REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION

GULF SHORES
INTERNATIONAL AIRPORT
JACK EDWARDS FIELD
Fly to Alabama's Beaches

Gulf Shores Airport Terminal Expansion 1.5
Gulf Shores, Baldwin County, Alabama

PREPARED FOR:
Barge Design Solutions, Inc.
2047 West Main Street
Dothan, Alabama 36301

NOVA Project Number: 10116-2025250

February 11, 2026

NOVA
ENGINEERING AND ENVIRONMENTAL

February 11, 2026

Barge Design Solutions, Inc.
2047 West Main Street
Dothan, Alabama 36301

Attention: Mr. Michael J. Cole PE, PMP

Subject: Report of Subsurface Exploration and Geotechnical Engineering Evaluation
GULF SHORES AIRPORT TERMINAL EXPANSION 1.5
Gulf Shores, Baldwin County, Alabama
NOVA Project Number 10116-2025250

Dear Mr. Cole:

NOVA Engineering and Environmental, LLC (NOVA) has completed the authorized subsurface exploration and geotechnical engineering evaluation for the proposed teminal expansion at the Gulf Shores International Airport in Gulf Shores, Baldwin County, Alabama. Our services were performed in general accordance with NOVA Proposal Number 10116-2025250r1, dated October 26th, 2025. 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

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1.0 INTRODUCTION

Our services on this project were as described in our Proposal Number 10116-2025250r1, dated October 16th, which was authorized by Mr. Michael Cole of Barge Design Solutions, Inc. on January 14th, 2025. The primary objectives of our services were to perform a subsurface exploration within the areas of the proposed construction and to assess the findings as they relate to geotechnical aspects of the planned site development.

The authorized geotechnical engineering services included a site reconnaissance, a soil test borings (STBs) and sampling program, laboratory testing, engineering evaluation of the obtained field and laboratory data, and the preparation of this report. As authorized in the above-mentioned proposal, this 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.
- A discussion of geology for the subject area based upon available information.
- A discussion of subsurface conditions encountered, including potential earthwork-related issues indicated by the exploration, such as materials that would unsuitable or deleterious soils, unstable soils, and shallow groundwater table.
- Suitability of on-site soils for re-use as structural fill and backfill and the criteria for suitable fill materials, including the criteria for suitable fill materials and the soil compaction requirements for foundations, structural fill, and pavements.
- Site preparation considerations, including geotechnical discussions regarding site stripping and subgrade preparation, compaction requirements, and engineered fill/backfill placement.
- 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.
- Foundation system recommendations for the proposed structure, based on the results of the test borings, including allowable foundation bearing capacities, minimum width of continuous footings (if shallow foundation support is feasible), recommended bearing depths, and installation considerations.
- Estimate of total and differential settlements of foundations based on available structural loading data.
- Recommendations for lateral earth pressure coefficients (i.e., active, passive, and at rest earth pressures) for the design of below-grade walls.
- Slab-on-grade construction considerations based upon the geotechnical findings, including the appropriate modulus of subgrade reaction (k), sub-base

requirements, and the potential need for a sub-slab vapor barrier or capillary layer.

- Flexible (asphalt) and rigid (concrete) pavement sections based on assumed traffic loading and subgrade strengths estimate from correlation with the data collected from the SPT borings and laboratory test results.
- Recommended quality control measures (i.e. sampling, testing, and inspection requirements) for site grading operations, and construction of pavement and foundations.

The assessment of the presence of wetlands, floodplains, or water classified as state waters was beyond the scope of this exploration. Additionally, the assessment of site environmental conditions, including the detection of pollutants in the soil, rock, or groundwater or a site-specific seismic study were also beyond the scope of this geotechnical exploration and evaluation. If requested, NOVA can provide these services under a supplemental study.

2.0 PROJECT INFORMATION

Our understanding of this project is based on discussions with the Client, review of the provided site plan, a site reconnaissance during boring layout, and our experience with similar projects. Please note that this exploration is limited to the geotechnical aspects of the project pertaining to site grading, as well as slab-on-grade (SOG), foundation, and pavement support of the proposed structure and pavements, hence additional information regarding overall site development is not relevant.

2.1 NAME AND LOCATION OF PROJECT

The Subject Property is located at Gulf Shores International Airport approximately 100 feet southeast of the existing terminal within an existing landscaped area north of the most eastern existing parking area in Gulf Shores, Baldwin County, Alabama. The parcel is identified as BCPA Parcel ID Nos. 05-66-02-04-4-001-001.002 & 05-66-02-04-4-001-001.003. The location of the site is indicated on the Site Location Map included in Appendix A.

2.2 PROJECT SITE

At the time of our field visit, the site was primarily landscaped area inside the Gulf Shores International Airport complex. The site was bounded by the airport complex to the north, south, east, and west.

2.3 PROPOSED DEVELOPMENT

NOVA understands that the project will include the construction of a new single-story pre-engineered metal building (PEMB) referred to as the “holdroom building”. The structure will have a footprint on the order of 16,000 SF, and will include a new emergency vehicle entrance southeast of the proposed PEMP structure. Expansion of the existing roadway and parking area located northwest of the existing terminal building are also planned. The PEMP structure is anticipated to be slab-on-grade (SOG) construction and supported by a conventional shallow foundation system.

Structural loadings and grading details were not available from the design team at the time of the preparation of this report. We have therefore assumed for purposes of developing the recommendations herein that maximum isolated interior column and exterior load bearing wall loads for the proposed structure will be limited to under 100 kips per column and 4 kips per lineal foot, respectively.

Based on published Google Earth aerial imagery, the site is relatively flat and near elevation EL +13 feet Earth Gravitational Model of 1996 (EGM96). Final grading details were not available from the Design Team at the time of the issuance of this report. We anticipate that less than 2 feet of cut and/or fill may be required to achieve the desired planned site grades and finished floor elevations of the proposed structure.

Traffic loading for the planned pavements was not provided. We have assumed the project's civil engineer will finalize the design of the asphalt and concrete pavements, incorporating the geotechnical recommendations from this exploration to ensure proper pavement design for the site based final design traffic loading.

To develop the pavement designs included herein, we have assumed that pavement loading conditions will be 100,000 Equivalent Single-Axle Loads (ESALs) for heavy-duty pavements and 30,000 ESALs for standard (light) duty pavement areas, with a 20-year design life. We have also assumed the terminal serviceability index and reliability for these pavement sections will be 2.0 and 85%, respectively.

If the above project information and/or assumptions are incorrect, NOVA should be afforded the opportunity to re-evaluate the conclusions and recommendations detailed herein based on the correct information. Once project design is complete, additional field and laboratory testing may be required to finalize the geotechnical aspects of the project.

3.0 SUBSURFACE EXPLORATION

3.1 AREA GEOLOGY

The site is located in the Baldwin County, Alabama 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 siliciclastic 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. Coastal deposits in the Baldwin 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.

3.2 FIELD EXPLORATION

Our field exploration was conducted on January 26th, 2026, and included performing:

- One 50-foot-deep standard penetration test (SPT) boring and four 30-foot-deep SPT borings (designated as Test Borings B-1 through B-5, respectively) within the proposed structure's footprint.
- Three 6-foot-deep SPT borings (numbered P-1 through P-3) within the proposed pavement areas.

The boring locations were established in the field by NOVA personnel using a handheld GPS device and estimating distances and angles from site landmarks. Prior to initiating field testing, underground utilities were marked by the appropriate state utility location service. Any required underground utility related adjustments of the test locations were then made at the time of the field exploration. The approximate test locations are shown on Figure 2 in Appendix A. If increased accuracy is desired by the Client, the boring locations and elevations should be surveyed.

The Test Boring Records in Appendix B shows the field-measured SPT resistances, or “N-values”, and present the subsurface conditions encountered at each boring location. These records represent our interpretation of the subsurface conditions based on the field exploration data, visual examination of the split-barrel 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. The groundwater levels reported on the Test Boring Records represent measurements made upon completion of each test boring. The test borings were subsequently backfilled with soil cuttings from the drilling process for safety concerns.

The borings were performed in general accordance with the guidelines of ASTM Designation D-1586, "Penetration Test and Split-Barrel Sampling of Soils". A hollow stem auger drilling process was used to advance the borings. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2.0-inch O.D., split-tube sampler. The sampler was first seated 6 inches and then driven an additional 1 foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated the "Penetration Resistance". Representative portions of the soil samples obtained from the sampler were placed in sealed containers and transported to our laboratory for further evaluation and laboratory testing.

3.3 LABORATORY TESTING

Following completion of the field exploration, soil samples obtained were returned to our office for visual classification and laboratory testing assignment. Laboratory testing of samples deemed representative of the soils encountered included the following:

- Manual/Visual Soil Classification of all samples
- Moisture Content Determination of 10 samples
- Fines Content (minus the #200 sieve) Determination of 10 samples

The purpose of the testing program was to classify the soils encountered relative to the Unified Soil Classification System (USCS) and to determine various physical characteristics of the soils tested. Detailed descriptions of the tests conducted are presented in Appendix C. The soil samples will be discarded following the submittal of this report, unless requested otherwise in writing.

3.4 SUBSURFACE CONDITIONS

The following paragraphs provide a generalized description of the subsurface conditions encountered in the test borings conducted during this exploration. The Boring Records in Appendix B should be reviewed to provide more detailed descriptions of the subsurface conditions encountered at each boring location. It should be understood that soil conditions may vary between boring locations.

3.4.1. Native Subgrade Soils

Beneath up to 6 inches of topsoil, the test borings generally encountered very loose to medium dense silty fine sand (USCS classification of SM) to depths of approximately 12 feet below existing grade (BEG). The upper silty sands were underlain by loose to medium dense fine sands to slightly silty fine sands (USCS classification of SP & SP-SM) to the maximum depth explored of approximately 50 feet BEG.

3.4.2. Groundwater Conditions

Groundwater in the Baldwin County area typically occurs as an unconfined aquifer condition. Consequently, the groundwater table is expected to be a subdued replica of the original surface topography. Recharge is provided by the infiltration of rainfall and surface water through soil overburden. More permeable zones in the soil matrix can affect groundwater conditions.

The groundwater level at the time of drilling was at a depth ranging from about 9 feet to 10½ feet below existing grade (BEG), which was during a period of relatively normal seasonal rainfall. Please note that the rotary wash drilling procedures were employed to advance the borings and the introduction of the drilling fluids could have artificially elevated the recorded groundwater levels. Since the field exploration was completed in one day, delayed groundwater levels were not recorded the next day.

4.0 GEOTECHNICAL ASSESSMENT

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

Based on the SPT boring's findings, following site stripping of trees, surficial vegetation, topsoil, and any other deleterious materials found to be present, the proposed construction appears to be feasible employing conventional site preparation practices as recommended in the Site Preparation section of this report.

A groundwater table was encountered at the time of our field exploration at a depth ranging from about 9 feet to 10½ feet below existing grade. Apparent groundwater is therefore not expected to adversely impact the development of this property. However, given the underlying low permeability silty soils present across the site, shallow perched/laterally flowing water conditions should be anticipated during construction, particularly if the site is not properly graded to prevent the accumulation of stormwater runoff during and shortly following significant rain events.

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", which would degrade the underlying silty soils and require undercutting to more dense underlying soils.

We understand that both flexible (asphalt) and rigid (concrete) pavement sections are desired for this development. Based on the results of our test borings, the subsurface conditions encountered appear to be adaptable for providing adequate support of either of these pavement sections.

We note that subsurface conditions in unexplored locations can and will vary from those encountered at the boring locations considered and discussed herein. 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.

The following sections present our recommendations for site preparation and grading, and for the design of the proposed shallow foundation systems and rigid and flexible pavement sections.

5.0 RECOMMENDATIONS

5.1 SITE PREPARATION

Prior to proceeding with site grading and construction, all topsoil, vegetation, associated root systems, and any other deleterious non-soil materials found to be present should be stripped from the proposed construction areas. Clean topsoil (free of debris and large roots) may be stockpiled and subsequently re-used in landscaped areas or as a "finishing layer" for areas to receive sod. 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.

We anticipate that finished site grades may require up to 2 feet of fill and/or cut to achieve the desired finished grade elevations. After clearing and stripping, areas that are at grade or will receive fill should be carefully evaluated by a NOVA geotechnical engineer. The engineer will require proofrolling of the subgrade with multiple passes of a 10 to 12-ton vibratory roller, or other vehicle of similar size and weight. Vibratory compaction should be turned off and static rolling should be performed if yielding conditions appear.

The purpose of the proofrolling is to locate soft/loose, weak, or excessively wet soils present at the time of construction. Unstable materials observed during the evaluation and proofrolling operations should be undercut and replaced with structural fill or stabilized in-place by scarifying and re-densifying. Also, the proofrolling should result in the upper 12 inches of soils exposed at the stripped grade elevation being compacted to a minimum soil density of at least 95 percent of the soil's modified Proctor maximum dry density (ASTM D-1557).

Should soft/very loose soils be encountered during construction within the limits of the building or pavements, typical recommendations may include undercutting and backfilling with structural fill and/or stabilizing in-place with geo-grid geotextiles, stone, or other remedial techniques. Actual remedial recommendations can best be determined by the geotechnical engineer in the field at the time of construction.

The site should be graded during construction to maintain positive drainage away from the construction areas, to prevent ponding of stormwater on the site during and shortly following significant rain events.

5.2 GROUNDWATER CONTROL

As previously stated, groundwater was encountered at a depth ranging from 9 feet to 10½ feet in the test borings to the maximum depth explored of about 50 feet BEG at the time of our field exploration, which occurred during a period of relatively normal seasonal rainfall. Apparent groundwater is therefore not expected to adversely impact the development of this property.

However, shallow perched/laterally flowing water conditions should be anticipated as being present for 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 sand 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", which would degrade the underlying silty soils and require undercutting to more firm underlying soils.

Should perched water conditions be encountered during the earthwork phase of this development, most likely localized dewatering efforts (e.g., via the excavation of trenches and the temporary use of sumps and pumps) should suffice. Permanent dewatering measures are not anticipated as being necessary for this development.

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.

5.3 FILL PLACEMENT

5.3.1. Fill Suitability

Fill materials should be relatively clean sands with less than 30 percent fines (material passing the No. 200 sieve), and free of non-soil materials and rock fragments larger than 3 inches in diameter. Prior to construction, bulk samples of the proposed fill materials should be laboratory tested to confirm their suitability.

The near surface soils across the site can be categorized as fine sands with varying amounts of silt (SP, SM, and SP-SM classification groupings). These sandy soil types are considered suitable for re-use as general fill and backfill.

Soils excavated at elevated moisture contents or below the groundwater table will require drying before placement.

We recommend that stockpiles of all materials planned for re-use be sealed as they are excavated to prevent (to the greatest extent practical) the intrusion of moisture into the core of the soil stockpile(s) during significant rain. 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.

5.3.2. Soil Compaction

All structural fill material 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 upper 12 inches of soil beneath all SOGs, footing excavations, and pavement subgrades should be compacted to at least 98 percent. In confined areas, such as utility trenches or behind retaining walls, portable compaction equipment and thinner fill lifts (3 to 4 inches) may be necessary.

Fill materials used in structure 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 of 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. The technician 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 2,500 square feet in structure areas should be performed at the stripped subgrade elevation as well as in each lift of fill, with test locations well distributed throughout construction footprint. When filling in small areas, at least one test per day per area should be performed. One test at conventional spread foundations and one test per 50 linear feet of continuous strip foundations are also recommended.

5.4 FOUNDATION SYSTEMS

We understand that the proposed site development will include the construction of a new single-story pre-engineered metal building (PEMB) structure of approximately 16,000 ft^2. We anticipate that the structure will include a slab-on-grade with the building supported by conventional shallow foundations. Structural; loads were not provided, but based on our experience with similar structures, we estimate that maximum loads will not exceed 100 kips per column and 4 kips per lineal foot for continuous wall footings. If final design includes structural loads greater than those stated herein, NOVA should be retained to re-evaluate and revise the recommendations below, if required.

5.4.1. Shallow Foundation Systems

Design: After the recommended site and subgrade preparation and/or fill placement have been completed, it is our professional opinion that a conventional shallow foundation system consisting of column and spread footings can be used to support the proposed structure.

Foundations bearing on approved firm to stiff existing in-situ soils and/or properly placed and compacted structural fill/backfill, as recommended in this report, can be designed for a net allowable soil bearing pressure of 2,000 pounds per square foot (psf).

We recommend a value of 0.35 can be employed as the coefficient of friction (sliding resistance) between foundations and the underlying residual or fill soils. Footings should be a minimum of 24 inches in width for ease of construction and to reduce the possibility of localized shear failures. Isolated exterior and interior footing bottoms should be established at least 18 inches below finished surrounding exterior grades. When utilizing a post-tensioned monolithic slab-on-grade design, exterior and interior footing bottoms should be established a minimum of 12 inches below adjacent finished grades.

Settlement: Settlements for spread foundations bearing on densified in-situ soils or properly placed and compacted structural fill were assessed using SPT values to estimate elastic modulus, based on published correlations and previous NOVA experience. We note that the settlements presented are based on a profile deemed representative of the subsurface conditions encountered by the test borings. If subsurface conditions at the time of construction are determined to be different from those described herein, then NOVA should be retained to evaluate the differing conditions.

Based on the previously stated assumed loading conditions, the site preparation recommendations stated herein, the recommended soil bearing capacity, the presumed foundation depths as discussed above, we expect post-construction, residual primary total settlement beneath individual foundations to be one inch or less.

The amount of differential settlement is difficult to predict because the subsurface and foundation loading conditions can vary considerably across the site. However, we anticipate residual differential settlement between adjacent foundations will be less than ½ inch. The final deflected shape of each structure will be dependent on actual foundation locations and loading.

Foundation support conditions can be erratic and may vary in short horizontal distances. It is anticipated that the geotechnical engineer may recommend a different bearing capacity or depth upon evaluation of the actual foundation subgrade at individual foundation locations.

To reduce the differential settlement if lower consistency/relative density soils are encountered, a lower bearing capacity should be used, the soft/loose soils undercut and replaced, or the foundations extended to more competent materials. We anticipate that timely communication between the geotechnical engineer and the structural engineer, as well as other design and construction team members, will be required.

Construction: Foundation excavations should be evaluated by the NOVA geotechnical engineer prior to reinforcing steel placement to observe foundation subgrade preparation and confirm bearing pressure capacity. Foundation excavations should be level and free of debris, ponded water, mud, and loose, frozen, or water-softened soils. Concrete should be placed as soon as is practical after the foundation is excavated and the subgrade evaluated. Foundation concrete should not be placed on frozen or saturated soil.

If a foundation excavation remains open overnight, or if rain or snow is imminent, a 3 to 4-inch thick "mud mat" of lean concrete should be placed in the bottom of the excavation to protect the bearing soils until reinforcing steel and concrete can be placed.

5.4.2. Slabs-on-Grade

General: The conditions exposed at subgrade levels will vary across the site and may include structural fill/backfill and/or approved medium dense existing in-situ soils. The slabs-on-grade (SOGs) may be adequately supported on these subgrade conditions subject to the recommendations in this report. The SOGs should be jointed around columns and along walls to reduce cracking due to differential movement. An underdrain system is not necessary beneath the slab, provided that the slab is established at least 2 feet above the seasonal high groundwater (SHGW) level. We recommend the use of impermeable vapor barriers beneath finished spaces to reduce dampness.

Once grading is completed, the subgrade is usually exposed to adverse construction activities and weather conditions during the period of sub-slab utility installation. The subgrade should be well-drained to prevent the accumulation of water. If the exposed subgrade becomes saturated or frozen, the geotechnical engineer should be consulted.

After utilities have been installed and backfilled, a final subgrade evaluation should be performed by the geotechnical engineer immediately prior to the SOGs placement. If practical, proofrolling may be used to re-densify the surface and to detect any soil that has become excessively wet or otherwise loosened.

Subgrade Modulus: A coefficient of subgrade reaction (***k***) of 125 pci (psi per inch) may be used for conventional slab design where slabs bear upon subgrades prepared in accordance with previous recommendations. Please note that this magnitude of ***k*** is intended to reflect the elastic response of soil beneath a typical floor slab under light loads with a small load contact area often measured in square inches, such as loads from forklifts, automobile/truck traffic or lightly loaded storage racks. <u>The recommended coefficient of subgrade reaction (*k*) is not applicable for heavy slab loads caused by bulk storage or tall storage racks, or for mat foundation design</u>.

Several design methods are applicable for conventional slab design. We have assumed that the slab designer will utilize the methods discussed in the American Concrete Institute (ACI) Committee 360 report, *"Guide to Design of Slabs-on-Ground, (ACI 360R-10)*.

5.5 LOADING DOCK AND RETAINING WALLS

The magnitude and distribution of earth pressures against retaining and basement walls depends on the deformation condition (rotation) of the wall, soil properties and water conditions. When the soil behind the wall is prevented from lateral strain as in the case of basement walls, the resulting force is known as the at-rest earth pressure (K_O). If the retaining structure can move away from the soil mass, the earth pressure decreases with the increasing lateral expansion until a minimum pressure, known as the active earth pressure (K_A), is reached. If the wall is forced into the soil mass, the earth pressure increases until a maximum pressure, known as the passive earth pressure (K_P), is obtained.

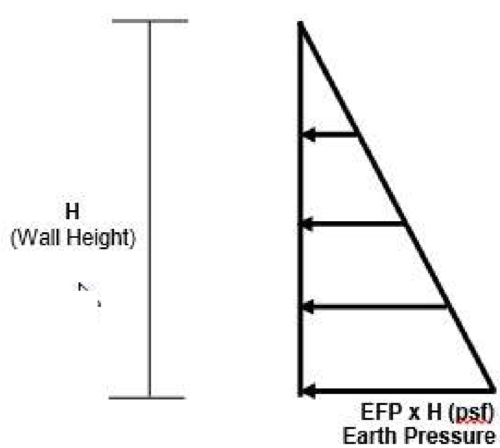
Free-standing retaining walls are usually designed for active earth pressures. Rigid walls (such as basements) are typically designed for at-rest earth pressures. If rigid walls will be backfilled before they are braced, they should also be designed to withstand active earth pressures as self-supporting cantilever walls. However, the earth pressures must be compatible with the wall rotation, which is limited by the wall's rigidity, foundation support conditions, and connections to adjoining structures. If active earth pressure development requires horizontal wall movements that cannot occur, or which are architecturally undesirable, walls should be designed for an intermediate pressure based on restraint conditions.

Laboratory analysis to determine actual soil shear strength properties was beyond the authorized scope of services. Based on our experience with similar soils and construction, we have provided the earth pressure estimates shown below:

Earth Pressure Condition	Earth Pressure Coefficient	Equivalent Fluid Pressure (pcf)	
		Above Water Table	Below Water Table
Active (K_a)	0.36	40	80
At-Rest (K_o)	0.53	60	89
Passive (K_p)	3.00	150*	TBD**

* *Passive earth pressure is frequently used in retaining wall design to resist active earth pressures. Wall movements required to develop full passive earth pressures are significantly greater than movements necessary for active earth pressures. Consequently, this passive pressure value has been reduced by at least 50% for wall design*

** *Passive earth pressure for submerged wall design shall be determined on a case-by-case basis.*



We recommend a value of 0.35 as the coefficient of friction (sliding resistance) between wall foundations and the underlying residual or fill soils. These design values do not contain a safety factor.

Our lateral earth pressure recommendations assume that:

- The ground surface adjacent to the wall is level,
- Residual soils will be reused for wall backfill, compacted between 95% to 98% of the standard proctor maximum dry density,
- Soil backfill weight is a maximum of 120 pcf,
- Heavy construction equipment does not operate within 5 feet of the walls,
- A constantly functioning drainage system is installed between the wall and the soil backfill to prevent hydrostatic pressures from acting on the wall,
- Foundations or other significant surcharge loads are located outside the wall a distance at least equal to the wall height,
- For active earth pressure, wall must rotate about base, with top lateral movements of about 0.002 H to 0.004 H, where H is wall height, and
- For passive earth pressure to develop, the wall must move horizontally to mobilize resistance.

5.6 PAVEMENT CROSS SECTION DESIGN

5.5.1. <u>General</u>

We understand that both flexible (asphalt) and rigid (concrete) pavement sections could potentially be employed for this development. 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 County and ALDOT specifications, and <u>assumed</u> loading conditions of 100,000 Equivalent Single-Axle Loads (ESALS) for heavy duty pavement areas and 30,000 Equivalent Single-Axle Loads (ESALS) for standard (light) duty pavement areas, with a 20-year design life. The terminal serviceability index and reliability for these pavement sections were assumed to be 2.0 and 85%, respectively. Traffic exceeding the stated criteria will require a heavier pavement section.

Please note that the recommended pavement sections are based on assumed post-construction traffic loadings. If the pavement section is to be constructed and utilized by construction traffic, the pavement sections provided below will likely prove insufficient for heavy truck traffic, such as concrete trucks or tractor-trailers used for construction delivery. Unexpected distress, reduced pavement life and /or pre-mature failure of the pavement section could result if subjected to heavy construction traffic and the owner should be made aware of this risk. If the assumed traffic loading stated herein is not correct, NOVA should review actual pavement loading conditions to determine if revisions to these recommendations are warranted.

As previously stated, very loose to medium dense sands were encountered during this exploration. Proofrolling observations and subgrade evaluation by NOVA's geotechnical engineer will be needed at the time of construction to determine the subgrade stabilization measures needed prior to pavement construction. If soft and/or very loose soils are identified at the pavement subgrade level and they cannot be densified in place, then there are 2 viable subgrade stabilization alternatives that we recommend be considered:

- Twelve to 18 inches of undercutting of the soft or very loose soils and replacement with a properly compacted structural fill.
- Placement of a geotextile, such as Tensar's H-Series™ Geogrids beneath the pavement sections for subgrade stabilization.

We recommend that the actual subgrade stabilization option be made at the time of construction based on the subgrade conditions encountered and the anticipated traffic loading.

5.5.2. <u>Flexible Pavements</u>

Based on the results of our test borings, the subsurface conditions encountered appear to be adaptable for providing adequate subgrade support of a flexible pavement section. We recommend employing the thicknesses for Standard-Duty and Heavy-Duty asphalt (flexible) pavement sections provided in Table 1 below.

Table 1 – Recommended Flexible Pavement Sections	
STANDARD DUTY PAVEMENT SECTION (PARKING STALLS, ETC.)	
Asphaltic surface course (SuperPave 9.5 mm)	1¼ inches
Asphaltic binder course (SuperPave 19 mm)	1½ inches
Base Course - Graded Aggregate Base (GAB) (from an ALDOT approved source, min. CBR of 80)	6 inches
Alternative Base Course – Type B Sand-Clay Base (from an ALDOT approved source, min. CBR of 6)	9 inches
Stabilized Subgrade Course (minimum CBR of 6)	12 inches

Table 1 – Recommended Flexible Pavement Sections	
HEAVY DUTY PAVEMENT SECTION (DRIVE LANES)	
Asphaltic surface course (SuperPave 9.5 mm)	1½ inch
Asphaltic binder course (SuperPave 19 mm)	1½ inches
Base Course - Graded Aggregate Base (GAB) (from an ALDOT approved source, min. CBR of 80)	8 inches
Stabilized Subgrade Course (minimum CBR of 6)	12 inches

We recommend specifying a minimum compaction requirement of 98 percent of the maximum dry density for the stabilized subgrade and base courses as determined by the modified Proctor compaction test (ASTM D-1557). The stabilized subgrade and base materials selected should conform to applicable sections of the Alabama Department of Transportation Standard Specifications for Highway Construction (Current Edition). All asphalt material and paving operations should meet applicable specifications of the Alabama Department of Transportation. A NOVA technician should observe placement and perform density testing of the base course material and asphalt.

5.5.3. Rigid Pavements

We recommend using concrete with a minimum compressive strength of 4,000 psi and a minimum 28-day flexural strength (modulus of rupture) of at least 600 pounds per square inch, based on 3rd point loading of concrete beam test samples.

All heavy-duty pavement sections should be reinforced with #3 rebar spaced 18 inches on-center, each way. Layout of the sawcut control joints should form square panels, and the depth of sawcut joint should be ¼ of the concrete slab thickness.

The joints should be sawed within six hours of concrete placement or as soon as the concrete has developed sufficient strength to support workers and equipment. We recommend that a non-woven geotextile (about 3 feet wide) be placed beneath the construction joints to prevent upward "pumping" movement of soil fines through the joints.

Beneath the rigid (concrete) pavement section, we recommend using clean fine-grained sand fill (USCS classification Grouping “SP” or “SP-SM”), densified to a minimum soil density of at least 98 percent of the modified Proctor test maximum dry density (ASTM D-1557) without additional stabilization, with the following stipulations:

- The surface of the subgrade soils should be smooth, and any disturbances or wheel rutting corrected prior to placement of concrete.
- The subgrade soils should be moistened prior to placement of concrete to reduce dehydration of the placed concrete.
- The concrete pavement thickness should be uniform throughout, with exception to thickened edges (curb or footing). The bottom of the pavement should be separated from the estimated typical seasonal high groundwater level by at least 18 inches.

Our recommendations for slab thickness for standard duty and heavy duty concrete pavements are based on the subgrade soils being densified to a minimum soil density of at least 98 percent of the modified Proctor test method (ASTM D-1557), employment of a design modulus of subgrade reaction (k) equal to 125 pounds per cubic inch, and an assumed 20-year design life with moderate traffic loadings appropriate to a medical facility of this size. Note that the assumed traffic loading conditions do not differ significantly, so the same rigid pavement section will suffice for both loading conditions.

We recommend using the design parameters in Table 2 below for the rigid pavement designs for this project.

Table 2 - Recommended Rigid Pavement Section	
Minimum Pavement Thickness	Maximum Control Joint Spacing
6 Inches	12 feet x 12 feet

We also recommend allowing NOVA to review and comment on the final concrete pavement design, including section and joint details (type of joints, joint spacing, etc.), prior to the start of construction. For further details on concrete pavement construction, please reference “Building Quality Concrete Parking Areas”, published by the Portland Cement Association.

6.0 LIMITATIONS

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 significantly 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 experience. If additional information becomes available that might impact our geotechnical opinions, it will be necessary for NOVA to review the information, reassess 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 test locations will differ from those encountered at specific test locations, that conditions are not as anticipated by the designers and/or the contractors, or that either natural events or the construction process have 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.

This report is intended for the sole use of Barge Design Solutions, Inc. for the above-mentioned project. The scope of work performed during this study may not satisfy other users' requirements. The 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 Alabama. This warranty is in lieu of all other statements or warranties, either expressed or implied.

APPENDIX A
Figures and Maps

Figure 1: Approximate Site Location Map

NOVA ENGINEERING AND ENVIRONMENTAL	PREPARED BY	PROJECT	LOCATION	
	NOVA Engineering and Environmental, LLC Pensacola, FL	Name: Gulf Shores Airport Terminal Expansion Number: 10116-2025250	30.287609, -87.671688 Gulf Shores, AL	**Scale:** See Above

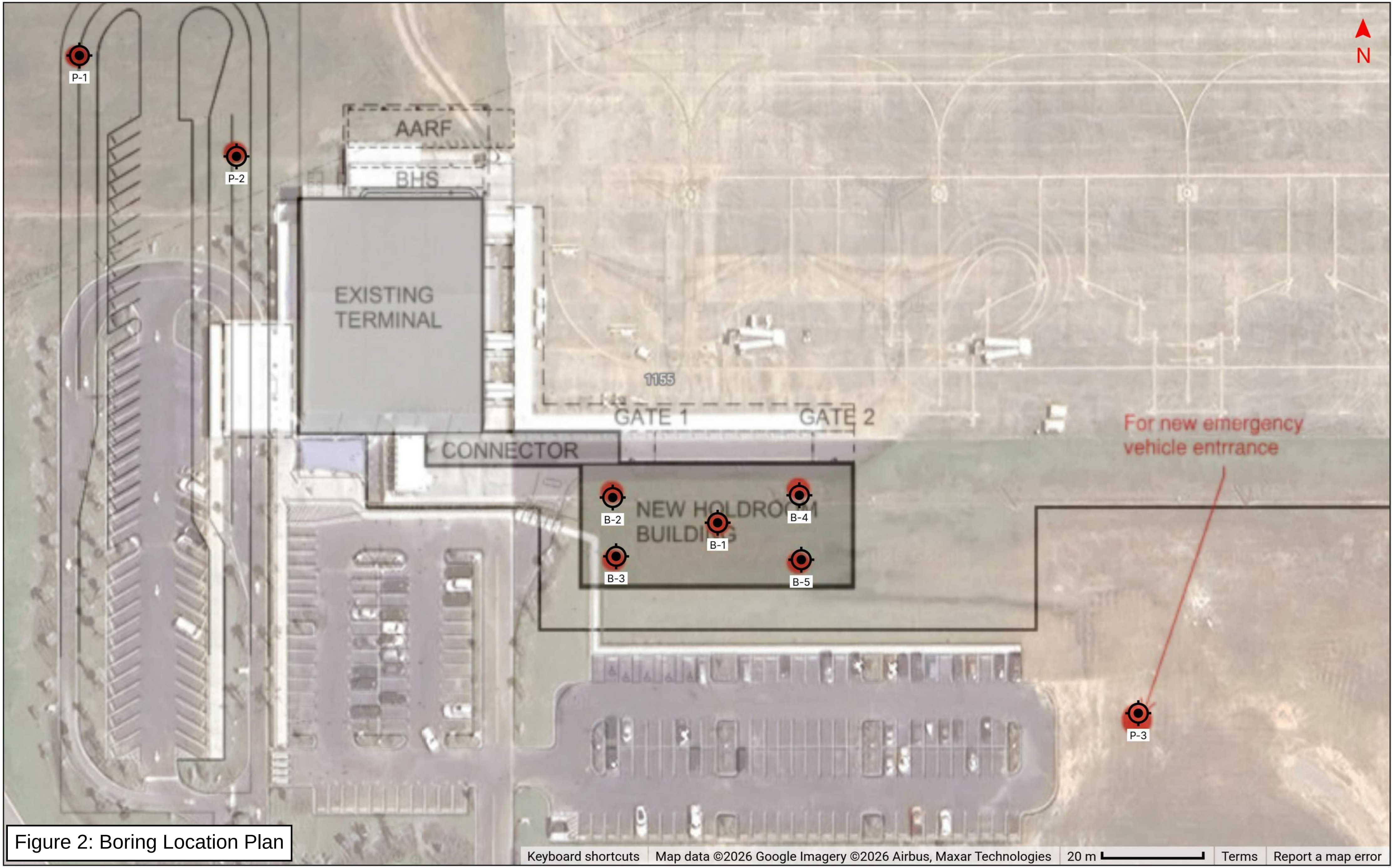


Figure 2: Boring Location Plan

NOVA ENGINEERING AND ENVIRONMENTAL	PREPARED BY	PROJECT	LOCATION	SYMBOL KEY
	NOVA Engineering and Environmental, LLC Pensacola, FL	Name: Gulf Shores Airport Terminal Expansion Number: 10116-2025250	30.287609, -87.671688 Gulf Shores, AL	Test Boring **Scale:** See Above

APPENDIX B
Subsurface Data

KEY TO SYMBOLS AND CLASSIFICATIONS

DRILLING SYMBOLS

	Standard Penetration Testing Sample
	Undisturbed Sample (UD)
	Auger without Sampling
	Rock Core Sample
	Standard Penetration Resistance (ASTM D1586)
	Dynamic Cone Penetrometer (DCP) Resistance
	Water Table at least 24 Hours after drilling
	Water Table 1 Hour or less after drilling
50/2"	Number of Blows (50) to Drive the Spoon a Number of Inches (2)
NX, NQ	Core Barrel Sizes: 2⅛- and 2-Inch Diameter Rock Core, Respectively
REC	Percentage of Rock Core Recovered
RQD	Rock Quality Designation - Percentage of Recovered Core Segments 4 or more Inches Long
	Loss of Drilling Fluid
N/E	Not Encountered
N/M	Not Measured
C	Boring Cave-in Depth
WOH	Weight of Hammer

DRILLING PROCEDURES

Soil sampling and standard penetration testing performed in general accordance with ASTM D1586-18$^{\varepsilon 1}$. The standard penetration resistance (N-value) is the number of blows of a 140-pound hammer falling 30 inches to drive a 2-inch O.D., 1.375-inch I.D. split-barrel sampler one foot. Core drilling performed in general accordance with ASTM D2113-14. The undisturbed sampling procedure is described by ASTM D1587-15. Unless other arrangements are made, NOVA will dispose of all soil and rock samples at the time of report submission.

Paving

Gravel / Graded Aggregate Base

Fill

Topsoil

Alluvium

Poorly Graded Sand - SP

Well Graded Sand - SW

Silty Sand - SM

Clayey Sand - SC

Poorly graded silty, clayey sand - SM/SC

Clayey Sand and Gravel - SC/GC

Silty Sand and Gravel - SM/GM

Silt - ML

Elastic Silt - MH

Low Plasticity Clay - CL

High Plasticity Clay - CH

Partially Weathered Rock (PWR)

Rock

NOVA

CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY

	Number of Blows, "N"	Approximate Relative Density
	0 – 4	Very Loose
	5 – 10	Loose
SANDS	11 – 30	Medium Dense
	31 – 50	Dense
	Over 50	Very Dense

	Number of Blows, "N"	Approximate Consistency
	0 – 2	Very Soft
	3 – 4	Soft
SILTS	5 – 8	Firm
and	9 – 15	Stiff
CLAYS	16 – 30	Very Stiff
	31 – 50	Hard
	Over 50	Very Hard

SOIL CLASSIFICATION CHART

COARSE GRAINED SOILS	**GRAVELS**	Clean Gravel less than 5% fines	GW	Well graded gravel
			GP	Poorly graded gravel
		Gravels with Fines more than 12% fines	GM	Silty gravel
			GC	Clayey gravel
	SANDS	Clean Sand less than 5% fines	SW	Well graded sand
			SP	Poorly graded sand
		Sands with Fines more than 12% fines	SM	Silty sand
			SC	Clayey sand
FINE GRAINED SOILS	**SILTS AND CLAYS** Liquid Limit less than 50	Inorganic	CL	Lean clay
			ML	Silt
		Organic	OL	Organic clay and silt
	SILTS AND CLAYS Liquid Limit 50 or more	Inorganic	CH	Fat clay
			MH	Elastic silt
		Organic	OH	Organic clay and silt
HIGHLY ORGANIC SOILS		Organic matter, dark color, organic odor	PT	Peat

PARTICLE SIZE IDENTIFICATION

GRAVELS	Coarse	¾ inch to 3 inches
	Fine	No. 4 to ¾ inch
SANDS	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40
SILTS AND CLAYS		Passing No. 200

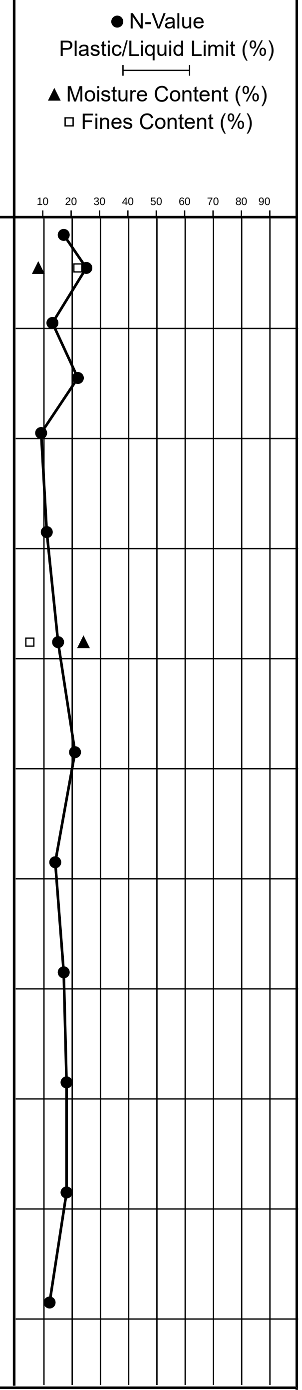
NOVA ENGINEERING AND ENVIRONMENTAL

TEST BORING RECORD B-1

PROJECT NAME	Gulf Shores Airport Terminal Expansion	**PROJECT NO.**	10116-2025250
CLIENT	Barge Design Solutions, Inc.	**LATITUDE**	30.28767
PROJECT LOCATION	Gulf Shores, Baldwin County, Alabama	**LONGITUDE**	-87.67166
LOCATION	Structure Footprint	**ELEVATION**	13' (EGM96)
DRILLER	American Drilling, Inc.	**LOGGED BY**	C. Reichley
DRILLING METHOD	Mud Rotary - Manual **% ENERGY** 60%	**DATE**	01/26/2025

DEPTH TO-WATER ▽ **INITIAL** 9' ▼ **AFTER 24 HOURS** N/M C **CAVING** N/M

DEPTH (ft)	MATERIAL DESCRIPTION	WATER LEVELS (ft)	BLOW COUNTS (UNCORRECTED N-VALUE)
0	Brown TOPSOIL		3-6-11 (17)
	Medium dense brown silty fine SAND (SM)		7-12-13 (25)
4	Loose to medium dense gray/red brown silty fine SAND (SM)		2-6-7 (13)
			7-10-12 (22)
9		▽	4-5-4 (9)
12	Medium dense light red/light brown slightly silty fine SAND (SP-SM) with seam of SC		2-4-7 (11)
16	Medium dense light red/light brown slightly silty fine SAND (SP-SM)		6-7-8 (15)
			6-10-11 (21)
			5-7-7 (14)
			4-6-11 (17)
			7-9-9 (18)
			7-9-9 (18)
			4-6-6 (12)
50	Boring Terminated at Approximately 50 feet BEG.		



Notes: 1) Ground surface elevations were interpolated through Google Earth imagery and should be noted as approximate.
2) A manual hammer with rope and cathead was used for SPT sampling and testing.
3) Hammer energy efficiency of 60% is a published reference value for manual safety hammers.
4) Groundwater level recorded upon boring completion may not be reflective of actual groundwater levels due to the introduction of drilling fluids during the drilling process.

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

NOVA ENGINEERING AND ENVIRONMENTAL

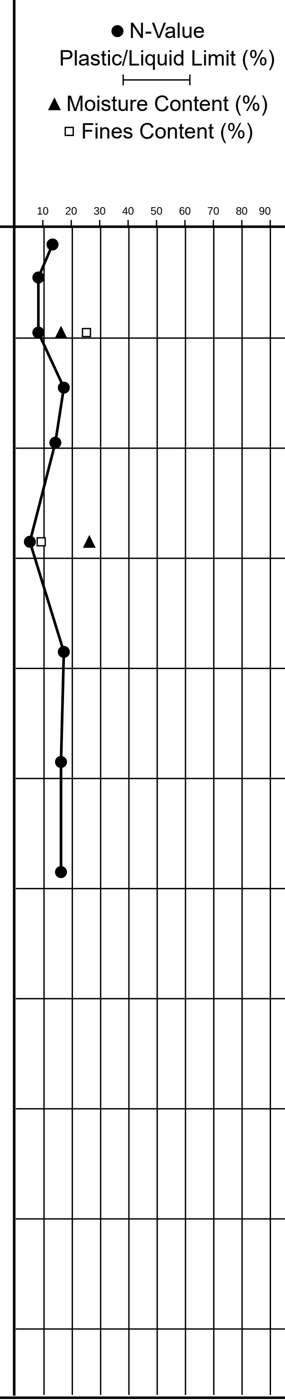
TEST BORING RECORD B-2

PROJECT NAME	Gulf Shores Airport Terminal Expansion	**PROJECT NO.**	10116-2025250
CLIENT	Barge Design Solutions, Inc.	**LATITUDE**	30.28772
PROJECT LOCATION	Gulf Shores, Baldwin County, Alabama	**LONGITUDE**	-87.67188
LOCATION	Structure Footprint	**ELEVATION**	15' (EGM96)
DRILLER	American Drilling, Inc.	**LOGGED BY**	C. Reichley
DRILLING METHOD	Mud Rotary - Manual **% ENERGY** 60%	**DATE**	01/26/2025

DEPTH TO-WATER ▽ **INITIAL** 10.5' ▼ **AFTER 24 HOURS** N/M C **CAVING** N/M

DEPTH (ft)	MATERIAL DESCRIPTION
0	Brown TOPSOIL
	Loose to medium dense brown silty fine SAND (SM)
4	Loose to medium dense red brown/light brown silty fine SAND (SM)
12	Loose to medium dense light red/light orange slightly silty fine SAND (SP-SM)
30	Boring Terminated at Approximately 30 feet BEG.

ELEVATION (ft)	DEPTH (ft)	WATER LEVELS (ft)	BLOW COUNTS (UNCORRECTED N-VALUE)
			2-6-7 (13)
			3-3-5 (8)
10	5		2-3-5 (8)
			6-8-9 (17)
5	10	▽	8-5-9 (14)
0	15		3-2-3 (5)
-5	20		6-7-10 (17)
-10	25		6-7-9 (16)
-15	30		6-8-8 (16)
-20	35		
-25	40		
-30	45		
-35	50		



Notes: 1) Ground surface elevations were interpolated through Google Earth imagery and should be noted as approximate.
2) A manual hammer with rope and cathead was used for SPT sampling and testing.
3) Hammer energy efficiency of 60% is a published reference value for manual safety hammers.
4) Groundwater level recorded upon boring completion may not be reflective of actual groundwater levels due to the introduction of drilling fluids during the drilling process.

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

NOVA ENGINEERING AND ENVIRONMENTAL

TEST BORING RECORD B-3

PROJECT NAME Gulf Shores Airport Terminal Expansion **PROJECT NO.** 10116-2025250

CLIENT Barge Design Solutions, Inc. **LATITUDE** 30.28761

PROJECT LOCATION Gulf Shores, Baldwin County, Alabama **LONGITUDE** -87.67187

LOCATION Structure Footprint **ELEVATION** 13' (EGM96)

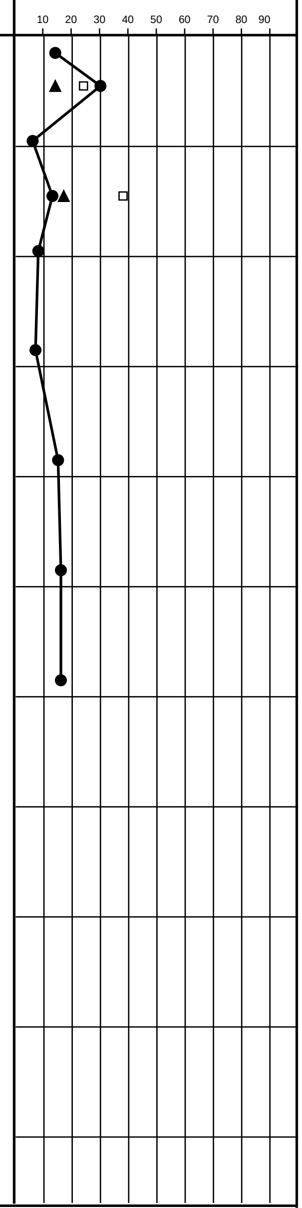
DRILLER American Drilling, Inc. **LOGGED BY** C. Reichley

DRILLING METHOD Mud Rotary - Manual **% ENERGY** 60% **DATE** 01/26/2025

DEPTH TO-WATER ▽ **INITIAL** 9.5' ▼ **AFTER 24 HOURS** N/M C **CAVING** N/M

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	WATER LEVELS (ft)	SAMPLE TYPE	BLOW COUNTS (UNCORRECTED N-VALUE)
		Brown TOPSOIL				2-6-8 (14)
10		Medium dense brown silty fine SAND (SM)				8-14-16 (30)
	5	Loose to medium dense gray/light brown silty fine SAND (SM)				3-3-3 (6)
5						4-6-7 (13)
	10			▽		4-4-4 (8)
0		Loose to medium dense light brown slightly silty fine SAND (SP-SM)				
	15					4-3-4 (7)
-5						
	20					5-7-8 (15)
-10						
	25					5-7-9 (16)
-15						
	30	Boring Terminated at Approximately 30 feet BEG.				6-7-9 (16)
-20	35					
-25	40					
-30	45					
-35	50					

● N-Value
Plastic/Liquid Limit (%)
▲ Moisture Content (%)
□ Fines Content (%)



Notes: 1) Ground surface elevations were interpolated through Google Earth imagery and should be noted as approximate.
2) A manual hammer with rope and cathead was used for SPT sampling and testing.
3) Hammer energy efficiency of 60% is a published reference value for manual safety hammers.
4) Groundwater level recorded upon boring completion may not be reflective of actual groundwater levels due to the introduction of drilling fluids during the drilling process.

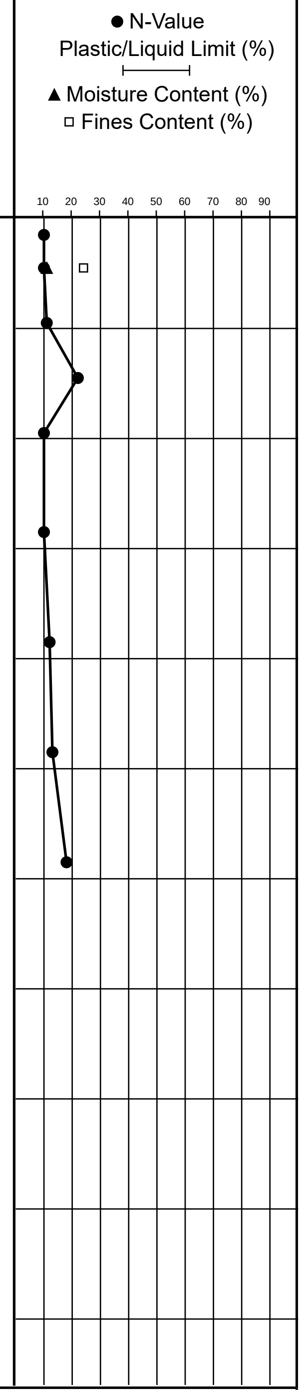
This information pertains only to this boring and should not be interpreted as being indicative of the site.

PROJECT NAME Gulf Shores Airport Terminal Expansion		**PROJECT NO.** 10116-2025250	
CLIENT Barge Design Solutions, Inc.		**LATITUDE** 30.28772	
PROJECT LOCATION Gulf Shores, Baldwin County, Alabama		**LONGITUDE** -87.67149	
LOCATION Structure Footprint		**ELEVATION** 14' (EGM96)	
DRILLER American Drilling, Inc.		**LOGGED BY** C. Reichley	
DRILLING METHOD Mud Rotary - Manual	**% ENERGY** 60%	**DATE** 01/26/2025	
DEPTH TO-WATER ▽ **INITIAL** 9.5'	▼ **AFTER 24 HOURS** N/M	C **CAVING** N/M	

NOVA ENGINEERING AND ENVIRONMENTAL

TEST BORING RECORD B-4

DEPTH (ft)	MATERIAL DESCRIPTION	WATER LEVELS (ft)	BLOW COUNTS (UNCORRECTED N-VALUE)
0	Brown TOPSOIL		2-3-7 (10)
	Loose brown silty fine SAND (SM)		6-6-4 (10)
4	Medium dense to loose red brown/light brown silty fine SAND (SM)		2-5-6 (11)
			4-11-11 (22)
		▽ 9.5	4-5-5 (10)
12	Loose red brown/light brown slightly silty fine SAND (SP-SM) with seam of SC		4-4-6 (10)
16	Medium dense light red/light brown slightly silty fine SAND (SP-SM)		4-5-7 (12)
			5-5-8 (13)
			6-8-10 (18)
30	Boring Terminated at Approximately 30 feet BEG.		



Notes: 1) Ground surface elevations were interpolated through Google Earth imagery and should be noted as approximate.
2) A manual hammer with rope and cathead was used for SPT sampling and testing.
3) Hammer energy efficiency of 60% is a published reference value for manual safety hammers.
4) Groundwater level recorded upon boring completion may not be reflective of actual groundwater levels due to the introduction of drilling fluids during the drilling process.

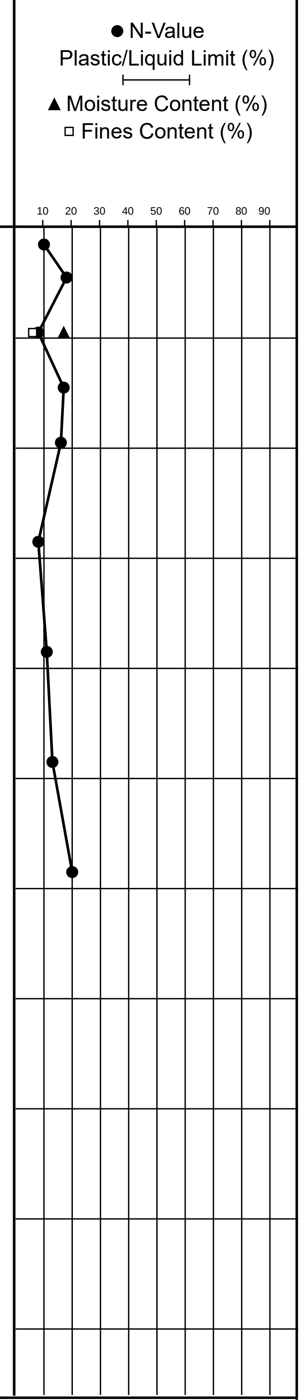
This information pertains only to this boring and should not be interpreted as being indicative of the site.

TEST BORING RECORD B-5

NOVA ENGINEERING AND ENVIRONMENTAL

PROJECT NAME	Gulf Shores Airport Terminal Expansion	**PROJECT NO.**	10116-2025250
CLIENT	Barge Design Solutions, Inc.	**LATITUDE**	30.28760
PROJECT LOCATION	Gulf Shores, Baldwin County, Alabama	**LONGITUDE**	-87.67149
LOCATION	Structure Footprint	**ELEVATION**	13' (EGM96)
DRILLER	American Drilling, Inc.	**LOGGED BY**	C. Reichley
DRILLING METHOD	Mud Rotary - Manual **% ENERGY** 60%	**DATE**	01/26/2025
DEPTH TO-WATER	▽ **INITIAL** 9' ▼ **AFTER 24 HOURS** I.D.	C **CAVING**	N/M

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	WATER LEVELS (ft)	BLOW COUNTS (UNCORRECTED N-VALUE)
13	0	Brown TOPSOIL		1-2-8 (10)
		Loose to medium dense brown silty fine SAND (SM)		9-9-9 (18)
		Loose red brown slightly silty fine SAND (SP-SM)		3-3-5 (8)
		Medium dense light brown silty fine SAND (SM)	▽ (9')	6-8-9 (17) 6-8-8 (16)
		Loose to medium dense light red/light brown slightly silty fine SAND (SP-SM)		3-4-4 (8) 4-4-7 (11) 4-6-7 (13) 6-9-11 (20)
-17	30	Boring Terminated at Approximately 30 feet BEG.		



Notes: 1) Ground surface elevations were interpolated through Google Earth imagery and should be noted as approximate.
2) A manual hammer with rope and cathead was used for SPT sampling and testing.
3) Hammer energy efficiency of 60% is a published reference value for manual safety hammers.
4) Groundwater level recorded upon boring completion may not be reflective of actual groundwater levels due to the introduction of drilling fluids during the drilling process.

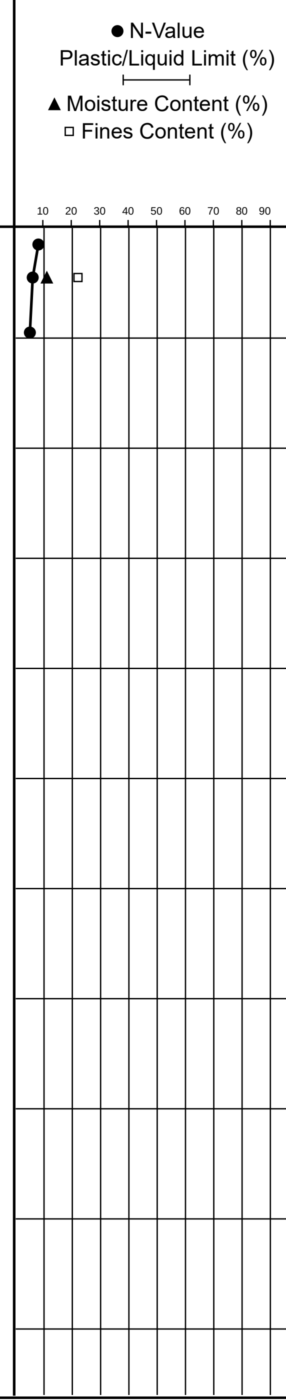
This information pertains only to this boring and should not be interpreted as being indicative of the site.

TEST BORING RECORD
P-1

NOVA ENGINEERING AND ENVIRONMENTAL

PROJECT NAME	Gulf Shores Airport Terminal Expansion	**PROJECT NO.**	10116-2025250
CLIENT	Barge Design Solutions, Inc.	**LATITUDE**	30.28850
PROJECT LOCATION	Gulf Shores, Baldwin County, Alabama	**LONGITUDE**	-87.67298
LOCATION	Pavement Footprint	**ELEVATION**	15' (EGM96)
DRILLER	American Drilling, Inc.	**LOGGED BY**	C. Reichley
DRILLING METHOD	Hollow Stem Auger; **% ENERGY** 60%	**DATE**	01/27/2025
DEPTH TO-WATER	**INITIAL** N/E; **AFTER 24 HOURS** N/M	**CAVING**	N/E

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	WATER LEVELS (ft)	SAMPLE TYPE	BLOW COUNTS (UNCORRECTED N-VALUE)
		Brown TOPSOIL			SPT	2-4-4 (8)
		Loose brown silty fine SAND (SM)			SPT	3-3-3 (6)
10	5	Loose gray silty fine SAND (SM)			SPT	2-3-2 (5)
		Boring Terminated at Approximately 5.5 feet BEG.				



Notes: 1) Ground surface elevations were interpolated through Google Earth imagery and should be noted as approximate.
2) A manual hammer with rope and cathead was used for SPT sampling and testing.
3) Hammer energy efficiency of 60% is a published reference value for manual safety hammers.

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

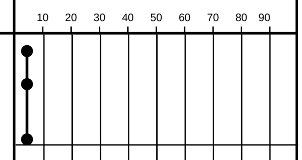
TEST BORING RECORD P-2

NOVA Engineering and Environmental

PROJECT NAME	Gulf Shores Airport Terminal Expansion	**PROJECT NO.**	10116-2025250
CLIENT	Barge Design Solutions, Inc.	**LATITUDE**	30.28832
PROJECT LOCATION	Gulf Shores, Baldwin County, Alabama	**LONGITUDE**	-87.67265
LOCATION	Pavement Footprint	**ELEVATION**	15' (EGM96)
DRILLER	American Drilling, Inc.	**LOGGED BY**	C. Reichley
DRILLING METHOD	Hollow Stem Auger; **% ENERGY** 60%	**DATE**	01/27/2025
DEPTH TO-WATER	**INITIAL** N/E; **AFTER 24 HOURS** N/M	**CAVING**	N/E

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	WATER LEVELS (ft)	SAMPLE TYPE	BLOW COUNTS (UNCORRECTED N-VALUE)
15	0	Brown TOPSOIL			SPT	2-2-2 (4)
		Very loose brown silty fine SAND (SM)			SPT	2-2-2 (4)
		Very loose gray silty fine SAND (SM)			SPT	2-2-2 (4)
10	5	Boring Terminated at Approximately 5.5 feet BEG.				

Legend: ● N-Value; Plastic/Liquid Limit (%); ▲ Moisture Content (%); □ Fines Content (%)



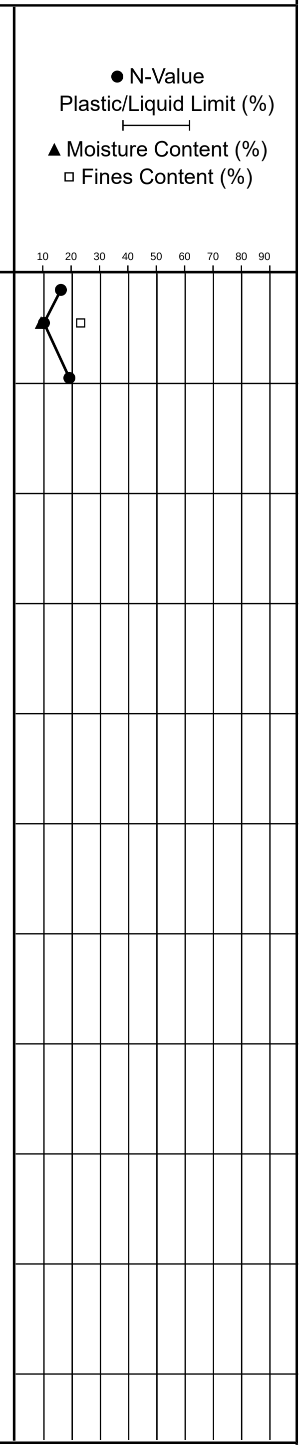
Notes: 1) Ground surface elevations were interpolated through Google Earth imagery and should be noted as approximate.
2) A manual hammer with rope and cathead was used for SPT sampling and testing.
3) Hammer energy efficiency of 60% is a published reference value for manual safety hammers.

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

PROJECT NAME Gulf Shores Airport Terminal Expansion	**PROJECT NO.** 10116-2025250
CLIENT Barge Design Solutions, Inc.	**LATITUDE** 30.28733
PROJECT LOCATION Gulf Shores, Baldwin County, Alabama	**LONGITUDE** -87.67079
LOCATION Pavement Footprint	**ELEVATION** 13' (EGM96)
DRILLER American Drilling, Inc.	**LOGGED BY** C. Reichley
DRILLING METHOD Hollow Stem Auger **% ENERGY** 60%	**DATE** 01/27/2025
DEPTH TO-WATER ▽ **INITIAL** N/E ▼ **AFTER 24 HOURS** N/M	C **CAVING** N/E

TEST BORING RECORD P-3

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	WATER LEVELS (ft)	SAMPLE TYPE	BLOW COUNTS (UNCORRECTED N-VALUE)
		Medium dense brown silty fine SAND (SM)				6-8-8 (16)
10		Medium dense light brown/orangish brown silty fine SAND (SM)				6-5-5 (10)
	5					7-9-10 (19)
		Boring Terminated at Approximately 5.5 feet BEG.				



Notes: 1) Ground surface elevations were interpolated through Google Earth imagery and should be noted as approximate.
2) A manual hammer with rope and cathead was used for SPT sampling and testing.
3) Hammer energy efficiency of 60% is a published reference value for manual safety hammers.

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

APPENDIX C
Laboratory Data

SUMMARY OF CLASSIFICATION & INDEX TESTING

Gulf Shores Airport Terminal Expansion
Gulf Shores, Baldwin County, Alabama
NOVA Project Number 10116-2025250

SUMMARY OF CLASSIFICATION AND INDEX TESTING				
Boring No.	Sample Depth (ft. BEG)	Natural Moisture (%)	Percent Fines (- #200)	USCS Soil Classification
B-1	1.5-3	8	22	SM
B-1	18.5-20	24	5	SP-SM
B-2	4-5.5	16	25	SM
B-2	13.5-15	26	9	SP-SM
B-3	1.5-3	14	24	SM
B-3	6.5-8	17	38	SM
B-4	1.5-3	11	24	SM
B-5	4-5.5	17	6	SP-SM
P-1	1.5-3	11	22	SM
P-3	1.5-3	9	23	SM

Note: BEG denotes Below Existing Grade

Laboratory Testing

Gulf Shores Airport Terminal Expansion 1.5
Gulf Shores, Baldwin County, Alabama
NOVA Project Number 10116-2025250

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. This testing was conducted in general accordance with ASTM Designation D-2216.

Fines Content

The percentage of fines passing through the No. 200 sieve is generally considered to represent the amount of silt and clay of the tested soil sample. The sieve analysis testing was conducted in general accordance with ASTM Designations D-6913 and D-1140.

APPENDIX D
Qualifications of Recommendations
GBA Document

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 past experience. If additional information becomes available that might impact our geotechnical opinions, it will be necessary for NOVA to review the information, reassess 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 will 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 have 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 geotechnical 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 document 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 observation and testing services.

This report is intended for the sole use of CLIENT only. The scope of work performed during this study was developed for purposes specifically intended by CLIENT 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 Alabama. 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.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include 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.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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