

# GEOTECHNICAL ENGINEERING REPORT



**SRCSO Flea Market Site Access Roadway**  
Gulf Breeze, Santa Rosa County, Florida

**PREPARED FOR:**  
**Santa Rosa County School District**  
6544 Firehouse Road  
Milton, Florida 32570

*NOVA Project Number: 10116-2022038*

March 22, 2022





March 22, 2022

**Santa Rosa County School District**

6544 Firehouse Road  
Milton, Florida 32570

**Attention:** Mr. Joseph B. Harrell  
Assistant Superintendent for Administrative Services

**Subject:** Geotechnical Engineering Report  
**SRCSO FLEA MARKET SITE ACCESS ROADWAY**  
Gulf Breeze, Santa Rosa County, Florida  
NOVA Project Number 10116-2022038

Dear Mr. Harrell:

**NOVA Engineering and Environmental LLC (NOVA)** has completed the authorized Geotechnical Engineering Report for the proposed roadway as part of the overall school campus development to be located in Gulf Breeze, Santa Rosa County, Florida. The work was performed in general accordance with NOVA Proposal Number 016-20229630, dated February 11, 2022. This report briefly discusses our understanding of the project at the time of the subsurface exploration, describes the geotechnical consulting services provided by NOVA, and presents our findings, conclusions, and recommendations.

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**

A handwritten signature in blue ink, appearing to be "Jesse James", written over a light blue circular stamp.

Jesse James, P.E.  
Assistant Branch Manager  
Florida Registration No. 90470

Copies Submitted:  
via electronic mail service

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## 1.0 INTRODUCTION

### 1.1 PROJECT INFORMATION

Our understanding of this project is based on discussions with the client, review of the provided drawings, a site reconnaissance performed during the boring layout, 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 Proposed Construction

We understand that the project will include constructing a 2- to 4- lane asphalt paved roadway with roadside swales that will traverse upland areas of the property connecting the proposed school campus development to Government Drive.

### 1.2 SCOPE OF WORK

The Santa Rosa County School District engaged NOVA to provide geotechnical engineering consulting services for the proposed improvements to be located in Gulf Breeze, Santa Rosa County, Florida. This report briefly discusses our understanding of the project, describes our exploratory procedures, and presents our findings, conclusions, and recommendations.

The primary objectives of this study were to perform a geotechnical exploration within the areas of the proposed construction and to assess these findings as they relate to geotechnical aspects of the planned site development. The authorized geotechnical engineering services included a site reconnaissance, a soil test boring and sampling program, laboratory testing, engineering evaluation of the field and laboratory data, and the preparation of this report. The services were performed substantially as outlined in our proposal number 016-20229630, dated February 11, 2022, and in general accordance with industry standards.

As authorized per the above referenced proposal, this completed geotechnical report includes:

- A description of the site, fieldwork, laboratory testing and general soil conditions encountered, including a Boring Location Plan and individual Test Boring Records.
- Site preparation considerations that include geotechnical discussions regarding site stripping and subgrade preparation, and engineered fill/backfill placement.
- Recommendations for controlling groundwater during construction, and the potential need for a permanent de-watering system based on the expected post construction groundwater levels.

- Recommendations for subgrade preparation along the planned roadway alignment.
- A recommended flexible pavement section based on provided or assumed traffic loading
- Geotechnical design parameters to aid in the SMS design, including measured apparent and estimated normal permanent seasonal high groundwater levels, a void ratio estimate, and appropriate hydraulic conductivity rates.
- 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, pavement, and foundation 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 Subject Property is located along the south side of Government Drive in Gulf Breeze, Santa Rosa County, Florida. A Site Location Map is included in Appendix A.

### 2.2 SUBJECT PROPERTY AND VICINITY GENERAL CHARACTERISTICS

At the time of our field exploration, the vicinity of the Subject Property was observed to be generally developed with single-family residences and was bordered by the following:

DIRECTION	LAND USE DESCRIPTION/OBSERVATIONS
NORTH	Government Drive
EAST	Single-Family Residences
SOUTH	Proposed SRCSD school campus
WEST	Single-Family Residences

### 2.3 CURRENT USE OF THE PROPERTY

At the time of our field exploration, the Subject Property was observed to be vacant land vegetated primarily with dense undergrowth and mature trees.

### 3.0 FIELD EXPLORATION

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

Our field exploration was conducted on February 28, 2022 and included performing three (3) auger borings along the proposed roadway alignment to depths of about 5 feet to 9 feet below existing grade (BEG), where the boreholes collapsed due to groundwater intrusion.

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

These records represent our interpretation of the subsurface conditions based on the field exploration data, visual examination of the recovered soil samples, laboratory test data, 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.

## **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. 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 Santa Rosa 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 southern Santa Rosa 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.

Beneath up to 9 inches of topsoil, the test borings generally encountered fine-grained sands (SP) to the maximum depth explored of about 9 feet BEG, where the boreholes collapsed due to groundwater intrusion. As an exception, Boring B-1 also encountered fine-grained slightly silty sands (SP-SM) below topsoil to a depth of about 3 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 Santa Rosa 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

A stabilized groundwater table was encountered in the test borings at depths ranging between about 4 feet to 7¾ feet BEG at the time of our field exploration, which occurred during a period of relatively normal seasonal rainfall.

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 for this site will occur within 1 foot above the measured depths to groundwater at each boring location, during the wet season. This data generally correlates to the values provided by the USGS Natural Resources Conservation Service.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

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

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

As previously noted, 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 boring locations and elevations be surveyed.

### 6.1 SITE PREPARATION

Prior to proceeding with construction, all topsoil and vegetation, trees and/or associated root systems, and any other deleterious non-soil materials found to be present should be stripped from along the proposed roadway alignment. We note that up to 9 inches of topsoil was encountered in the borings, and the reader is cautioned that thicker topsoil deposits should be anticipated as being present across this property. 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.

The soils exposed at the stripped grade elevation (or undercut elevations) should then be compacted to a minimum soil density of at least 95 percent of the maximum dry density as determined by the Modified Proctor test method (ASTM D-1557). We note that vibratory compaction operations should not be performed within a clear distance of 50 feet from any adjacent structures.

NOVA should observe the compaction of the subgrade to locate soft, weak, or excessively wet fill or existing soils present at the time of construction. Any unstable materials observed during the evaluation and compaction operations should be undercut and replaced with structural fill or stabilized in-place by scarifying and re-densifying.

#### 6.1.1 Soil Suitability

The majority of the on-site near surface soils can be categorized as SP, or fine-grained sands based on the Unified Soil Classification System (USCS).

This sandy soil type is considered suitable for re-use as structural fill along the proposed roadway alignment or as lot fill; however, care should be taken to maintain moisture control during placement.

All materials to be used for backfill or compacted fill construction should be evaluated and, if necessary, tested by NOVA prior to placement to determine if they are suitable for their intended use. In general, based upon the boring results, the near surface sands such as those encountered in the borings can be used as structural fill as well as general subgrade fill and backfill, provided that the fill material is free of rubble, clay, rock, roots and organics, and is within +/- 3% of its optimum moisture content at the time of placement. Any off-site materials used as fill should be approved by NOVA prior to acquisition.

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.

#### **6.1.2 Fill Placement**

Fill should be placed in thin, horizontal loose lifts (maximum 12-inch) and compacted to a minimum soil density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557). The final 6-inch lift of fill along the proposed roadway alignment (i.e., the Stabilized Subgrade Course) should be compacted to at least 98 percent.

Fill materials used in structural areas should have a target maximum dry density of at least 95 pounds per cubic foot (pcf). 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 3 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. Moisture control may be difficult during rainy weather.

Filling operations should be observed by a NOVA soils technician, who can confirm suitability of material used and uniformity and appropriateness of compaction efforts. He/she can also document compliance with the specifications by performing field density tests using thin-walled tube, nuclear, or sand cone testing methods (ASTM D-2937, D-6938, or D-1556, respectively). One test per 400 cubic yards and every 2 feet of placed fill is recommended, with test locations well distributed throughout the fill mass. When filling in small areas, at least one test per day per area should be performed.

## 6.2 GROUNDWATER CONTROL

A stabilized groundwater table was encountered in the test borings at depths ranging between about 4 feet to 7¾ feet BEG at the time of our field exploration, which occurred during a period of relatively normal seasonal rainfall.

Depending on the areas of the site under consideration, groundwater levels have differing implications for design and construction. The extent and nature of any dewatering required during construction will be dependent on the actual groundwater conditions prevalent at the time of construction and the effectiveness of construction drainage to prevent run-off into open excavations.

Based on our understanding of the proposed construction and our assumed maximum fill height limitation of 2 feet above current grades, we do not anticipate significant groundwater control issues during mass grading and pavement construction.

However, the relatively shallow groundwater table present in lower-lying portions of the site may require temporary dewatering efforts during subsurface utility installations.

As previously noted, groundwater levels are subject to seasonal, climatic, and other variations and may be different at other times and locations. The extent and nature of any dewatering required during construction will be dependent on the actual groundwater conditions prevalent at the time of construction and the effectiveness of construction drainage to prevent run-off into open excavations.

## 6.3 PAVEMENTS

We understand that a flexible (asphalt) pavement section is desired for the proposed roadway planned as part of this development. A recommended heavy duty pavement section has 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 to heavy traffic loadings. Based on the results of our test borings, the subsurface conditions encountered appear to be adaptable for the pavement section provided below.

RECOMMENDED PAVEMENT SECTION	
Structural Course (FDOT SuperPave – SP fine)	2½ inches
GAB, Crushed Limerock or Crushed Concrete Base Course (from an FDOT approved source, min. LBR of 100)	8 inches
Stabilized Subgrade (minimum LBR of 40)	6 inches

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.

We further note that the existing near-surface soils encountered in the test borings performed for this project will likely require improvement (typically by mixing them with additional base course material or some other source of soil fines or aggregate) in order to meet the LBR requirement of 40 for the required Stabilized Subgrade Course, as the native sand (SP) soils are estimated to have an in-situ LBR value on the order of 15 to 25.

#### 6.4 STORMWATER MANAGEMENT SYSTEM

Based on conversations with the design team, we understand that the project will include constructing roadside swales to treat and dispose of stormwater runoff associated with the planned site improvements. Based on the results of the test borings, the subsurface conditions encountered on the project site appear to be adaptable for employing the desired SMS. We recommend utilizing the SMS design parameters provided below for the design of this SMS. We note that the provided rates are unfactored.

SMS Soil Design Parameters	
Corresponding Soil Boring Test Locations	B-1, B-2, B-3
Approximate Depth to Confining Stratum, (BEG)	Below 9 feet
Measured Vertical Hydraulic Conductivity (Kv)	33 feet/day
Calculated Horizontal Hydraulic Conductivity (Kh)	50 feet/day
Estimated Infiltration Rate, DRI	11 inches/hour
Estimated Fillable Porosity of Soil	25%
Estimated Depth to Normal Permanent SHGW table, BEG	5 feet*

\*Referenced to the B-2 Boring Location

The estimated average normal permanent seasonal high groundwater level provided in the table above is based on our experience with projects in this locale; the soil strata encountered in the test borings; the groundwater levels measured at the site; and the published information by the “Web Soil Survey” National database, NRCS division of the United States Department of Agriculture (USDA).

The actual exfiltration rate from the SMS may be influenced by SMS geometry, natural soil variability, in-situ depositional characteristics and soil density, retention volume, and groundwater mounding effects. Appropriate factors of safety should be incorporated into the design process. We note that NOVA performs remolded laboratory permeability testing using generally accepted practices of the local engineering community. These types of tests are the quickest and most economical for stormwater retention basin design. However, the user of this information is cautioned that the potential variability of results of these types of tests can be significant, and the reproducibility of results can vary by factors of up to 100 percent.

Also, the permeability measured by such tests may not be representative of the total effective aquifer thickness. Factors of safety can compensate for part of the inherent test limitations, but the designer must exercise judgment regarding final selection and applicability of provided soil design input parameters.

Should the modeling analysis indicate marginally acceptable compliance with Water Management District design criteria, it may be advisable to perform more extensive and representative in-situ permeability testing by collecting “undisturbed” horizontal and vertical soil samples and/or installing grouted piezometers or wells for slug testing. NOVA can perform these field tests if desired.

## **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 foundation or slab-on-grade placement. If practical, proofrolling 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.



# **APPENDIX A**

## **Figures and Maps**



Scale: Not To Scale

Date Drawn: March 2, 2022

Drawn By: C.Pickett

Checked By: J.James



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

### PROJECT LOCATION MAP

SRCSD Flea Market Access Roadway

Santa Rosa County, Florida

NOVA Project Number 10116-2022038



# Soil Map—Santa Rosa County, Florida



## 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: Santa Rosa County, Florida

Survey Area Data: Version 18, Sep 13, 2021

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

Date(s) aerial images were photographed: Feb 10, 2015—Feb 18, 2015

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
21	Lakeland sand, 0 to 5 percent slopes	0.3	20.2%
35	Pickney loamy sand	1.3	79.8%
<b>Totals for Area of Interest</b>		<b>1.6</b>	<b>100.0%</b>


# **APPENDIX B**

## **Subsurface Data**





# **LEGEND**

 B-x = 10-ft. Auger Boring

Scale: Not To Scale

Date Drawn: March 2, 2022

Drawn By: C.Pickett

Checked By: J.James








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

**BORING LOCATION PLAN**  
**SRCSD Flea Market Access Roadway**  
Santa Rosa County, Florida  
NOVA Project Number 10116-2022038



## 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 diamictaceous 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 Blows/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

(Sils 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%





# TEST BORING RECORD B-1

PROJECT: SRCSO Flea Market Access Roadway PROJECT NO.: 10116-2022038  
CLIENT: Santa Rosa County School District  
PROJECT LOCATION: Santa Rosa County, Florida  
LOCATION: Per Boring Location Plan ELEVATION: Existing Grade  
DRILLER: C.Pickett LOGGED BY: C.Pickett  
DRILLING METHOD: Auger Boring DATE: February 28, 2022  
DEPTH TO - WATER> INITIAL: 4 ft. AFTER 24 HOURS: 4 ft. CAVING> C 4 ft.

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	<div><div><div>■</div>%&lt;#200</div><div><div>●</div>BLOW COUNT</div><div><div>▲</div>NATURAL MOISTURE</div></div> <div>PLASTIC LIMIT   LIQUID LIMIT</div> <div>10203040507090</div>															
0		TOPSOIL (Approx. 3-inches)	<div><div></div></div>	<div></div>	<div><div></div></div>																	
		Red/orange fine-grained slightly silty SAND (SP-SM)	<div><div></div></div>																			
1.5																						
		Brown/red fine-grained slightly silty SAND (SP-SM)	<div><div></div></div>																			
3																						
		Off-white fine-grained SAND (SP)	<div><div></div></div>																			
4.5			Off-white/light brown fine-grained SAND (SP)				<div><div></div></div>	<div><div></div></div>														
		Boring Terminated at 5 ft.																				
6																						
7.5																						
9																						
10.5																						



# TEST BORING RECORD B-2

PROJECT: SRCSO Flea Market Access Roadway PROJECT NO.: 10116-2022038  
CLIENT: Santa Rosa County School District  
PROJECT LOCATION: Santa Rosa County, Florida  
LOCATION: Per Boring Location Plan ELEVATION: Existing Grade  
DRILLER: C.Pickett LOGGED BY: C.Pickett  
DRILLING METHOD: Auger Boring DATE: February 28, 2022  
DEPTH TO - WATER> INITIAL: 6.75 ft. AFTER 24 HOURS: 6.75 ft. CAVING> C 6.75 ft.

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	<div><div><div>■</div> %&lt;#200</div><div><div>●</div> BLOW COUNT</div><div><div>▲</div> NATURAL MOISTURE</div></div> <div>PLASTIC LIMIT   LIQUID LIMIT</div> <div>10 20 30 40 50 70 90</div>														
0		TOPSOIL (Approx. 9-inches)																			
		Off-white/light gray fine-grained SAND (SP)																			
1.5																					
3		Light orange/brown fine-grained SAND (SP)																			
4.5																					
		Brown fine-grained SAND (SP)																			
6																					
7.5		Off-white/light brown fine-grained SAND (SP)																			
		Boring Terminated at 7.75 ft.																			
9																					
10.5																					



# TEST BORING RECORD B-3

PROJECT: SRCSO Flea Market Access Roadway PROJECT NO.: 10116-2022038  
CLIENT: Santa Rosa County School District  
PROJECT LOCATION: Santa Rosa County, Florida  
LOCATION: Per Boring Location Plan ELEVATION: Existing Grade  
DRILLER: C.Pickett LOGGED BY: C.Pickett  
DRILLING METHOD: Auger Boring DATE: February 28, 2022  
DEPTH TO - WATER> INITIAL: 7.75 ft. AFTER 24 HOURS: 7.75 ft. CAVING> C 7.75 ft.

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	<div><div><div>■</div>%&lt;#200</div><div><div>●</div>BLOW COUNT</div><div><div>▲</div>NATURAL MOISTURE</div></div> <div>PLASTIC LIMIT   LIQUID LIMIT</div> <div>10203040507090</div>												
0																			
		TOPSOIL (Approx. 6-inches)																	
		Off-white/light gray fine-grained SAND (SP)																	
1.5																			
		Light orange/brown fine-grained SAND (SP)																	
3																			
		Off-white/orange/brown fine-grained SAND (SP)																	
4.5																			
6																			
7.5																			
		Off-white/light brown fine-grained SAND (SP)																	
9		Boring Terminated at 8.75 ft.																	
10.5																			

# **APPENDIX C**

## **Laboratory Data**

## SUMMARY OF CLASSIFICATION & INDEX TESTING

SRCSD Flea Market Access Roadway  
Santa Rosa County, Florida  
NOVA Project No. 10116-2022038

SUMMARY OF CLASSIFICATION AND INDEX TESTING						
Boring No.	Sample Depth (ft. BEG)	Natural Moisture (%)	Percent Fines (- #200)	Hydraulic Conductivity		USCS Soil Classification
				K <sub>vs</sub> (ft/day)	Unit Weight of Sample (pcf)	
B-2	3-5	3	3	---	---	SP
B-2	5-6.75	11	2	33	98	SP
B-3	0.5-2.5	3	4	---	---	SP
B-3	3.5-7.75	5	3	51	97	SP

## REMOLDED LABORATORY PERMEABILITY TEST DATA SHEET

PROJECT: SRCSD Flea Market Access Roadway

NOVA PROJECT #: 10116-2022038

DATE: 2/28/2022

ASSIGNED BY: J.James

TESTED BY: C.Pickett

Sample LOCATION / BORING NO.	<b>B-2</b>
Sample NUMBER / DEPTH	<b>5-7 ft.</b>

FALLING HEAD PERMEABILITY (ASTM D 5084)			
No. of LAYERS:	<b>3</b>	Wt. of MOLD (lbs):	<b>4.48</b>
BLOWS/LAYER:	<b>15</b>	Wt. of MOLD/SOIL (lbs):	<b>8.10</b>
HEIGHT (FT)	TRIAL #1 (SEC)	PERMEABILITY	
7	<b>0.0</b>	1.20E-02	
6	<b>1.2</b>	1.14E-02	
5	<b>3.0</b>	1.16E-02	
4	<b>5.0</b>	1.12E-02	
3	<b>7.4</b>	1.24E-02	
2	<b>10.8</b>		
1	<b>16.2</b>		
		<b>1.2E-02</b>	cm/sec

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

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

PERMEABILITY TESTING SUMMARY			
PERMEABILITY ( $K_v$ )	→	<b>33</b>	ft/day
Corresponding $K_h$	→	<b>50</b>	ft/day
DRY DENSITY	→	<b>98</b>	lbs/ft <sup>3</sup>
MOISTURE CONTENT	→	<b>11</b>	%
-200 FINES CONTENT	→	<b>2</b>	%

MOISTURE CONTENT (ASTM D 2216)	
Pan NUMBER	<b>G</b>
Wt. of WET SOIL & PAN (g)	<b>221.9</b>
Wt. of DRY SOIL & PAN (g)	<b>206.7</b>
Wt. of PAN (g)	<b>65.6</b>
Wt. of Water (g)	15.2
Wt. of Dry Soil (g)	141.1
MOISTURE CONTENT (%)	<b>10.8</b>

-200 SIEVE WASH (ASTM D 1140)	
Pan NUMBER	<b>G</b>
Wt. of DRY SOIL & PAN (g)	<b>206.7</b>
Wt. of WASH SOIL & PAN (g)	<b>204.1</b>
Wt. of PAN (g)	<b>65.6</b>
Wt. of Original Dry Sample (g)	141.1
Wt. of -200 Material (g)	2.6
Wt. of Washed Dry Sample (g)	138.5
-200 FINES CONTENT (%)	<b>1.8</b>



## REMOLDED LABORATORY PERMEABILITY TEST DATA SHEET

PROJECT: SRCSD Flea Market Access Roadway

NOVA PROJECT #: 10116-2022038

DATE: 2/28/2022

ASSIGNED BY: J.James

TESTED BY: C.Pickett

Sample LOCATION / BORING NO.	<b>B-3</b>
Sample NUMBER / DEPTH	<b>3.5-8 ft.</b>

FALLING HEAD PERMEABILITY (ASTM D 5084)			
No. of LAYERS:	<b>3</b>	Wt. of MOLD (lbs):	<b>4.48</b>
BLOWS/LAYER:	<b>15</b>	Wt. of MOLD/SOIL (lbs):	<b>7.86</b>
HEIGHT (FT)	TRIAL #1 (SEC)	PERMEABILITY	
7	<b>0.0</b>	1.83E-02	
6	<b>1.0</b>	1.77E-02	
5	<b>2.1</b>	1.76E-02	
4	<b>3.4</b>	1.64E-02	
3	<b>5.0</b>	1.92E-02	
2	<b>7.2</b>		
1	<b>10.6</b>		
		<b>1.8E-02</b>	cm/sec

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

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

PERMEABILITY TESTING SUMMARY			
PERMEABILITY ( $K_v$ )	→	51	ft/day
Corresponding $K_h$	→	76	ft/day
DRY DENSITY	→	97	lbs/ft <sup>3</sup>
MOISTURE CONTENT	→	5	%
-200 FINES CONTENT	→	3	%

MOISTURE CONTENT (ASTM D 2216)	
Pan NUMBER	<b>I</b>
Wt. of WET SOIL & PAN (g)	<b>204.5</b>
Wt. of DRY SOIL & PAN (g)	<b>197.8</b>
Wt. of PAN (g)	<b>65.5</b>
Wt. of Water (g)	6.7
Wt. of Dry Soil (g)	132.3
MOISTURE CONTENT (%)	<b>5.1</b>

-200 SIEVE WASH (ASTM D 1140)	
Pan NUMBER	<b>I</b>
Wt. of DRY SOIL & PAN (g)	<b>197.8</b>
Wt. of WASH SOIL & PAN (g)	<b>193.8</b>
Wt. of PAN (g)	<b>65.5</b>
Wt. of Original Dry Sample (g)	132.3
Wt. of -200 Material (g)	4.0
Wt. of Washed Dry Sample (g)	128.3
-200 FINES CONTENT (%)	<b>3.0</b>



## **APPENDIX D**

### **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 **Santa Rosa County School District** only. The scope of work performed during this study was developed for purposes specifically intended by of **Santa Rosa County School District** 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.



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