



PROJECT SUMMARY

GREEN SQUARE NATURE RESEARCH CENTER AND PARKING DECK

Architect: Obrien Atkins / Fentress
Contractor: Clancy + Theys

Located in downtown Raleigh, North Carolina, the Nature Research Center and parking deck are part of the public-private Green Square Complex development along Jones Street between Dawson and Salisbury Street. The project consisted of the construction of the 101,000 sq. ft. NRC building with two levels of below-grade parking. Construction began in 2009.

Tai and Associates completed subsurface exploration services for the project providing design and construction recommendations. The NRC building and parking deck are supported on caissons with a design capacity of 20 tsf. Prior to construction, three full-scale load tests were performed to verify the design assumptions.

During caisson construction, Tai and Associates provided field engineering, testing and inspection services. We monitored drilling and approved caissons for the required capacity as well as completely rebar inspections and concrete testing.

Tai and Associates worked in cooperation with the project special inspector, GKC Associates, and served as agent to the special inspector during our testing and inspection services.



Tai and Associates, PLLC

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PROJECT SUMMARY

DUKE UNIVERSITY MEDICAL CENTER

Tai and Associates has completed over 100 projects at Duke University and DUMC. We have completed over 700 projects in the Durham Triassic Basin, the relatively small geologic region in which Duke is located. The following three projects are a sample in which we performed geotechnical engineering, field inspection of foundations, concrete, and rebar.

PROJECTS PERFORMED AT DUMC AND DUKE UNIVERSITY

DUMC AMBULATORY CARE CLINICS
DUMC BRAIN IMAGING
DUMC CENTER FOR HUMAN DISEASE
DUMC CHILDRENS AND OBSTETRICAL
DUMC CLINICS & ERS PHASE II
DUMC ED EXPANSION
DUMC EYE CLINIC AND PGIV
DUMC GSRB 2
DUMC HOSPITAL ADDITION FOR SURG.
DUMC HOSPITAL ENTRY AND PG2 IMPR
DUMC MHA AND CANCER CENTER
DUMC MSRB 2
DUMC PARKING GARAGE III
DUMC PATIENT TRANSPORT ALCOVE
DUMC RESEARCH PARKING GARAGE
DUMC VIVARIUM ADDITION
DUMC-HELISTOP RELOCATION
DUMC-MHA PARKING DECK
DUKE UNIVERSITY BASKETBALL
DUKE UNIVERSITY BOOK DEPOSITORY

DUKE UNIVERSITY BRYAN CENTER PG
DUKE UNIVERSITY CENTRAL CAMPUS PHASE I
DUKE UNIVERSITY ENGINEERING (CIEMAS)
DUKE UNIVERSITY DIVINITY SCHOOL ADDITION
DUKE UNIVERSITY EAST CAMPUS DORMITORY
DUKE UNIVERSITY FEW EDENS LINK PROJECT
DUKE UNIVERSITY FOOTBALL BLD SUBSURF
DUKE UNIVERSITY GENETICS BUILDING
DUKE UNIVERSITY GEONOME LABORATORY
DUKE UNIVERSITY GROSS CHEMISTRY CHILLER
DUKE UNIVERSITY LAW SCHOOL ADDITION
DUKE UNIVERSITY LIBRARY SERVICES CENTER
DUKE UNIVERSITY NURSING SCHOOL
DUKE UNIVERSITY OIT BUILDING RENOVATION
DUKE UNIVERSITY OUTDOOR TENNIS FACILITY
DUKE UNIVERSITY PERKINS LIBRARY ADDITION
DUKE UNIVERSITY PG9
DUKE UNIVERSITY PGV
DUKE UNIVERSITY SANFORD INSTITUTE BLD
DUKE UNIVERSITY-MORRIS BLDG ADDITION

DUMC-MSRB II

Owner: Duke University Medical Center
GC: Bovis Lend Lease

The 6-story cast in place structure was founded on high bearing capacity shallow foundations (8,000 psf!). Bovis, placed concrete at high speeds, but we were able to keep up with an on-site testing lab, which we mobilized solely for that project, where we completed over 1,200 concrete test cylinders.



Duke Engineering, CIEMAS

Owner: Duke University
Contractor: Skanska USA

The Center for Interdisciplinary Engineering, Medicine and Applied Sciences (CIEMAS) building at Duke University was complicated due to size and proximity to adjacent structures. The 4-building, 332,000 sf complex was constructed of cast-in-place concrete, for which we also mobilized an on-site concrete testing lab. Thorough coordination between the Structural Engineer, Architect, and our firm resulted in almost no change orders during site work and shallow foundation construction.



DUMC Children's Health Center and Brain Imaging Center

Owner: Duke University Medical Center
Contractor: Bovis Lend Lease

The Duke Children's Health Center was supported by a hybrid foundation system consisting of high capacity shallow foundations (5 tsf) and caissons (20 tsf). Tai and Associates provided similar recommendations for the Brain Imaging and Emergency Department Additions located behind the Children's Center.



PROJECT SUMMARY

CENTRAL REGION PSYCHIATRIC HOSPITAL

Architect: The Freelon Group

Owner: NC DHHS

Contractor: RN Rouse

Butner, NC

Project Size: 450,000 SQ. FT

Project Cost: \$110,000,000

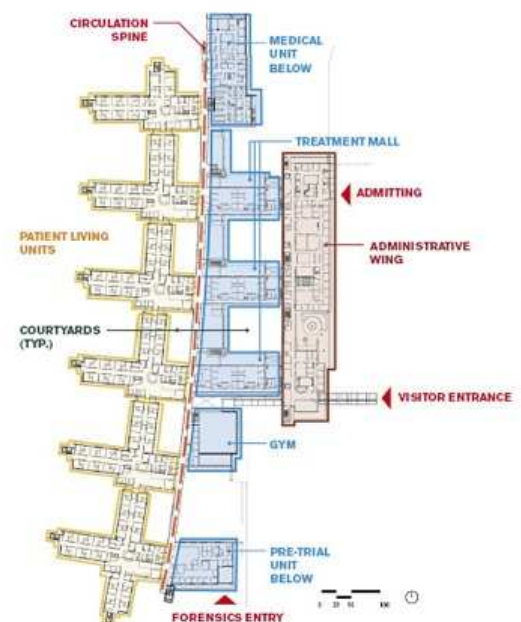
Occupancy Date: 09/30/2007

Project Awards: AIA North Carolina
Honor Award 2006



The Department of Health and Human Services consolidated two aging psychiatric hospitals located in Raleigh and Butner, North Carolina into a single new 432 patient room facility located in Butner, North Carolina. Tai and Associates, working with The Freelon Group and Stewart Engineering, provided geotechnical engineering services for the new 450,000 square foot prototype facility.

During Construction of the \$110,000,000 facility, Tai and Associates also provided field engineering, testing, and inspection services for the referenced project from 2005 through 2008. Materials testing included the completion of 302 In-Place Density tests and 2,148 concrete test cylinders.





PROJECT SUMMARY

NORTH CAROLINA STATE UNIVERSITY ENGINEERING BUILDING II

Architect: Perkins + Will
Contractor: Clancy + Theys

Located at Centennial Campus, the Engineering Building II project consisted of site grading and the construction of the 211,000 sq. ft. building. Construction was completed in 2005.

Tai and Associates completed subsurface exploration services for the project providing design and construction recommendations. The College of Engineering Phase II building is supported on 4,000 psf shallow foundations.

During construction of the \$41 million facility, Tai and Associates provided field engineering, testing and inspections services. We performed density testing during mass grading and utility installation, foundation bearing capacity inspections, concrete testing, masonry testing and inspection, rebar inspections and fireproofing testing.

Tai and Associates worked in cooperation with the project special inspector, Atlas Engineering, Inc., and served as agent to the special inspector during our testing and inspection services.





PROJECT SUMMARY

AMERICAN TOBACCO CAMPUS, DURHAM, NORTH CAROLINA

Downtown Durham's Entertainment district includes the The American Tobacco Campus, the Durham Performing Arts Center, Diamond View Office Buildings, and the Durham Bulls Athletic Park.

Over the past ten years, Tai and Associates has provided on-going engineering services for multiple clients on the following projects:

1. Stadium Additions to the Durham Bulls Athletic Park
2. Diamond View I Office Building
3. Diamond View II Office Building
4. Durham Performing Arts Center
5. American Tobacco Phase III Apartments
6. American Tobacco East Parking Deck
7. American Tobacco South Parking Deck
8. American Tobacco North Parking Deck
9. American Tobacco Building Renovations



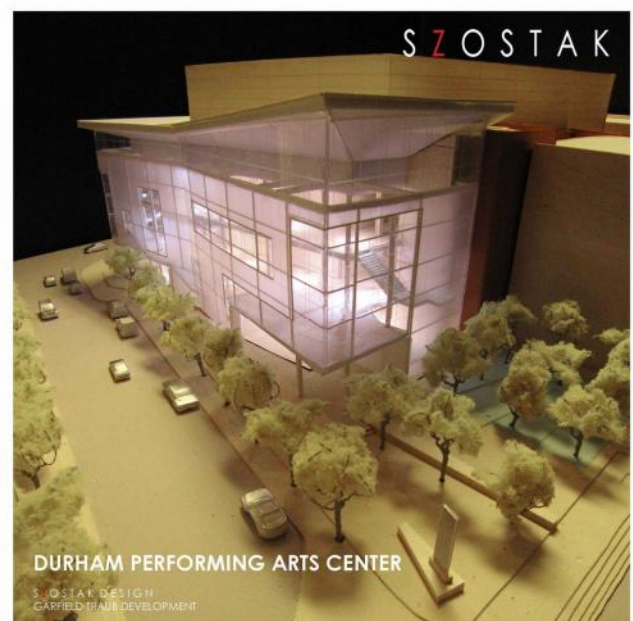
Durham Performing Arts Center

Architect: Szostak Design

GC: Skanska USA

Owner: City of Durham, Capital Broadcasting

The 2,800-seat Durham Performing Arts Center consists of a combination of cast-in-place concrete and structural steel construction. The primary technical issue was its subgrade consisting of two different geologic conditions: Triassic Basin and Diabase Dike. After thorough study of site, and based on extensive experience with the local geology, we worked with Stewart Engineering and Szostak Design to develop a foundation design consisting of high bearing capacity shallow footings (8,000 psf!). Tai and Associates provided inspection of soils, foundations, rebar, structural steel, and fireproofing.





PROJECT SUMMARY

AMERICAN TOBACCO CAMPUS, DURHAM, NORTH CAROLINA (Continued)

American Tobacco North and South Decks

Architect: Belk Architecture

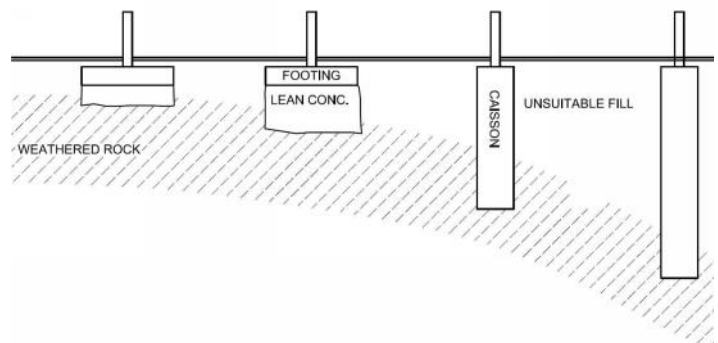
Contractor: Bovis Lend Lease

Owner: City of Durham

The American Tobacco North and South Decks each encountered complex subsurface conditions. The north deck was founded partially on a diabase dike. It was also founded adjacent to a 35-foot deep sanitary sewer line. About half of the south deck subgrade consisted of over 20 feet of existing soft fill placed 50 years earlier. Tai and Associates provided a subsurface exploration program and foundation design recommendations.

Both decks were constructed simultaneously by Bovis Lend Lease, but each had a different design team and Owner. Both deck foundations consisted of hybrid of drilled shafts (20 tsf end bearing) and high capacity shallow foundation systems (up to 10,000 psf!). During Construction, Tai and Associates provided field engineering, testing, and inspection of soils, foundations, concrete, and rebar.

Tai and Associates provided engineering and testing services on multiple projects within a small area at the American Tobacco Complex. We utilized the same drillers, technicians, and engineers throughout the project over the course of ten years. As a result, we were able to provide continuity of service throughout the project, an invaluable service that can only be accomplished through long term retention of employees.



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PROJECT SUMMARY

BRIAR CHAPEL MIDDLE SCHOOL

Owner: Chatham County Schools

Architect: SfL+a Architects

Engineer: H&H Engineering

Contractor: JS Clark

Construction: 2008-2010

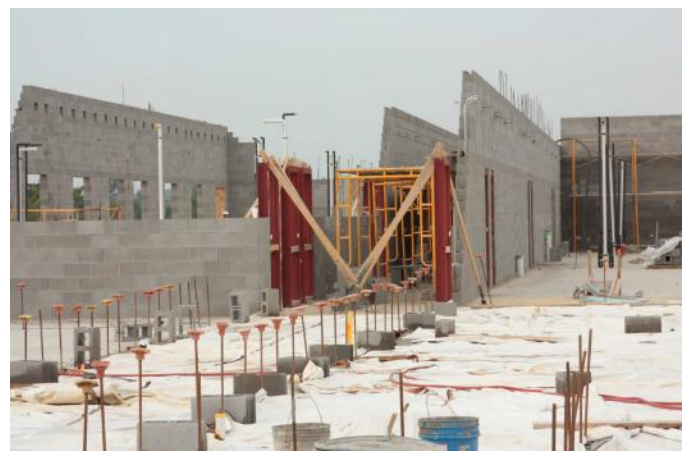
Tai and Associates has worked on over 50 public schools in the past 10 years providing a variety of engineering services for K-12 public schools. Briar Chapel Middle School is the most recent project performed in Chatham County. We have also worked in Harnett, Durham and 13 other counties.

Typical public school construction consists of structural steel and elevated concrete slabs supported on masonry load bearing walls founded on cast-in-place continuous and spread footings. The ever changing factor in typical school construction is the soils that support the building. Tai and Associates has invaluable experience and knowledge of the predominant subsurface conditions of the North Carolina Piedmont and Coast Plain deposits.

Tai and Associates provided field engineering, testing, and special inspections during the foundation, cast-in-place concrete, structural steel and masonry construction of the Briar Chapel Middle School project.

K-12 SCHOOL PROJECTS PERFORMED BY TAI AND ASSOCIATES PAST 10 YEARS

JOB NAME	COUNTY	JOB NAME	COUNTY
ELEMENTARY SCHOOL HEBRON RD	DURHAM	ENLOE HIGH SCHOOL ADDITION	WAKE
NEW MIDDLE SCHOOL SNOW HILL RD	DURHAM	EM HOLT ELEMENTARY SCHOOL ADD.	ALAMANCE
BRIERWOOD ELEMENTARY SCHOOL	MECKL	HEATH SPRINGS ELEMENTARY SCHOOL	DAVIDSON
NORTHERN HIGH SCHOOL ADDITION	DURHAM	BETHESDA ELEMENTARY SCHOOL	DURHAM
BRIER CHAPEL MIDDLE SCHOOL	CHATHAM	BROUGHTON HIGH SCHOOL PARKING LOT	WAKE
HARNETT CO ELEMENTARY-ANGER	HARNETT	LUMBERTON HIGHSCHOOL ADDITION	ROBESON
HARNETT COUNTY NEW ELEMENTARY	HARNETT	NEWTON MIDDLE SCHOOL	CATAWBA
CHATHAM SCHOOLS BUS MAINT	CHATHAM	ORANGE CHARTER SCHOOL	ORANGE
CHATHAM SCHOOLS ADMIN	CHATHAM	FUQUAY VARINA HIGH SCHOOL AD.	WAKE
HIGHLAND ELEMENTARY SCHOOL GYM	LEE	J. S. WATERS SCHOOL GYM FLOOR	LEE
RB DEAN ELEMENTARY SCHOOL CAF	ROBESON	OAK GROVE ELEMENTARY SCHOOL	DURHAM
FOREST HILLS HIGH SCHOOL	UNION	VASS LAKEVIEW SCHOOL	MOORE
OVERHILLS ELEMENTARY-SI	HARNETT	LAKEWOOD ELEMENTARY	DURHAM
A. L. STANBACK MIDDLE SCHOOL	ORANGE	CHAPEL HILL HIGH SCHOOL ADDITION	ORANGE
STOUGH ELEMENTARY	WAKE	PINECREST HIGH SCHOOL	MOORE
PINECREST HIGH SCHOOL ADDITION	MOORE	MIDDLEBROOK HIGH SCHOOL	WAKE
BRAWLEY MIDDLE SCHOOL ADDITION	HALIFAX	BONLEE ELEMENTARY DINING	CHATHAM
DURHAM HIGH SCHOOL RENOVATION	DURHAM	EAST MONTGOMERY MIDDLE PARKING	MONTG
Y E SMITH ELEMENTARY SCHOOL	DURHAM	BISCOE SCHOOL SITE	MONTG
J. T. WILLIAMS MIDDLE SCHOOL ADDITION	MECKL	NEWTON-CANOVER HIGH SCHOOL	CATAWBA
APEX ELEMENTARY SCHOOL	WAKE	JENKINS ROAD ELEMENTARY	WAKE
CARRINGTON MIDDLE SCHOOL	DURHAM	R. N. HARRIS ELEMENTARY SCHOOL	DURHAM
CARRINGTON HIGH	DURHAM	SALEM ELEMENTARY SCHOOL	WAKE
WILSON SCHOOLS WELLS ELEM ADDITION	WILSON	ELM CITY MIDDLE SCHOOL ADDITIONS	WILSON
DURHAM HS RENOVATION	DURHAM	DURHAM HIGH SCHOOL WEAVER AUD.	DURHAM
PINECREST HIGH STADIUM ADDITION	MOORE	HOGGARD HIGH SCHOOL ADDITION	NEW HAN





PROJECT SUMMARY

NORTH CAROLINA STATE UNIVERSITY CENTENNIAL CAMPUS – VENTURE CENTER

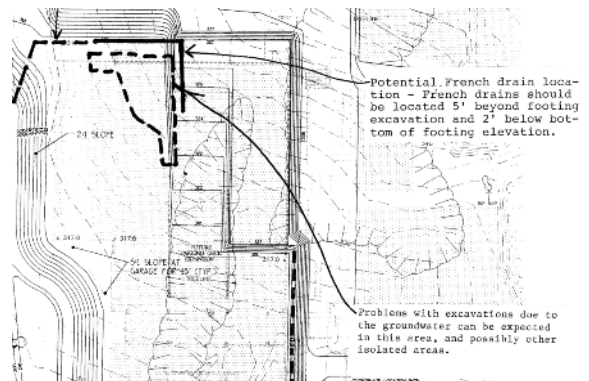
Developer: Craig Davis Properties
Contractor: J. D. Beam

Venture Center is located at NCSU's Centennial Campus. Construction of the final building, Venture IV, was completed in 2004.

Tai and Associates completed subsurface exploration services for the entire Venture Center tract. Two buildings are founded on timber pile foundations, while the remaining three buildings and the entire parking deck are supported by 4,000 psf shallow foundations. Difficult soil conditions existed due to a shallow groundwater table and existing unsuitable fill soils over 25 feet deep.

During construction, Tai and Associates provided field engineering, testing and inspection services for all five buildings and the entire parking deck. During grading, the groundwater was monitored closely to determine where it would impact the foundation excavations. Specific groundwater control measures were provided to allow the Contractor to continue with construction without delay.

In addition to observation and density testing during mass grading, Tai and Associates also provided a full range of ITL services. This included foundation bearing capacity inspection, concrete testing, rebar inspection, structural steel inspection, and fireproofing testing.





PROJECT SUMMARY

REX HEALTHCARE MEDICAL OFFICE BUILDING EAST AND PARKING DECK

Owner: Capital Associates
Owner: Rex Healthcare
Contractor: Brasfield & Gorrie

Tai and Associates has completed more than 15 projects on the REX Healthcare hospital campus. The parking deck is a component of the medical office building completed in 2005 for Capital Associates and REX Healthcare. It was a pre-cast addition to the existing deck, which Tai and Associates also worked on in 1988.



The MOB and Parking Deck projects were complicated by a close proximity to adjacent buildings, MSE retaining walls, deep utilities, and the storm water pond. Detailed shoring systems were required to be coordinated with the proposed structural and site retaining wall elements.



Soil Conditions were complicated by the presence of highly micaceous sandy SILTS with SPT N-Values of 10 to 20, and a shallow water table. Tai and Associates recommended a foundation design consisting of shallow foundations with a 4,000 psf bearing capacity.

Tai and Associates provided Subsurface Exploration Services and Shoring Design. We also performed field engineering, testing, and inspection services during the soils, foundation, concrete and steel construction of the project.



PROJECT SUMMARY

WAKEMED P1 PARKING DECK

Owner: WakeMed

Contractor: Brasfield & Gorrie

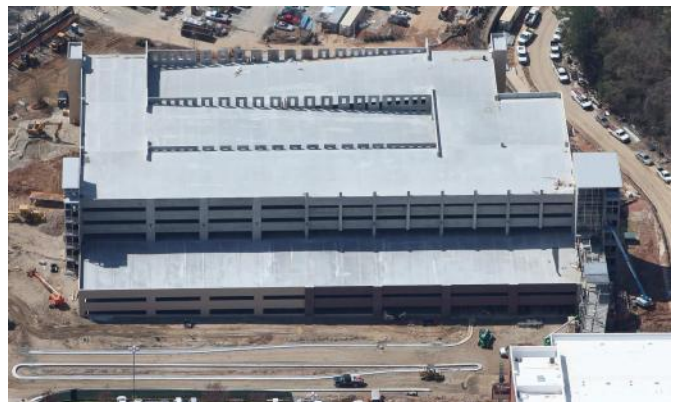
PARKING DECK PROJECTS PERFORMED IN THE LAST 10 YEARS

VA HOSPITAL PARKING DECK	WAKEMED P1 REPLACEMENT
DUMC-MHA PARKING DECK	UNC-CH BELL TOWER PARKING DECK
DUKE UNIVERSITY PG9	WAKEMED PG5 ADDITION
AMERICAN THEATER PARKING GARAGE	UNC-CH ARTS COMMONS PARKING GARAGE
CP&L PARKING DECK—SHORING PROBLEM	PIEDMONT TRIAD RESEARCH PARK BUILDING AND PARKING DECK
DUKE UNIVERSITY PGV	UNC-CH JACKSON CIRCLE PARKING DECK
BLUE CROSS BLUE SHIELD CSC PARKING DECK REPAIR	REX HOSPITAL BIRTHING CENTER PARKING DECK EXPANSION
DUMC RESEARCH PARKING GARAGE	OBERLIN COURT PARKING DECK
AMERICAN TOBACCO SOUTH DECK	AMERICAN TOBACCO COMPANY NORTH DECK
DUKE UNIVERSITY BRYAN CENTER PARKING GARAGE	NEW HANOVER COUNTY PARKING GARAGE AND OFFICE BUILDING
UNC-CH RAMS HEAD PARKING DECK	DUMC EYE CLINIC AND PGIV
BLUE CROSS BLUE SHIELD PHASE II PARKING DECK AND DAY CARE SITE	DIAMOND VIEW II PARKING DECK

Tai and Associates has worked on 24 parking decks in the past 10 years providing a variety of engineering services, including two parking deck projects on the WakeMed hospital campus. The latest parking deck was constructed in tandem with a new patient tower on the WakeMed hospital campus.

The Parking Deck project was complicated due to the presence of deep, boulder fill placed over 20 years prior to construction. Deep foundations were recommended due to concerns of consolidation settlement of the uncontrolled fill under the 2400 kip column loads. Caisson or driven pile foundations were not selected due to the potential construction problems associated with the large diameter boulder obstructions. More than 300 micropiles were installed to support the parking deck consisting of 400-kip piles installed with a percussion hammer capable of advancing through the boulders.

Tai and Associates provided field engineering, testing, and special inspections during the foundation, cast-in-place concrete, and pre-cast concrete construction of the project.



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PROJECT SUMMARY

COURTYARD BY MARRIOTT CHAPEL HILL, NC

Owner: Winston Hotels
GC: J. D. Beam, Inc.
Designer: HC Architecture
Tai Project Engineer: Matthew T. Ryan, PE

Construction of the addition (left wing in photo) was completed in 2007, while the original building construction was finalized in 2000.

The initial construction consisted of reinforced masonry supporting pre-cast hollow core deck. The addition consisted of structural metal stud framing.



Both structures were supported on 4,000 psf shallow footings on a combination of hard residual soil and new compacted fill.

Tai and Associates, PLLC provided subsurface exploration services, as well as field engineering, testing and inspection services during the grading, concrete, and masonry, and structural steel construction.

HOTELS SINCE 2000	DORMITORIES SINCE 2000
HILTON GARDEN INN CARY	BELMONT ABBEY RESIDENCE HALL
HILTON INN AT SOUTHPOINT	UNC PEMBROKE RESIDENCE HALL
RESIDENCE INN CHAPEL HILL	NCSU POLK HALL ADDITION AND RENOVATION
BELMONT HAMPTON INN	UNC PEMBROKE WEST HALL
MARRIOTT ON ERWIN ROAD	UNC CH ROSENAU HALL RENOVATION
MARRIOTT AT ARBORETUM	UNC CH HANES HALL RENOVATION
CRABTREE RESIDENCE INN	UNC CH HILL HALL ADDITION
RESIDENCE INN CHARLOTTE UPTOWN	BARTON COLLEGE NEW RESIDENCE HALL
MARRIOTT COURTYARD CHAPEL HILL	DUKE UNIVERSITY EAST CAMPUS DORMITORY