TERRATECH
ENGINEERS • INC

Geotechnical Engineering
Environmental Consulting
Construction Materials Testing

July 8, 2002

Mr. Tom Holland, Jr.
Atlantic Foundation and Repair
7605 Wellborn Street
Raleigh, NC 27615

Report of Axial Load Testing
On Steel Helical Piers
Our Project Number 121-02-26080

Gentlemen:

As requested, TerraTech Engineers, Inc. has performed a load testing program on The Stabilizer helical piers manufactured by Atlantic Foundation and Repair. The purpose of our testing was to evaluate the axial load capacity of The Stabilizer helical piers. The results of our testing are provided herein.

Executive Summary

The Stabilizer Helical piers were installed at a site in the Piedmont geologic province of North Carolina for a determination of axial load capacity. Four of the helical piers were used to anchor a reaction frame for the test pier. Load testing was performed in accordance with section 5.6 (Quick Load Test Method for Individual Piles) of ASTM Standard D1143-81 *Standard Test Method for Piles Under Static Axial Compressive Load*. The Stabilizer helical piers supported an axial load of 50 kips with a maximum deflection of 0.19 inches. Using a standard factor of safety of 2, The Stabilizer helical pier that we tested was suitable for a design axial load of 25 kips.

Site Geologic and Subsurface Conditions

The tested site is a property on Sumner Drive in Raleigh, North Carolina. This site is located in the Raleigh Belt of the Piedmont Physiographic Province of North Carolina. Soils in this area have been formed by the in-place weathering of the underlying crystalline rock, which accounts for their classification as "residual" soils. Residual soils near the ground surface, which have experienced advanced weathering, frequently consist of clayey silt (ML) or silty clay (CL). The thickness of this surficial clayey zone may range up to roughly 6 feet. (For various reasons, such as erosion or local variation of mineralization, the upper clayey zone is not always present.) With increased depth, the soil becomes less weathered, coarser grained, and the structural character of the underlying parent rock becomes more evident. These residual soils are typically classified as sandy micaceous silt (ML) or silty micaceous sand (SM). With an increase in depth, the soils eventually become quite hard and resemble the underlying parent rock. When these materials have a standard penetration resistance of 100 blows per foot or greater, they are referred to as partially weathered rock. The transition from soil to partially weathered rock is usually a gradual one. Lenses or layers of partially weathered rock are not unusual in the soil profile. The thickness of the zone of partially weathered rock and the depth to the rock surface have both been found to vary considerably over relatively short distances. The depth to the rock surface may frequently range from the ground surface to 80 feet or more.

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One soil test boring was performed in the vicinity of the test pile location to evaluate the site subsurface conditions. The results of this boring are provided on the Test Boring Record (B-1) included in the Appendix. In general, the subsurface conditions at this site consisted of an approximately 5 foot thick layer of native sandy silts that have been placed as fill materials, underlain by an approximately 1.5 foot thick layer of sandy clay residual soils. Beneath the sandy clay soils, silty sand residual soils were present to the boring termination depth of 14.5 feet. Standard penetration resistances in the fill soils ranged from 15 to 19 blows per foot. Standard penetration resistances in the residual soils ranged from 11 to 23 blows per foot. The standard penetration resistance at the approximate tip elevation of the tested pier was 23 blows per foot. No ground water was encountered in our test boring.

Pier Configuration and Test Results

The pier tested at this site consisted of an approximately 14 foot long, hollow stem 3.5 inch diameter A-36 steel shaft with a 12 inch single flight helix near the tip. The shaft was comprised of two 7 foot long shaft sections that were bolted together using standard ASTM A-325 bolts. The tip of the pier was located approximately 14 feet below the ground surface at the time of the load test. The test frame consisted of a series of steel I-beams that were bolted to the reaction piers. The reaction piers were similar to the test piers in length and configuration. A hydraulic jack and ram that was calibrated in our laboratory prior to the field test was used to apply a maximum axial load of 50 kips.

The maximum deflection of the top of the pier under an axial load of 50 kips was 0.19 inches. There was no net deflection after removal of the load. None of the reaction piers showed measurable uplift. A load-deflection curve for the test pier is provided in the Appendix.

Conclusions

The results of the test site indicate that The Stabilizer helical pier manufactured by Atlantic Foundation and Repair is capable of supporting an axial load of 50 kips when supported on suitable soils. The measured maximum deflection of 0.19 inches is minimal for the anticipated use of the pier, since most residential and light commercial structures are capable of withstanding up to 1 inch of total settlement without adverse effect. Using a standard factor of safety of 2, The Stabilizer helical pier that we tested was suitable for a design axial load of 25 kips.

Closure

We appreciate the opportunity to provide this engineering evaluation. If you have any questions about this report, or if we can be of additional service, please do not hesitate to contact us.

Sincerely,
TerraTech Engineers, Inc.

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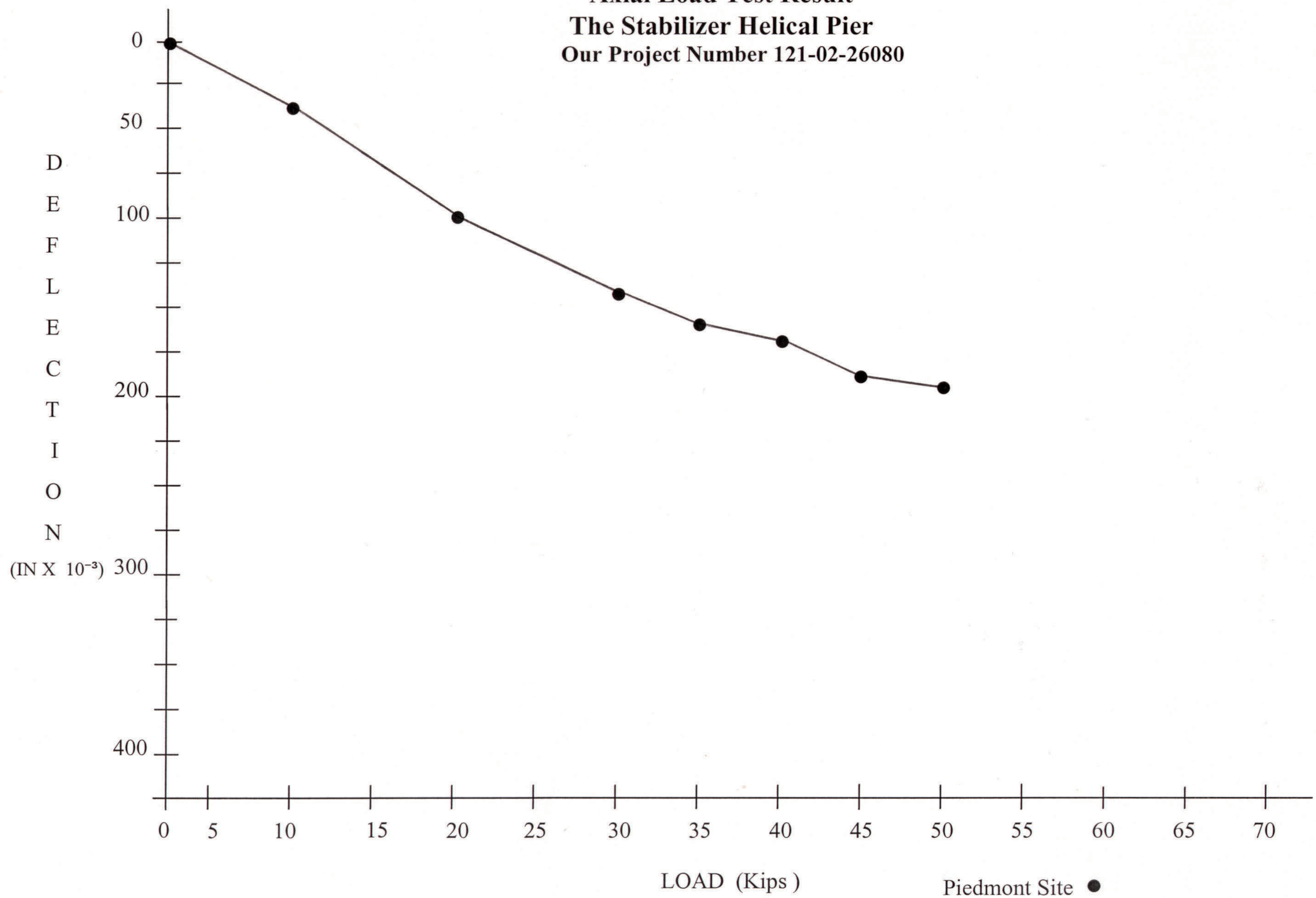
JET/jb

Enclosures

APPENDIX

Axial Load Test Result
The Stabilizer Helical Pier
Our Project Number 121-02-26080



Symbols and Nomenclature

▮	Undisturbed Sample (UD)
●	Standard penetration resistance (ASTM D-1586)
100/2"	Number of blows (100) to drive the spoon a number of inches (2)
W-O-H, R	Weight of Hammer, Weight of Rods
AX, BX, NX	Core barrel sizes for rock cores
65%	Percentage of rock core recovered
RQD	Rock quality designation - % of core 4 or more inches long
▼	Water table at least 24 hours after drilling
▼	Water table one hour or less after drilling
△	Loss of drilling water
A	Atterberg Limits test performed
C	Consolidation test performed
GS	Grain size test performed
T	Triaxial shear test performed
P	Proctor compaction test performed
18	Natural moisture content (percent)

Penetration Resistance Results

Sands	Number of Blows, N	Relative Density
	0-4	very loose
	5-10	loose
	11-20	firm
	21-30	very firm
	31-50	dense
	over 50	very dense

Silts and Clays	Number of Blows, N	Approx. Consistency
	0-1	very soft
	2-4	soft
	5-8	firm
	9-15	stiff
	16-30	very stiff
	31-50	hard
	over 50	very hard

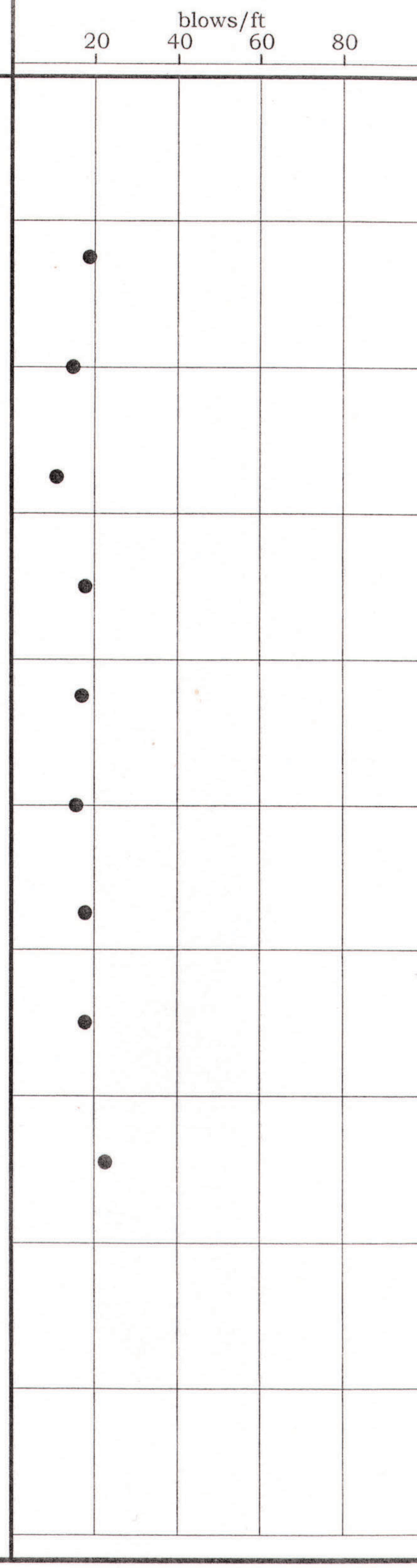
Drilling Procedures

Soil sampling and standard penetration testing performed in accordance with ASTM D-1586. The standard penetration resistance is the number of blows of a 140 pound hammer falling 30 inches to drive a 2 inch O.D., 1.4 inch I.D. split spoon sampler one foot. Core drilling performed in accordance with ASTM D-2113. Undisturbed sampling performed in accordance with ASTM D-1587.

TEST BORING RECORD

Depth	Description	Elev.	Water Level	Blow Counts
1				
2–5	Very stiff red brown fine to coarse sandy micaceous silt (ML) with quartz fragments and clay (FILL)	-5		7-9-10 8-7-8
5–6.5	Stiff red brown fine to coarse sandy micaceous clay (CL) with quartz fragments and silt (RESIDUUM)	-6.5		5-5-6
6.5–15	Firm to very firm tan brown silty micaceous fine to coarse sand (SM)	-14.9		5-8-10 8-8-9 7-8-8 7-8-10 7-8-10 5-9-14
15	BORING TERMINATED			
16–20				

Standard Pentration Test



Water Level 24 hr.: Boring Backfilled Upon Completion
Water Level 1 hr.: Not Encountered

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Boring Number: B-1
Project Number: 121-02-26080
Date Drilled: 6/5/02
Sheet: 1 of 1