparation and engineered fill/backfill placement.
- Flexible (asphalt) pavement section design recommendations based on assumed or provided traffic loadings.
- Recommendations for controlling groundwater and/or run-off during construction and, the need for permanent dewatering systems based on the anticipated post construction groundwater levels.
- Measured apparent and estimated SHGW levels for each boring.
- SMS design parameters per NWFWMD ERP requirements.
- Suitability of on-site soils for re-use as structural fill and backfill. Additionally, the criteria for suitable fill materials will be provided.
- Recommended quality control measures (i.e. sampling, testing, and inspection requirements) for site grading and pavement section construction.

The assessment of site environmental conditions, including the presence of wetlands or detection of pollutants in the soil, rock or groundwater, laboratory testing of samples, or a site-specific seismic study was beyond the scope of this geotechnical study. If requested, NOVA can provide these services.

2.0 SITE DESCRIPTION

2.1 LOCATION AND LEGAL DESCRIPTION

The Pine Valley Estates subdivision is located along Eight Mile Creek Road in the Beulah area of Escambia County, Florida. A Site Location Map is included in Appendix A.

2.2 SUBJECT PROPERTY AND VICINITY GENERAL CHARACTERISTICS

At that time of our field exploration, the vicinity of the Subject Property was generally developed with single-family residential land uses, and was bordered by the following:

DIRECTION	LAND USE DESCRIPTION/OBSERVATIONS
NORTH	Single-Family Residences
EAST	Timberland
SOUTH	Single-Family Residences
WEST	Eight Mile Creek Road

2.3 CURRENT USE OF THE PROPERTY

At the time of our field exploration, the Pine Valley Estates subdivision was developed with single-family residences along three (3) asphalt-paved roadways (Dunaway Lane, Pursell Lane, and Fridinger Drive). The development was observed to generally slope downward towards the southeast.

3.0 FIELD AND LABORATORY PROCEDURES

3.1 FIELD EXPLORATION

Boring locations were established in the field by NOVA personnel using the provided Coring Location Plan and by estimating/taping distances and angles from existing site landmarks. The approximate locations are shown in Appendix B. Consequently, referenced core/boring and elevations should be considered approximate. If increased accuracy is desired by the client, NOVA recommends that the locations and elevations be surveyed.

Our field exploration was conducted between July 17 and July 27, 2020 and included:

- Performing fifteen (15) pavement cores with subsequent 5-foot deep auger borings (designated as C-1 through C-15) along the existing roadway alignments.
- Performing five (5) auger borings (R-1 through R-5) along proposed swale/drainage conduit alignments.
- Obtaining digital photographs to document the existing pavement conditions.

The auger borings were performed using the guidelines of ASTM Designation D-1452, "Soil Exploration and Sampling by Auger Borings". A 3-inch OD mechanical-operated helix auger was used to advance the boring and representative portions of the disturbed soil samples, obtained from the auger flights, were placed in sealed containers and transported to our laboratory for further evaluation and laboratory testing.

The Test Boring Records provided in the Appendix present the soil conditions encountered at each core/boring location. These records represent our interpretation of the subsurface conditions based on the field exploration data, visual examination of the samples, and generally accepted geotechnical engineering practices. The stratification lines and depth designations represent approximate boundaries between various subsurface strata. Actual transitions between materials may be gradual. Also, subsurface conditions intermediate of each core/boring location may vary.

The groundwater levels reported on the Test Boring Records represent measurements made at the completion of the borings. The borings were backfilled with soil cuttings, and the core locations were capped with cold-patch asphalt at completion of the field exploration for safety concerns. Please refer to the Test Boring Records included in the Appendix for the subsurface conditions encountered at the specific core/boring locations.

4.0 LABORATORY TESTING

A laboratory testing program was conducted to characterize materials which exist at the site using the recovered samples. Selected test data are presented on the Test Boring Records attached in the Appendix. The specific tests are briefly described below. It should be noted that all soil samples will be properly disposed of 30 days following the submittal of this NOVA subsurface exploration report unless you request otherwise.

4.1 SOIL CLASSIFICATION

Soil classification provides a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our explorations, samples obtained during drilling operations are observed in our laboratory and visually classified by an engineer. The soils are classified according to consistency, color and texture. These classification descriptions are included on our Test Boring Records. The classification system discussed above is primarily qualitative; laboratory testing is generally performed for detailed soil classification. Using the test results, the soils were classified using the Unified Soil Classification System. This classification system and the in-place physical soil properties provide an index for estimating the soil's behavior.

4.2 MOISTURE CONTENT

The moisture content is the ratio expressed as a percentage of the weight of water in a given mass of soil to the weight of the solid particles and was conducted in general accordance with ASTM D-2216.

4.3 PERCENT FINES

The percent fines is defined as the percentage of the total dry soil mass which passes a #200 sieve. This test was conducted in general accordance with ASTM D-1140.

4.4 FALLING-HEAD LABORATORY PERMEABILITY TEST

A remolded falling head permeability test (ASTM D-5084) is a common laboratory test used to determine the hydraulic conductivity of fine-grained soils. The test involves the flow of water through a re-molded, fully saturated soil sample inside a rigid-wall permeameter connected to a standpipe of constant diameter. Before beginning the flow measurements, the soil sample is saturated, and the standpipe is filled with water to a given level. The test then starts by allowing the water to flow through the sample until the water in the standpipe reaches a lower limit. The time required for the water to flow from the upper to lower limit is recorded

5.0 SUBSURFACE CONDITIONS

5.1 GEOLOGY

The site is located in the Escambia County, Florida area and according to the United States Geological Survey (USGS), is situated within the greater Gulf Coastal Plain region. The site is generally covered with Alluvium sediments of the Pleistocene/Holocene periods underlain by the Citronelle formation of the Pliocene/Pleistocene periods. The alluvial sediments typically consist of siliciclastics that are fine to coarse quartz sand containing clay lenses and gravel in places. Sands consists primarily of very fine to very coarse poorly sorted quartz grains; gravel is composed of quartz, quartzite, and chert pebbles. In areas of the Valley and Ridge province gravels are generally composed of angular to sub-rounded chert, quartz, and quartzite pebbles. Coastal deposits in the Escambia County area include fine to medium quartz sand with shell fragments and accessory heavy minerals along Gulf beaches and fine to medium quartz sand, silt, clay, peat, mud and ooze in the Mississippi Sound, Little Lagoon, bays, lakes, streams, and estuaries. The Citronelle formation consists primarily of varicolored/mottled lenticular beds of poorly sorted sand, clayey sand, clay, and clayey gravel. Limonite pebbles and lenses of limonite cemented sand occur locally in weathered Miocene exposures. Surficial soils in the region are primarily siliciclastic sediments deposited in response to the renewed uplift and erosion in the Appalachian highlands to the north and sea-level fluctuations. The extent and type of deposit is influenced by numerous factors, including mineral composition of the parent rock and meteorological events.

5.2 SOIL CONDITIONS

The following paragraph provides a generalized description of the subsurface profiles and soil conditions encountered in the borings conducted during this study. The Test Boring Records in the Appendix should be reviewed to provide detailed descriptions of the conditions encountered at each boring location. Conditions may vary at other locations and times.

The roadway test borings generally encountered a pavement section consisting of approximately 1 inch to 4½ inches of asphalt and roughly 3 inches to 14 inches of underlying an sand-clay base course, which was generally underlain by mixed strata of fine-grained silty sands and fine-grained sands with silt (USCS classifications of SM and SP-SM, respectively) to the maximum depth explored of about 5 feet below existing grade (BEG).

The test borings conducted within the proposed SMS areas encountered between 6 inches to 12 inches of topsoil underlain by mixed strata of very low permeability fine-grained silty sands to clayey sands (SP-SM, SM, SC) to the maximum depth explored of about 15 feet BEG.

5.3 GROUNDWATER CONDITIONS

5.3.1 General

Groundwater in the Gulf Coastal Plain typically occurs as an unconfined aquifer condition. Recharge is provided by the infiltration of rainfall and surface water through the soil overburden. More permeable zones in the soil matrix can affect groundwater conditions. The groundwater table is expected to be a subdued replica of the original surface topography. Based on a review of topographic maps and our visual site observations, we anticipate the groundwater flow at the site to be towards the south.

Groundwater levels vary with changes in season and rainfall, construction activity, surface water runoff and other site-specific factors. Groundwater levels in the Escambia County area are typically lowest in the late fall to winter and highest in the early spring to mid-summer with annual groundwater fluctuations by seasonal rainfall; consequently, the water table may vary at times.

5.3.2 Soil Test Boring Groundwater Conditions

Groundwater was encountered in several of the deeper SMS test borings at depths varying between about 4 feet to 14 feet BEG, and was not encountered in the remaining borings to the maximum depths explored along the existing roadway alignments (about 5 feet BEG) and along the proposed SMS alignments (about 15 feet BEG) at the time of our field exploration, which occurred during a period of relatively normal seasonal rainfall and within a pattern of frequent (daily) rainfall events.

Based on comparisons of current annual monthly rainfall data to historical rainfall data extending back 50+ years in time, we estimate that the normal permanent seasonal high groundwater (SHGW) table will occur within 1 foot above the measured groundwater table (where encountered), during the wet season.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on our understanding of the proposed project, our site observations, our evaluation and interpretation of the field and laboratory data obtained during this exploration, our experience with similar subsurface conditions on other projects in the vicinity of this project site, and generally accepted geotechnical engineering principles and practices.

Subsurface conditions in unexplored locations or at other times may vary from those encountered at specific core/boring locations. If such variations are noted during construction, or if project construction plans are changed, we request the opportunity to review the changes and amend our recommendations, if necessary.

As previously noted, core/boring locations were established in the field by estimating distances and angles from existing site landmarks. If increased accuracy is desired by the client, we recommend that the core/boring locations and elevations be surveyed.

6.1 PAVEMENT CONDITION SURVEY

Based on the results of the asphalt cores and our observations of the existing pavement sections made at the time of our field exploration as memorialized by the photographs presented in the Appendix, we present these types of pavement distresses that were observed to be present throughout the asphalt pavements present within the subject development:

Cracking – Horizontal and/or vertical displacement of a pavement surface which is categorized in terms of both severity (Class 1B, Class II, or Class III) and type (single, branch, alligator, block, or combination cracks). Class 1B cracks are “hairline” cracks less than ⅛-inch-wide, Class II cracks are ⅛ to ¼ inch wide, and Class III cracks are ¼ inch or wider. Single and branch cracks can be longitudinal and/or transverse to the roadway and can be caused by hardening of the asphalt or fatigue failure of either the asphalt concrete or the supporting soils.

Patching – Rutting is the displacement of material creating channels within wheel paths along the path of traffic.

Rutting – Patches, indicative of previous repairs, are considered a defect in the pavement that has been repaired and is considered a pavement distress.

Potholes – Potholes are a localized loss of pavement material cause by traffic loading, fatigue, and inadequate strength.

Raveling – Raveling is a progressive loss of pavement material from the surface downward. Slight to moderate raveling has loss of fines, while severe raveling has a loss of coarse aggregate.

The photographs presented in the Appendix of this report were obtained on July 17, 2020. In general, the visual pavement survey identified variable pavement distresses that are discussed below, divided into separate zones based on the level of distresses observed.

The table provided below presents the results of the asphalt cores performed for this project. The table includes the asphalt and base course thicknesses and indicates the base course type encountered at each core location.

Table 1 – Asphalt and Base Evaluation

Core Location	Asphalt Thickness (inches)	Base Thickness (inches)	Base Type
C-1	1	8	Sand-Clay (SCB)
C-2	1	14	SCB
C-3	1¾	4¼	SCB
C-4	2	9	SCB
C-5	1¾	3	SCB
C-6	2	4	SCB
C-7	3	6	SCB
C-8	4½	3½	SCB
C-9	3¾	4	SCB
C-10	2¾	5¼	SCB
C-11	2½	4½	SCB
C-12	2¾	4¼	SCB
C-13	3½	4½	SCB
C-14	3¼	4¾	SCB
C-15	3¼	4¾	SCB

Based on our observations of the existing pavements present within the development, it is our professional opinion that the pavement sections are nearing the end of their useful life span (i.e., they are already failing, or soon will be) and full removal and replacement (R&R) will be required to restore the pavement sections to an acceptable level.

Severe pavement distresses (alligator cracking, raveling, extensive potholes and patches, etc.) were observed throughout the development, asphalt sections in many areas were found to be too thin to be reasonably milled without tearing out the entire asphalt section, and an insufficient pavement base thickness was found to be present in 10 of the 15 cores performed for this project.

We note that the sand clay base course for pavement sections in developments of this type is typically recommended to be a minimum of 9 inches for light duty pavement areas and 12 inches for heavy duty pavement areas (e.g., the main entrances off of Eight Mile Creek Road, and intersections where static wheel turning will be necessary).

6.1.1 New Pavement Sections

Recommended heavy duty and light duty pavement sections have been developed for this project based on our understanding of the existing subsurface conditions, review of applicable FDOT specifications, and the assumed pavement design parameters of a 20-year pavement design life with moderate traffic loadings.

Based on the results of our test borings, the subsurface conditions encountered appear to be adaptable for the following pavement sections, provided a minimum separation of at least 12 inches between the bottom of an FDOT Graded Aggregate Base (GAB) course and the apparent groundwater table or a significant perched water zone can be maintained. Based on the results of the roadway test borings, maintaining this separation is not anticipated to be an issue for this project.

We acknowledge that Escambia County requires that Graded Aggregate Base (GAB) be employed for roadways that will be turned over to the County for maintenance, unless the subsurface conditions encountered along the roadway alignments for a specific development are found to be acceptable for utilizing an alternative base course.

Given the presence of near-surface silty to clayey sand (SM, SC) subgrade soils, some with fines contents exceeding 25 percent, we concur that GAB should be utilized as the base course for the rehabilitated roadways in this development.

Standard-Duty Pavement Section (Roadways)	
Structural Course (FDOT SuperPave – SP fine)	1½ inches
GAB (from an FDOT approved source, min. LBR of 100)	6 inches
Stabilized Subgrade (minimum LBR of 40)	12 inches
Heavy-Duty Pavement Section (Entrance Drives)	
Structural Course (FDOT SuperPave – SP fine)	2½ inches
GAB (from an FDOT approved source, min. LBR of 100)	8 inches
Stabilized Subgrade (minimum LBR of 40)	12 inches

Following removal of the existing pavement sections, the subgrade should be prepared as recommended in the subsequent sections of this report.

Furthermore, we recommend specifying a minimum compaction requirement of at least 98 percent of the maximum dry density for the base course and stabilized subgrade course materials as determined by the Modified Proctor test method (ASTM D-1557). All asphalt material and paving operations should meet applicable specifications of the Asphalt Institute and FDOT requirements. A NOVA technician should observe placement and perform density testing of the stabilized subgrade, base course material and asphalt.

6.2 SITE PREPARATION

We anticipate that site grading will closely match existing grades within the existing roadway alignments. The new swales have been assumed to have an invert elevation on the order of 3 feet to 5 feet below existing grade (BEG) and the drainage conduits are assumed to have an invert elevation of less than 10 feet BEG.

Prior to proceeding with construction, the existing pavement sections as well all topsoil and vegetation, trees and associated root systems, and any other deleterious non-soil materials found to be present along the subject roadway and SMS alignments should be stripped from the proposed construction areas. We note that between 6 inches to 12 inches of topsoil was encountered at the SMS boring locations, and the reader is cautioned thicker topsoil deposits should be anticipated as being present along the swale and drainage conduit alignments. Clean topsoil may be stockpiled and subsequently re-used in landscaped areas. Debris-laden materials should be excavated, transported, and disposed of off-site in accordance with appropriate solid waste rules and regulations. All existing utility locations should be reviewed to assess their impact on the proposed construction and relocated/grouted in-place as appropriate.

Proof rolling of the exposed subgrade soils along the improved roadway alignments should then be performed under the direct observation of a NOVA geotechnical engineer using a fully loaded, tandem axle dump truck. Based on our recent experience with other developments in the near vicinity to this project site, we note that there is a strong likelihood that the soils present within the upper 4± feet of the soil horizon along portions of the roadway alignments could become overly wet and unstable during construction, and could subsequently require either undercutting or stabilization prior to installing fill soils or pavement elements.

Remedial recommendations for zones that exhibit pumping during the proof rolling operation will be made in the field at that time, and could include either undercutting to more firm underlying materials or possibly stabilizing the area(s) by choking aggregate into the unstable subgrade, with the actual measures recommended to be employed being dependent on the severity of the pumping and the depth/thickness of unstable materials.

The soils exposed at the stripped grade elevation (or undercut elevations depending on the results of the proof rolling) along the roadway alignments should then be compacted using non-vibratory methods (i.e., a large drum roller operating in the static mode) to a minimum soil density of at least 98 percent of the maximum dry density as determined by the Modified Proctor test method (ASTM D-1557). Vibratory compaction of the exposed subgrade soils is not recommended due to the presence of underlying moisture-sensitive silty to clayey sands, which could become unstable and require further undercutting if a vibratory roller is employed.

The Construction Bid Documents should include a Bid Alternate for contractors to provide a contingency budget for remediating unstable soil zones through means and methods of their choosing, and NOVA recommends that bidding contractors be afforded the opportunity to thoroughly investigate the subsurface conditions and satisfy themselves of existing conditions so as to be able to present costs and add alternate contingencies for subgrade stabilization, if required.

6.2.1 Soil Suitability

Fill materials should be relatively clean sands with less than 12 percent fines (material passing the No. 200 sieve), and free of non-soil materials and rock fragments larger than 3 inches in diameter. Soils with fines contents between 13 and 25 percent may also be used as fill soils for this project, but we note that strict moisture control would be required at the time of placement for these moisture-sensitive soils.

<u>Based on visual examination and limited laboratory soil testing results, the existing surficial soils encountered during this exploration may or may not be suitable for reuse as structural fill, depending on the fines contents of the materials being excavated and the moisture condition at that time.</u>

The majority of the on-site near surface soils can be categorized as SP-SM, SM or SC, or slightly silty to clayey fine-grained sands based on the Unified Soil Classification System (USCS), some of which were found to have more than 25 percent soil fines. Prior to construction, bulk samples of the proposed fill materials should be laboratory tested to confirm their suitability.

Organic and/or debris-laden material is not suitable for re-use as structural fill. Topsoil, mulch, and similar organic materials can be wasted in architectural areas. Debris-laden materials should be excavated, transported, and disposed of off-site in accordance with appropriate solid waste rules and regulations.

6.2.2 <u>Soil Compaction</u>

Structural fill along the roadway and underlying drainage conduit alignments should be placed in thin, horizontal loose lifts (maximum 12-inch) and compacted using non-vibratory methods to a minimum soil density of at least 98 percent of the Modified Proctor maximum dry density (ASTM D-1557). In confined areas, such as utility trenches, portable compaction equipment and thinner loose fill lifts (3 to 4 inches) may be necessary.

Fill materials used in structural areas should have a target maximum dry density of 95 pcf or greater. If lighter weight fill materials are used, the NOVA geotechnical engineer should be consulted to assess the impact on design recommendations.

Soil moisture content should be maintained within 2 percent of the optimum moisture content. We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. Soils excavated from below the water table will likely require significant efforts to adjust the moisture contents prior to reuse as fill.

A NOVA soils technician, who can assess suitability of materials used, and uniformity and appropriateness of compaction efforts, should observe all filling and subgrade preparation. Field tests, using thin-wall tube, nuclear or sand cone testing methods (ASTM D-2937, D-6938, or D-1556, respectively) should also be performed. When filling in small areas, at least one test per day per area should be required.

6.2.3 Trench and Pipe Bedding

Excavations greater than four feet deep should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29CFR Part 1926), excavation safety standards. It should be noted that the Contractor is solely responsible for site safety. This information is provided only as a service and under no circumstances should NOVA be assumed to be responsible for construction site safety.

Each excavation should be observed and classified by an OSHA-competent person. All excavations below the groundwater level are classified as OSHA Class C soils for excavation purposes.

After site stripping, trench excavation, and existing pipe removal, a NOVA geotechnical engineer should carefully evaluate the soils exposed at the bottom-of-pipe elevations. Additional recommendations (e.g., undercutting below the proposed pipe bearing elevations and replacing unsuitable soils with structural backfill, or possibly "choking" aggregate into the yielding subgrade soils to stiffen them up) will be rendered in the field should such action be deemed necessary.

Structural backfill and pipe bedding materials should consist of relatively clean sands, similar to the existing on-site soils, with less than 12 percent fines (material passing the No. 200 sieve), and free of non-soil materials and rock fragments larger than 3 inches in diameter. Structural backfill and pipe bedding materials should be placed in thin, horizontal loose lifts (maximum 6-inch) and compacted to a minimum soil density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557).

Based on visual examination, much of the existing soils encountered during this exploration appear suitable for reuse as structural backfill and pipe bedding materials provided the excavated materials are at/near their optimum moisture content at the time of their reuse. Materials that contain organic debris are not suitable for reuse as structural backfill. Prior to construction, bulk samples of the proposed backfill materials should be laboratory tested to confirm their suitability.

Stormwater pipe installation should be performed in general compliance with ASTM D-2321, Standard Practice for Underground Installation of Pipe for Sewers and Other Gravity Flow Applications.

6.3 GROUNDWATER CONTROL

Groundwater was encountered in several of the deeper SMS test borings at depths varying between about 4 feet to 14 feet BEG, and was not encountered in the remaining borings to the maximum depths explored along the existing roadway alignments (about 5 feet BEG) and along the proposed SMS alignments (about 15 feet BEG) at the time of our field exploration, which occurred during a period of relatively normal seasonal rainfall and within a pattern of frequent (daily) rainfall events.

Apparent groundwater is not expected to impact the development of this property. However, shallow perched/laterally flowing groundwater conditions should be expected to be present during the construction phase of this project, particularly if the site is not properly graded during construction to prevent the accumulation of stormwater runoff during and shortly following significant rain events from perching on the underlying low permeability, silty to clayey soils.

Maintaining proper grades (i.e., positive drainage paths) during the construction phase of this project will be critical to avoid the development of “bird baths” along the roadway and drainage conduit alignments, which would degrade the underlying silty/clayey soils and require undercutting to more firm underlying soils.

Should perched groundwater conditions be encountered during the earthwork phase of this development, most likely localized dewatering efforts (e.g., construction ditches, temporary sumps, etc.) will suffice to allow for earthwork operations to be performed in the dry. Permanent dewatering measures are not anticipated as being necessary for this development.

6.4 STORMWATER MANAGEMENT SYSTEM

We understand that the SMS improvements for the project are proposed to consist of several conventional shallow swales to treat and dispose of stormwater runoff. Based on the results of the SMS test borings, the subsurface conditions encountered on the project site are considered poorly suited for the treatment and disposal of stormwater runoff via the proposed improvements due to the presence of very low-permeability soils that were encountered across the areas of the proposed improvements. We recommend that alternate means of stormwater treatment and disposal (e.g., employing an underdrain system) be included as part of the SMS improvements for Pine Valley Estates.

7.0 CONSTRUCTION OBSERVATIONS

7.1 SUBGRADE

Once site grading is completed, the subgrade may be exposed to adverse construction activities and weather conditions. The subgrade should be well-drained to prevent the accumulation of water. If the exposed subgrade becomes saturated or frozen, the NOVA geotechnical engineer should be consulted.

A final subgrade evaluation should be performed by the NOVA geotechnical engineer immediately prior to pavements or slab-on-grade placement. If practical, proof rolling may be used to re-densify the surface and to detect any soil, which has become excessively wet or otherwise loosened.

7.2 PAVEMENTS

The recommended pavement sections should utilize materials and be constructed in accordance with applicable FDOT specifications. Also, NOVA should be retained during construction to confirm subgrade conditions are as anticipated and that the construction process is as required by the contract documents.

7.3 SUBSURFACE UTILITY INSTALLATIONS

NOVA should be retained during construction to confirm subgrade conditions are as anticipated and that the trench backfilling operations occur as required by the contract documents.

APPENDIX A
Figures and Maps

Scale: Not To Scale

Date Drawn: August 3, 2020

Drawn By: J. James

Checked By: W. Lawrence

NOVA

140-A Lurton Street
Pensacola, Florida 32505
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PROJECT LOCATION MAP

Pine Valley – Roadway and Drainage Improvement Project
Pensacola, Escambia County, Florida
NOVA Project Number 10116-2020120

Soil Map—Escambia County, Florida
(10116-2020120 Pine Valley - Roadway and Drainage Improvement Project)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Escambia County, Florida
Survey Area Data: Version 20, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

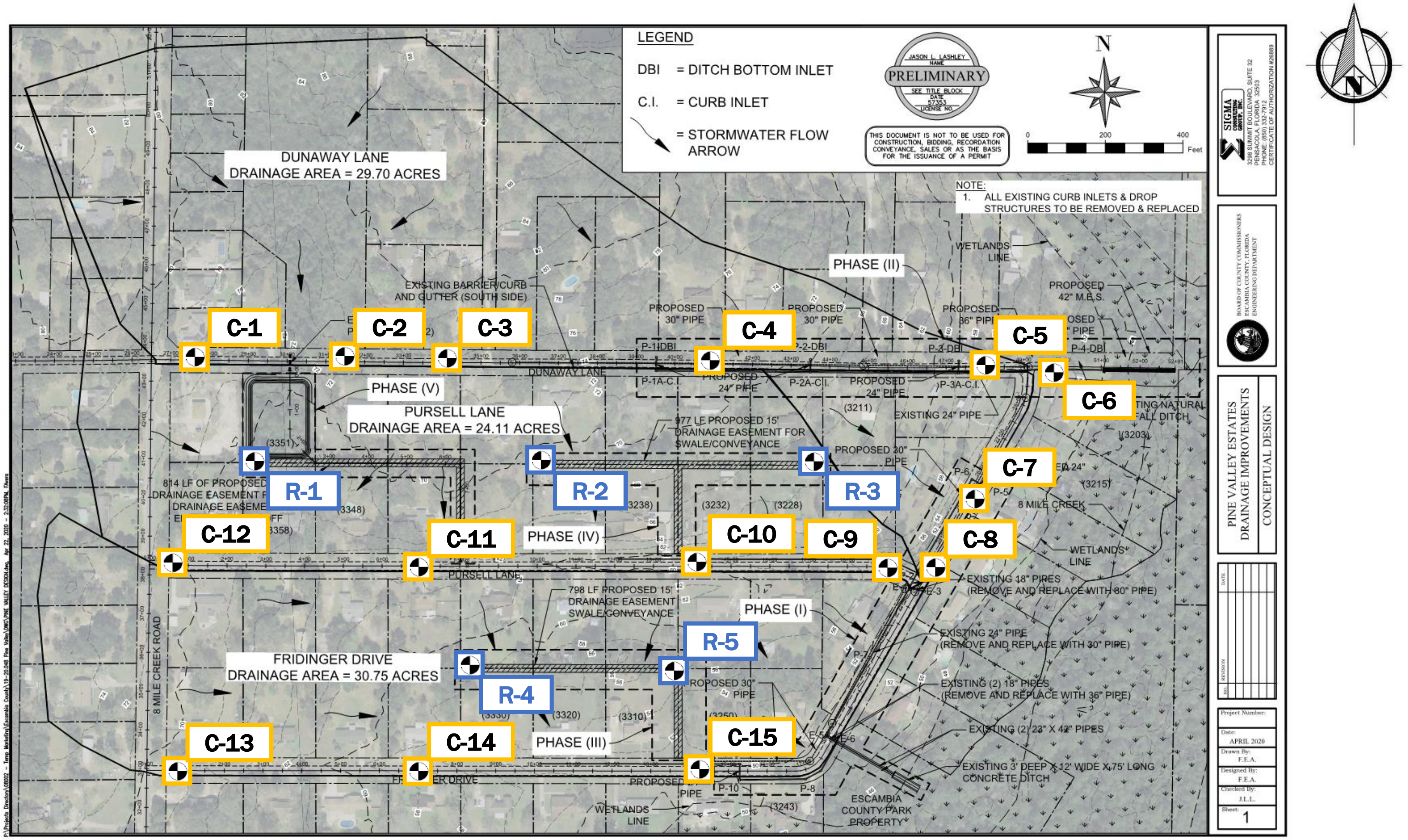
Date(s) aerial images were photographed: Feb 3, 2020—Feb 28, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
25	Poarch sandy loam, 2 to 5 percent slopes	17.9	20.7%
38	Bonifay loamy sand, 0 to 5 percent slopes	49.1	56.8%
49	Dorovan muck and Fluvaquents, frequently flooded	7.2	8.3%
51	Pelham loamy sand, 0 to 2 percent slopes	12.2	14.1%
Totals for Area of Interest		**86.5**	**100.0%**

APPENDIX B
Subsurface Data



LEGEND

⊕ C-x = Asphalt Coring/ 5-ft. Auger Boring

⊕ R-x = 15-ft. SMS Auger Boring

Scale: Not To Scale
Date Drawn: August 3, 2020
Drawn By: J. James
Checked By: W. Lawrence

NOVA

140-A Lurton Street
Pensacola, Florida 32505
850.607.7782 ♦ 850.249.6683

BORING LOCATION PLAN
Pine Valley Estates
Escambia County, Florida
NOVA Project Number 10116-2020120

KEY TO BORING LOGS

SYMBOLS AND ABBREVIATIONS

SYMBOL	DESCRIPTION
N-Value	No. of Blows of a 140-lb. Weight Falling 30 Inches Required to Drive a Standard Spoon 1 Foot
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
◨	Sample from Auger Cuttings
◩	Standard Penetration Test Sample
▯	Thin-wall Shelby Tube Sample (Undisturbed Sampler Used)
% REC	Percent Core Recovery from Rock Core Drilling
RQD	Rock Quality Designation
▼	Stabilized Groundwater Level
▽	Seasonal High Groundwater Level (also referred to as the W.S.W.T.)
NE	Not Encountered
GNE	Groundwater Not Encountered
BT	Boring Terminated
-200 (%)	Fines Content or % Passing No. 200 Sieve
MC (%)	Moisture Content
LL	Liquid Limit (Atterberg Limits Test)
PI	Plasticity Index (Atterberg Limits Test)
K	Coefficient of Permeability
Org. Cont.	Organic Content
G.S. Elevation	Ground Surface Elevation

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on the No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS 5% or less passing No. 200 sieve	SW**	Well-graded sands and gravelly sands, little or no fines
			SP**	Poorly graded sands and gravelly sands, little or no fines
		SANDS with 12% or more passing No. 200 sieve	SM**	Silty sands, sand-silt mixtures
			SC**	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diamicaceous fine sands or silts, elastic silts
			CH	Inorganic clays or clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
			PT	Peat, muck and other highly organic soils

*Based on the material passing the 3-inch (75 mm) sieve

** Use dual symbol (such as SP-SM and SP-SC) for soils with more than 5% but less than 12% passing the No. 200 sieve

RELATIVE DENSITY

(Sands and Gravels)

Very loose – Less than 4 Blow/Foot
Loose – 4 to 10 Blows/Foot
Medium Dense – 11 to 30 Blows/Foot
Dense – 31 to 50 Blows/Foot
Very Dense – More than 50 Blows/Foot

CONSISTENCY

(Silts and Clays)

Very Soft – Less than 2 Blows/Foot
Soft – 2 to 4 Blows/Foot
Medium Stiff – 5 to 8 Blows/Foot
Stiff – 9 to 15 Blows/Foot
Very Stiff – 16 to 30 Blows/Foot
Hard – More than 30 Blows/Foot

RELATIVE HARDNESS

(Limestone)

Soft – 100 Blows for more than 2 Inches
Hard – 100 Blows for less than 2 Inches

MODIFIERS

These modifiers Provide Our Estimate of the Amount of Minor Constituents (Silt or Clay Size Particles) in the Soil Sample

Trace – 5% or less
With Silt or With Clay – 6% to 11%
Silty or Clayey – 12% to 30%
Very Silty or Very Clayey – 31% to 50%

These Modifiers Provide Our Estimate of the Amount of Organic Components in the Soil Sample

Trace – Less than 3%
Few – 3% to 4%
Some – 5% to 8%
Many – Greater than 8%

These Modifiers Provide Our Estimate of the Amount of Other Components (Shell, Gravel, Etc.) in the Soil Sample

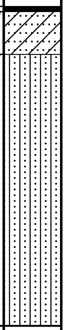
Trace – 5% or less
Few – 6% to 12%
Some – 13% to 30%
Many – 31% to 50%

NOVA

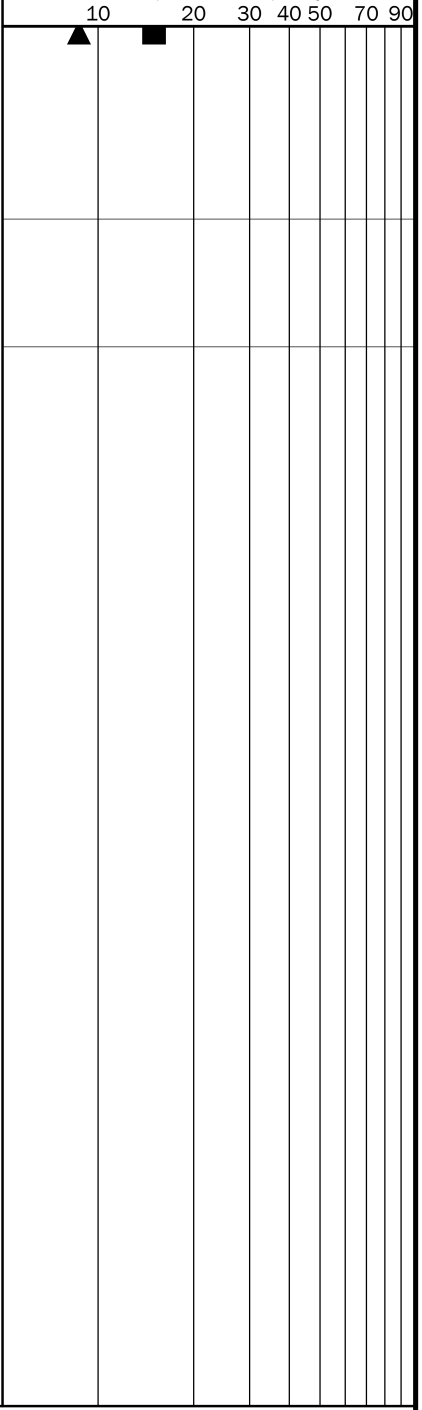
TEST BORING RECORD
C-1

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 24, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0						
		ASPHALT (Approx. 1-inch)				
		Red fine-grained clayey SAND (SC, Approx. 8-inches)				
		Brown fine-grained silty SAND (SM)				
3						
		Boring Terminated at 5 ft.				
6						
9						
12						
15						
18						
21						



■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├──┤ LIQUID LIMIT



This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
C-2

PROJECT: Pine Valley - Roadway and Drainage PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan ELEVATION: Existing Grade
DRILLER: S. San Filippo LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger DATE: July 24, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ CAVING> C

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├──┤ LIQUID LIMIT
10 20 30 40 50 70 90

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value	
0							
		ASPHALT (Approx. 1-inch)	■		▮		
		Red fine-grained clayey SAND (SC, Approx. 14-inches)	▨		▮		▲ ■
		Brown fine-grained silty SAND (SM)	▒		▮		
3							
		Boring Terminated at 5 ft.					
6							
9							
12							
15							
18							
21							

This information pertains only to this boring and should not be interpreted as being indicative of the site.

TEST BORING RECORD
C-3

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 24, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ CAVING> C

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├──┤ LIQUID LIMIT
10 20 30 40 50 70 90

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0						
		ASPHALT (Approx. 1.75-inches)				
		Red fine-grained clayey SAND (SC, Approx. 4.25-inches)				
		Brown fine-grained silty SAND (SM)				
3						
6		Boring Terminated at 5 ft.				
9						
12						
15						
18						
21						

This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
C-4

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0		ASPHALT (Approx. 2-inches)				
		Red fine-grained clayey SAND (SC, Approx. 9-inches)				
		Grey fine-grained slightly silty SAND (SP-SM)				
		Light brown fine-grained silty SAND (SM)				
3						
6		Boring Terminated at 5 ft.				
9						
12						
15						
18						
21						

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├──┤ LIQUID LIMIT
10 20 30 40 50 70 90

▲ ■

This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD C-5

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ∇ GNE AFTER 24 HOURS: ▼ CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0						
		ASPHALT (Approx. 1.75-inches)				
		Red fine-grained clayey SAND (SC, Approx. 3-inches)				
		Brown fine-grained silty SAND (SM)				
		Light brown fine-grained silty SAND (SM)				
3						
		Boring Terminated at 5 ft.				
6						
9						
12						
15						
18						
21						

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├──┤ LIQUID LIMIT
10 20 30 40 50 70 90

This information pertains only to this boring and should not be interpreted as being indicative of the site.

TEST BORING RECORD
C-6

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 24, 2020
DEPTH TO - WATER> INITIAL: ∇ GNE AFTER 24 HOURS: ▼ ______ CAVING> C ______

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT |——| LIQUID LIMIT
10 20 30 40 50 70 90

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0		ASPHALT (Approx. 2-inches)				
		Red fine-grained clayey SAND (SC, Approx. 4-inches)				
		Brown fine-grained silty SAND (SM)				
		Brown/grey fine-grained clayey SAND (SC)				
3						
6		Boring Terminated at 5 ft.				
9						
12						
15						
18						
21						

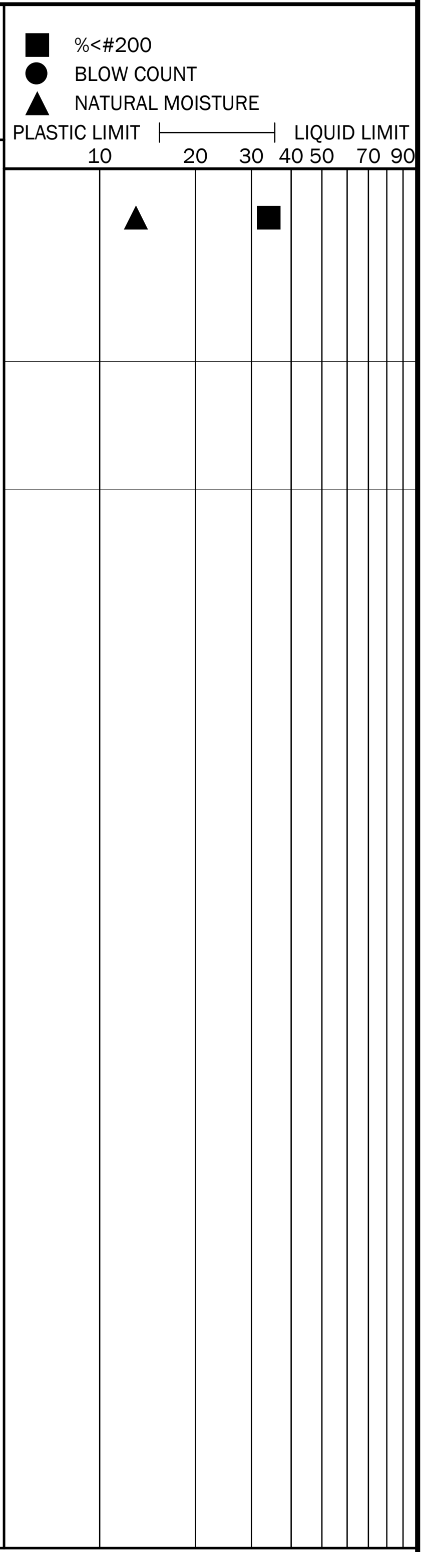
This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
C-7

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 24, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0		ASPHALT (Approx. 3-inches)				
		Red fine-grained clayey SAND (SC, Approx. 6-inches)				
		Grey fine-grained clayey SAND (SC)				
3						
6		Boring Terminated at 5 ft.				
9						
12						
15						
18						
21						



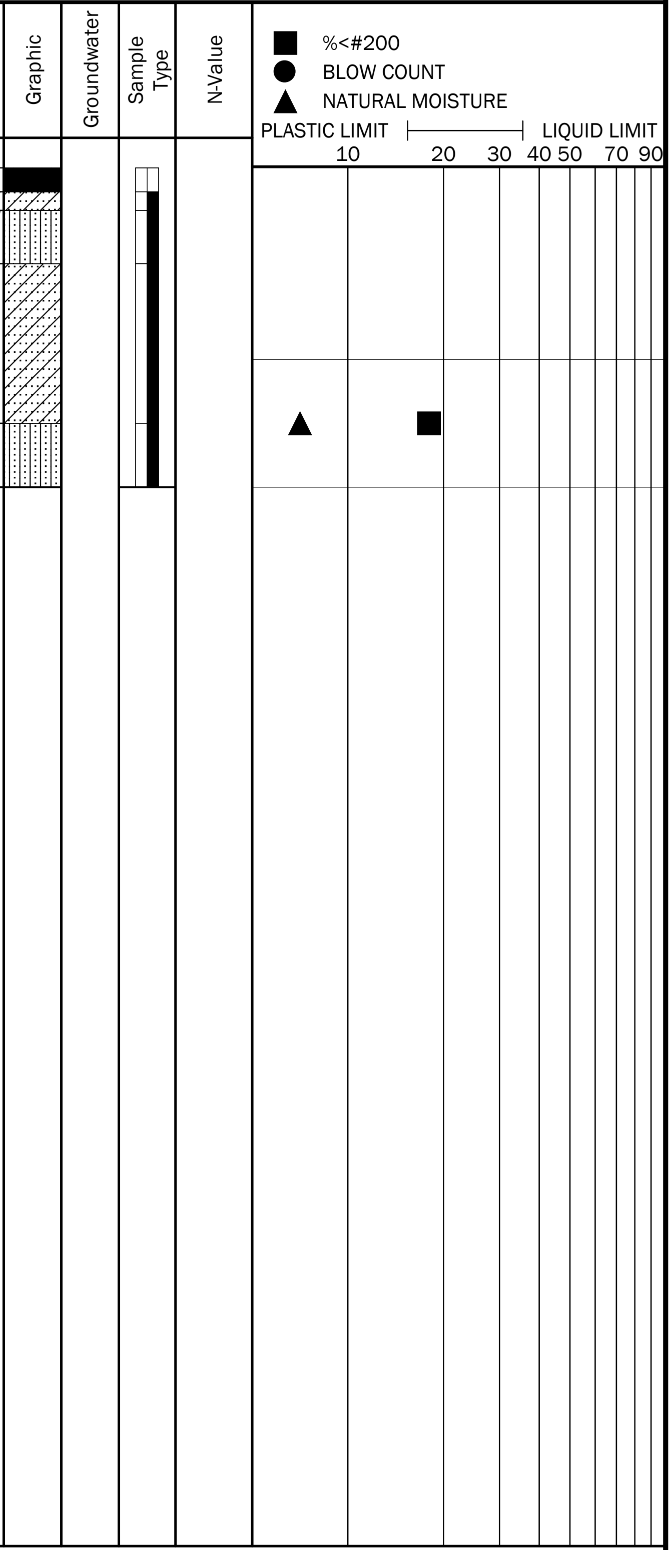
This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
C-8

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE
AFTER 24 HOURS: ▼
CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description
0		ASPHALT (Approx. 4.5-inches)
		Red fine-grained clayey SAND (SC, Approx. 3.5-inches)
		Orange/grey fine-grained silty SAND (SM)
		Grey fine-grained clayey SAND (SC)
3		
		Light brown fine-grained silty SAND (SM)
		Boring Terminated at 5 ft.
6		
9		
12		
15		
18		
21		



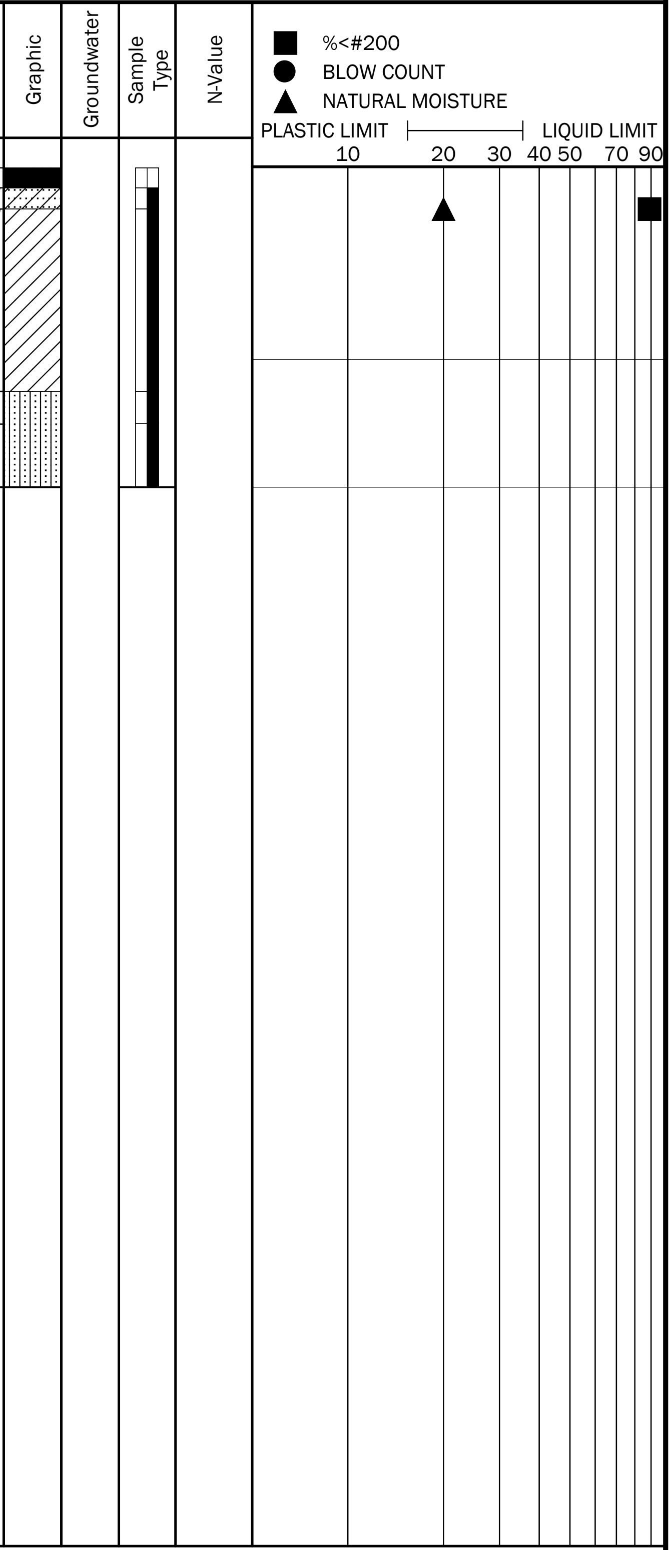
This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
C-9

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description
0		ASPHALT (Approx. 3.75-inches)
		Red fine-grained clayey SAND (SC, Approx. 4-inches)
		Grey low-plasticity CLAY (CL)
3		Red fine-grained silty SAND (SM)
		Light brown fine-grained silty SAND (SM)
6		Boring Terminated at 5 ft.
9		
12		
15		
18		
21		

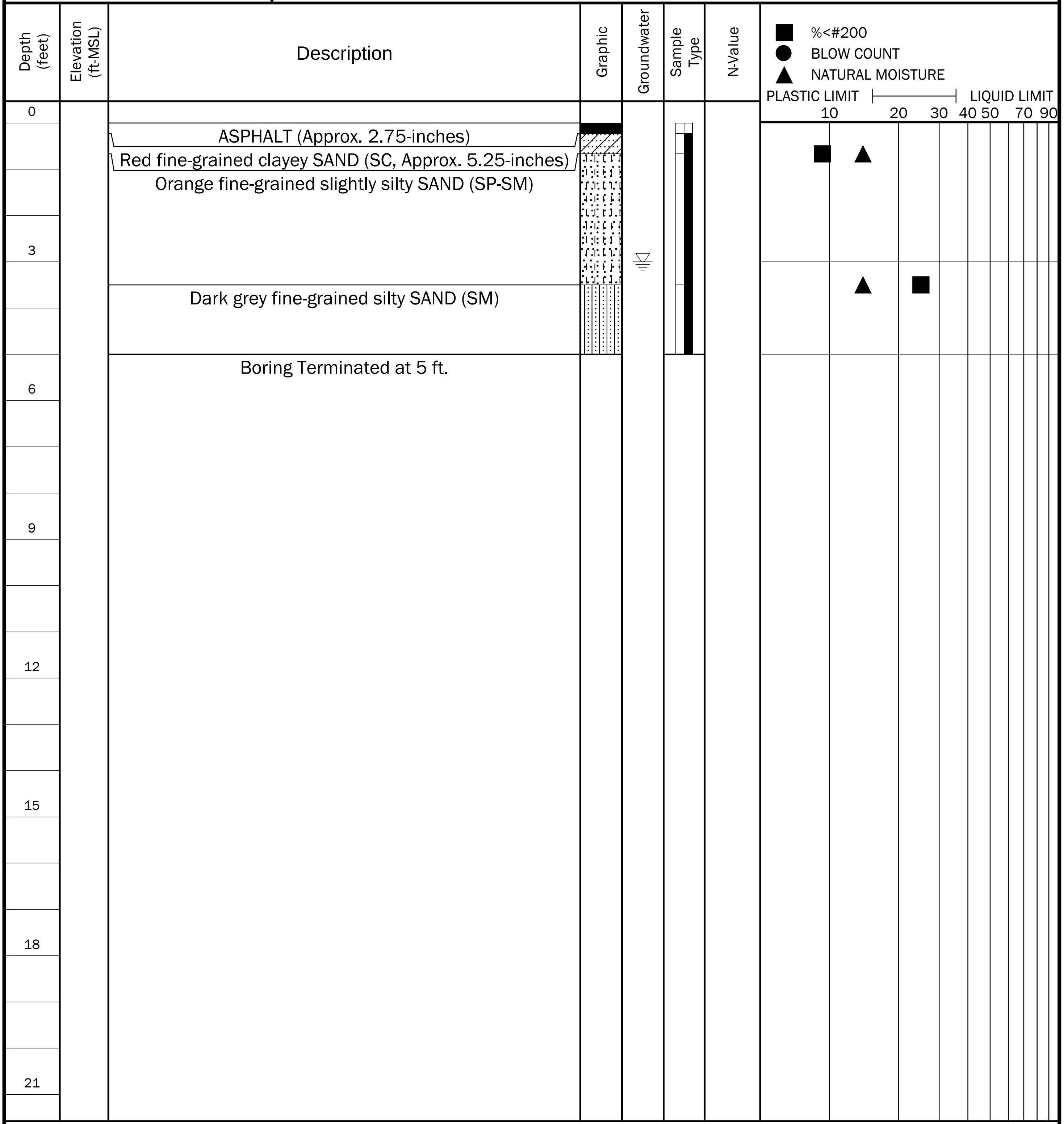


This information pertains only to this boring and should not be interpreted as being indicative of the site.

TEST BORING RECORD
C-10

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ▽ 3 feet AFTER 24 HOURS: ▼ CAVING> C

This information pertains only to this boring and should not be interpreted as being indicative of the site.



ASPHALT (Approx. 2.75-inches)

Red fine-grained clayey SAND (SC, Approx. 5.25-inches)

Orange fine-grained slightly silty SAND (SP-SM)

Dark grey fine-grained silty SAND (SM)

Boring Terminated at 5 ft.

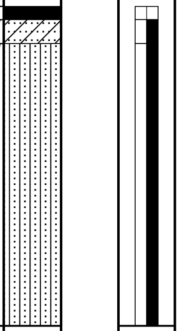
NOVA

TEST BORING RECORD
C-11

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE
AFTER 24 HOURS: ▼
CAVING> C

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT |——| LIQUID LIMIT
10 20 30 40 50 70 90

Depth (feet)	Elevation (ft-MSL)	Description
0		
		ASPHALT (Approx. 2.5-inches)
		Red fine-grained clayey SAND (SC, Approx. 4.5-inches)
		Brown fine-grained silty SAND (SM)
3		
		Boring Terminated at 5 ft.
6		
9		
12		
15		
18		
21		



This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
C-12

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ☲ GNE AFTER 24 HOURS: ▼ CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0		ASPHALT (Approx. 2.75-inches)				
		Red fine-grained clayey SAND (SC, Approx. 4.25-inches)				
		Dark brown fine-grained silty SAND (SM)				
		Orange fine-grained silty SAND (SM)				
3						
6		Boring Terminated at 5 ft.				
9						
12						
15						
18						
21						

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├──┤ LIQUID LIMIT
10 20 30 40 50 70 90

This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
C-13

PROJECT: Pine Valley - Roadway and Drainage PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan ELEVATION: Existing Grade
DRILLER: S. San Filippo LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0						
		ASPHALT (Approx. 3.5-inches)				
		Red fine-grained clayey SAND (SC, Approx. 4.5-inches)				
		Brown fine-grained slightly silty SAND (SP-SM)				
		Orange fine-grained silty SAND (SM)				
3						
6		Boring Terminated at 5 ft.				
9						
12						
15						
18						
21						

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├──┤ LIQUID LIMIT
10 20 30 40 50 70 90

This information pertains only to this boring and should not be interpreted as being indicative of the site.

TEST BORING RECORD
C-14

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ ______ CAVING> C ______

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├───┤ LIQUID LIMIT
10 20 30 40 50 70 90

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0						
		ASPHALT (Approx. 3.25-inches)				
		Red fine-grained clayey SAND (SC, Approx. 4.75-inches)				
		Brown fine-grained slightly silty SAND (SP-SM)				
		Light brown fine-grained slightly silty SAND (SP-SM)				
3		Brown fine-grained slightly silty SAND (SP-SM)				
		Brown fine-grained silty SAND (SM)				
		Orange fine-grained silty SAND (SM)				
6		Boring Terminated at 5 ft.				
9						
12						
15						
18						
21						

This information pertains only to this boring and should not be interpreted as being indicative of the site.

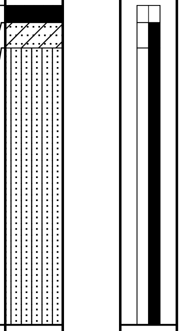
NOVA

TEST BORING RECORD
C-15

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: S. San Filippo
LOGGED BY: S. San Filippo
DRILLING METHOD: Pavement Coring/Auger
DATE: July 27, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ CAVING> C

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├──┤ LIQUID LIMIT
10 20 30 40 50 70 90

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0		ASPHALT (Approx. 3.25-inches) Red fine-grained clayey SAND (SC, Approx. 4.75-inches) Dark brown fine-grained silty SAND (SM)				
3						
		Boring Terminated at 5 ft.				
6						
9						
12						
15						
18						
21						



This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
R-1

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: W. Cantrell
LOGGED BY: S. San Filippo
DRILLING METHOD: Hand Auger Boring
DATE: July 23, 2020
DEPTH TO - WATER> INITIAL: ▽ 14 feet AFTER 24 HOURS: ▼ CAVING> C

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT |———| LIQUID LIMIT
10 20 30 40 50 70 90

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0		TOPSOIL (Approx. 9-inches)				
0.75–5.5		Brown fine-grained silty SAND (SM)				
5.5–9		Light brown fine-grained slightly silty SAND (SP-SM)				
9–15		Brown fine-grained silty SAND (SM)		▽		
15		Boring Terminated at 15 ft.				

Depth scale: 0, 3, 6, 9, 12, 15, 18, 21

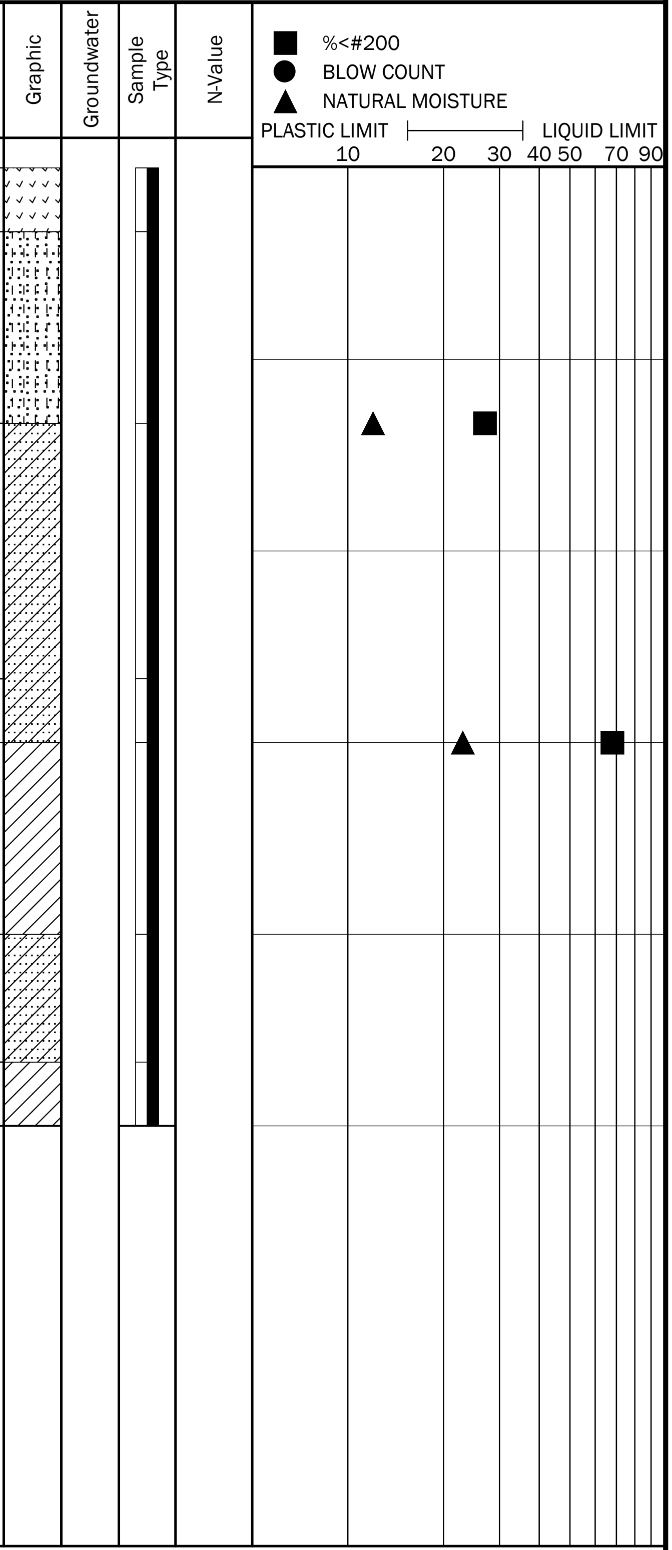
This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
R-2

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: W. Cantrell
LOGGED BY: S. San Filippo
DRILLING METHOD: Hand Auger Boring
DATE: July 23, 2020
DEPTH TO - WATER> INITIAL: ∇ GNE AFTER 24 HOURS: ▼ CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description
0		
		TOPSOIL (Approx. 12-inches)
		Brown fine-grained slightly silty SAND (SP-SM)
3		
		Brown fine-grained clayey SAND (SC)
6		
		Orange fine-grained clayey SAND (SC)
9		
		Grey low-plasticity CLAY (CL)
12		
		Orange/grey fine-grained clayey SAND (SC)
		Grey low-plasticity CLAY (CL)
15		
		Boring Terminated at 15 ft.
18		
21		



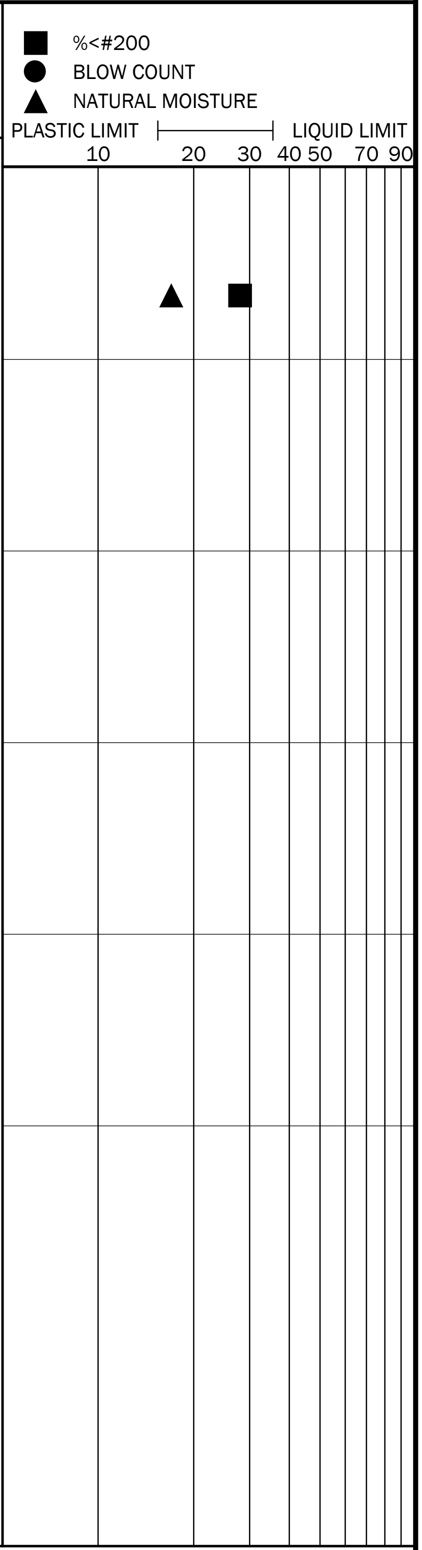
This information pertains only to this boring and should not be interpreted as being indicative of the site.

NOVA

TEST BORING RECORD
R-3

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: W. Cantrell
LOGGED BY: S. San Filippo
DRILLING METHOD: Hand Auger Boring
DATE: July 23, 2020
DEPTH TO - WATER> INITIAL: ∇ 9 feet AFTER 24 HOURS: ▼ CAVING> C

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0		TOPSOIL (Approx. 6-inches)				
		Brown fine-grained slightly silty SAND (SP-SM)				
3		Orange fine-grained silty SAND (SM)				
6						
9		Orange fine-grained clayey SAND (SC)		∇		
12		Red fine-grained silty SAND (SM)				
15		Boring Terminated at 15 ft.				
18						
21						



This information pertains only to this boring and should not be interpreted as being indicative of the site.

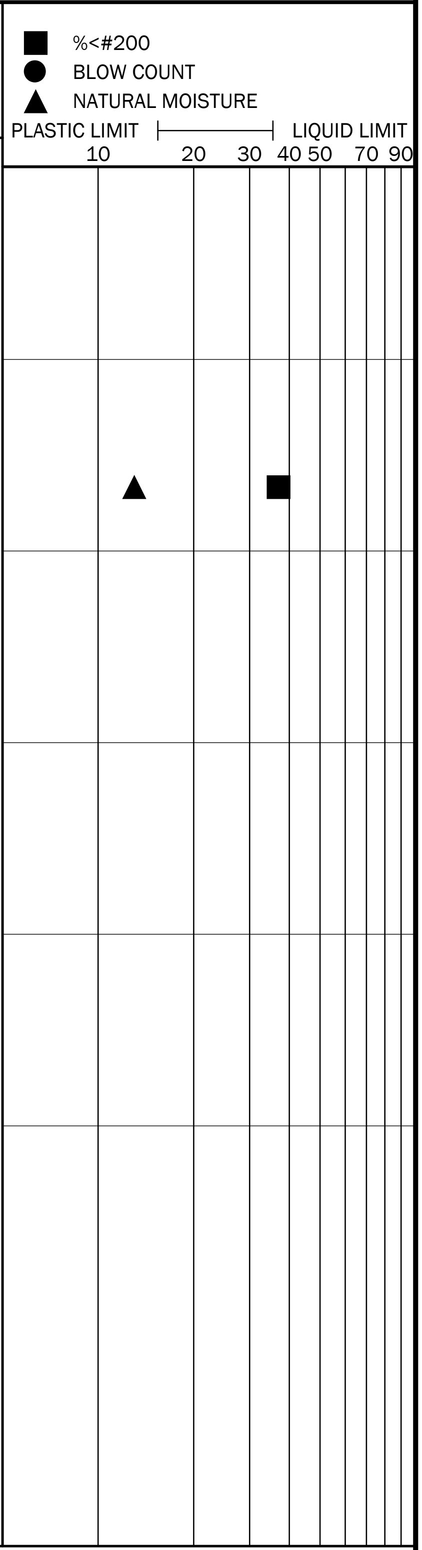
NOVA

TEST BORING RECORD
R-4

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: W. Cantrell
LOGGED BY: S. San Filippo
DRILLING METHOD: Hand Auger Boring
DATE: July 23, 2020
DEPTH TO - WATER> INITIAL: ▽ GNE AFTER 24 HOURS: ▼ CAVING> C

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0		TOPSOIL (Approx. 8-inches)				
		Brown fine-grained slightly silty SAND (SP-SM)				
3						
6		Orange fine-grained clayey SAND (SC)				
9		Red/grey fine-grained clayey SAND (SC)				
12		Orange fine-grained clayey SAND (SC)				
15		Boring Terminated at 15 ft.				
18						
21						



Page 1 of 1

NOVA

TEST BORING RECORD
R-5

PROJECT: Pine Valley - Roadway and Drainage
PROJECT NO.: 10116-2020120
CLIENT: SIGMA Consulting Group
PROJECT LOCATION: Escambia County, Florida
LOCATION: Per Boring Location Plan
ELEVATION: Existing Grade
DRILLER: W. Cantrell
LOGGED BY: S. San Filippo
DRILLING METHOD: Hand Auger Boring
DATE: July 23, 2020
DEPTH TO - WATER> INITIAL: ▽ 4 feet AFTER 24 HOURS: ▼ CAVING> C

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Elevation (ft-MSL)	Description	Graphic	Groundwater	Sample Type	N-Value
0						
		TOPSOIL (Approx. 12-inches)	✓		■	
		Brown fine-grained silty SAND (SM)	▥		■	
3			▥		■	
		Brown fine-grained clayey SAND (SC)	▨		■	
		Grey fine-grained silty SAND (SM)	▥	▽	■	
6			▥		■	
			▥		■	
		Orange fine-grained silty SAND (SM)	▥		■	
9		Dark brown/grey low-plasticity CLAY (CL)	▨		■	
		Boring Terminated at 9 ft.				
12						
15						
18						
21						

■ %<#200
● BLOW COUNT
▲ NATURAL MOISTURE
PLASTIC LIMIT ├──┤ LIQUID LIMIT
10 20 30 40 50 70 90

APPENDIX C
Laboratory Data

SUMMARY OF CLASSIFICATION & INDEX TESTING

Pine Valley - Roadway and Drainage Improvement
Escambia County, Florida
NOVA Project No. 10116-2020120

SUMMARY OF CLASSIFICATION AND INDEX TESTING						
Boring No.	Sample Depth (ft. BEG)	Natural Moisture (%)	Percent Fines (- #200)	Hydraulic Conductivity		USCS Soil Classification
				K_{vs} (ft/day)	Unit Weight of Sample (pcf)	
C-1	4"-9"	8	15	—	—	SM
C-2	1.25-5	2	20	—	—	SM
C-4	1-4	11	16	—	—	SM
C-7	0.75-5	13	34	—	—	SC
C-8	4-5	5	18	—	—	SM
C-9	8"-3.5	20	89	—	—	CL
C-10	8"-3.5	14	9	—	—	SP-SM
C-10	3.5-5	14	25	—	—	SM
R-2	4-8	12	27	<0.1	<0.1	SC
R-2	9-12	23	68	—	—	CL
R-3	2-8	17	28	0.20	110	SM
R-4	5-9	13	37	0.11	103	SC

REMOLDED LABORATORY PERMEABILITY TEST DATA SHEET

PROJECT: Pine Valley - Roadway and Drainage Improvement

NOVA PROJECT #: 10116-2020120

DATE: 8/2/2020

ASSIGNED BY: JAJ

TESTED BY: SRS

Sample LOCATION / BORING NO.	R-2
Sample NUMBER / DEPTH	4-8

PERMEABILITY TESTING SUMMARY			
PERMEABILITY (K_V)	→	<0.1	ft/day
Corresponding K_h	→	<0.1	ft/day
DRY DENSITY	→	115	lbs/ft^3
MOISTURE CONTENT	→	12	%
-200 FINES CONTENT	→	27	%

FALLING HEAD PERMEABILITY (ASTM D 5084)

No. of LAYERS:	3	Wt. of MOLD (lbs):	4.50
BLOWS/LAYER:	15	Wt. of MOLD/SOIL (lbs):	8.82

HEIGHT (FT)	TRIAL #1 (SEC)	TRIAL #2 (SEC)	PERMEABILITY
7	0.0		#DIV/0!
6	2HR		#VALUE!
5			#DIV/0!
4			#DIV/0!
3			#DIV/0!
2			
1			
		#DIV/0!	cm/sec

MOISTURE CONTENT (ASTM D 2216)

Pan NUMBER	GG
Wt. of WET SOIL & PAN (g)	274.5
Wt. of DRY SOIL & PAN (g)	260.9
Wt. of PAN (g)	149.3
Wt. of Water (g)	13.6
Wt. of Dry Soil (g)	111.6
MOISTURE CONTENT (%)	12.2

-200 SIEVE WASH (ASTM D 1140)

Pan NUMBER	GG
Wt. of DRY SOIL & PAN (g)	260.9
Wt. of WASH SOIL & PAN (g)	230.7
Wt. of PAN (g)	149.3
Wt. of Original Dry Sample (g)	111.6
Wt. of -200 Material (g)	30.2
Wt. of Washed Dry Sample (g)	81.4
-200 FINES CONTENT (%)	27.1

NUMBER OF INCHES MOLD WAS SHORT? 0.000 INCHES (ZERO INCHES IS DEFAULT)

PERMEABILITY CONSTANT USED WAS → 0.23 (Includes 3/8"ID tubing)

NOVA

REMOLDED LABORATORY PERMEABILITY TEST DATA SHEET

PROJECT: Pine Valley - Roadway and Drainage Improvement

NOVA PROJECT #: 10116-2020120

DATE: 8/2/2020

ASSIGNED BY: JAJ

TESTED BY: SRS

Sample LOCATION / BORING NO.	R-3
Sample NUMBER / DEPTH	2-8

PERMEABILITY TESTING SUMMARY			
PERMEABILITY (K_V)	→	0.20	ft/day
Corresponding K_h	→	0.29	ft/day
DRY DENSITY	→	110	lbs/ft^3
MOISTURE CONTENT	→	17	%
-200 FINES CONTENT	→	28	%

FALLING HEAD PERMEABILITY (ASTM D 5084)			
No. of LAYERS:	3	Wt. of MOLD (lbs):	4.50
BLOWS/LAYER:	15	Wt. of MOLD/SOIL (lbs):	8.79
HEIGHT (FT)	TRIAL #1 (SEC)	TRIAL #2 (SEC)	PERMEABILITY
7	0.0		7.18E-05
6	211.3		6.64E-05
5	431.3		6.20E-05
4	751.2		7.44E-05
3	1253.7		7.08E-05
2	1864.4		
1	2705.0		
		6.9E-05	cm/sec

MOISTURE CONTENT (ASTM D 2216)	
Pan NUMBER	II
Wt. of WET SOIL & PAN (g)	336.7
Wt. of DRY SOIL & PAN (g)	310.1
Wt. of PAN (g)	149.8
Wt. of Water (g)	26.6
Wt. of Dry Soil (g)	160.3
MOISTURE CONTENT (%)	16.6

-200 SIEVE WASH (ASTM D 1140)	
Pan NUMBER	II
Wt. of DRY SOIL & PAN (g)	310.1
Wt. of WASH SOIL & PAN (g)	265.9
Wt. of PAN (g)	149.8
Wt. of Original Dry Sample (g)	160.3
Wt. of -200 Material (g)	44.2
Wt. of Washed Dry Sample (g)	116.1
-200 FINES CONTENT (%)	27.6

NUMBER OF INCHES MOLD WAS SHORT? 0.000 INCHES (ZERO INCHES IS DEFAULT)

PERMEABILITY CONSTANT USED WAS → 0.23 (Includes 3/8"ID tubing)

NOVA

REMOLDED LABORATORY PERMEABILITY TEST DATA SHEET

PROJECT: Pine Valley - Roadway and Drainage Improvement

NOVA PROJECT #: 10116-2020120

DATE: 8/2/2020

ASSIGNED BY: JAJ

TESTED BY: SRS

Sample LOCATION / BORING NO.	R-4
Sample NUMBER / DEPTH	5-9

PERMEABILITY TESTING SUMMARY			
PERMEABILITY (K_V)	→	0.11	ft/day
Corresponding K_h	→	0.17	ft/day
DRY DENSITY	→	103	lbs/ft^3
MOISTURE CONTENT	→	13	%
-200 FINES CONTENT	→	37	%

FALLING HEAD PERMEABILITY (ASTM D 5084)

No. of LAYERS:	3	Wt. of MOLD (lbs):	4.50
BLOWS/LAYER:	15	Wt. of MOLD/SOIL (lbs):	8.39

HEIGHT (FT)	TRIAL #1 (SEC)	TRIAL #2 (SEC)	PERMEABILITY
7	0.0		4.20E-05
6	344.0		3.96E-05
5	777.3		3.69E-05
4	1364.3		4.10E-05
3	2160.0		4.24E-05
2	3113.5		
1	4627.4		
		4.0E-05	cm/sec

MOISTURE CONTENT (ASTM D 2216)	
Pan NUMBER	JJ
Wt. of WET SOIL & PAN (g)	287
Wt. of DRY SOIL & PAN (g)	270.7
Wt. of PAN (g)	148.9
Wt. of Water (g)	16.3
Wt. of Dry Soil (g)	121.8
MOISTURE CONTENT (%)	13.4

-200 SIEVE WASH (ASTM D 1140)	
Pan NUMBER	JJ
Wt. of DRY SOIL & PAN (g)	270.7
Wt. of WASH SOIL & PAN (g)	225.7
Wt. of PAN (g)	148.9
Wt. of Original Dry Sample (g)	121.8
Wt. of -200 Material (g)	45.0
Wt. of Washed Dry Sample (g)	76.8
-200 FINES CONTENT (%)	36.9

NUMBER OF INCHES MOLD WAS SHORT? 0.000 INCHES (ZERO INCHES IS DEFAULT)

PERMEABILITY CONSTANT USED WAS → 0.23 (Includes 3/8"ID tubing)

NOVA

APPENDIX D
Pavement Condition Survey

PHOTO 1

The above photo depicts the typical pavement conditions at the entrance to Dunaway Lane from Eight Mile Creek Road. The pavement conditions were noted to consist of several patches, loss of pavement along the shoulders, raveling and polishing of the pavement surface, and longitudinal cracks.

PHOTO 2

The above photo depicts the typical pavement conditions along Dunaway Lane from Eight Mile Creek Road. In addition to previously mentioned distresses, the roadway was noted to have minor rutting within the wheel paths.

PHOTO 3

Photo of the loss of pavement in the shoulder (Dunaway Lane)

PHOTO 4

Previously patched area along driveway.

Scale: Not to Scale
Date Taken: July 17, 2020
Taken by: J. James
Checked by: W. Lawrence

NOVA

140-A Lurton Street
Pensacola, Florida 32505
850.607.7782 ♦ 850.249.6683

PHOTO ESSAY
Pine Valley Roadway and Drainage Improvements
Escambia County, Florida
NOVA Project Number 10116-2020120

PHOTO 5

The above photo depicts block cracking along Dunaway Lane, as well as other pavement distresses consistent with previously mentioned conditions.

PHOTO 6

A sanitary sewer was observed to be within the approximate centerline of the roadway.

PHOTO 7

The above photo depicts traveling and “alligator” cracking and surface raveling along the Dunaway Lane alignment.

PHOTO 8

Photo of the approximate east-west center of Dunaway Lane where a previously patched area was observed.

Scale: Not to Scale
Date Taken: July 17, 2020
Taken by: J. James
Checked by: W. Lawrence

NOVA

140-A Lurton Street
Pensacola, Florida 32505
850.607.7782 ♦ 850.249.6683

PHOTO ESSAY
Pine Valley Roadway and Drainage Improvements
Escambia County, Florida
NOVA Project Number 10116-2020120

PHOTO 9

Photo of a concrete-lined ditch along the south side of Dunaway Lane.

PHOTO 10

The above photo depicts raveling and block cracking along the Dunaway Lane alignment.

PHOTO 11

Photo of the intersection of Dunaway Lane and Fridinger Drive.

PHOTO 12

The above photo depicts block cracking (measured to be between ¼ to ¾ inch in width) along Fridinger Drive. Some cracks did have established vegetation and were observed to extend the full depth of the existing pavement section.

Scale: Not to Scale
Date Taken: July 17, 2020
Taken by: J. James
Checked by: W. Lawrence

NOVA
140-A Lurton Street
Pensacola, Florida 32505
850.607.7782 ♦ 850.249.6683

PHOTO ESSAY
Pine Valley Roadway and Drainage Improvements
Escambia County, Florida
NOVA Project Number 10116-2020120

PHOTO 13

The above photo depicts a recent utility patch along Fridinger Drive. This patch was observed to have excessive rutting.

PHOTO 14

The above photo depicts “alligator” cracking, rutting, and raveling within the Fridinger Drive alignment.

Scale: Not to Scale
Date Taken: July 17, 2020
Taken by: J. James
Checked by: W. Lawrence

NOVA

140-A Lurton Street
Pensacola, Florida 32505
850.607.7782 ♦ 850.249.6683

PHOTO ESSAY
Pine Valley Roadway and Drainage Improvements
Escambia County, Florida
NOVA Project Number 10116-2020120

PHOTO 15

The above photo depicts extensive block cracking (some in excess of ¾ inch) along the eastern terminus of Pursell Lane.

PHOTO 16

The above photo depicts the typical pavement conditions along Pursell Lane which consisted of severe block cracking, rutting, raveling and polishing of the pavement surfaces, and isolated areas of "alligator" cracking.

PHOTO 17

Area of “alligator” cracking and raveling along Pursell Lane.

PHOTO 18

The above photo depicts an isolated area along Pursell Lane which was observed to be shoving towards the shoulder from the centerline.

PHOTO 19

Area of compromised curbing along Pursell Lane.

PHOTO 20

The above photo further depicts the typical pavement conditions along Pursell Lane.

Scale: Not to Scale
Date Taken: July 17, 2020
Taken by: J. James
Checked by: W. Lawrence

PHOTO ESSAY
Pine Valley Roadway and Drainage Improvements
Escambia County, Florida
NOVA Project Number 10116-2020120

PHOTO 21

This photo depicts an area of pothole formation along Pursell Lane.

PHOTO 22

The above photo depicts the typical pavement conditions at the western terminus of Fridinger Lane adjacent to Eight Mile Creek Road. The pavements along this alignment were consistent with others within the development.

Scale: Not to Scale
Date Taken: July 17, 2020
Taken by: J. James
Checked by: W. Lawrence

NOVA

140-A Lurton Street
Pensacola, Florida 32505
850.607.7782 ♦ 850.249.6683

PHOTO ESSAY
Pine Valley Roadway and Drainage Improvements
Escambia County, Florida
NOVA Project Number 10116-2020120

PHOTO 23

Branch and block cracking (observed to be less than ½ inch in width) along Fridinger Drive.

PHOTO 24

Area of extensive block cracking and raveling along Fridinger Drive.

Scale: Not to Scale
Date Taken: July 17, 2020
Taken by: J. James
Checked by: W. Lawrence

NOVA

140-A Lurton Street
Pensacola, Florida 32505
850.607.7782 ♦ 850.249.6683

PHOTO ESSAY
Pine Valley Roadway and Drainage Improvements
Escambia County, Florida
NOVA Project Number 10116-2020120

PHOTO 25

The above photo depicts branch cracking (observed to be between ¼ inch to 1 inch in width) along Fridinger Drive. Some cracks had extensive vegetative growth.

PHOTO 26

Photo of loss of pavement surface and extensive "alligator" cracking and raveling along Fridinger Drive. .

Scale: Not to Scale
Date Taken: July 17, 2020
Taken by: J. James
Checked by: W. Lawrence

NOVA

140-A Lurton Street
Pensacola, Florida 32505
850.607.7782 ♦ 850.249.6683

PHOTO ESSAY
Pine Valley Roadway and Drainage Improvements
Escambia County, Florida
NOVA Project Number 10116-2020120

PHOTO 27

Utility patch surrounded with excessively distressed pavements.

PHOTO 28

The above photo depicts the east to north turn of Fridinger Drive where the pavement has begun pothole formation due to excessive cracking and raveling.

PHOTO 29

The above photo depicts another area of extensive “alligator” cracking along Fridinger Drive.

.

Scale: Not to Scale	
Date Taken: July 17, 2020	
Taken by: J. James	
Checked by: W. Lawrence	

NOVA

140-A Lurton Street
Pensacola, Florida 32505
850.607.7782 ♦ 850.249.6683

PHOTO ESSAY
Pine Valley Roadway and Drainage Improvements
Escambia County, Florida
NOVA Project Number 10116-2020120

APPENDIX E
Qualifications of Recommendations

QUALIFICATIONS OF RECOMMENDATIONS

The findings, conclusions and recommendations presented in this report represent our professional opinions concerning subsurface conditions at the site. The opinions presented are relative to the dates of our site work and should not be relied on to represent conditions at later dates or at locations not explored. The opinions included herein are based on information provided to us, the data obtained at specific locations during the study, and our previous experience. If additional information becomes available which might impact our geotechnical opinions, it will be necessary for NOVA to review the information, re-assess the potential concerns, and re-evaluate our conclusions and recommendations.

Regardless of the thoroughness of a geotechnical exploration, there is the possibility that conditions between borings may differ from those encountered at specific boring locations, that conditions are not as anticipated by the designers and/or the contractors, or that either natural events or the construction process has altered the subsurface conditions. These variations are an inherent risk associated with subsurface conditions in this region and the approximate methods used to obtain the data. These variations may not be apparent until construction.

The professional opinions presented in this report are not final. Field observations and foundation installation monitoring by the geotechnical engineer, as well as soil density testing and other quality assurance functions associated with site earthwork and foundation construction, are an extension of this report. Therefore, NOVA should be retained by the owner to observe all earthwork and foundation construction to confirm that the conditions anticipated in this study actually exist, and to finalize or amend our conclusions and recommendations. NOVA is not responsible or liable for the conclusions and recommendations presented in this report if NOVA does not perform these observations and testing services.

This report is intended for the sole use of SIGMA Consulting Group, Inc. only. The scope of work performed during this study was developed for purposes specifically intended by of SIGMA Consulting Group, Inc. only and may not satisfy other users' requirements. Use of this report or the findings, conclusions or recommendations by others will be at the sole risk of the user. NOVA is not responsible or liable for the interpretation by others of the data in this report, nor their conclusions, recommendations or opinions.

Our professional services have been performed, our findings obtained, our conclusions derived and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices in the State of Florida. This warranty is in lieu of all other statements or warranties, either expressed or implied.

Important Information about This
Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL
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Distortion

Shoving or rippling is surfacing material displaced crossways to the direction of traffic. It can develop into washboarding when the asphalt mixture is unstable because of poor quality aggregate or improper mix design. Repair by milling smooth and overlaying with stable asphalt mix.

Other pavement distortions may be caused by settling, frost heave, etc. Patching may provide temporary repair. Permanent correction usually involves removal of unsuitable subgrade material and reconstruction.

▼ **Heavy traffic has shoved pavement into washboard ripples and bumps.**

► **Severe settling from utility trench.**

► **Frost heave damage from spring break-up.**

▼ **Widely spaced, well-sealed cracks.**

CRACKS

Transverse cracks

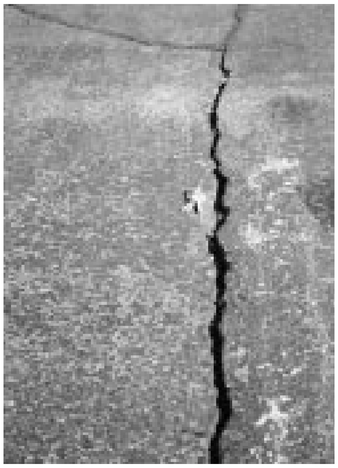
A crack at approximately right angles to the center line is a transverse crack. They are often regularly spaced. The cause is movement due to temperature changes and hardening of the asphalt with aging.

Transverse cracks will initially be widely spaced (over 50'). Additional cracking will occur with aging until they are closely spaced (within several feet). These usually begin as hairline or very narrow cracks; with aging they widen. If not properly sealed and maintained, secondary or multiple cracks develop parallel to the initial crack. The crack edges can further deteriorate by raveling and eroding the adjacent pavement.

Prevent water intrusion and damage by sealing cracks which are more than ¼″ wide.

◄
Sealed cracks, a few feet apart.

▲ **Tight cracks less than ¼" in width.**



▲ **Open crack – ½" or more in width.**

▲ **Water enters unsealed cracks softening pavement and causing secondary cracks.**

▲ **Pavement ravels and erodes along open cracks causing deterioration.**

Block cracks

Block cracking is interconnected cracks forming large blocks. Cracks usually intersect at nearly right angles. Blocks may range from one foot to approximately 10′ or more across. The closer spacing indicates more advanced aging caused by shrinking and hardening of the asphalt over time. Repair with sealcoating during early stages to reduce weathering of the asphalt. Overlay or reconstruction required in the advanced stages.

► **Large blocks, approximately 10′ across.**

► **Intermediate-size block cracking, 1′-5′ across with open cracks.**

▲ **Extensive block cracking in an irregular pattern.**

► **Severe block cracking – 1′ or smaller blocks. Tight cracks with no raveling.**

PATCHES AND POTHOLES

Patches

Original surface repaired with new asphalt patch material. This indicates a pavement defect or utility excavation which has been repaired. Patches with cracking, settlement or distortions indicate underlying causes still remain. Recycling or reconstruction are required when extensive patching shows distress.

▶ **Typical repair of utility excavation. Patch in fair to good condition.**

▶ **Edge wedging. Pavement edges strengthened with wedges of asphalt. Patch is in very good condition.**

▶ **Extensive patching in very poor condition.**