JACKSON GEOTECHNICAL ENGINEERING

Consulting Geotechnical Engineers

REPORT OF GEOTECHNICAL EXPLORATION
A STREET PARKING IMPROVEMENTS
ST. AUGUSTINE BEACH, FLORIDA
JGE PROJECT NO. 22-313.1

Prepared for:

Matthews Design Group
7 Waldo Street
St. Augustine, Florida 32084

Prepared by:

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Phone: 904-252-2292

June 2, 2023

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Mr. Rudd Jones, P.E.
Matthews Design Group
7 Waldo Street
St. Augustine, Florida 32084

Report of Geotechnical Exploration and Engineering Services
A Street Parking Improvements
St. Augustine Beach, Florida
JGE Project No. 22-313.1

Dear Mr. Jones:

As requested, Jackson Geotechnical Engineering has completed a geotechnical exploration for the subject project. The exploration was performed to evaluate the general subsurface conditions to facilitate drainage design. We understand drainage improvements will consist of exfiltration through pervious pavers, and possibly underground exfiltration.

We appreciate this opportunity to be of service as your geotechnical consultant on this phase of the project. Please contact us if you have any questions, or if we may be of any further service.

Sincerely:
Jackson Geotechnical Engineering, LLC.

Jeff S. Jackson, P.E.
Licensed, Florida 51979

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1.0 PROJECT INFORMATION

1.1 Site Location and Description

The site of the subject project is located within the northwestern quadrant of the intersection of A Street and A1A Beach Boulevard in St. Augustine Beach, Florida. The site currently is an unimproved (dirt) parking lot. Based on visual observation, the topography across the site is relatively level. Adjacent parcels to the west are occupied with commercial businesses. The site is bound to the north by 1st Street.

1.2 Project Description

Project information was provided to us during correspondence with you. We were provided with a copy of an aerial photograph of the subject site and adjacent areas. The requested boring locations were superimposed on the aerial photograph.

The existing parking lot at the subject site utilizes a gravel/shell surface. The project will consist of implementing pervious pavers and possibly underground retention. The project design will maximize the amount of on-site stormwater treatment prior to conveyance to the municipal stormwater system.

2.0 FIELD EXPLORATION

2.1 Soil Borings

In order to explore the subsurface conditions at the requested location, 1 Standard Penetration Test (SPT) boring (B-1) was performed to a depth of 10 feet below the ground surface. The boring was located in the field by using measurements, and visual references, from existing site features. The location of the boring, and the subsurface conditions encountered at the boring location, are presented in Appendix A on the Boring Location Plan and Subsurface Profile, respectively.

2.2 Relatively Undisturbed Soil Samples

Two relatively undisturbed soil samples were obtained at the locations of Boring B-1 for the purposes of permeability (hydraulic conductivity) testing. The soil samples were obtained using thin-walled tube sampling techniques (Shelby tube). The Shelby tubes were transported to our laboratory for permeability testing.

3.0 LABORATORY TESTING

3.1 Index Testing

Soil samples recovered during the field exploration were visually classified in accordance with ASTM D 2488. The results of the classification testing are presented on the Subsurface Profiles in Appendix A.

3.2 Permeability Testing

A horizontal and vertical permeability (hydraulic conductivity) test was conducted on the undisturbed soil samples to estimate the coefficient of horizontal permeability of the appropriate soil layers. The coefficient of permeability is a measure of a soil's ability to transmit water under hydraulic loading conditions. It typically is a required input parameter for groundwater modeling, such as dry pond and exfiltration recoveries, background seepage, etc. The laboratory permeability test is typically conducted by placing the undisturbed soil sample in a permeameter, and while in the permeameter, the soil sample is subjected to differential hydraulic loading over a period of time. The volume of water that is transmitted through the soil sample is recorded, and along with the known hydraulic loading conditions, Darcy's law is utilized to calculate the coefficient of permeability. The coefficient of permeability is shown on the Subsurface Profile at the depth of which the soil sample was obtained.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General Soil Profile

The boring location and general subsurface conditions that were encountered are presented on the Boring Location Plan and Subsurface Profile. When reviewing these records, it should be understood the soil conditions may change significantly at adjacent, unexplored locations. The following discussion summarizes the soil conditions encountered.

In general, the boring encountered medium dense to very dense fine sand (SP) throughout the 10-foot exploration depth. As an exception, four inches of gravel/sand mix was located at the surface.

4.2 Groundwater Level

The stabilized groundwater level was measured at the boring location, 24+ hours subsequent to boring completion, at a depth of 2.4 feet below the existing ground surface. The depth of the encountered groundwater level is presented on the Subsurface Profile.

The groundwater table will fluctuate depending on seasonal variations, tidal fluctuations, adjacent construction, surface water runoff, etc. Our estimate of the normal seasonal high groundwater level at the boring location is presented on the Subsurface Profile in Appendix A. Our estimate is based on the results of the soil boring, review of available published literature, and information provided for this study. Should rainfall intensity exceed normal quantities, or should other variables that affect the seasonal high groundwater level be altered, the groundwater profile at the site could change significantly.

Seasonal low groundwater levels represent the lowest level of the phreatic surface during a sustained time period over the course of a normal year. We estimate the seasonal-low groundwater level to be 2.5 feet below the measured water table.

5.0 RETENTION RECOMMENDATIONS

5.1 General

The stormwater system includes pervious pavers which will allow retained water in the parking lot to infiltrate into the ground to achieve treatment. Underground stormwater retention may also be utilized. Retention systems retain the necessary minimum amount of stormwater runoff (treatment volume) during the storm event. The volume retained is treated by infiltration into the ground. Infiltration into the ground is primarily affected by permeability of the soil, vertical height of stored stormwater (hydraulic loading), depth of the aquifer, soil porosity, and vertical distance between the stored water and the water table.

5.2 Soils and Groundwater Parameters

The table below summarizes the results of the estimated soils and groundwater parameters. A factor of safety of 2.0 should be utilized in the recovery analysis.

Location	Horizontal Permeability (ft/day)	Vertical Permeability (ft/day)	Effective Porosity	Depth to Bottom of Aquifer(1) (feet)	Estimated Depth of Seasonal High Groundwater Level(1) (feet)
B-1	16.8	20.6	25%	10.0(2)	2.4

(1) Depth references ground surface at the time of the subsurface exploration.
(2) Aquifer depth limited to boring depth, in accordance with SJRWMD guidelines.

Notes:
(1) Permeability values represent existing, in-situ soils. If fill is utilized, it should meet the specifications of the drainage engineer.
(2) Surficial soils excessively compacted by traffic may require loosening/scarification to promote infiltration.

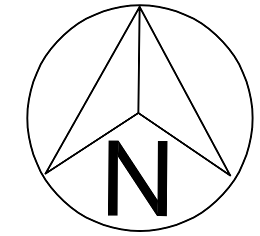
6.0 LIMITATIONS

We have conducted the geotechnical engineering in accordance with principles and practices normally accepted in the geotechnical engineering profession. Our analysis and recommendations are dependent on the information provided to us. Jackson Geotechnical Engineering is not responsible for independent conclusions or interpretations based on the information presented in this report.

APPENDIX A

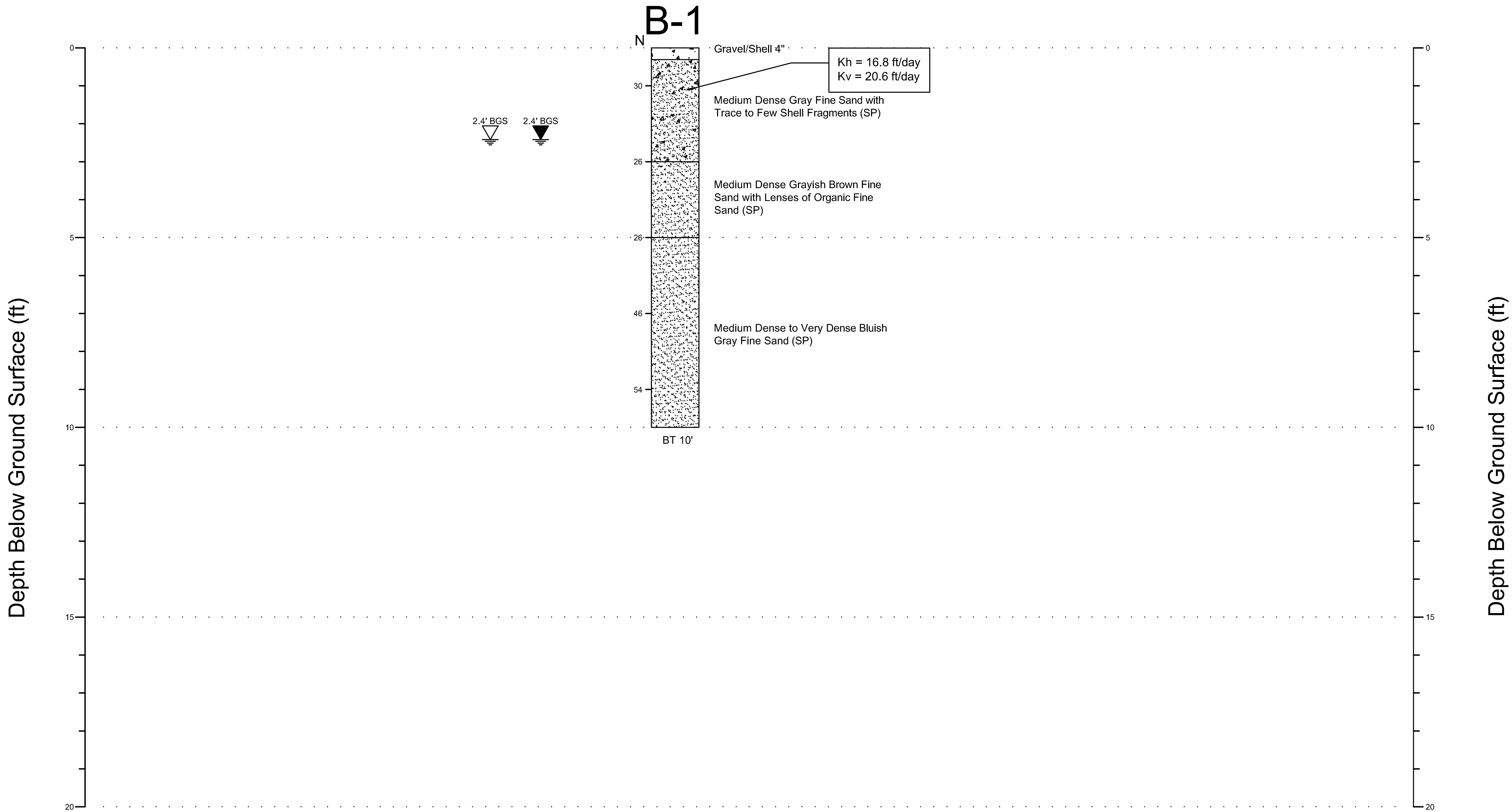
BORING LOCATION PLAN

SUBSURFACE PROFILE



SPT Boring Location

Jackson Geotechnical Engineering	
Boring Location Plan	
A-Street Parking	
June 2, 2023	Drawn by: MJ
Project No. 22-313	Figure 1



Fine Sand (SP)

Fine Sand with Trace to Few Shell Fragments

Gravel/Shell

Kh Coefficient of Horizontal Permeability

Kv Coefficient of Vertical Permeability

▽ Seasonal High Groundwater Table Estimated Below Existing Ground Surface

▼ Groundwater Table Measured Below Ground Surface

BT Boring Terminated

BGS Below Ground Surface

N SPT - N Blow Count

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Subsurface Profiles	
A-Street Parking	
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APPENDIX B

KEY TO SOIL CLASSIFICATION

FIELD AND LABORATORY TEST PROCEDURES

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KEY TO SOIL CLASSIFICATION

CORRELATION OF PENETRATION WITH RELATIVE DENSITY & CONSISTENCY

SANDS AND GRAVEL	
BLOW COUNT	RELATIVE DENSITY
0-3	VERY LOOSE
4-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

SILTS AND CLAYS	
BLOW COUNT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	FIRM
16-30	VERY STIFF
31-50	HARD
OVER 50	VERY HARD

PARTICLE SIZE IDENTIFICATION (UNIFIED CLASSIFICATION SYSTEM)

CATEGORY	***DIMENSIONS***
Boulders	Diameter exceeds 12 inches
Cobbles	3 to 12 inches
Gravel	Coarse – 0.75 to 3 inches in diameter Fine – 4.76 mm to 0.75 inch diameter
Sand	Coarse – 2.0 mm to 4.76 mm diameter Medium – 0.42 mm to 2.0 mm diameter Fine – 0.074 mm to 0.42 mm diameter
Silt and Clay	Less than 0.074 mm (invisible to the naked eye)

MODIFIERS

These modifiers provide our estimate of the amount of minor constituent (sand, silt, or clay size particles) in the soil sample

PERCENTAGE OF MINOR CONSTITUENT	***MODIFIERS***
0% to 5%	No Modifier
5 % to 12 %	With Silt, With Clay
12% to 30%	Silty, Clayey, Sandy
30% to 50%	Very Silty, Very Clayey, Very Sandy

APPROXIMATE CONTENT OF OTHER COMPONENTS (SHELL, GRAVEL, ETC.)	***MODIFIERS***	***APPROXIMATE CONTENT OF ORGANIC COMPONENTS***
0% to 5%	TRACE	1 to 2%
5% to 12%	FEW	2% to 4%
12% to 30%	SOME	4% to 8%
30% to 50%	MANY	>8%

FIELD AND LABORATORY TEST PROCEDURES

Penetration Borings

The penetration borings were made in general accordance with ASTM D 1586-67, "Penetration Test and Split-Barrel Sampling of Soils". Each boring was advanced to the water table by augering and, after encountering the groundwater table, further advanced with a rotary drilling technique that uses a circulating bentonite fluid for borehole flushing and stability. At two-foot intervals within the upper 10 feet and at five-foot intervals thereafter, the drilling tools were removed from the borehole and a split-barrel sampler inserted to the borehole bottom. The sampler was then driven 18 inches into the material using a 140-pound SPT hammer falling, on the average, 30 inches per hammer blow. The number of hammer blows for the final 12 inches of penetration is termed the "penetration resistance, blow count, or N-value". This value is an index to several in-place geotechnical properties of the material tested, such as relative density and Young's Modulus.

After driving the sampler 18 inches (or less, if in hard rock or rock-like material) at each test interval, the sampler was retrieved from the borehole and a representative sample of the material within the split-barrel was placed in a watertight container and sealed. After completing the drilling operations, the samples for each boring were transported to our laboratory where our Geotechnical Engineer examined them in order to verify the driller's field classifications. The samples will be kept in our laboratory for a period of two months after submittal of formal written report, unless otherwise directed by the Client.

Soil Classification

Soil samples obtained from the performance of the borings were transported to our laboratory for observation and review. An engineer, registered in the State of Florida and familiar with local geological conditions, conducted the review and classified the soils in accordance with ASTM 2488. The results of the soil classification are presented on the boring records.

Constant Head Permeability Test

The coefficient of permeability for the laminar flow of water through granular soils was determined in general accordance with the latest revision of ASTM D 2434. The constant head permeability test is a measure of the quantity of water that flows through a sample contained in a cylinder of known height and diameter in a measured time while maintaining a constant head of water on the sample. The coefficient of permeability is determined by application of the Darcy's Law shown below:

$$k = \frac{Q\,L}{hAt}$$

k = Coefficient of permeability

Q = Quantity of water discharge

L = Length of specimen

h = Constant head of water

A = Cross-sectional area of specimen

t = Total time of discharge

Undisturbed Sampling

Relatively undisturbed samples were obtained in general accordance with the latest revision of ASTM A 1587, “Thin-Walled Tube Sampling of Soils”. Manual methods were used to advance the 3-inch O.D. – 16 gauge stainless steel sampler tubes into the soils at the selected depths. After retrieving the samples, the ends were capped and then transported to our laboratory.