



Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

March 30, 2023
Proposal Number 23-04-07

City of North Port
Utilities Department
6644 W. Price Boulevard
North Port, Florida 34291

Attention: Mr. Michael Acosta, P.E.

Subject: Scope and Budget Proposal for Geotechnical Engineering Investigation/Survey
Related to Future Development of Warm Mineral Springs
North Port, Florida

Dear Mr. Acosta:

As requested, we are pleased to present this scope and budget proposal for conducting a geotechnical engineering investigation/survey related to the proposed development around Warm Mineral Springs. We understand based on review of the Warm Mineral Springs Enclave conceptual site plan dated September 2022, that the existing approximate 81-acre area park surrounding Warm Mineral Springs will be developed with numerous buildings, including a resort hotel & spa, wellness center, medical office, museum, restaurant, and multi-family residential buildings.

The purposes of the investigation/survey will be to evaluate the subsurface conditions within the proposed building areas relative to presence of potential underground feeder veins of the spring, cavities, sinkholes, or other conditions that could impact the proposed development.

The following summarizes our proposed scope of work and associated fees for conducting the subject investigation/survey.

PROPOSED SCOPE OF WORK

Our proposed scope of work will include conducting the geotechnical engineering investigation/survey within the proposed building footprint areas using a two-phased approach. Phase I will consist of performing a Ground Penetrating Radar (GPR) study to attempt to identify potential anomalies within the developmental footprint areas. Representative anomalies encountered during the GPR study will be investigated with Standard Penetration Test (SPT) borings to evaluate the nature of the anomalies. If the anomalous areas are indicative of feeder veins, cavities, sinkholes, or other conditions that could impact development, we will notify the design team so that consideration can be given to relocate the building(s). If no adverse conditions to development are found during Phase I of the investigation/survey, we will proceed to Phase II with the concurrence of the design team and City of North Port, which will consist of performing an Electrical Resistivity (ER) survey within the proposed building footprint areas. Anomalous areas identified during the ER survey may need to be further evaluated with additional SPT borings.

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Florida: Bartow, Cocoa, Fort Myers, Miami, Orlando, Port St. Lucie, Sarasota, Tallahassee, Tampa, West Palm Beach
Louisiana: Baton Rouge, New Orleans, Shreveport

Texas: Houston

It is our opinion, that although the GPR survey has limitations, this phased approach will be significantly more efficient than only performing an ER survey with SPT borings, especially if

conditions that pose an impact to development are present within the proposed building footprint areas.

The following sections further describe our proposed scope of work and project approach.

Ground Penetrating Radar Survey

GPR is a geophysical method that detects interfaces between subsurface materials with differing dielectric constants. The GPR system consists of an antenna that houses the transmitter and receiver; a control unit, that processes the received signal and produces a graphic display of the data; and a video display unit that displays the data as a graph of distance versus two-way travel time of the GPR signal.

The transmitter radiates electromagnetic energy in the frequency range of 16 MHz to 2,600 MHz. A trigger pulse is generated at the control unit through the control cable to the antenna, where the pulse is transformed into a bipolar pulse. The pulse is radiated into the subsurface as the antenna moves across the ground surface. In the subsurface, the radar waves are reflected back to the receiver by interfaces where there is a dielectric contrast. The intensity of the reflected signal is a function of the contrast in the dielectric constant between the materials, the conductivity of the material through which the wave is traveling, and the frequency of the signal. Under favorable conditions (sandy soils, deeper groundwater), penetration up to 50 feet may be achieved.

The signal amplitude determines the shade of gray on the display. Subsurface features that commonly cause such reflections are:

- 1) natural geology, changes in sediment composition such as sand and clay, bedding and cementation horizons, voids and variations in water content; or
- 2) unnatural changes to the subsurface such as disturbed soils, soil backfill, buried debris, tanks, pipelines and utilities.

The scans are digitally recorded on the control unit for subsequent processing and evaluation. Normal geologic conditions, as viewed on a GPR profile, are frequently characterized by the occurrence of relatively continuous and horizontal GPR reflections representing soil horizons.

The GPR data will be acquired along transects spaced at approximate 20 ft to 40 ft grid lines within the proposed building footprint areas. The GPR data will be analyzed using the computer program RADAN 7, V 7.5 18 23370 or similar program. The depth to which the GPR signal can penetrate is highly site-specific. The depth of investigation decreases due to increases in soil water content, clay content, and electrical conductivity. Depth of investigation is also dependent on the antenna's transmitting frequency. Depth of investigation generally increases as transmitting frequency decreases; however, the ability to resolve smaller subsurface features is diminished as frequency is decreased. Highly conductive soil or groundwater may affect the GPR signal such that the penetration depth is severely reduced. RADAN 7 provides a tool to mark the effective depth of each transect based on the depth at which the Signal to Noise Ratio becomes too small to provide meaningful data.

Electrical Resistivity Testing

Geophysical surveys using electrical resistivity (ER) testing will be performed to obtain additional information relative to the characterization of the subsurface conditions within the proposed building areas. The electrical resistivity testing transmits a small pulse of electrical charge into the ground from one pair of electrodes to another. The current and voltage measurements obtained during the test are used to calculate the apparent resistivity of the soils. The apparent resistivity is a weighted average of different resistivities that the electrical charge is flowing through in a general area under the four electrodes. The apparent resistivity is converted to an inverted resistivity to display the “true” resistivity of the soil profiles by distributing the apparent resistivities so that the model best fits the apparent resistivities. The soil profiles can then be interpreted based on correlations between measured soil resistivity and soil types. Electrical resistivities of typical soils depend on soil mineralogy, soil fabric (soil particle arrangement), organic contents, inclusions, moisture contents, temperature, and pore water chemistry. Generally, clay soils have lower electrical resistivities than sandy soils due to the surface charge of the clay particles. The accuracy, resolution, and depth of the measurements depend on the number of survey points and inter-electrode spacing. A 2.5D model will go beyond the 2D survey to provide a quasi-3D model by interpreting resistivities between parallel surveys, rather than a flat 2D profile.

We propose to conduct the ER geophysical survey along the same transects used for the GPR survey (i.e., approximate 40 ft by 40 ft grid within the proposed building footprint areas). The transects will each consist of 2 parallel runs, which will provide a 2.5D model of the subsurface soils and rock. Each survey “run” will consist of electrical resistivity testing using 56 electrodes spaced at intervals necessary to achieve the desired survey depth.

SPT Borings

The proposed geotechnical engineering investigation program also includes SPT borings to obtain information on subsurface conditions at specific locations and aid in evaluating anomalies encountered in the GPR and ER surveys. For this evaluation, we propose budgeting up to 25 SPT borings to depths of 50 feet (1,250 LF).

The SPT borings will be drilled using a procedure similar to the procedure outlined in ASTM D-1586. The borings will be sampled at 18-inch intervals to 10 feet deep and at 5-foot intervals below 10 feet. Each sample will be removed from the sampler in the field and then examined and visually classified by our crew chief. Representative portions will be sealed and packaged for transportation to our laboratory for further analysis as required. Water level observations will be made in the boreholes during the drilling operation. The borings will be backfilled with cement grout upon completion.

Survey Location and Land Clearing

We recommend that the project surveyor locate the corners of all proposed building locations, transect gridlines, and SPT boring locations horizontally and vertically (i.e., determine the elevation of the ground surface). This information will increase the accuracy of the data obtained. We assume that the surveyor will be retained by the client/design team to provide these services.

Clearing of paths along the proposed GPR and ER transect grid lines and to the boring locations will be necessary due to the wooded and heavily vegetated nature of portions of the project site. The clearing is intended to be limited in scope and will be performed to provide access to proposed geophysical survey transect lines and drilling locations within the property. We note that Ardaman & Associates, Inc. cannot be held responsible for potential damage to wetland

and/or upland (protected) vegetation, or endangered and/or threatened species of animals. If such concerns exist on the site, we recommend an experienced environmental specialist be present during clearing activities.

REPORT OF FINDINGS

Engineering analysis of data obtained will be made to evaluate the subsurface conditions within the proposed building footprint areas with respect to the presence of underground feeder veins of the spring, cavities, sinkholes, or other conditions that could potentially impact the proposed development. We note that our analysis does not include providing design level recommendations for the proposed development, however, the data produced can be considered in a future evaluation once the building locations and loading information are finalized.

Our findings will be submitted in written reports in general accordance with list of deliverables and schedule outlined in RFLOI No. 2023-11.

BUDGET ESTIMATE

We recommend a budget of **\$264,377.00** to perform the scope of work outlined above. This scope is intended to be inclusive of services needed to complete the geotechnical engineering investigation/survey relative to the presence of underground feeder veins of the spring, cavities, sinkholes, or other conditions that could impact the proposed development. We believe that the budget estimate presented herein is appropriate for planning purposes; however, because of the nature of this type of work, we recognize the possibility that the above estimate may be more (or less) than anticipated. We will invoice our services for actual work performed and work within an established budget. We will not exceed the above estimated amount without prior written approval of a change in scope, conditions, or level of service.

Table 1 summarizes the estimated budget for the proposed services. An itemized breakdown of the budget estimate and our 2023 Corporate Fee Schedule for additional services (if needed) is attached to this proposal.


Table 1 - Estimated Budget Summary

Description	Budget (\$)
Land Clearing	\$38,500.00
GPR Field Survey	\$37,735.00
ER Field Survey	\$137,907.00
SPT Borings	\$50,235.00
Total	\$264,377.00

We appreciate the opportunity to present you with this proposal and look forward to assisting you with these services. Please call one of the undersigned if you have any questions or when we may be of further assistance.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.

JMP for
Virginia Goff, P.E.
Project Manager



Jason Parker, P.E.
Senior Engineer

Attachment: Itemized Budget Estimate
2023 Fee Schedule



Itemized Budget Estimate
Geotechnical Engineering Investigation/Survey
Warm Mineral Springs, North Port, Florida
Ardaman Proposal No. 23-04-07
March 30, 2023

Task	Quantity	Units	Unit Cost	Cost
I. Land Clearing				
Skidsteer and Mower (Subcontractor)	10	Days	\$2,200.00	\$22,000.00
Field Technician III	100	Hours	\$78.00	\$7,800.00
Principal Engineer	10	Hours	\$275.00	\$2,750.00
Senior Project Engineer	5	Hours	\$205.00	\$1,025.00
Project Engineer III	10	Hours	\$168.00	\$1,680.00
Assistant Project Engineer	20	Hours	\$146.00	\$2,920.00
CADD Operator	5	Hours	\$65.00	<u>\$325.00</u>
			Subtotal	\$38,500.00
II. GPR Field Survey				
GPR Equipment	10	Days	\$375.00	\$3,750.00
GPR Operator - Field Technician V	100	Hours	\$101.00	\$10,100.00
Vehicle/Trip Charge	10	Days	\$85.00	\$850.00
Per Diem	10	Days	\$66.00	\$660.00
Lodging	9	Days	\$175.00	\$1,575.00
Principal Engineer	10	Hours	\$275.00	\$2,750.00
Senior Project Engineer	25	Hours	\$205.00	\$5,125.00
Project Engineer III	75	Hours	\$168.00	\$12,600.00
CADD Operator	5	Hours	\$65.00	\$325.00
Technical Secretary	5	Hours	\$65.00	<u>\$325.00</u>
			Subtotal	\$37,735.00
III. Electrical Resistivity Survey				
AGI Sting R1-IP	55	Days	\$318.00	\$17,490.00
ER Operator - Field Technician V	550	Hours	\$101.00	\$55,550.00
ER Assistant - Field Technician III	550	Hours	\$78.00	\$42,900.00
Per Diem	7	Days	\$175.00	\$1,225.00
Lodging	7	Days	\$66.00	\$462.00
Principal Engineer	5	Hours	\$275.00	\$1,375.00
Senior Project Engineer	10	Hours	\$205.00	\$2,050.00
Project Engineer III	25	Hours	\$168.00	\$4,200.00
Assistant Project Engineer	80	Hours	\$146.00	\$11,680.00
CADD Operator	10	Hours	\$65.00	\$650.00
Technical Secretary	5	Hours	\$65.00	<u>\$325.00</u>
			Subtotal	\$137,907.00
IV. SPT Borings				
Mobilization of Drilling Crew and Equipment	10	Hours	\$240.00	\$2,400.00
25 Borings X 50 LF (1,250 LF)	1250	LF	\$21.40	\$26,750.00
Grout Boreholes (estimate 500 LF)	1250	LF	\$6.00	\$7,500.00
Temporary Casing (Estimate 500 LF)	500	LF	\$12.70	\$6,350.00
Laboratory Classification Testing Allowance (Estimate)	1	NTE	\$2,500.00	\$2,500.00
Project Engineer III	5	Hours	\$168.00	\$840.00
Assistant Project Engineer	20	Hours	\$146.00	\$2,920.00
CADD Operator	10	Hours	\$65.00	\$650.00
Technical Secretary	5	Hours	\$65.00	<u>\$325.00</u>
			Subtotal	\$50,235.00
ESTIMATED TOTAL COST				\$264,377.00

ARDAMAN & ASSOCIATES, INC.
2023 FEE SCHEDULE
PROFESSIONAL AND SUPPORT SERVICES

PROFESSIONAL SERVICES

Senior Consultant	Per Hour	\$275.00
Principal Engineer	Per Hour	\$245.00
Project Director	Per Hour	\$223.00
Senior Project Manager/Engineer	Per Hour	\$205.00
Senior Construction Manager	Per Hour	\$204.00
Project Manager/Construction Manager VII	Per Hour	\$173.00
Project Engineer V	Per Hour	\$173.00
Senior Geologist/Scientist/Ecologist	Per Hour	\$168.00
Project Engineer III	Per Hour	\$168.00
Safety Officer	Per Hour	\$160.00
Project Engineer I/Engineering Associate	Per Hour	\$160.00
Project Geologist III	Per Hour	\$154.00
Assistant Project Engineer/Scientist	Per Hour	\$146.00
Project Geologist I	Per Hour	\$142.00
Staff Engineer III/Geologist III/Scientist III	Per Hour	\$129.00
Staff Engineer I/Geologist I/Scientist I	Per Hour	\$103.00
Staff Ecologist III	Per Hour	\$86.00
Engineer Assistant	Per Hour	\$78.00
Staff Ecologist I	Per Hour	\$72.00
Engineer Intern	Per Hour	\$54.00

GIS SERVICES

GIS Analyst III	Per Hour	\$152.00
GIS Analyst I	Per Hour	\$135.00
GIS Specialist III	Per Hour	\$104.00
GIS Specialist I	Per Hour	\$86.00

**CONSTRUCTION MONITORING AND
FIELD/LABORATORY TESTING SERVICES**

Field Engineer V/Construction Manager V	Per Hour	\$128.00
Field Engineer III/Construction Manager III	Per Hour	\$118.00
Laboratory Manager	Per Hour	\$112.00
Field Engineer II	Per Hour	\$110.00
Field Engineer I	Per Hour	\$103.00
Field/Lab Technician V	Per Hour	\$101.00
Field/Lab Technician IV	Per Hour	\$90.00
Field/Lab Technician III	Per Hour	\$78.00
Field/Lab Technician II	Per Hour	\$68.00
Field/Lab Technician I	Per Hour	\$54.00

DESIGN AND SUPPORT SERVICES

Engineering Designer V	Per Hour	\$122.00
Engineering Designer III	Per Hour	\$106.00
Engineering Designer I	Per Hour	\$93.00
Technical Drafter V	Per Hour	\$85.00
Technical Drafter III	Per Hour	\$78.00
Technical Drafter I	Per Hour	\$65.00
Administrative Assistant	Per Hour	\$65.00
Office Assistant	Per Hour	\$34.00

MISCELLANEOUS EXPENSES

Outside Services and Expenses	Per Job	At Cost + 12%
Outside Printing and Reproduction	Per Job	At Cost + 12%
Printing/Copying – Black and White (up to 11"x17")	Per Page	\$0.10
Printing/Copying - Color (up to 11"x17")	Per Page	\$0.50
Printing/Plotting – Black and White (24"x36"; 30"x42")	Per Sheet	\$2.50
Printing/Plotting - Color (24"x36"; 30"x42")	Per Sheet	\$5.00
Mileage (Automobile)	Per Mile	\$0.62
Mileage (Truck)	Per Mile	\$0.85

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December 8, 2022

ARDAMAN & ASSOCIATES, INC.
2023 FEE SCHEDULE
FIELD SERVICES (PAGE 1 OF 3)

MOBILIZATION/DEMOBILIZATION

Mobilization and Demobilization

• Conventional Drill Rig	Per Rig-Hour	\$240.00
• Longboat LF350e Drill Rig	Each	Determined by Project
• Mileage – Rig	Per Mile	\$1.65
• Mileage – Truck	Per Mile	\$0.85
• Portable Barge	Each	Determined by Project

STANDARD DRILLING

All-Terrain Vehicle	Add'l Price Per LF	\$1.00
Auger Borings (4-inch)	Per Lineal Foot	\$14.30
Wash Borings - Cuttings Only (up to 3-inch)		
• Soil Drilling	Per Lineal Foot	\$10.20
• Rock Drilling	Per Lineal Foot	\$17.10
Standard Penetration Test (SPT) Borings (ASTM D-1586) in Soil (N-values <50):		
• From surface to 25 feet	Per Lineal Foot	\$21.40
• From 25 feet to 50 feet	Per Lineal Foot	\$23.90
• From 50 feet to 100 feet	Per Lineal Foot	\$26.30
• From 100 feet to 125 feet	Per Lineal Foot	\$33.80
• From 125 feet to 150 feet	Per Lineal Foot	\$44.60
Standard Penetration Test (SPT) Borings in High Resistance Soil/Rock (N-values >50)	Add'l Price Per LF	\$4.30
Furnish, Install, and Remove Casing (up to 4-inch):		
• From surface to 50 feet	Per Lineal Foot	\$12.70
• From 50 feet to 100 feet	Per Lineal Foot	\$15.60
• From 100 feet to 150 feet	Per Lineal Foot	\$20.10
• From 150 feet to 200 feet	Per Lineal Foot	\$22.40
• From 200 feet to 250 feet	Per Lineal Foot	\$26.90
• From 250 feet to 300 feet	Per Lineal Foot	\$30.50
Drilling (Time Basis)/2-Person Crew	Per Crew-Hour	\$265.00
Drilling (Time Basis)/3-Person Crew	Per Crew-Hour	\$333.00
Drilling LF350e Rig/3-Person Crew, 12-Hour Shift	Per Crew-Shift	\$6,450.00
Drilling LF350e Rig/3-Person Crew, Beyond 12 Hours	Add'l Crew-Hour	\$530.00
Angle Drilling Rig	Per Crew-Hour	\$405.00
Rock Coring (N or H size)		
• From surface to 50 feet	Per Lineal Foot	\$49.90
• From 50 feet to 100 feet	Per Lineal Foot	\$57.10
• From 100 feet to 150 feet	Per Lineal Foot	\$64.50
• From 150 feet to 200 feet	Per Lineal Foot	\$71.10
• From 200 feet to 250 feet	Per Lineal Foot	\$77.60
• From 250 feet to 300 feet	Per Lineal Foot	\$84.60

SAMPLING

Additional SPT and Samples		
• From 10 feet to 25 feet	Per Add'l Sample	\$41.00
• From 25 feet to 50 feet	Per Add'l Sample	\$44.80
• From 50 feet to 100 feet	Per Add'l Sample	\$51.10
• From 100 feet to 125 feet	Per Add'l Sample	\$57.40
• From 125 feet to 150 feet	Per Add'l Sample	\$71.80
Undisturbed Samples		
• Shelby Tube	Per Sample	\$183.00
• Fixed-Piston Shelby, Osterberg, Pitcher	Per Sample	\$222.00

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ARDAMAN & ASSOCIATES, INC.
2023 FEE SCHEDULE
FIELD SERVICES (PAGE 2 OF 3)

SOUNDINGS

Electric Dutch Cone Soundings	Per Lineal Foot	\$17.50
Piezocone Soundings	Per Lineal Foot	\$19.20
Muck Probing/Clay Sampling	Per Crew-Hour	\$278.00
Electric Dutch Cone Soundings (Time Basis)	Per Crew-Hour	\$268.00
Piezocone/Piezoprobe Soundings (Time Basis)	Per Crew-Hour	\$290.00
Piezocone Dissipation Monitoring	Per Crew-Hour	\$290.00
Piezoprobe Dissipation Monitoring	Per Crew-Hour	\$231.00

OTHER CHARGES

Clearing Difficult Access, Hole Location and Set-up	Per Crew-Hour	\$236.00
Standby Time Conventional Drill Rig/2-Person Crew	Per Crew-Hour	\$236.00
Standby Time – LF350e Drill Rig/3-Person Crew	Per Crew-Day	\$5,800.00
Piezometer and Well Installation (plus materials)	Per Crew-Hour	\$264.00
Bore Hole Grouting and Sealing (plus materials)	Per Crew-Hour	\$264.00
Well Clearing/Sensitivity Test/Water Level Reading	Per Crew-Hour	\$264.00
Double Ring Infiltration Test	Per Test	\$770.00
Air Boat Use	Per Day	\$500.00
Support Water Truck Use	Per Day	\$200.00
Instrumentation Unit Use	Per Day	\$344.00
Meal Expenses for Field Employees (in Florida)	Per Crewman-Day	\$60.00
Meal Expenses for Field Employees (outside Florida)	Rate Determined Per Job	
Materials and Supplies	Per Job	At Cost + 12%

GENERAL FIELD EQUIPMENT

Data Logger	Per Day	\$445.00
Organic Vapor Analyzer (OVA 128 or Gastech)	Per Day	\$161.50
Photo Ionization Detector (Photovac Tip)	Per Day	\$201.00
Methane Detector	Per Day	\$166.00
Explosimeter	Per Day	\$105.50
Generator	Per Day	\$186.00
Air Compressor	Per Day	\$99.00
Steam Cleaner	Per Day	\$163.00
Surveying Equipment	Per Day	\$102.00
Centrifugal Development Pump	Per Day	\$81.00
Submersible Sampling Pump and Controller (Daily)	Per Day	\$235.00
Submersible Sampling Pump and Controller (Weekly)	Per Week	\$700.00
Submersible Development Pump (Daily)	Per Day	\$112.00
Submersible Development Pump (Weekly)	Per Week	\$322.00
Peristaltic Purging Pump	Per Day	\$80.00
Magnetometer	Per Day	\$76.50
Product/Water Interface Probe	Per Day	\$99.00
pH/Conductivity Meter	Per Day	\$35.00
Turbidity Meter	Per Day	\$82.00
Dissolved Oxygen Meter	Per Day	\$145.00
Water Level Indicator	Per Day	\$35.00
Bailer Usage	Per Day	\$34.00
Stream-Gaging Flow Meter	Per Day	\$38.00
Concrete Saw	Per Day	\$173.00
Vibration Monitor	Per Day	\$325.00
Trimble Geo7X w/ Centimeter Kit GPS	Per Day	\$88.00

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ARDAMAN & ASSOCIATES, INC.
2023 FEE SCHEDULE
FIELD SERVICES (PAGE 3 OF 3)

GENERAL FIELD EQUIPMENT (Continued)

Trimble R2 RTK Receiver	Per Day	\$125.00
Trimble R12 RTK Receiver	Per Day	\$145.00
Transducer	Per Day	\$120.00
Hand Auger	Per Day	\$24.50
Jon Boat and Motor	Per Day	\$250.00
Ponar Dredge	Per Day	\$30.00
Kemmerer Sampler	Per Day	\$30.00
Manta Data Sonde	Per Day	\$220.00
Bridge Board	Per Day	\$130.00
Inflatable Boat	Per Day	\$104.00

EXPENDABLE SUPPLIES

High Capacity (1 or 0.45 micron) Filter	Each	\$31.00
Disposal Teflon Bailer	Each	\$29.00
Disposable Polyethylene Bailer	Each	\$18.30
Disposable Free Product Bailer	Each	\$30.50
Isopropyl Alcohol (decontamination)	Per Gallon	\$20.10
Deionized Water (decontamination)	Per Five Gallons	\$14.75
16 oz. Soil Jars (soil headspace analysis)	Per Box of 12	\$14.75
Tygon Tubing	Per Foot	\$3.80
Polyethylene Tubing	Per Foot	\$0.65
55-gallon Drum	Each	\$92.55
Master Lock	Each	\$19.85

GEOPHYSICAL EQUIPMENT

Geonics EM 34-3	Per Day	\$340.00
AGI Sting R1-IP	Per Day	\$318.00
Liner Leak Detection Equipment	Per Day	\$357.00
Microgravity	Per Day	\$535.00

UNMANNED AERIAL VEHICLE EQUIPMENT

Carrier H6 Hexacopter	Per Day	\$455.00
MicaSense Altum Multispectral Sensor	Per Day	\$405.00
Sony Alpha 7R III Camera	Per Day	\$198.00

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ARDAMAN & ASSOCIATES, INC.
2023 FEE SCHEDULE
LABORATORY SOIL TESTING SERVICES (PAGE 1 OF 2)

CLASSIFICATION TESTS

Soil Water Content (ASTM D2216-Method B)	Each	\$18.50
Gypsum Water Content (ASTM D2216 at 40°C)	Each	\$32.00
Organic Content		
Loss on Ignition (ASTM D2974)	Each	\$42.25
Wet Combustion (AASHTO T-194)	Each	\$210.00
Undisturbed Tube Sample Total Unit Weight and Dry Density (ASTM D7263-Method B; w/ Soil Water Content and Classification)	Each	\$83.50
Particle-Size Distribution		
Sieve Analysis (ASTM D6913)	Each	\$64.50
Fines Content (ASTM D1140-Method B)	Each	\$44.00
Hydrometer Analysis (ASTM D7928)	Each	\$140.50
Atterberg Limits (ASTM D4318; Method A; Wet Preparation)		
Plasticity Index Less Than 150%	Per Set	\$141.00
Plasticity Index Greater Than 150%	Add'l Per Set	\$86.00
Shrinkage Limit (ASTM D4943)	Each	\$113.00
Specific Gravity (ASTM D854-Method A; Wet Preparation)	Each	\$123.75
Marsh Funnel Viscosity (ASTM D6910; API 13B-1)	Each	\$29.00
Slump Cone (ASTM C143)	Each	\$29.00
Effective Porosity (ASTM D6836 – Method C; $u_g = 1/3$ atm)	Each	\$99.00
Soil Thermal Conductivity (ASTM D5334; 1 w_c and γ_d)	Each	\$160.00
Rock Thermal Conductivity (ASTM D5334; 1 w_c and γ_d)	Each	\$350.00

COMPACTION TESTS

Standard (ASTM D698) or Modified Proctor (ASTM D1557)		
Up to 5 Points	Per Test	\$142.50
More than 5 Points	Per Add'l Point	\$19.50
Plasticity Index Greater Than 20%	Add'l Per Test	\$153.00
Maximum-Minimum Density (ASTM D4253-Method 1A; D4254-Method A)	Per Set	\$160.00
Limerock Bearing Ratio (3 Points)	Per Set	\$479.00

CONSOLIDATION TESTS

Incremental Consolidation Test (ASTM D2435-Method B; w/c_v and C_{ae})		
Up to Ten Load or Unload Increments	Per Test	\$795.00
More than Ten Load or Unload Increments	Per Add'l Increment	\$71.50
Constant Rate of Strain Consolidation Test (ASTM D4186)	Each	\$795.00
Settling Test (D=10cm; Ho=30cm)	Each	\$157.00

PERMEABILITY TESTS

Permeability Test – Rigid Mold (ASTM D5856; D2434)	Each	\$312.00
Permeability Test – Flexible Wall (ASTM D5084)		
$k > 1E-08$ cm/sec	Each	\$399.00
$k \leq 1E-08$ cm/sec	Each	\$559.00
Permeation with Fluid Other Than Water	Add'l Per Test	\$253.00

STRENGTH TESTS

Strength Index Tests (Torvane, Penetrometer)	Each	\$8.00
Vane Shear Test (ASTM D4648)	Each	\$32.00
Unconfined Compression Test (ASTM D2166)		
Strength Only	Each	\$71.25
With Stress-Strain Curve	Each	\$131.50
Triaxial Tests		
Unconsolidated-Undrained (ASTM D2850)	Each	\$335.00
Unconsolidated-Undrained (ASTM D2850; with Δu response)	Each	\$745.00
Consolidated-Undrained (ASTM D4767)	Each	\$745.00
Consolidated-Drained on Sands (ASTM D7181)	Each	\$615.00
Consolidated-Drained on Fine-Grained Soils (ASTM D7181)	Each	\$800.00

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ARDAMAN & ASSOCIATES, INC.
2023 FEE SCHEDULE
LABORATORY SOIL TESTING SERVICES (PAGE 2 OF 2)

STRENGTH TESTS (Continued)

Direct Shear Tests		
Conventional 2.3" Box Shear (ASTM D3080)	Per Normal Load	\$375.00
2.3" Box Shear with Stress Reversals	Per Normal Load	\$570.00
2.3" Box Shear with Geosynthetics	Per Normal Load	\$390.00
Direct Simple Shear Test (ASTM D6528)	Per Normal Load	\$940.00
Split Tensile for Rock Cores (ASTM D3967)	Each	\$182.50
Angle of Repose	Each	\$64.50

Preparation of laboratory samples for testing (e.g., sedimented or compacted) will be charged at \$45.75 per sample. Prices for visual classification, special sample preparation, special laboratory tests (slurry consolidation, leaching tests, settling tests, etc.), and for testing contaminated soils or hazardous materials will be determined per project based on technician hours and other considerations. In addition, a daily charge of \$26.25 per day will be assessed for special long-term laboratory tests (i.e., slurry consolidation, leaching tests, etc.).

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ARDAMAN & ASSOCIATES, INC.
2023 FEE SCHEDULE
LABORATORY CHEMICAL AND GEOSYNTHETIC TESTING SERVICES

CHEMICAL TESTS

pH (FM5-550)	Each	\$10.25
Specific Conductance (FM3-D 1125)	Each	\$11.25
Sulfate (FM5-553)	Each	\$54.75
Chloride (FM5-552)	Each	\$54.75
Soil pH (FM5-550)	Each	\$54.75
Soil Specific Conductance	Each	\$54.75
Soil Resistivity (ASTM G57 or FM5-551)	Each	\$61.25
Carbonate Content (ASTM D4373; HCl gasometric)	Each	\$90.50
Carbonate Content (FM5-514; HCl gravimetric)	Each	\$150.50
Water Corrosivity Series (FM5-550,552,553, FM3-D 1125)	Each	\$125.25
Soil Corrosivity Series (ASTM D2216, FM5-550, 551, 552, 553)	Each	\$220.25
Aggregate Soluble Silica (H2SO4 Extraction)	Each	\$325.00
Concrete Low-Level Chloride (FM5-516)	Each	\$200.00

GEOSYNTHETICS

Geomembrane Thickness (ASTM D751, D5199, or D5994)	Per Sample	\$21.00
Textured Geomembrane Thickness (ASTM D5994; 10 specimens)	Per Sample	\$21.00
Geomembrane Asperity Height (ASTM D7466)	Per Sample	\$45.00
Geomembrane Density (ASTM D792)	Per Sample	\$39.75
Carbon Black Content (ASTM D1603)	Per Sample	\$43.00
Geomembrane Tensile Strength (ASTM D6693; 5 MD/5 XD)	Per Set	\$101.00
Geomembrane Tear Resistance (ASTM D1004; 10 MD/10 XD)	Per Set	\$89.25
Geomembrane Seams (ASTM D6392)		
• Extrusion Weld (5 Peel/5 Shear)	Per Set	\$59.50
• Double-Wedge Fusion Weld (10 Peel/5 Shear)	Per Set	\$88.75
Geotextile Grab Strength ((ASTM D4632; 10 MD/10 XD)	Per Set	\$100.50
Geotextile Trapezoidal Tear (ASTM D4533; 10 MD/10 XD)	Per Set	\$118.75
Geotextile Wide-Width Tensile (ASTM D4595; 6 MD/6 XD)	Per Set	\$153.75
Geotextile Mass/Unit Area (ASTM D3776 or D5261)	Per Sample	\$40.75
Geotextile Thickness (ASTM D1777 or D5199)	Per Sample	\$21.25
Geotextile Seam Strength (ASTM D4884; 6 specimens)	Per Set	\$77.50
Geotextile Apparent Opening Size (ASTM D4751-Method A; 5 specimens)	Per Sample	\$175.00
Geotextile Permeability/Permittivity (ASTM D4491; 4 specimens)	Per Sample	\$145.00
Geocomposite Bond Strength (ASTM D7005; 5 MD Both Sides)	Per Set	\$125.75
Geocomposite Transmissivity (ASTM D4716; 2 specimens, 1 σ_n and 1i)	Per Sample	\$145.00
Geocomposite Ply Adhesion	Per Sample	\$117.00
Geonet Thickness (ASTM D5199-Procedure A; 10 specimens)	Per Sample	\$21.00
Geonet Mass/Unit Area	Per Sample	\$40.75
Geonet Density (ASTM D792-Method A; 2 specimens)	Per Sample	\$39.75
Geonet Tensile Strength	Per Set	\$69.25
Geonet Transmissivity (ASTM D4716; 2 specimens, 1 σ_n and 1i)	Per Sample	\$145.00
Geonet Breaking Force (ASTM D7179; 5 MD)	Per Set	\$74.50
GCL Bonding Peel Strength (ASTM D6496; 5 MD)	Per Set	\$74.50
GCL Tensile Strength (ASTM D6768; 5 MD)	Per Set	\$74.50
Interface Direct Shear (ASTM D5321)		
• Geosynthetic to Geosynthetic	Per Normal Stress	\$344.00
• Geosynthetic to Soil	Per Normal Stress	\$465.00

SAMPLE PREPARATION AND SPECIAL TESTS

Preparation of samples for testing (e.g., crushing for carbonate content determination, filtering of clayey soil for chemical tests) will be charged at \$45.75 per sample. Prices for other tests on geomembranes and geotextiles will be determined per project based upon technician hours and other considerations.

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