

Tryon Drive Drainage Improvements

APPENDIX D

Permits, Reports, and Supporting Documentation



ROY COOPER

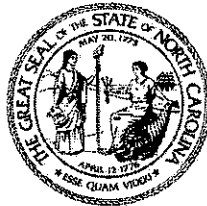
Governor

ELIZABETH S. BISER

Secretary

WILLIAM E. TOBY VINSON, JR.

Interim Director



NORTH CAROLINA
Environmental Quality

October 10, 2023

LETTER OF APPROVAL

City of Fayetteville
Douglas Hewett, Manager
433 Hay Street
Fayetteville, NC 28301

RE: Project Name: Tryon Drive Drainage Improvements
Acres Approved: 3.8
Project ID: CUMBE-2024-038
County: Cumberland, City: Fayetteville
Address: Tryon Drive
River Basin: Cape Fear
Stream Classification: Other
Submitted by: Travis Crissman
Date Received by LQS: September 22, 2023
Plan Type: Utility

Dear Mr. Hewett:

This office has reviewed the subject erosion and sedimentation control plan. We find the plan to be acceptable and hereby issue this Letter of Approval. The enclosed Certificate of Approval must be posted at the job site. This plan shall expire three (3) years following the date of approval, if no land disturbing activity has been undertaken, as is required by Title 15A NCAC 4B .0129.

As of April 1, 2019, all new construction activities are required to complete and submit an electronic Notice of Intent (NOI) form requesting a Certificate of Coverage (COC) under the NCG010000 Construction Stormwater General Permit. This form MUST be submitted and COC issued prior to the commencement of any land disturbing activity on the above-named project. The NOI form may be accessed at deq.nc.gov/NCG01. Please direct questions about the NOI form to Annette Lucas at Annette.lucas@ncdenr.gov or Paul Clark at Paul.clark@ncdenr.gov. After you submit a complete and correct NOI Form, a COC will be emailed to you within **three business days**. Initially, DEMLR will not charge a fee for coverage under the NCG01 permit. However, on or after June 1, 2019, a \$100 fee will be charged annually. This fee is to be sent to the DEMLR Stormwater Central Office staff in Raleigh.

Title 15A NCAC 4B .0118(a) and the NCG01 permit require that the following documentation be kept on file at the job site:



North Carolina Department of Environmental Quality | Division of Energy, Mineral and Land Resources
Fayetteville Regional Office | 225 Green Street, Suite 714 | Fayetteville, North Carolina 28301
910.433.3300

1. The approved E&SC plan as well as any approved deviation.
2. The NCG01 permit and the COC, once it is received.
3. Records of inspections made during the previous 30 days.

Also, this letter gives the notice required by G.S. 113A-61.1(a) of our right of periodic inspection to ensure compliance with the approved plan.

North Carolina's Sedimentation Pollution Control Act is performance-oriented, requiring protection of existing natural resources and adjoining properties. If, following the commencement of this project, the erosion and sedimentation control plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statute 113A-51 through 66), this office may require revisions to the plan and implementation of the revisions to ensure compliance with the Act.

Acceptance and approval of this plan is conditioned upon your compliance with Federal and State water quality laws, regulations, and rules. In addition, local city or county ordinances or rules may also apply to this land-disturbing activity. This approval does not supersede any other permit or approval.

Please note that this approval is based in part on the accuracy of the information provided in the Financial Responsibility Form, which you provided. You are requested to file an amended form if there is any change in the information included on the form. This permit allows for a land-disturbance, as called for on the application plan, not to exceed the approved acres. Exceeding the acreage will be a violation of this permit and would require a revised plan and additional application fee. Any addition in impervious surface, over that already noted on the approved plan, would also require a revised plan to verify the appropriateness of the erosion control measures and the stormwater retention measures. (GS 113A-54.1(b)). In addition, it would be helpful if you notify this office of the proposed starting date for this project. Please notify us if you plan to have a preconstruction conference.

Your cooperation is appreciated.

Sincerely,



Chris Baker
Assistant Regional Engineer
DEMLR - Fayetteville Regional Office

Enclosures: Certificate of Approval

cc: Joseph Staton, City of Fayetteville Permit Office – email copy
Fayetteville Regional Office





Report of Subsurface Exploration and Geotechnical Engineering Evaluation

Tryon Drive Drainage Improvements
Fayetteville, North Carolina
F&R Project No. 66A-0075

Prepared For:
Kimley-Horn
421 Fayetteville Street, Suite 600
Raleigh, North Carolina 27601

Prepared By:
Froehling & Robertson, Inc.
310 Hubert Street
Raleigh, North Carolina 27603

July 15, 2022



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July 15, 2021

Mr. Travis Crissman, P.E.
Kimley-Horn
421 Fayetteville Street, Suite 600
Raleigh, North Carolina 27601

**Subject: Report of Subsurface Exploration and Geotechnical Engineering Evaluation
Tryon Drive Drainage Improvements**

Fayetteville, North Carolina
F&R Project No. 66A-0075

Dear Mr. Crissman:

Froehling & Robertson, Inc. (F&R) has completed the authorized subsurface exploration and geotechnical engineering evaluation for the Tryon Drive Drainage Improvements project in Fayetteville, North Carolina. Our services were performed in general accordance with F&R's Proposal 2266-00046 dated February 28, 2022. The attached report presents our understanding of the project, reviews our exploration procedures, describes existing site and general subsurface conditions, and presents our geotechnical recommendations for design and construction of the project.

We have enjoyed working with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

Sincerely,

FROEHLING & ROBERTSON, INC.

Brian W. McCarthy, P.E.
Geotechnical Staff Engineer



Michael S. Sabodish Jr., Ph.D., P.E.
Geotechnical Department Manager



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1.0 PURPOSE & SCOPE OF SERVICES

The purpose of this subsurface exploration and geotechnical engineering evaluation was to explore the subsurface conditions in the area of the proposed culvert replacements in order to provide geotechnical engineering recommendations that can be used during the design and construction phases of the project.

F&R's scope of services included the following:

- Completion of seven soil test borings (B-1 through B-7) to depths of 20 feet below the existing ground surface;
- Preparation of typed boring logs and development of a subsurface profile;
- Performing geotechnical laboratory testing on representative soil samples;
- Performing a geotechnical engineering evaluation of the subsurface conditions with regard to their suitability for the proposed construction; and
- Preparation of this report by professional engineers.

2.0 PROJECT INFORMATION

The project site is located along Tryon Drive and Swann Street in Fayetteville, North Carolina. The site generally consists of single-family homes with manicured lawns and landscaping. A small stream runs through a pipe/culvert under Tryon Drive between 1752 and 1751 Tryon Drive. The stream then daylights and runs in a generally southeast direction through the front of 1743 Tryon Drive. The stream then traverses under Swann Street through a pipe/culvert, and terminates on the east side of 1716 Tryon Drive.

It is our understanding that improvements are being made to the City of Fayetteville's stormwater system. Based on the provided plan "Tryon Road Drainage Improvements" dated February 21, 2022, the proposed construction will consist of two box culverts ranging from 10'W x 4'H to 12'W x 4'H, which will replace the existing pipes/culverts under Tryon Drive and Swann Street.

3.0 EXPLORATION PROCEDURES

3.1 SUBSURFACE EXPLORATION

F&R advanced seven (7) soil test borings, B-1 through B-7, to depths of 20 feet below the existing ground surface. The approximate boring locations are shown on the Boring Location Plan presented as Figure 2 in Appendix I. The test boring locations were established in the field by F&R using a hand-held GPS unit with reported sub-meter accuracy. Ground surface elevations were



estimated from the Cumberland County GIS. Given these methods of determination, the boring locations and ground surface elevations should only be considered approximate.

The test borings were advanced by an ATV-mounted drill rig using 2-1/4" inside diameter (I.D.) hollow stem augers for borehole stabilization. Representative soil samples were obtained using a standard, two-inch outside diameter (O.D.) split-barrel sampler in general accordance with ASTM D 1586, Penetration Test and Split-Barrel Sampling of Soils (Standard Penetration Test). The number of blows required to drive the split barrel sampler three, consecutive 6-inch increments with an automatic hammer is recorded and the blows of the last two 6-inch increments are added to obtain the Standard Penetration Test (SPT) N-value representing the penetration resistance of the soil. Five (5) SPT samples were collected in the top 10 feet and then at a nominal interval of 5 feet thereafter.

A representative portion of the soil was obtained from each SPT sample, sealed in an eight-ounce glass jar, labeled, and transported to our laboratory for final classification and analysis by a geotechnical engineer. The soil samples were classified in general accordance with the AASHTO classification system, using visual-manual identification procedures (ASTM D2488). A Boring Log for each test boring is presented in Appendix II.

Groundwater measurements were attempted in all borings, with the exception of boring B-6, at the termination of drilling, and the borings were then backfilled with soil cuttings. An asphalt cold patch was placed at the surface of boring B-4 which was conducted in the roadway.

3.2 LABORATORY TESTING

F&R selected three (3) soil samples and subjected them to geotechnical index testing consisting of natural moisture content, sieve analysis (% passing #200 sieve only), and Atterberg Limits determinations. The purpose of the index testing was to aid in classification of the soil samples and development of engineering recommendations. The laboratory testing was performed in general accordance with applicable ASTM standards. The laboratory test results are presented in Appendix III of this report.

4.0 REGIONAL GEOLOGY & SUBSURFACE CONDITIONS

4.1 REGIONAL GEOLOGY

The referenced site is located within the Coastal Plain Province of North Carolina. The Coastal Plain Province is a broad, flat plain with widely-spaced and low-rolling hills where the near-surface soils have their origin from the deposition of sediments several million years ago during the period that the ocean receded from this area to its present location along the Atlantic coast. It is noted that the coastal plain soils vary in thickness from only a few feet along the western border (one to two



counties north and west of the site) to over ten thousand feet in some areas along the coast. Our test borings were terminated in Coastal Plain soils.

According to the *Geologic Map of North Carolina (1985)*, the site is specifically located within an area mapped as Cretaceous-period deposits and is comprised of sedimentary deposits that appear to be located within the Middendorf Formation. The Middendorf Formation is described as sandy deposits that vary in color from gray to orange gray with discontinuous bedding with cross bedding common.

4.2 SUBSURFACE CONDITIONS

4.2.1 General

The subsurface conditions discussed in the following paragraphs and those shown on the attached boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally-accepted geotechnical engineering judgments. Although individual soil test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times. Data from the specific soil test borings are shown on the boring logs presented in Appendix II of this report.

A subsurface profile has been prepared from the boring data and is presented as Figure 3 in Appendix I to graphically illustrate the subsurface conditions encountered at the site. Strata breaks designated on the boring logs and subsurface profile represent approximate boundaries between soil types. The transition from one soil type to another may be gradual or occur between soil samples. This section of the report provides a general discussion of subsurface conditions encountered within areas of proposed construction at the project site. More-detailed descriptions of the subsurface conditions at the individual boring locations are presented on the boring logs provided in Appendix II.

4.2.2 Surficial Materials

Asphalt was encountered at the surface of boring B-4 due to its location in the road. The thickness of the asphalt was about 3 inches. Approximately 2 inches of Surficial Organic Soils were encountered at the surface of the remaining borings (B-1 through B-3, B-5, B-6, and B-7). The Surficial Organic Soils generally consisted of dark-colored soil material containing roots, fibrous matter, and/or other organic components, and is generally unsuitable for engineering purposes. F&R has not performed any laboratory testing to determine the organic content or other horticultural properties of the observed Surficial Organic Soil materials. Therefore, the term Surficial Organic Soil is not intended to indicate suitability for landscaping and/or other purposes. The Surficial Organic Soil depths provided in this report are based on driller observations and should be



considered approximate. We note that the transition from Surficial Organic Soil to underlying materials may be gradual, and therefore the observation and measurement of the Surficial Organic Soil depths is subjective. Actual Surficial Organic Soil depths should be expected to vary.

4.2.3 Fill Soils

Below the existing asphalt and surficial organic soils, fill soils were encountered in all of the borings to depths ranging from 2 to 6.5 feet. The presence of this fill is likely a result of the original culvert construction and residential development of the area. The fill consisted of very loose to medium dense silty and clayey sands (USCS – SM and SC soils) with SPT N-values from 4 to 25 blows per foot (bpf). N-values of less than 4 bpf are generally indicative of fill with poor compaction while N-values of 5 to 8 bpf are generally indicative of fill with moderate compaction. Well-compacted structural fill would generally be expected to exhibit N-values of 9 bpf or greater. In general, it appears the fill soils encountered are moderately compacted with localized areas of poorly and well-compacted soils.

4.2.4 Alluvial Soils

Alluvial and possible alluvial soils were encountered below the fill soils in all of the borings, with the exception of boring B-7, at depths ranging from 2 to 3.5 feet below the existing ground surface, and extended to depths ranging from 6.5 to 13.5 feet. Alluvial soils are defined as soils that have been transported by water. Alluvial soils are likely to be encountered in other unexplored areas of the site along areas of the site along drainage and surface water features. The alluvial and possible alluvial soils generally consisted of very loose to loose silty and clayey sands (SC and SM) with SPT N-values from weight-of-hammer (WOH) to 9 bpf.

4.2.5 Coastal Plain Soils

The native Coastal Plain and possible Coastal Plain soils were encountered below the fill soils in boring B-7, and below the alluvial and possible alluvial soils in the remaining borings (B-1 through B-6). The Coastal Plain soils generally consisted of silty and/or clayey sands (SM and SC), and sandy silts (USCS – ML). The soils typically exhibited very loose to dense relative density for the sands with SPT N-values ranging from WOH to 42 bpf, and stiff consistency for the silts with a SPT N-value of 13 bpf.

Highly plastic silty clays (USCS – CH) were encountered deeper in the soil profile in borings B-3 and B-7 at depths of 13.5 and 18.5 feet, respectively, and extended to 18.5 feet in boring B-3, and to boring termination at 20 feet in boring B-7. The highly plastic silty clays typically exhibited stiff to hard consistency with SPT N-values ranging from 9 to 31 bpf.



4.3 Soil Moisture and Groundwater Conditions

Moist soil conditions (i.e., within 3 to 5 percent of the estimated optimum moisture content) were encountered in the borings in the upper 2 to 6.5 feet of the soil profile. Below the moist soils, wet and/or saturated soil conditions (5 to 6 percent or greater over the estimated optimum moisture content) were encountered in the borings and typically extended to termination depth of the borings. Moist soil layers were encountered deeper in the soil profile in boring B-3 from a depth of 13.5 to 18.5 feet and boring B-6 from a depth of 18.5 to 20 feet.

Groundwater level measurements were attempted at the termination of drilling in all borings with the exception of boring B-6, and after a stabilization period of at least 24 hours in all of the borings with the exception of boring B-4. Immediately after drilling completion, groundwater was encountered in all borings except B-6, at depths ranging from 9.0 to 16.0 feet. Temporary observation wells were installed in three borings (B-2, B-5, and B-6) to facilitate the measurement of stabilized groundwater levels. Stabilized groundwater was encountered in all borings except boring B-4, at depths ranging from 5.9 feet to 7.5 feet below the existing ground surface. Borehole cave depths were also recorded in the borings, which can sometimes be an approximate indicator of the groundwater table. Caving of the borehole was encountered in the borings at depths ranging from about 9.0 to 10.1 feet.

It should be noted that groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary from those described in this report. F&R notes that due to the presence of relatively impervious silty and clayey soils noted on the project site, trapped or perched water conditions may be encountered during periods of inclement weather and during seasonally wet periods.

5.0 GEOTECHNICAL ENGINEERING EVALUATION AND RECOMMENDATIONS

5.1 GENERAL

The conclusions and recommendations contained in this section of the report are based upon the results of the seven (7) soil test borings performed by F&R, our experience with similar projects and subsurface conditions, and the information provided to us regarding the proposed construction. It is our opinion that the subsurface conditions encountered at the project site are generally suitable for the proposed construction from a geotechnical engineering perspective provided the recommendations presented in subsequent sections of this report are followed throughout the design and construction phases of this project. It is our understanding that design and construction of the stormwater culverts will generally conform to the Fayetteville PWC Standard Specifications.



5.2 STRUCTURAL FILL PLACEMENT AND COMPACTION

It is expected that the low-plasticity on-site cut soils (SM, SC and ML) that are free of organics will be suitable for use as structural fill/backfill material provided they are at a moisture content suitable to achieve proper compaction and are stable during compaction and at final bearing grade. These low to moderately plastic soils are generally considered fair to good materials for use as structural earth fill. Highly plastic clay (CH) soils were encountered in borings B-3 and B-7 at depths ranging from 13.5 and 18.5 feet, respectively, and extended to depths of approximately 18.5 and 20 feet, respectively. Highly plastic soils are considered poorer materials for re-use as structural fill because they can be difficult to properly place and compact and have the potential to shrink and/or swell with varying moisture levels. It is generally recommended that these soils be used in the lower portions of the excavations or wasted.

Most of the cut soils are expected to be wet and/or saturated. Based on anticipated excavation depths and site conditions at the time of construction, some soils may require moisture conditioning (*e.g.*, drying of wet soils or wetting of dry soils) prior to use as structural fill. As such, it is recommended that earthwork be performed during the summer months when the weather conditions are more conducive to moisture conditioning of fill materials.

If imported soils are determined to be necessary, F&R recommends that a qualified geotechnical engineer or engineering technician working under the direction of the geotechnical engineer approve the suitability of the imported soils prior to their delivery to the site. Imported structural fill should consist of low plasticity soil (LL<35, PI<20), have a maximum dry density of at least 100 pcf, and be free of organic and other deleterious materials.

Structural earth fill should be compacted at a moisture content within ± 3 percentage points of the optimum moisture content and placed in loose lifts not exceeding 8 inches. All structural earth fill (*i.e.*, fill placed in roads and driveways) should be compacted to at least 95 percent of the Standard Proctor maximum dry density as determined by ASTM D-698 and 100 percent in the top 12 inches. Structural earth fill placed in non-structural/grassy areas should be compacted to at least 92 percent of the standard Proctor maximum dry density. At a minimum, the corresponding cross-section of the area removed (asphalt, concrete, or gravel) should be replaced per the original section.

All structural fill material should be placed and compacted under the full-time control and supervision of a qualified geotechnical engineer or engineering technician working under the direction of the geotechnical engineer. The placement and compaction of all fill material should be tested at frequent intervals in order to confirm that the recommended degree of compaction is achieved.



As previously stated, the on-site soils have sufficient silt/clay content to render them moisture sensitive. The on-site soils will become unstable (*i.e.*, pump and rut) during normal construction activities when in the presence of excess moisture. Soils with a moisture content greater than three percentage points above the optimum moisture content are generally considered to have excessive moisture. During earthwork and construction activities, surface-water runoff must be drained away from construction areas to prevent water from ponding on or saturating the soils within excavations or on subgrades.

Exposure to the environment may weaken the soils at the bearing level if excavations remain open for long periods of time. The bearing surfaces should be level or suitably-benched and free of loose soil, ponded water, and debris. If the bearing soils are softened by surface water intrusion, subsurface seepage or exposure, the softened soils should be removed from the excavation immediately prior to placement of stone, concrete, or other pipe bedding materials.

5.3 EXCAVATION CHARACTERISTICS

Based on the results of the soil test borings and indicated excavation depths which range from 6 to 8 feet below ground surface, we anticipate that the open-cut excavations can be performed using conventional backhoes and tracked excavators. However, steps should be implemented to suitably lower groundwater levels in advance of the excavation operations to provide for adequate slope stability, safety and more efficient grading operations. A majority of the soils consisted of very loose to dense sands and stiff to hard silts and silty clays. Very hard/very dense soils or PWR were not encountered within the depth of the exploration at any of the boring locations. As such, it is not anticipated that difficult excavation with respect to very hard/dense soil or PWR will be encountered within the excavation depths based on the provided storm drain inverts and anticipated culvert foundation bearing grades.

5.4 CULVERT RECOMMENDATIONS

We understand the existing culverts will be replaced with new culverts. Based on the information provided by Kimley-Horn, it is anticipated the culvert invert elevations will range from 6 to 8 feet below the existing ground surface (approximately EL 166.5 to 172 feet).

Based on the results of the borings and provided culvert invert elevations, it is anticipated that the soils at the culvert bearing grades will consist of wet and/or saturated, very loose to loose silty and clayey sands (SM and SC). Given the presence of very loose, wet and/or saturated soils, and groundwater at and/or above the proposed invert elevations, subgrade repair will likely be required to provide a stable foundation bearing grade for the proposed box culverts. We anticipate the very loose soils may need to be undercut to depths of 2-4 feet below the bearing grade and replaced with No. 57 washed stone up to the planned bearing grade and encased with a geotextile filter fabric. The washed stone thickness should not exceed two feet before the surface



of the washed stone is required to be densified with a heavy vibratory plate compactor to the satisfaction of the geotechnical engineer or their representative.

As previously mentioned, groundwater was encountered in the borings at depths ranging from approximately 5.9 to 7.5 feet below existing ground surface. Also, wet and/or saturated soil conditions were encountered in the borings typically at depths ranging from 2 to 6.5 feet below existing ground surface. Based on proposed invert elevations, groundwater will likely be encountered at the culvert invert elevation in the areas near borings B-1 and B-2, and to about 1-4 feet *above* the proposed invert elevations in the areas near borings B-3 through B-7. As such, it should be expected that groundwater will likely be encountered during construction in these areas and dewatering will likely be required. Dewatering will be discussed in detail in a later section.

Spread foundations bearing on approved native soils (stiff/ medium dense or better) or properly-compacted structural fill or NCDOT No. 57 washed stone and/or concrete overlying approved native materials can be proportioned for a net allowable soil bearing capacity of 2,000 psf. Final foundation sizes should be determined by the culvert designer based on the actual design loads, building code requirements, and other structural considerations.

We recommend that the foundation excavations and culvert subgrade be observed by a qualified geotechnical engineer or their representative prior to placement of NCDOT No. 57 washed stone and/or concrete. The purpose of the engineering observation would be to determine that the foundations bear on suitable and stable soils and that unsuitable, soft or loose materials are undercut and backfilled appropriately. Hand augers and Dynamic Cone Penetrometer (DCP) testing may be recommended to verify the consistency of the bearing grade and underlying soils. Exposure to the environment may weaken the soils at the footing bearing level if the excavation remains open for long periods of time. The foundation bearing surface should be level or suitably-benched and free of loose soil, ponded water, and debris. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation immediately prior to placement of the washed stone and geotextile.

5.5 LATERALLY LOADED WALLS

We expect that culvert headwalls and wingwalls will consist of conventional cast-in-place concrete cantilever retaining walls. Recommendations for conventional walls are provided below. If another wall type is proposed, such as Mechanically Stabilized Earth (MSE), F&R should be notified so that we can provide recommendations for that specific wall type.

F&R assumes that the walls will be permitted to rotate at the top and therefore should be designed to resist active lateral earth pressures. Assuming the walls will be backfilled with low plasticity on-site or off-site borrow materials (USCS ML, SC or SM soils), the walls should be



designed using an active earth pressure coefficient (K_a) of 0.33. Assuming a most unit weight of 120 pounds per cubic foot (pcf), F&R recommends an active earth pressure equivalent fluid weight (EFW) of 40 pcf be used in design. For sliding resistance along the base of the foundations, a friction factor ($\tan \delta$) of 0.25 should be utilized for concrete bearing on native soils. A passive earth pressure coefficient (K_p) of 1.25 can be used in design where the foundation faces bear directly against undisturbed, medium dense native soils; this coefficient incorporates a factor of safety of 2.0 to limit the amount of movement to mobilize the passive resistance. Assuming an in-situ buoyant density of approximately 60 pcf for native, undisturbed soils, the passive earth pressure equivalent fluid weight (EFW) would be 75 pcf. It is recommended that the upper 2 feet of soil not be considered as contributing to the passive resistance due to possible disturbances during construction (e.g., installation of utilities, re-grading, etc.).

Lateral earth pressures arising from surcharge loading (vehicular traffic), earthquake loading, and groundwater (including flood events) should be added to the above soil earth pressures to determine the total lateral earth pressure, which the walls must resist. Transient loads imposed on the walls by construction equipment during backfilling should be taken into account during design. In addition, the toe of the walls should be properly protected from scour/erosion and/or designed with additional embedment to account for the soil loss.

Excessive compaction near the wall(s) may cause damage to the walls; F&R recommends that low ground pressure equipment (such as small, walk-behind rollers) be utilized to compact material to a distance of at least 8 to 10 feet behind the walls. F&R recommends that all walls be provided with a drainage system to maintain the wall backfill in a drained condition at all times such that the walls are not subject to hydrostatic pressures.

While borings were not requested at possible locations of headwalls or wing walls, it is anticipated that headwall and wing wall subgrades will likely consists of wet, loose soils due to their anticipated construction locations typically being within close proximity to existing drainage features. As such, we anticipate spread foundations bearing on these soils can likely be proportioned for a net allowable soil bearing capacity of 2,000 psf after the completion of previously recommended repairs, but should be confirmed by the project geotechnical engineer. Final foundation sizes should be determined by the structural engineer based on the actual design loads, building code requirements, and other structural considerations.

We recommend that the headwall and wing wall foundation bearing grades be observed by a qualified geotechnical engineer or his representative. In addition, hand augers and Dynamic Cone Penetrometer (DCP) testing should be performed to verify the consistency of the bearing grade and underlying soils. The purpose of the engineering observation would be to determine that the foundations bear on suitable and stable soils and that unsuitable, loose materials are undercut and backfilled appropriately.



5.6 DEWATERING

As previously mentioned, groundwater was encountered in the borings at depths ranging from approximately 5.9 to 7.5 feet below the existing ground surface. Also, wet and/or saturated soil conditions were encountered in the borings typically at depths ranging from 2 to 6.5 feet below the existing ground surface. Based on proposed culvert invert elevations, groundwater will likely be encountered at and/or 1-4 feet above the inverts. As such, it should be expected that groundwater will likely be encountered during construction and dewatering will likely be required. As such, excavation dewatering will be required in order to maintain a drained, stable excavation and to prevent softening/loosening of the excavation subgrade. The groundwater should be lowered to a depth of at least 3 to 4 feet below the bottom of the excavation and should be lowered prior to removal of the final 3 to 4 feet of overburden. Depending upon the prevailing weather conditions during construction and flow in the channel, pumping from sump pits may be sufficient to maintain a drained excavation. However during periods of inclement weather, sump pits and pumping may not be sufficient to control both groundwater and surface water, and more extensive drainage/dewatering measures may be required. The method of surface water and groundwater control should be determined and designed by the contractor, but may require well points, creek diversion, coffer dams, sheet piling, or other means.

It should be noted that if groundwater levels are not effectively maintained below the base of the excavation during construction, unstable and loosened/softened subgrade conditions could develop, which may cause excessive settlements to develop beneath the completed structure or require additional subgrade repair (*e.g.*, densification, undercutting & replacement with washed stone, etc.). Therefore, efforts should be incorporated in the construction sequence to properly control groundwater levels during construction. Additionally, it is recommended that only excavation contractors experienced in similar excavations and groundwater control should be allowed to perform this work.

5.7 TEMPORARY EXCAVATION RECOMMENDATIONS

Due to the limited construction area available within the easement for the existing culvert, we anticipate the excavations may not be able to be sufficiently sloped and will require temporary shoring. Trench boxes or internally-braced excavations are anticipated; however, the type of excavation stabilization or shoring system used should be selected and designed by the contractor.

Mass excavations and other excavations required for construction of this project should be performed in accordance with the United States Department of Labor, Occupational Safety and Health Administration (OSHA) guidelines (29 CFR 1926, Subpart P, Excavations), or other applicable jurisdictional codes for permissible temporary side-slope ratios and/or shoring requirements. The OSHA guidelines require daily inspections of excavations, adjacent areas and



protective systems by a “competent person” for evidence of situations that could result in cave-ins, indications of failure of a protective system, or other hazardous conditions. All excavated soils, equipment, building supplies, etc., should be placed away from the edges of excavations at a distance equaling or exceeding the depth of the excavation. F&R cautions that the actual excavation slopes will need to be evaluated frequently each day by the “competent person” and flatter slopes or the use of shoring may be required to maintain a safe excavation depending upon excavation-specific circumstances. The contractor is responsible for providing the “competent person” and all aspects of site excavation safety. F&R can evaluate specific excavation slope situations if we are informed and requested by the owner, designer, or contractor’s “competent person”.

6.0 CONTINUATION OF SERVICES

The Geotechnical Engineer of Record should be retained to monitor and test earthwork activities, and subgrade preparations for foundations and excavations, as applicable. It should be noted that the actual soil conditions at the various invert elevations and culvert bearing grades will vary across this site and thus the presence of the Geotechnical Engineer and/or their representative during construction will serve to validate the subsurface conditions and recommendations presented in this report. We recommend that F&R be employed to monitor the earthwork and foundation construction, and to report that the recommendations contained in this report are completed in a satisfactory manner. Our involvement on the project will aid in the proper implementation of the recommendations discussed herein. The following is a recommended scope of services:

- Review of project plans and construction specifications to verify that the recommendations presented in this report have been properly interpreted and implemented;
- Observe and perform testing during earthwork to document that subsurface conditions encountered during construction are consistent with those anticipated in this report;
- Observe subgrade preparation including undercutting of soft/loose unsuitable soils, installation of drainage materials, geotextiles and fill placement;
- Observe placement and compaction of any structural fill and backfill, and perform laboratory and field compaction testing of the fill; and
- Observe all foundation excavations and footing bearing grades for compliance with the geotechnical recommendations.

7.0 LIMITATIONS

This report has been prepared for the exclusive use of Kimley-Horn and/or their agents, for specific application to the referenced project in accordance with generally-accepted soil and foundation engineering practices. No other warranty, express or implied, is made. Our evaluations and recommendations are based on design information furnished to us; the data obtained from the



previously-described, subsurface exploration program, and generally-accepted geotechnical engineering practice. The evaluations and recommendations do not reflect variations in subsurface conditions, which could exist intermediate of the boring locations or in unexplored areas of the site. Should such variations become apparent during construction, it will be necessary to re-evaluate our recommendations based upon our on-site observations of the conditions.

There are important limitations to this and all geotechnical studies. Some of these limitations are discussed in the information prepared by the Geoprofessional Business Association (GBA), which is included in the Appendix IV. We ask that you please review this information.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers should evaluate earthwork, and foundation construction to observe that the conditions anticipated in design actually exist. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications, or recommendations.

In the event that changes are made in the proposed construction, the recommendations presented in the report shall not be considered valid unless the changes are reviewed by our firm and conclusions of this report modified and/or verified in writing. If this report is copied or transmitted to a third party, it must be copied or transmitted in its entirety, including text, attachments, and enclosures. Interpretations based on only a part of this report may not be valid.

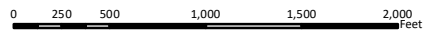


APPENDIX I

FIGURES



Site Vicinity Map

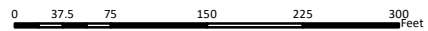


Froehling & Robertson, Inc.
 310 Hubert Street
 Raleigh, North Carolina 27603
 T 919.828.3441

Client:	Kimley Horn
Project:	Tryon Dr. Drainage Improvement
Location	Fayetteville, Cumberland County, NC
Project Number:	66A-0075
Data:	Open Street
Date:	July 2022
Scale: 1 inch = 1,000 feet	



Boring Location Plan



FROEHLING & ROBERTSON
Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

Client:	Kimley Horn	
Project:	Tryon Dr. Drainage Improvement	
Location:	Fayetteville, Cumberland County, NC	
Project Number:	66A-0075	
Data:	NCOne Map Aerial 2021	
Date:	July 2022	Scale: 1 inch = 150 feet

FIGURE No.: 2



SUBSURFACE PROFILE

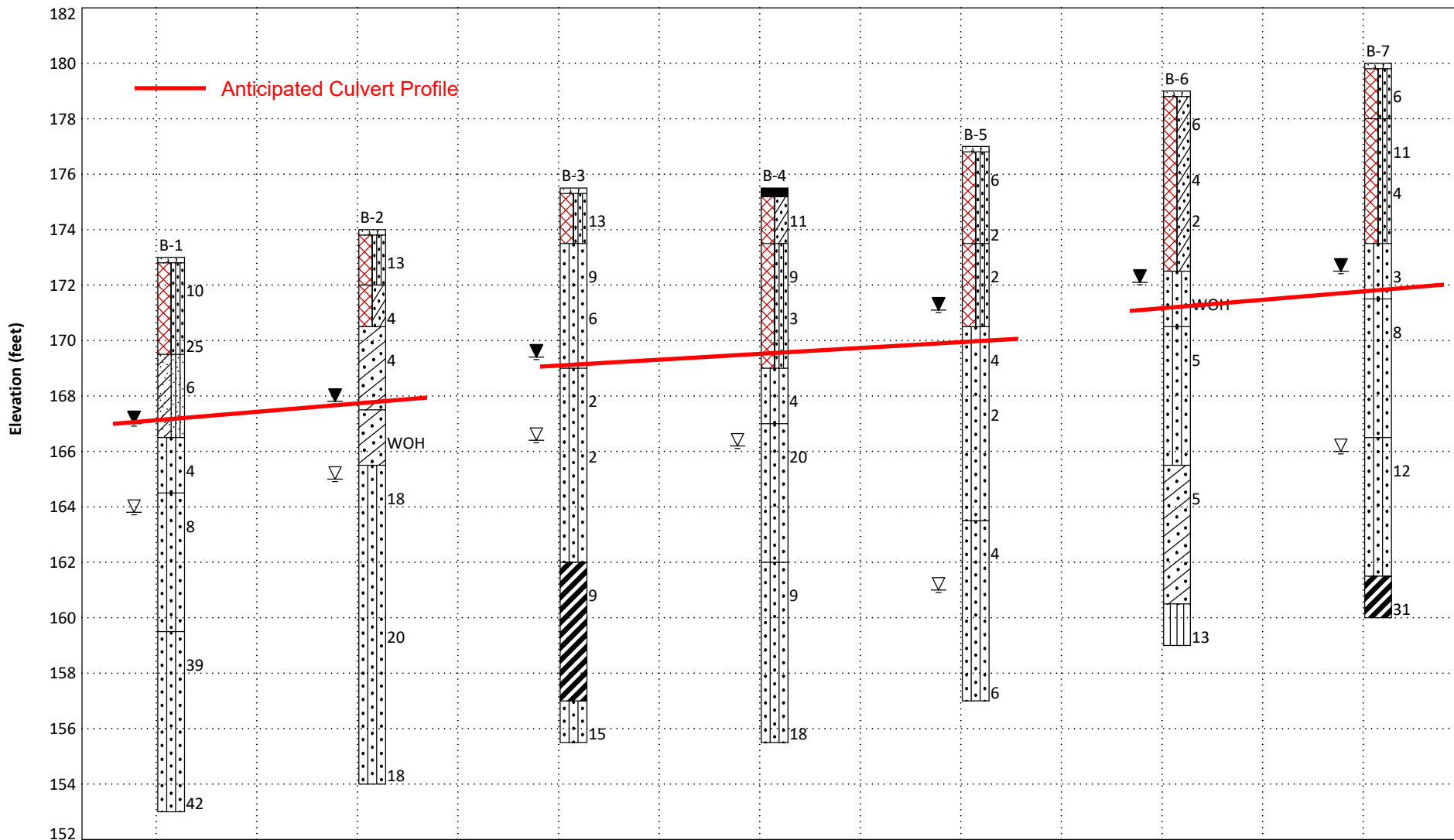
Plot Based on Elevation
Profile Name: Figure No. 3

Project No: 66A-0075

Client: Kimley Horn

Project: Tryon Dr. Drainage Improvement

City/State: Fayetteville, NC





APPENDIX II

BORING LOGS



FROEHLING & ROBERTSON

Engineering Stability Since 1881

Boring	Northing	Easting
B-1	488344	2019560
B-2	488355	2019493
B-3	488349	2019426
B-4	488385	2019371
B-5	488428	2019303
B-6	488495	2019177
B-7	488521	2019133



KEY TO SOIL CLASSIFICATION

**Correlation of Penetration Resistance with
Relative Density and Consistency**

<u>Sands and Gravels</u>		<u>Silts and Clays</u>	
<u>No. of Blows, N</u>	<u>Relative Density</u>	<u>No. of Blows, N</u>	<u>Relative Density</u>
0 - 4	Very loose	0 - 2	Very soft
5 - 10	Loose	3 - 4	Soft
11 - 30	Medium dense	5 - 8	Firm
31 - 50	Dense	9 - 15	Stiff
Over 50	Very dense	16 - 30	Very stiff
		31 - 50	Hard
		Over 50	Very hard

**Particle Size Identification
(Unified Classification System)**

Boulders:	Diameter exceeds 8 inches
Cobbles:	3 to 8 inches diameter
Gravel:	<u>Coarse</u> - 3/4 to 3 inches diameter <u>Fine</u> - 4.76 mm to 3/4 inch diameter
Sand:	<u>Coarse</u> - 2.0 mm to 4.76 mm diameter <u>Medium</u> - 0.42 mm to 2.0 mm diameter <u>Fine</u> - 0.074 mm to 0.42 mm diameter
Silt and Clay:	Less than 0.07 mm (particles cannot be seen with naked eye)

Modifiers

The modifiers provide our estimate of the amount of silt, clay or sand size particles in the soil sample.

<u>Approximate Content</u>	<u>Modifiers</u>
≤ 5%:	Trace
5% to 12%:	Slightly silty, slightly clayey, slightly sandy
12% to 30%:	Silty, clayey, sandy
30% to 50%:	Very silty, very clayey, very sandy

<u>Field Moisture Description</u>	
Saturated:	Usually liquid; very wet, usually from below the groundwater table
Wet:	Semisolid; requires drying to attain optimum moisture
Moist:	Solid; at or near optimum moisture
Dry:	Requires additional water to attain optimum moisture

Ground Water

▽ Water Level in Bore Hole Immediately after Drilling

▼ Static Water Level after 24 Hours



UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

<i>MAJOR DIVISION</i>				<i>TYPICAL NAMES</i>
<i>GRAVELS</i> More than 50% of coarse fraction larger than No. 4 sieve	<i>CLEAN GRAVEL</i> (little or no fines)		GW	Well graded gravels
	<i>GRAVELS with fines</i>		GP	Poorly graded gravels
			GM	Silty gravels
		GC	Clayey gravels	
<i>SANDS</i> More than 50% of coarse fraction smaller than No. 4 sieve	<i>CLEAN SAND</i> (little or no fines)		SW	Well graded sands
	<i>SAND with fines</i>		SP	Poorly graded sands
			SM	Silty sands, sand/silt mixtures
		SC	Clayey sands, sand/clay mixtures	
<i>SILTS AND CLAYS</i> Liquid Limit is less than 50			ML	Inorganic silts, sandy and clayey silts with slightly plasticity
			CL	Sandy or silty clays of low to medium plasticity
			OL	Organic silts of low plasticity
<i>SILTS AND CLAYS</i> Liquid Limit is greater than 50			MH	Inorganic silts, sandy micaceous or clayey elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
<i>HIGHLY ORGANIC SOILS</i>			PT	Peat and other highly organic soils
<i>MISCELLANEOUS MATERIALS</i>				PWR (Partially Weathered Rock)
				Rock
				Asphalt
				ABC Stone
				Concrete
				Surficial Organic Soil



Project No: 66A-0075

Client: Kimley Horn

Project: Tryon Dr. Drainage Improvement

City/State: Fayetteville, NC

Elevation: 173 ±

Total Depth: 20.0'

Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA

Hammer Type: Automatic

Date Drilled: 6/21/22

Driller: A. Sturchio

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
172.8	0.2	SURFICIAL ORGANIC SOILS FILL: Loose to Medium Dense, Dry, Orange and Gray, Silty Fine SAND (SM) with Fine Gravel and Trace Roots	4-5-5	0.0	10	GROUNDWATER DATA: 0 Hr: 9.2', Caved at 9.3' 24 Hrs: 6.0', Caved at 9.7'
				1.5		
			12-13-12	2.0		
169.5	3.5	POSSIBLE ALLUVIUM: Loose, Wet, Gray, Silty Clayey Fine to Coarse SAND (SC-SM)	7-3-3	3.5	25	
				5.0		
166.5	6.5	ALLUVIAL: Very Loose, Wet, Dark Gray, Silty Fine to Coarse SAND (SM) with Wood Fragments and Roots	2-2-2	6.5	6	
				8.0		
164.5	8.5	COASTAL PLAIN: Loose, Saturated, Light Gray, Silty Fine to Coarse SAND (SM)	2-3-5	8.5	4	
				10.0		
				13.5		
159.5	13.5	Dense, Wet, Orange, Silty Fine to Coarse SAND (SM)	13-17-22	13.5	8	
				15.0		
				18.5		
			20-21-21	18.5	39	
				20.0		
153.0	20.0	Boring Terminated at 20.0 feet.				

BORING LOG 66A-0075 BORE LOGS.GPJ F&R.GDT 7/15/22

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



Project No: 66A-0075

Client: Kimley Horn

Project: Tryon Dr. Drainage Improvement

City/State: Fayetteville, NC

Elevation: 174 ±

Total Depth: 20.0'

Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA

Hammer Type: Automatic

Date Drilled: 6/21/22

Driller: A. Sturchio

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
173.8	0.2	SURFICIAL ORGANIC SOILS	5-6-7	0.0		GROUNDWATER DATA: 0 Hr: 9.0' inside PVC 24 Hrs: 6.2' inside PVC
		FILL: Medium Dense, Dry, Orange, Silty Fine to Coarse SAND (SM)		1.5	13	
172.0	2.0	Very Loose, Moist, Orange and Brown, Clayey Fine to Medium SAND (SC)	2-2-2	2.0	4	
170.5	3.5	ALLUVIAL: Very Loose, Wet, Gray, Clayey Fine to Coarse SAND (SC) with Roots	2-2-2	3.5	4	
				5.0		
167.5	6.5	POSSIBLE COASTAL PLAIN: Very Loose, Wet, Gray and Brown, Clayey Fine to Coarse SAND (SC)	WOH-WOH-WOH	6.5	0	
165.5	8.5	COASTAL PLAIN: Medium Dense, Saturated, Gray and Orange, Silty Fine to Coarse SAND (SM)	4-8-10	8.5	18	
				10.0		
			5-8-12	13.5	20	
				15.0		
			6-6-12	18.5	18	
154.0	20.0	Boring Terminated at 20.0 feet.			20.0	

BORING_LOG_66A-0075_BORE_LOGS.GPJ_F&R.GDT_7/15/22

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



Project No: 66A-0075

Elevation: 175.5 ±

Drilling Method: 2.25" ID HSA

Client: Kimley Horn

Total Depth: 20.0'

Hammer Type: Automatic

Project: Tryon Dr. Drainage Improvement

Boring Location: See Boring Location Plan

Date Drilled: 6/21/22

City/State: Fayetteville, NC

Driller: A. Sturchio

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
175.3	0.2	SURFICIAL ORGANIC SOILS	5-6-7	0.0		GROUNDWATER DATA: 0 Hr: 9.1', Caved at 9.3' 24 Hrs: 6.1', Caved at 10.1'
		FILL: Medium Dense, Moist, Brownish Gray, Silty Fine to Coarse SAND (SM)		1.5	13	
173.5	2.0	ALLUVIAL: Loose, Wet, Dark Gray, Silty Fine to Coarse SAND (SM) with Wood Fragments	4-4-5	2.0	9	
			3-3-3	3.5	6	
				5.0		
169.0	6.5	Very Loose, Wet, Dark Gray, Silty Fine to Coarse SAND (SM) with Roots	1-1-1	6.5	2	
			1-1-1	8.0		
				8.5	2	
				10.0		
162.0	13.5	COASTAL PLAIN: Stiff, Moist, Dark Gray, Silty CLAY (CH)	2-4-5	13.5	9	
				15.0		
157.0	18.5	Medium Dense, Saturated, Orange, Silty Fine to Coarse SAND (SM)	3-5-10	18.5	15	
155.5	20.0	Boring Terminated at 20.0 feet.		20.0		

BORING_LOG_66A-0075_BORE_LOGS.GPJ_F&R.GDT_7/15/22

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



Project No: 66A-0075

Elevation: 175.5 ±

Drilling Method: 2.25" ID HSA

Client: Kimley Horn

Total Depth: 20.0'

Hammer Type: Automatic

Project: Tryon Dr. Drainage Improvement

Boring Location: See Boring Location Plan

Date Drilled: 6/21/22

City/State: Fayetteville, NC

Driller: A. Sturchio

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
175.2	0.3	SURFICIAL ORGANIC SOILS	5-5-6	0.0		GROUNDWATER DATA: 0 Hr: 9.3', Caved at 9.4' Backfilled Immediately After Drilling
		FILL: Medium Dense, Moist, Light Brown, Clayey Fine to Medium SAND (SC) with Fine Gravel		1.5	11	
173.5	2.0	Loose to Very Loose, Moist, Orange, Silty Fine to Coarse SAND (SM)	6-5-4	2.0	9	
			4-2-1	3.5	3	
				5.0		
169.0	6.5	ALLUVIAL: Very Loose, Wet, Black, Silty Fine to Medium SAND (SM) with Wood Fragments	1-2-2	6.5	4	
				8.0		
167.0	8.5	POSSIBLE COASTAL PLAIN: Medium Dense, Wet, Gray, Silty Fine to Medium SAND (SM)	4-10-10	8.5	20	
				10.0		
162.0	13.5	COASTAL PLAIN: Loose to Medium Dense, Saturated, Orange, Silty Fine to Coarse SAND (SM)	11-6-3	13.5	9	
				15.0		
			4-8-10	18.5	18	
155.5	20.0	Boring Terminated at 20.0 feet.		20.0		

BORING LOG 66A-0075 BORE LOGS.GPJ F&R.GDT 7/15/22

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



Project No: 66A-0075

Elevation: 177 ±

Drilling Method: 2.25" ID HSA

Client: Kimley Horn

Total Depth: 20.0'

Hammer Type: Automatic

Project: Tryon Dr. Drainage Improvement

Boring Location: See Boring Location Plan

Date Drilled: 6/20/22

City/State: Fayetteville, NC

Driller: A. Sturchio

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks	
176.8	0.2	SURFICIAL ORGANIC SOILS	2-3-3	0.0	6	GROUNDWATER DATA: 0 Hr: 16.0' inside PVC 24 Hrs: 5.9' inside PVC	
		FILL: Loose to Very Loose, Moist, Light Brown to Orange, Silty Fine to Coarse SAND (SM) with Roots		1.5			
			2-1-1	2.0			
173.5	3.5	Very Loose, Saturated, Tan, Silty Fine to Coarse SAND (SM)	1-1-1	3.5	2		
				5.0			
170.5	6.5	POSSIBLE ALLUVIAL: Very Loose, Wet, Dark Gray, Silty Fine to Coarse SAND (SM) with Roots	2-2-2	6.5	4		
				8.0			
			1-1-1	8.5			
				10.0	2		
				13.5			
163.5	13.5	COASTAL PLAIN: Very Loose to Loose, Saturated, Gray-Tan, Silty fine to Coarse SAND (SM)	2-2-2	13.5	4		
				15.0			
				18.5	6		
			3-3-3	20.0			
157.0	20.0	Boring Terminated at 20.0 feet.					

BORING LOG 66A-0075 BORE LOGS.GPJ F&R.GDT 7/15/22

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



Project No: 66A-0075

Elevation: 179 ±

Drilling Method: 2.25" ID HSA

Client: Kimley Horn

Total Depth: 20.0'

Hammer Type: Automatic

Project: Tryon Dr. Drainage Improvement

Boring Location: See Boring Location Plan

Date Drilled: 6/20/22

City/State: Fayetteville, NC

Driller: A. Sturchio

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks	
178.8	0.2	SURFICIAL ORGANIC SOILS FILL: Loose to Very Loose, Moist, Brown, Clayey Fine to Medium SAND (SC)	4-3-3	0.0	6	GROUNDWATER DATA: 0 Hr: Not Measured 24 Hrs: 6.9' inside PVC	
				1.5			
			3-2-2	2.0			
			1-1-1	3.5			
				5.0			
172.5	6.5	ALLUVIAL: Very Loose, Wet, Gray and Dark Gray, Silty Fine to Coarse SAND (SM) with Trace Rootlets	WOH-WOH-WOH	6.5	0		
170.5	8.5	POSSIBLE COASTAL PLAIN: Loose, Saturated, Gray, Fine to Coarse Silty SAND (SM)	1-2-3	8.5	5		
				10.0			
165.5	13.5	COASTAL PLAIN: Loose, Wet, Gray and Orange, Clayey Fine to Coarse SAND (SC)	2-2-3	13.5	5		
				15.0			
160.5	18.5	Stiff, Moist, Dark Gray, Fine Sandy SILT (ML)	6-6-7	18.5	13		
159.0	20.0	Boring Terminated at 20.0 feet.					

BORING LOG 66A-0075 BORE LOGS.GPJ F&R.GDT 7/15/22

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



Project No: 66A-0075

Elevation: 180 ±

Drilling Method: 2.25" ID HSA

Client: Kimley Horn

Total Depth: 20.0'

Hammer Type: Automatic

Project: Tryon Dr. Drainage Improvement

Boring Location: See Boring Location Plan

Date Drilled: 6/20/22

City/State: Fayetteville, NC

Driller: A. Sturchio

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
179.8	0.2	SURFICIAL ORGANIC SOILS FILL: Loose, Moist, Brown, Silty Fine to Medium SAND (SM) with Trace Rootlets	2-3-3	0.0	6	GROUNDWATER DATA: 0 Hr: 14.0', Caved at 14.6' 24 Hrs: 7.5', Caved at 9.0'
				1.5		
178.0	2.0	Medium Dense to Very Loose, Moist, Gray, Silty Fine to Medium SAND (SM)	5-5-6	2.0	11	
				3.5		
				5.0		
173.5	6.5	POSSIBLE COASTAL PLAIN: Very Loose, Saturated, Dark Gray and Gray, Silty Fine to Coarse SAND (SM)	2-2-1	6.5	3	
				8.0		
171.5	8.5	COASTAL PLAIN: Loose, Saturated, Gray, Silty Fine SAND (SM)	1-2-6	8.5	8	
				10.0		
				13.5		
166.5	13.5	Medium Dense, Saturated, Orange, Silty Fine to Coarse SAND (SM)	6-5-7	13.5	12	
				15.0		
161.5	18.5	Hard, Wet, Gray, Silty CLAY (CH)	8-15-16	18.5	31	
				20.0		
160.0	20.0	Boring Terminated at 20.0 feet.				

BORING LOG 66A-0075 BORE LOGS.GPJ F&R.GDT 7/15/22

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



APPENDIX III

LABORATORY TEST RESULTS

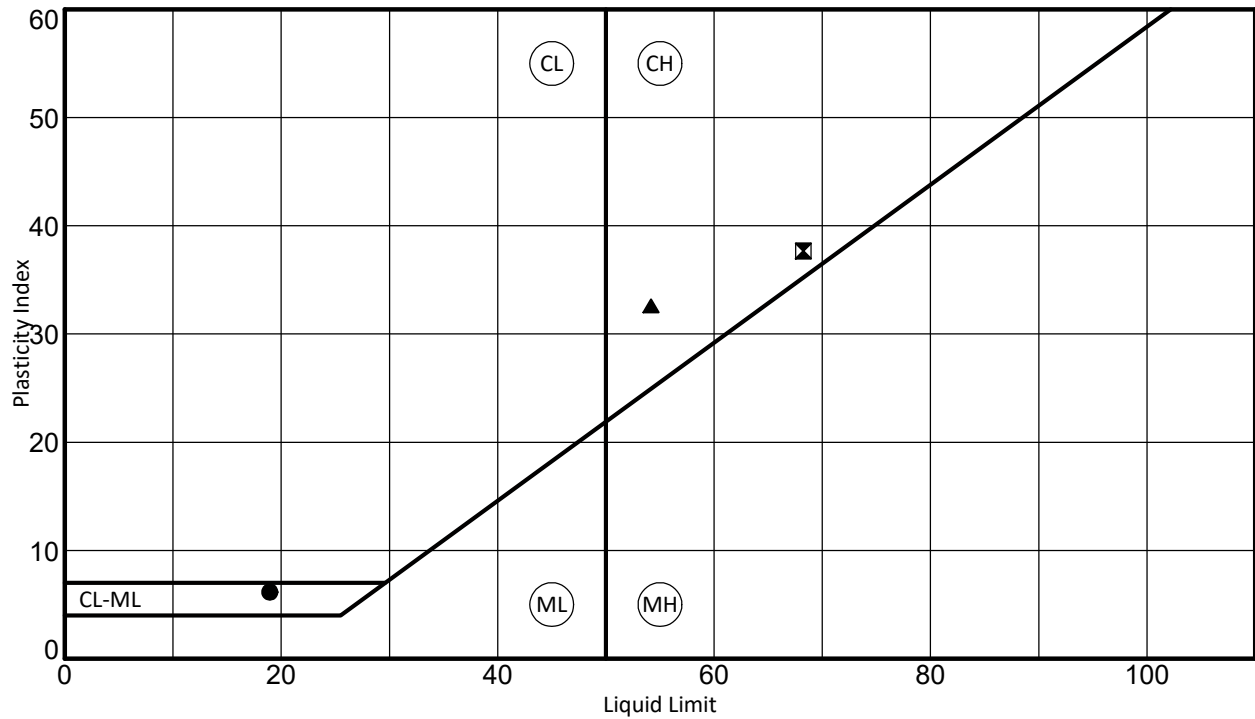


Project No: 66A-0075

Client: Kimley Horn

Project: Tryon Drive Drainage Improvements

City/State: Fayetteville, NC



Boring No.	Depth	LL	PL	PI	Fines	Classification	% Natural Water Content
● B-1	3.5' - 5.0'	19	13	6	21.0	SILTY, CLAYEY SAND (SC-SM)	11.4
■ B-3	13.5' - 15.0'	68	31	37	95.4	FAT CLAY (CH)	31.7
▲ B-6	13.5' - 15.0'	54	22	32	23.3	CLAYEY SAND (SC)	22.8



APPENDIX IV

GBA DOCUMENT

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, clients can benefit from a lowered exposure to the subsurface problems 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 below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs 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. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project 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.*

This Report May Not Be Reliable

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

- for a different client;
- for a different project;
- 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, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been 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 your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

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

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment 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 from project start to project finish, so the individual can provide 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 judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed 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 full-time 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 on hand quickly 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 observation.

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 informational 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, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. 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. 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 relate any 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 yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

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, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled 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*.



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Report of Subsurface Exploration and Geotechnical Engineering Evaluation

Tryon Drive Drainage Improvements – Additional Borings
Fayetteville, North Carolina
F&R Project No. 66C-0159

Prepared For:
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421 Fayetteville Street, Suite 600
Raleigh, North Carolina 27601

Prepared By:
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310 Hubert Street
Raleigh, North Carolina 27603

February 13, 2025



February 13, 2025

Travis Crissman, P.E.
Kimley-Horn
421 Fayetteville Street, Suite 600
Raleigh, North Carolina 27601

**Subject: Report of Subsurface Exploration and Geotechnical Engineering Evaluation
Tryon Drive Drainage Improvements – Additional Borings**
Fayetteville, North Carolina
F&R Project No. 66C-0159

Dear Mr. Crissman:

Froehling & Robertson, Inc. (F&R) has completed the authorized subsurface exploration and geotechnical engineering evaluation for the Tryon Drive Drainage Improvements – Additional Borings project in Fayetteville, North Carolina. Our services were performed in general accordance with F&R's Proposal 2466-00171 Rev. 2 dated September 19, 2024. The attached report presents our understanding of the project, reviews our exploration procedures, describes existing site and general subsurface conditions, and presents our geotechnical recommendations for design and construction of the project.

We have enjoyed working with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

Sincerely,
FROEHLING & ROBERTSON, INC.

Dave Morse, E.I., M.S.
Geotechnical Staff Engineer



Michael S. Sabodish Jr., Ph.D., P.E.
Geotechnical Department Manager



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Key to Soil Classification
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GBA Document "Important Information about
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1.0 PURPOSE & SCOPE OF SERVICES

The purpose of this subsurface exploration and geotechnical engineering evaluation was to explore the subsurface conditions in the areas of the proposed stormwater improvements, and to provide geotechnical engineering recommendations that can be used during the design and construction phases of the project.

F&R's scope of services included the following:

- Completion of three soil test borings (C-1 through C-3) each advanced to a depth of 30 feet below the existing ground surface;
- Preparation of typed boring logs and development of a subsurface soil profile;
- Performing geotechnical laboratory testing on representative soil samples;
- Performing a geotechnical engineering evaluation of the subsurface conditions with regard to their suitability for the proposed construction; and
- Preparation of this report by professional engineers.

2.0 PROJECT INFORMATION

The project site is located within residential lots located along Swann Street and Daisy Lane in Fayetteville, North Carolina. The site generally consists of single family homes with manicured lawns and landscaping. An existing utility easement starts at Tryon Drive and runs southeast between 1759 and 1763 Tryon Drive and between 1735 and 1737 Swann Street before terminating at an existing curb inlet on the north side of Swann Street. The utility easement then continues on the south side of Swann Street starting between 1732 and 1734 Swann Street and runs southeast before turning to the southwest behind 1733 Daisy Lane, and then again turning to the southeast between 1729 and 1733 Daisy Lane. From there, the easement terminates on the north side of Daisy Lane at its intersection with Webster Avenue.

It is our understanding that improvements are being made to the City of Fayetteville's stormwater system. Based on the provided plan "Tryon Drive Drainage Improvements 100% Design Drawings" dated January 2024, the proposed construction will consist of the replacement of reinforced concrete pipes (RCP) varying in diameter between 24 and 30 inches within the existing easements. In select locations, it will be necessary to install shoring and/or foundation protection systems for the single family homes located at 1732, 1734, 1735, and 1737 Swann Street, and at 1729 and 1733 Daisy Lane. Between catch basin (CB) 12 and CB-15, approximately 298 feet of 42-inch diameter RCP will be installed. Further south along the alignment, approximately 447 feet of 30 to 42-inch diameter RCP will be installed between CB-17 and CB-21.



Based on topographic information obtained from the Cumberland County GIS database, existing site grades in the areas of the proposed improvements slope down from south to north with a high elevation of about 210 feet between 1729 and 1733 Daisy Lane, to a low elevation of about 196 feet between 1735 and 1737 Swann Street.

3.0 EXPLORATION PROCEDURES

3.1 SUBSURFACE EXPLORATION

F&R advanced three (3) soil test borings, C-1 through C-3, each to a depth of 30 feet below the existing ground surface. The approximate boring locations are shown on the Boring Location Plan presented as Figure 2, and the Storm Plan and Profile presented as Figures 4 and 5, in Appendix I. The test boring locations were established in the field by F&R using a hand-held GPS unit with reported sub-meter accuracy. Ground surface elevations at the boring locations were obtained from Cumberland County GIS topographic data and the provided plans. Given these methods of determination, the boring locations and ground surface elevations should only be considered approximate.

The test borings were advanced by a track-mounted drill rig using 2-1/4" inside diameter (I.D.) hollow stem augers for borehole stabilization. Representative soil samples were obtained using a standard two-inch outside diameter (O.D.) split-barrel sampler in general accordance with ASTM D1586, Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils. The number of blows required to drive the split-barrel sampler three consecutive 6-inch increments with an automatic hammer is recorded and the blows of the last two 6-inch increments are summed to obtain the Standard Penetration Test (SPT) N-value representing the penetration resistance of the soil. Five (5) SPT samples were collected in the top 10 feet and then at a nominal interval of 5 feet thereafter.

A representative portion of soil was obtained from each SPT sample, sealed in a glass jar, labeled, and transported to our laboratory for classification and analysis by a geotechnical engineer. The soil samples were classified in general accordance with the Unified Soil Classification System (USCS) using visual-manual identification procedures (ASTM D2488). A Boring Log for each test boring is presented in Appendix II.

Groundwater level measurements were attempted immediately after drilling in each of the borings. After a stabilization period of approximately 24-hours following the completion of drilling, groundwater level measurements were attempted in borings C-1 and C-2; boring C-3 was backfilled immediately after drilling. Temporary piezometers were installed in borings C-1 and C-2 to facilitate the measurement of stabilized groundwater levels. The temporary piezometers consisted of 1-inch diameter, hand-slotted PVC pipe installed into the completed borings.



Following the collection of the stabilized groundwater readings, the temporary piezometers were removed from the borings and all of the boreholes were backfilled with soil cuttings.

3.2 LABORATORY TESTING

F&R selected three (3) soil samples and subjected them to geotechnical index testing consisting of natural moisture content, sieve analysis (% passing #200 sieve only), and Atterberg Limits determinations. The purpose of the index testing was to aid in classification of the soil samples and development of engineering recommendations. The laboratory testing was performed in general accordance with applicable ASTM standards. The laboratory test results are presented in Appendix III of this report.

In addition to the index testing, F&R selected three (3) samples for corrosivity testing. The samples were selected to cover the depth range of soil strata anticipated during the installation of sheet piling. These samples were submitted to Waypoint Analytical for corrosivity testing, including pH, chloride ions, soluble sulfates, electrical resistivity, redox potential, and sulfides. Details related to test samples and results are presented in Section 4.4 of this report, and all laboratory test results are presented in Appendix III of this report.

4.0 REGIONAL GEOLOGY & SUBSURFACE CONDITIONS

4.1 REGIONAL GEOLOGY

The referenced site is located within the Coastal Plain Province of North Carolina. The Coastal Plain Province is a broad, flat plain with widely-spaced and low-rolling hills where the near-surface soils have their origin from the deposition of sediments several million years ago during the period that the ocean receded from this area to its present location along the Atlantic coast. It is noted that the coastal plain soils vary in thickness from only a few feet along the western border to over ten thousand feet in some areas along the coast.

According to the *Geologic Map of North Carolina (1985)*, the site is underlain by sedimentary deposits of the Middendorf Formation. The Middendorf Formation consists of sand, sandstone, and mudstone, with clay balls and iron-cemented concretions. The formation is described to be cross-bedded, and exhibits lateral discontinuity.

4.2 SUBSURFACE CONDITIONS

4.2.1 General

The subsurface conditions discussed in the following paragraphs and those shown on the attached boring logs represent an estimate of the subsurface conditions based on interpretation of the boring



data using normally-accepted geotechnical engineering judgments. Although individual soil test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times. Data from the specific soil test borings are shown on the boring logs presented in Appendix II of this report.

A subsurface profile has been prepared from the boring data to graphically illustrate the subsurface conditions encountered at the site. The subsurface profile for each boring has been overlaid on sheets 13 and 14 of the provided “Tryon Drive Drainage Improvements 100% Design Drawings,” which are included in Appendix I as Figures 4 and 5. Strata breaks designated on the boring logs and subsurface profiles represent approximate boundaries between soil types. The transition from one soil type to another may be gradual or occur between soil samples. This section of the report provides a general discussion of subsurface conditions encountered within areas of proposed construction at the project site. More-detailed descriptions of the subsurface conditions at the individual boring locations are presented on the boring logs provided in Appendix II.

4.2.2 Surficial Materials

Surficial Organic Soils were encountered at the existing ground surface of each of the borings, with thicknesses ranging from 4 to 5 inches. The Surficial Organic Soils generally consisted of dark-colored soil material containing roots, fibrous matter, and/or other organic components, and is generally unsuitable for engineering purposes. F&R has not performed any laboratory testing to determine the organic content or other horticultural properties of the observed Surficial Organic Soil materials. Therefore, the term Surficial Organic Soil is not intended to indicate suitability for landscaping and/or other purposes. The Surficial Organic Soil thicknesses provided in this report are based on driller observations and should be considered approximate. We note that the transition from Surficial Organic Soil to underlying materials may be gradual, and therefore the observation and measurement of Surficial Organic Soil thickness is subjective. Actual Surficial Organic Soil thicknesses should be expected to vary.

4.2.3 Fill Soils

Below the surficial organic soils, fill soils were encountered in each of the borings and extended to depths ranging from 2 to 3.5 feet below the existing ground surface. The presence of this fill is likely a result of the original stormwater line construction and residential development of the area. The fill soils consisted of very loose to loose silty and clayey sands (USCS – SM and SC) with SPT N-values ranging from 4 to 7 blows per foot (bpf). N-values of less than 4 bpf are generally indicative of fill with poor compaction while N-values of 5 to 8 bpf are generally indicative of fill with moderate compaction. Well-compacted structural fill would generally be expected to exhibit



N-values of 9 bpf or greater. As such, it appears the fill soils were placed with poor to moderate compactive effort.

A layer of very loose fill soil (USCS – SM) was encountered in boring C-2 below the surficial organic soil, and extended to an approximate depth of 1.5 feet below the existing ground surface.

4.2.4 Coastal Plain Soils

Coastal Plain soils were encountered below the fill soils and extended to the termination depths of each boring. The Coastal Plain soils generally consisted of very loose to dense silty and clayey sands (USCS - SM and SC) with SPT N-values ranging from 3 to 31 bpf; firm low-plasticity clays (USCS – CL) with SPT N-values ranging from 6 to 8 bpf; and soft to very stiff highly plastic clays (USCS – CH) with SPT N-values ranging from 4 to 20 bpf.

Highly plastic silty clays (USCS – CH) were encountered in each boring at variable depths: in boring C-1 from 18.5 to 30 feet; in boring C-2 from 28.5 to 30 feet; and in boring C-3 from 13.5 to 18.5 feet below the existing ground surface.

Layers of very loose or soft Coastal Plain soil were encountered in boring C-1 at depths of 2 to 3.5 feet (USCS – SM) and 18.5 to 20 feet (USCS – CH), and in boring C-2 at a depth of 23.5 to 25 feet (USCS – SM) below the existing ground surface.

4.3 SOIL MOISTURE AND GROUNDWATER CONDITIONS

The majority of soil samples recovered from the borings were described as moist (*i.e.*, within 3 to 5 percent of the estimated optimum moisture content). Wet and/or saturated soil conditions (5 to 6 percent or greater above the estimated optimum moisture content) were encountered in borings C-1, C-2, and C-3 at depths of 18.5, 23.5, and 13.5 feet, respectively. In borings C-1 and C-2, once wet or saturated soils were encountered, these conditions extended to the termination depth of the borings.

Groundwater level measurements were attempted at the termination of drilling in all borings, and groundwater was encountered in borings C-1 and C-2 at depths of 24 and 27.3 feet, respectively. After a stabilization period of approximately 24 hours following the completion of drilling, groundwater was encountered in borings C-1 and C-2 at depths of 22.2 and 24.3 feet.

It should be noted that groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary from those described in this report. F&R notes that due to the presence of relatively impervious clayey soils noted on the project site, trapped or perched water conditions may be encountered during periods of inclement weather and during seasonally wet periods.



4.4 SOIL CORROSIVITY EVALUATION

Corrosivity potential of soils for the sheet pile walls is dependent upon several factors, including moisture, pH, Chlorides, Sulfates, Sulfide concentrations, Electrical Resistivity, and Oxidation Reduction Potential (REDOX), in addition to the location of the water table and any Bi-Metallic considerations during placement. Based on input from Kimley-Horn, laboratory testing was performed on 3 soil samples within the range of subsurface strata where sheet piles will be installed to determine their potential corrosive characteristics. The completed corrosivity testing results are presented in the table below, and are also included in Appendix III.

Boring	Sample Depth (ft)	pH	Chlorides (mg/kg) ¹	Sulfates (mg/kg) ¹	Sulfides (mg/kg) ¹	Electrical Resistivity (ohm-cm)	Oxidation Reduction Potential (mV)	Moisture Content (%)
C-1	8.5-10	5.62	<274	<384	<27.4	8130	380	8.83
C-2	13.5-15	4.73	<265	<371	<26.5	7810	400	5.75
C-3	18.5-20	5.13	<269	<377	<26.8	9620	411	7.04

¹BELOW INDICATED REPORTING LIMITS

From our review of available literature regarding corrosivity of soils relative to the proposed construction, and the results of the above corrosion analyses, the soils at the project site generally present a low potential for corrosion. According to the North American Steel Sheet Piling Association publication T.02 “Guidance on Corrosion”, and the US Army Corps of Engineers publication EM 1110-2-2504 “Design of Sheet Pile Walls”, sheet piles driven into undisturbed natural soils will not require supplemental corrosion protection due to the deficiency of oxygen below the ground surface. However, increased corrosion rates should be anticipated for sheet piles driven into freshly-placed fill soils due to oxygen replenishment.

Based on AASHTO LRFD Bridge Design Specifications, *Fifth Edition*, the tested soils are not considered indicative of a potential pile deterioration or corrosion situation due to the high resistivity and low sulfate values.

According to USDOT Publication No. FHWA-NHI-16-009, the high resistivity values are indicative of a non-aggressive soils environment regarding corrosion or deterioration.

Based on the Ductile Iron Pipe Research Association (DIPRA) AWWA C105/A21.5 (Polyethylene Encasement for Ductile-Iron Pipe Systems), the soils at the locations tested have a low corrosion potential based on the high resistivity and redox values.



Other corrosive factors such as coal, cinders, peat, mine wastes, and/or landfills are not known and were not observed during the subsurface exploration.

5.0 GEOTECHNICAL ENGINEERING EVALUATION AND RECOMMENDATIONS

5.1 GENERAL

The conclusions and recommendations contained in this section of the report are based upon the results of the three (3) soil test borings performed by F&R, our experience with similar projects and subsurface conditions, and the information provided to us regarding the proposed construction. From a geotechnical engineering perspective, it is our opinion that the subsurface conditions encountered at the project site are generally suitable for the proposed construction, provided the recommendations presented in subsequent sections of this report are followed throughout the design and construction phases of this project.

- The predominant soil types encountered in the borings consisted of silty and clayey sands (SM & SC), and highly plastic clays (CH). Very loose silty sands were encountered in the upper 3.5 feet of the soil profile in borings C-1 and C-2. Deeper in the soil profile, a layer of soft clay was encountered in boring C-1 at a depth of 18.5 feet, and a layer of very loose sand was encountered in boring C-2 at a depth of 23.5 feet below the existing ground surface.
- Highly plastic clays (CH) were encountered in each boring, at variable depths and thicknesses as follows: in boring C-1 from a depth of 18.5 to 30 feet below the existing ground surface; in boring C-2 from a depth of 28.5 to 30 feet; and in boring C-3 from a depth of 13.5 to 18.5 feet. These soils are moisture sensitive and can be difficult to properly place and compact.
- Wet and/or saturated soils were encountered in each boring, at variable depths as indicated in Section 4.3. Due to the moisture sensitivity of the on-site soils and potential for wet or saturated conditions, it is typically recommended that earthwork operations be performed during the seasonally-drier months (typically May to October) when weather conditions are more conducive to moisture-conditioning of earth fill (*e.g.*, drying of wet soils or wetting of dry soils) and achieving proper compaction of structural fill/backfill. If earthwork is performed during the seasonally wet months, additional repair (*i.e.*, drying of wet soils) will likely be required.
- Stabilized groundwater was encountered in borings C-1 and C-2 at depths of 22.2 and 24.3 feet below the existing ground surface, respectively. Even though groundwater was not measured or encountered in boring C-3, soil moisture and groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. Therefore, wet/saturated soil conditions and/or groundwater should be considered during design. Depending upon the prevailing weather conditions near the time of construction, groundwater levels may vary from what has been described in this report.



5.2 STRUCTURAL FILL PLACEMENT AND COMPACTION

It is expected that the low-plasticity on-site soils (SM, SC, and CL) will be suitable for use as structural fill/backfill material, provided they are at a moisture content suitable to achieve proper compaction and are stable during compaction and at final bearing grade. These low-plasticity soils are generally considered fair to good materials for use as structural earth fill. Highly plastic clays (CH) were encountered in each boring at variable depths. Highly plastic soils are considered poor materials for use as structural fill because they can be difficult to properly place and compact, and have the potential to undergo volume changes (shrink/swell) with varying moisture levels. It is generally recommended that these soils be used in the lower portions of the excavations or wasted.

Based on anticipated excavation depths and site conditions at the time of construction, some soils may require moisture conditioning (*e.g.*, drying of wet soils or wetting of dry soils) prior to use as structural fill. As such, it is recommended that earthwork be performed during the summer months when the weather conditions are more conducive to moisture conditioning of fill materials.

If imported soils are determined to be necessary, F&R recommends that a qualified geotechnical engineer or engineering technician working under the direction of the geotechnical engineer approve the suitability of the imported soils prior to their delivery to the site. Imported structural fill should consist of low plasticity soil (LL<35, PI<20), have a maximum dry density of at least 100 pcf, and be free of organic and other deleterious materials.

Structural earth fill should be compacted at a moisture content within ± 3 percentage points of the optimum moisture content and placed in loose lifts not exceeding 8 inches. All structural earth fill (*i.e.*, fill placed in roads and driveways) should be compacted to at least 95 percent of the Standard Proctor maximum dry density as determined by ASTM D698 and to 100 percent in the top 12 inches. Structural earth fill placed in non-structural/grassy areas should be compacted to at least 92 percent of the standard Proctor maximum dry density.

All structural fill material should be placed and compacted under the full time control and supervision of a qualified geotechnical engineer or engineering technician working under the direction of the geotechnical engineer. The placement and compaction of all fill material should be tested at frequent intervals to confirm the recommended degree of compaction is achieved.

As previously stated, the on-site soils have sufficient silt/clay content to render them moisture sensitive. The on-site soils will become unstable (*i.e.*, pump and rut) during normal construction activities when in the presence of excess moisture. Soils with a moisture content greater than three percentage points above the optimum moisture content are generally considered to have excessive moisture. During earthwork and construction activities, surface-water runoff must be drained away



from construction areas to prevent water from ponding on or saturating the soils within excavations or on subgrades.

Exposure to the environment may weaken the soils at the bearing level if excavations remain open for long periods of time. The bearing surfaces should be level or suitably-benched and free of loose soil, ponded water, and debris. If the bearing soils are softened by surface water intrusion, subsurface seepage, or exposure, the softened soils should be removed from the excavation immediately prior to placement of stone, concrete, or other pipe bedding materials.

5.3 TEMPORARY EXCAVATION AND SHORING RECOMMENDATIONS

Based on our understanding of the project, excavation depths for the stormwater pipe will extend to about 10 feet below the existing ground surface, and it will be necessary to install shoring and/or foundation protection systems for the single family homes located at 1732, 1734, 1735, and 1737 Swann Street, and 1729 and 1733 Daisy Lane. F&R is providing soil parameters for use by Kimley-Horn in their shoring design. The soil parameters provided are for application to the soils encountered at the specified boring location only.

It is the responsibility of the shoring designer to apply the soil parameters to the locations and elevations of the shoring being designed, and to use appropriate factors of safety. Lateral earth pressures arising from surcharge loading (e.g., soil stockpiles, construction supplies, vehicular traffic, etc.) and foundations behind the shoring should also be considered by the designer. In addition, transient loads imposed on the walls by construction equipment should be taken into account. Tables of Soil Parameters are provided in Appendix II. The moist unit weights indicated are the total unit weights. For strata below the design groundwater elevation, F&R recommends the use of the buoyant unit weights. A higher groundwater elevation and/or an unbalanced groundwater condition may be considered by the designer to be conservative.

F&R understands that temporary shoring and/or sheeting will be necessary at each of the boring locations of our recent subsurface exploration. These three locations are described below:

- ***Between 1735 and 1737 Swann Street:*** Boring C-1 was advanced in this area. Based on the boring data, it is expected the stormwater pipe will typically be installed through moist, loose to medium dense silty and clayey sands (SM and SC). As such, it is not anticipated that difficult excavation will be encountered during the excavation and sheeting/shoring activities. Subgrade repairs for the waterline installation are also not anticipated at this location.

Stabilized groundwater was encountered at a depth of 22.2 feet in the boring performed in this area. As such, wet soil conditions and groundwater will likely not be encountered



during the anticipated 10-foot excavation depths. However, wet soils and groundwater should be considered in shoring design.

- **Between 1732 and 1734 Swann Street:** Boring C-2 was advanced in this area. Based on the boring data, it is expected the stormwater pipe will typically be installed through moist, loose to dense silty and clayey sands (SM and SC). As such, it is not anticipated that difficult excavations will be encountered during the excavation and sheeting/shoring activities. Subgrade repairs for the waterline installation are also not anticipated at this location.

Stabilized groundwater was encountered at a depth of 24.3 feet in the boring performed in this area. As such, groundwater and wet soil conditions will likely not be encountered during the anticipated 10-foot excavation depths. However, wet soils and groundwater should be considered in shoring design.

- **Between 1729 and 1733 Daisy Lane:** Boring C-3 was advanced in this area. Based on the boring data, it is expected the stormwater pipe will typically be installed through moist, firm clays (CL) and medium dense silty sands (SM). As such, it is not anticipated that difficult excavation will be encountered during the excavation and sheeting/shoring activities. Subgrade repairs for the waterline installation are also not anticipated at this location.

Initial groundwater was not encountered in this boring. A stabilized groundwater measurement was not taken at this location as the boring was backfilled immediately after drilling. Groundwater and wet soil conditions will likely not be encountered during the anticipated 10-foot excavation depths. However, given the wet soil conditions at this location, and the possibility of the groundwater table being encountered above the termination depth of our boring, wet soils and groundwater may be considered in shoring design.

Mass excavations and other excavations required for construction of this project must be performed in accordance with the United States Department of Labor, Occupational Safety and Health Administration (OSHA) guidelines (29 CFR 1926, Subpart P, Excavations) or other applicable jurisdictional codes for permissible temporary side-slope ratios and/or shoring requirements. The OSHA guidelines require daily inspections of excavations, adjacent areas, and protective systems by a “competent person” for evidence of situations that could result in cave-ins, indications of failure of a protective system, or other hazardous conditions. All excavated soils, equipment, building supplies, etc., should be placed away from the edges of excavations at a distance equaling or exceeding the depth of the excavation. F&R cautions that the actual excavation slopes will need to be evaluated frequently each day by the “competent person” and



flatter slopes or the use of shoring may be required to maintain a safe excavation. The contractor is responsible for providing the “competent person” and all aspects of site excavation safety. F&R can evaluate specific excavation slope situations if we are informed and requested to by the owner, designer, or contractor’s “competent person”.

6.0 CONTINUATION OF SERVICES

We recommend that site preparation, subgrade evaluation, and structural fill placement and compaction be monitored by the geotechnical engineer of record or engineering technician working under the supervision of the geotechnical engineer. A qualified soils technician should monitor fill placement and perform density tests on each lift of compacted fill and at final subgrades to verify that adequate compaction is being achieved. It should be noted that the actual soil conditions will vary across this site and thus the presence of the geotechnical engineer and/or their representative during construction will serve to validate the subsurface conditions and recommendations presented in this report.

We recommend that F&R be retained to monitor the construction, and to confirm that the recommendations contained in this report are completed in a satisfactory manner. Our continued involvement on the project will aid in the proper implementation of the recommendations discussed herein. The following is a recommended scope of services:

- Review of project plans and construction specifications to verify that the recommendations presented in this report have been properly interpreted and implemented;
- Observe the earthwork process to document that subsurface conditions encountered during construction are consistent with the conditions anticipated in this report;
- Observe the subgrade conditions before placing structural fill; and,
- Observe the placement and compaction of any structural fill and backfill, and perform laboratory and field compaction testing of the fill.

7.0 LIMITATIONS

This report has been prepared for the exclusive use of Kimley-Horn and/or their agents, for specific application to the referenced project in accordance with generally-accepted soil and foundation engineering practices. No other warranty, express or implied, is made. Our evaluations and recommendations are based on design information furnished to us, the data obtained from the previously-described subsurface exploration program, and generally-accepted geotechnical engineering practice. The evaluations and recommendations do not reflect variations in subsurface conditions, which could exist intermediate of the boring locations or in unexplored areas of the site. Should such variations become apparent during construction, it will be necessary to re-evaluate our recommendations based upon our on-site observations of the conditions.



There are important limitations to this and all geotechnical studies. Some of these limitations are discussed in the information prepared by the Geoprofessional Business Association (GBA), which is included in the Appendix IV. We ask that you please review this information.

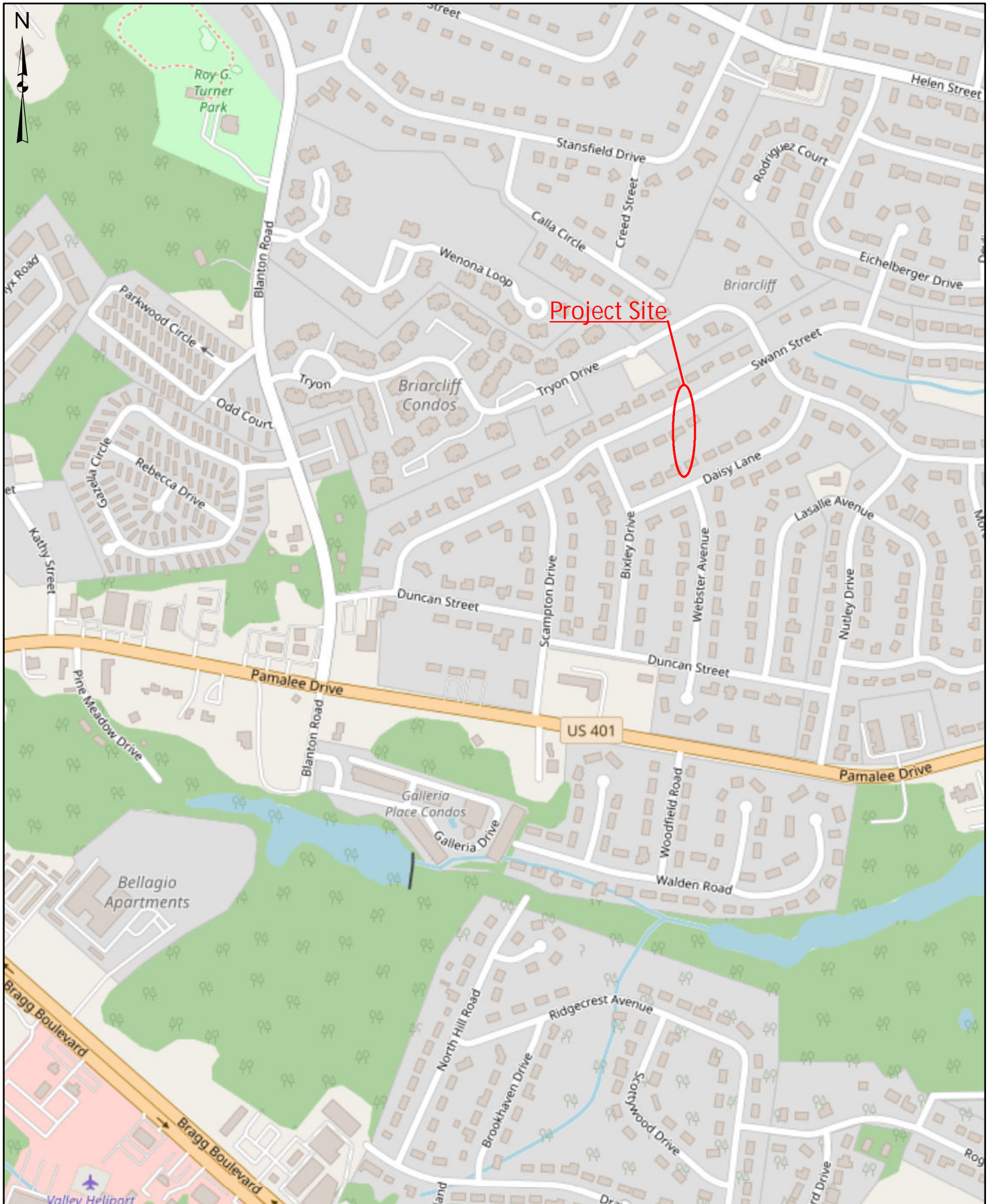
Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers should observe earthwork and foundation construction to confirm that conditions anticipated in design actually exist. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications, or recommendations.

In the event that changes are made in the proposed construction, the recommendations presented in this report shall not be considered valid unless the changes are reviewed by our firm and conclusions of this report are modified and/or verified in writing. If this report is copied or transmitted to a third party, it must be copied or transmitted in its entirety, including text, attachments, and enclosures. Interpretations based on only a part of this report may not be valid.

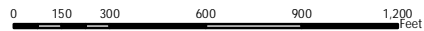


APPENDIX I

FIGURES



Site Vicinity Map



FROEHLING & ROBERTSON
Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

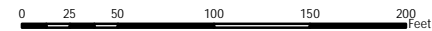
Client:	City of Fayetteville
Project:	Tryon Drive Drainage Improvement
Location:	Fayetteville, Cumberland County, NC
Project Number:	66C-0159
Data:	Open Street
Date:	February 2025

Scale: 1 inch = 600 feet

FIGURE No.: 1



Boring Location Plan



310 Hubert Street
 Raleigh, North Carolina 27603
 T 919.828.3441

Client:	City of Fayetteville	
Project:	Tryon Drive Drainage Improvement	
Location:	Fayetteville, Cumberland County, NC	
Project Number:	66C-0159	
Data:	NCOneMap Aerial 2021/Parcels 2024	
Date:	February 2025	Scale: 1 inch = 100 feet

FIGURE No.: 2



SUBSURFACE PROFILE

Plot Based on Elevation
Profile Name: Figure No. 3

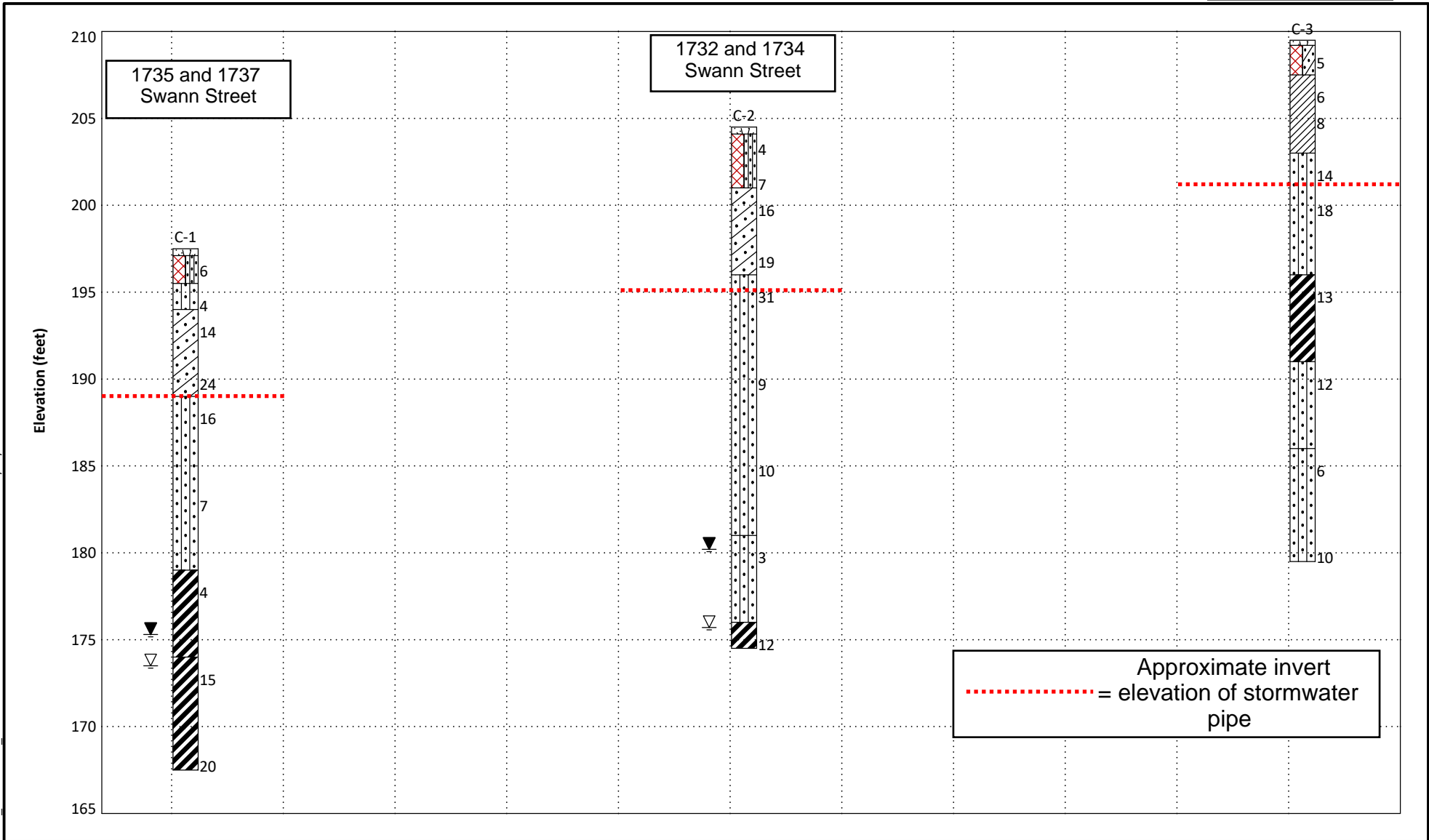
Project No: 66C-0159

Client: Kimley-Horn

Project: Tryon Dr. Drainage Improvements

City/State: Fayetteville, NC

1729 and 1733
Daisy Lane



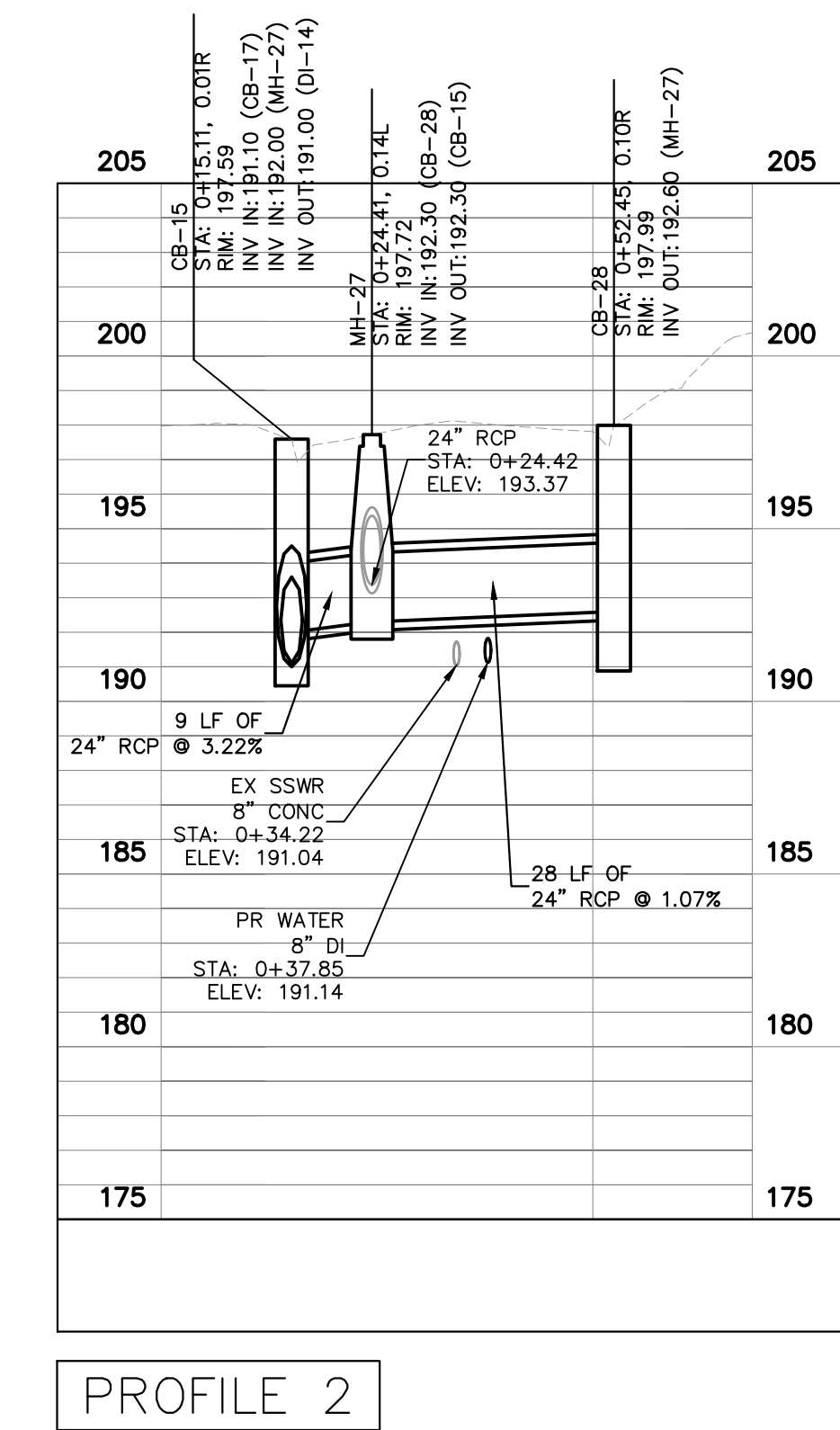
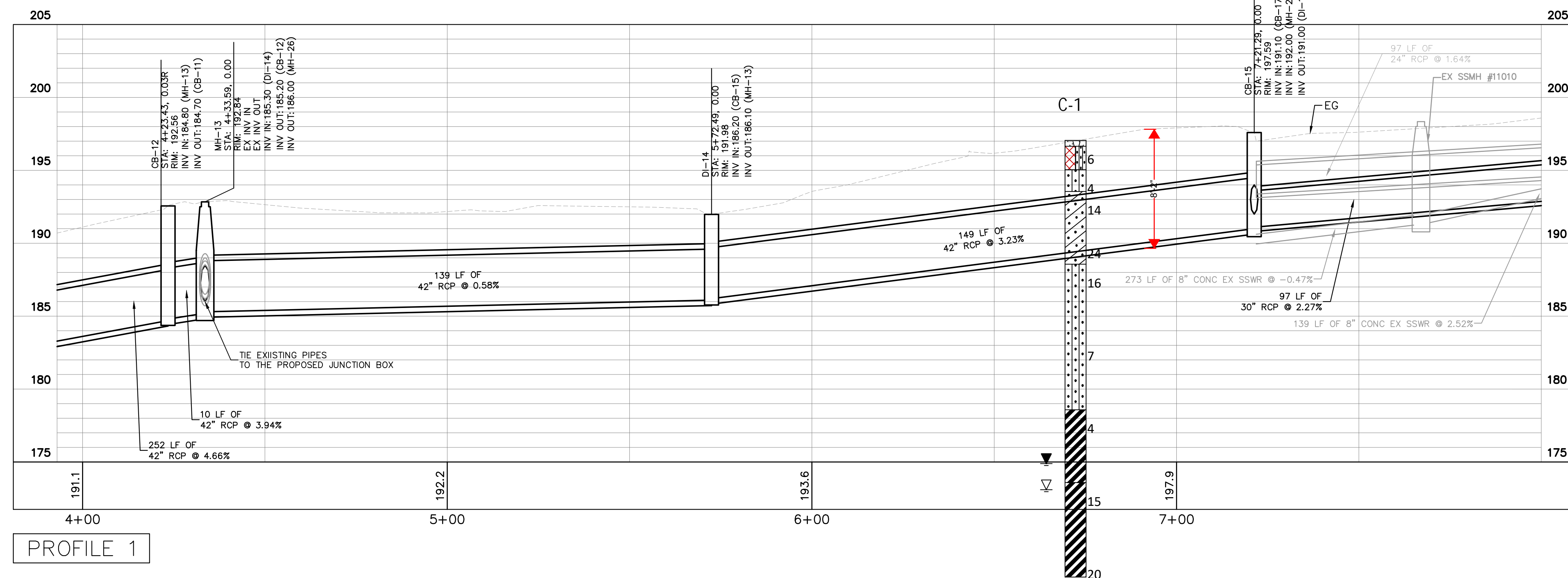
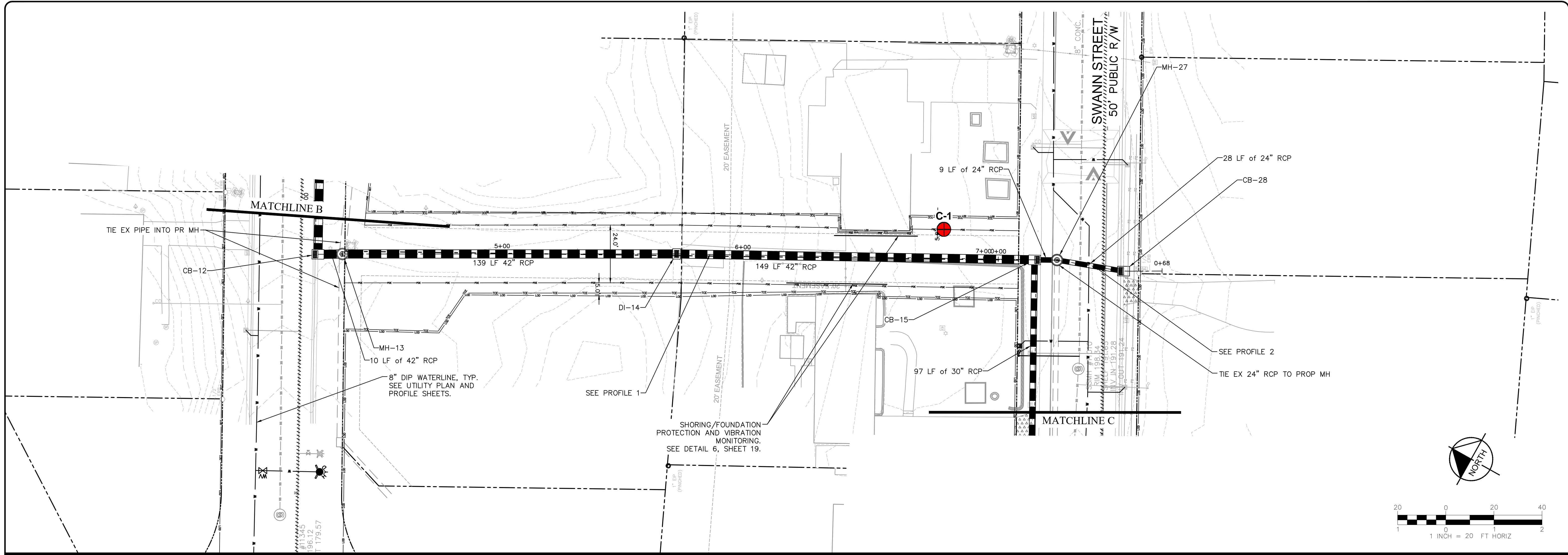
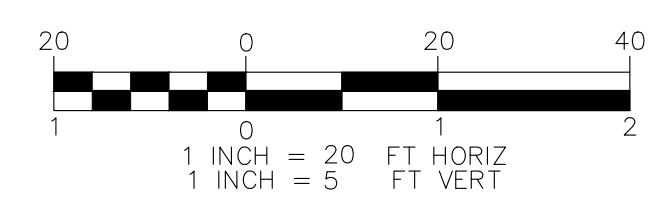


Figure No. 4



STORM PLAN PROFILE (3)
 PLAN TYPE
 SHEET NUMBER
13 of 31

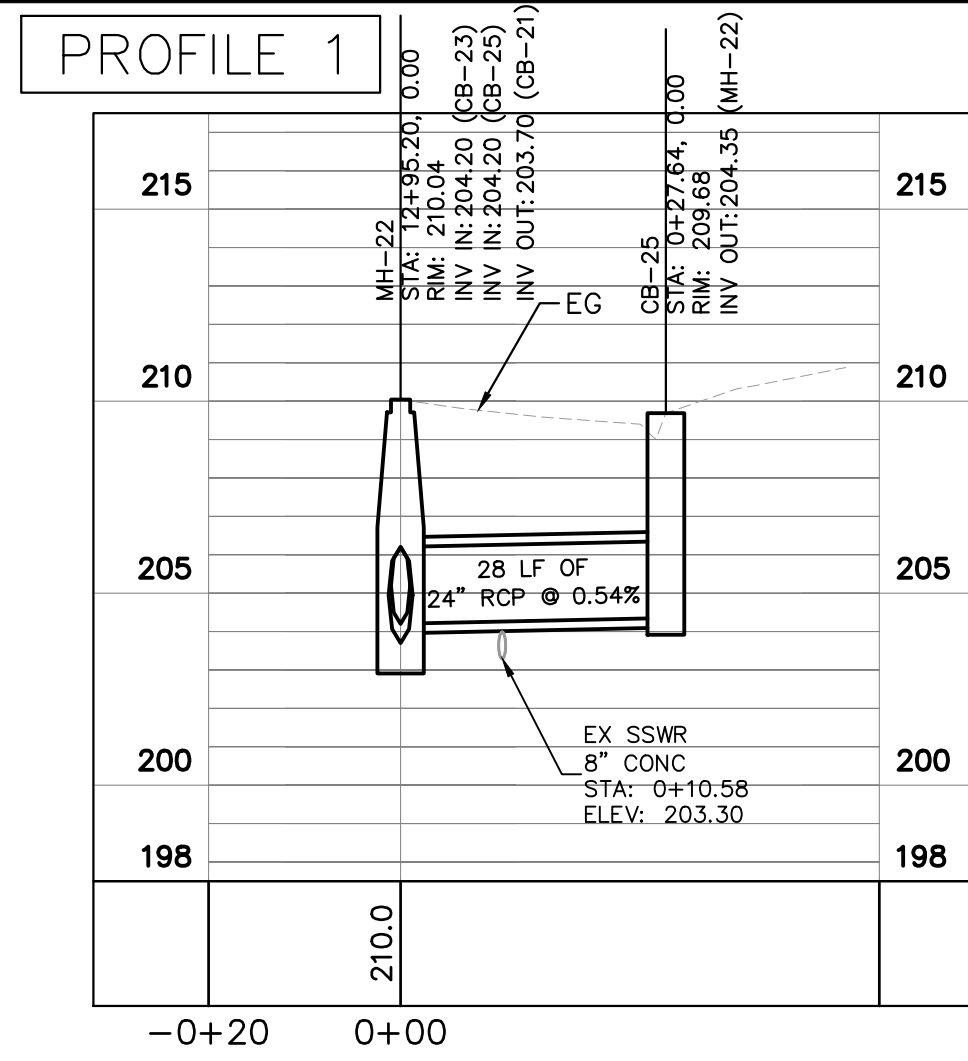
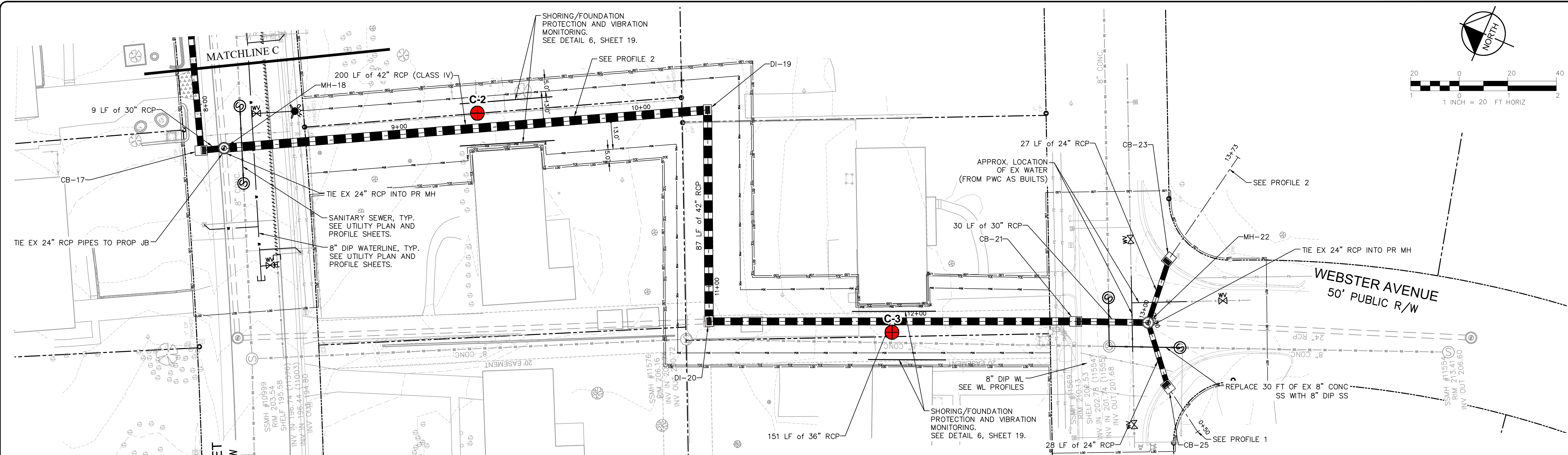
Kimley»Horn
 421 FAYETTEVILLE STREET
 SUITE 600
 RALEIGH, NC 27601
 NC LICENSE F-0102

FAYETTEVILLE:
PUBLIC SERVICES
 ENGINEERING DIVISION
 ENGINEERING & INFRASTRUCTURE DEPARTMENT
 432 HAY STREET, FAYETTEVILLE, NC 28501



PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT NAME :	TRYON DRAINAGE
DESIGNER :	G. SEITZ
CHECKER :	T. CRISSMAN
APPROVED :	T. CRISSMAN
DATE :	JANUARY 2024
PROJECT NO. :	KH.011017025
SUB-LEDGER NO. :	



PROFILE 2

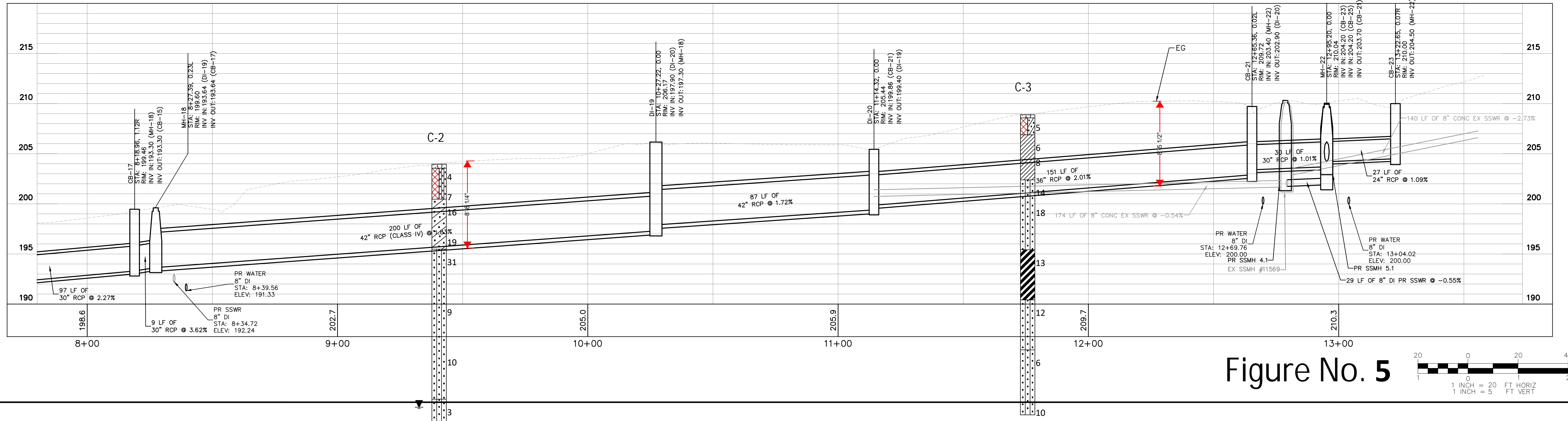


Figure No. 5

STORM PLAN PROFILE (4)

PLAN TYPE

SHEET NUMBER

14 of 31

Kimley»Horn

421 FAYETTEVILLE STREET
SUITE 600
RALEIGH, NC 27601
NC LICENSE F-0102

FAYETTEVILLE:
PUBLIC SERVICES

ENGINEERING DIVISION

ENGINEERING & INFRASTRUCTURE DEPARTMENT
430 EAST STREET, FAYETTEVILLE, NC 28401



REV. #	REVISIONS	DESCRIPTION	REV. BY	DATE

PRELIMINARY

NOT FOR CONSTRUCTION

PROJECT: TRYON DRAINAGE

NAME: SCALE

CHECK: DATE

APPROVED: T. CRISSMAN

PROJECT NO. KH.01.017025

SUB-LEDGER NO.



APPENDIX II

BORING LOGS



KEY TO SOIL CLASSIFICATION

Correlation of Penetration Resistance with Relative Density and Consistency

<u>Sands and Gravels</u>		<u>Silts and Clays</u>	
<u>No. of Blows, N</u>	<u>Relative Density</u>	<u>No. of Blows, N</u>	<u>Relative Density</u>
0 - 4	Very loose	0 - 2	Very soft
5 - 10	Loose	3 - 4	Soft
11 - 30	Medium dense	5 - 8	Firm
31 - 50	Dense	9 - 15	Stiff
Over 50	Very dense	16 - 30	Very stiff
		31 - 50	Hard
		Over 50	Very hard

Particle Size Identification (Unified Classification System)

Boulders:	Diameter exceeds 8 inches
Cobbles:	3 to 8 inches diameter
Gravel:	<u>Coarse</u> - 3/4 to 3 inches diameter <u>Fine</u> - 4.76 mm to 3/4 inch diameter
Sand:	<u>Coarse</u> - 2.0 mm to 4.76 mm diameter <u>Medium</u> - 0.42 mm to 2.0 mm diameter <u>Fine</u> - 0.074 mm to 0.42 mm diameter
Silt and Clay:	Less than 0.07 mm (particles cannot be seen with naked eye)

Modifiers

The modifiers provide our estimate of the amount of silt, clay or sand size particles in the soil sample.

<u>Approximate Content</u>	<u>Modifiers</u>
≤ 5%:	Trace
5% to 12%:	Slightly silty, slightly clayey, slightly sandy
12% to 30%:	Silty, clayey, sandy
30% to 50%:	Very silty, very clayey, very sandy

<u>Field Moisture Description</u>	
Saturated:	Usually liquid; very wet, usually from below the groundwater table
Wet:	Semisolid; requires drying to attain optimum moisture
Moist:	Solid; at or near optimum moisture
Dry:	Requires additional water to attain optimum moisture





















Ground Water

▽ Water Level in Bore Hole Immediately after Drilling

▼ Static Water Level after 24 Hours



UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

<i>MAJOR DIVISION</i>				<i>TYPICAL NAMES</i>
<i>GRAVELS</i> More than 50% of coarse fraction larger than No. 4 sieve	<i>CLEAN GRAVEL</i> (little or no fines)		GW	Well graded gravels
	<i>GRAVELS with fines</i>		GP	Poorly graded gravels
			GM	Silty gravels
		GC	Clayey gravels	
<i>SANDS</i> More than 50% of coarse fraction smaller than No. 4 sieve	<i>CLEAN SAND</i> (little or no fines)		SW	Well graded sands
	<i>SAND with fines</i>		SP	Poorly graded sands
			SM	Silty sands, sand/silt mixtures
		SC	Clayey sands, sand/clay mixtures	
<i>SILTS AND CLAYS</i> Liquid Limit is less than 50			ML	Inorganic silts, sandy and clayey silts with slightly plasticity
			CL	Sandy or silty clays of low to medium plasticity
			OL	Organic silts of low plasticity
<i>SILTS AND CLAYS</i> Liquid Limit is greater than 50			MH	Inorganic silts, sandy micaceous or clayey elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
<i>HIGHLY ORGANIC SOILS</i>			PT	Peat and other highly organic soils
<i>MISCELLANEOUS MATERIALS</i>				PWR (Partially Weathered Rock)
				Rock
				Asphalt
				ABC Stone
				Concrete
				Surficial Organic Soil



Project No: 66C-0159

Client: Kimley-Horn

Project: Tryon Dr. Drainage Improvements

City/State: Fayetteville, NC

Elevation: 197.5 ±

Total Depth: 30.0'

Boring Location: See Boring Location Plan

Drilling Method: 2.25" I.D. HSA

Hammer Type: Automatic

Date Drilled: 1/23/25

Driller: S. Davis

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
197.1	0.4	SURFICIAL ORGANIC SOIL	2-2-4	0.0		GROUNDWATER DATA: 0 hrs: 24.0' inside PVC 24 hrs: 22.2' inside PVC
195.5	2.0	FILL: Loose, Brown-Tan, Moist, Silty Fine SAND (SM)	2-2-2	1.5 2.0	6	
194.0	3.5	COASTAL PLAIN: Very Loose, Tan, Moist, Silty Fine to Medium SAND (SM)	3-6-8	3.5	4	
		Medium Dense, Orange-Brown, Moist, Clayey Fine to Medium SAND (SC)		5.0	14	
			10-11-13	6.5		
				8.0	24	
189.0	8.5	Loose to Medium Dense, Orange-Tan, Moist, Silty Fine to Medium SAND (SM)	8-8-8	8.5		
				10.0	16	
			4-3-4	13.5		
				15.0	7	
179.0	18.5	Soft, Gray-Tan, Wet, Fine to Coarse Sandy CLAY (CH)	2-1-3	18.5		
				20.0	4	
174.0	23.5	Stiff to Very Stiff, Gray to Dark Gray, Wet, Fine to Coarse Sandy CLAY (CH)	6-6-9	23.5		
				25.0	15	
			5-9-11	28.5		
167.5	30.0	Boring Terminated at 30 Feet		30.0	20	

BORING_LOG_66C-0159 BORING LOGS.GPJ F&R.GDT 2/13/25

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



Project No: 66C-0159

Client: Kimley-Horn

Project: Tryon Dr. Drainage Improvements

City/State: Fayetteville, NC

Elevation: 204.5 ±

Total Depth: 30.0'

Boring Location: See Boring Location Plan

Drilling Method: 2.25" I.D. HSA

Hammer Type: Automatic

Date Drilled: 1/23/25

Driller: S. Davis

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
204.1	0.4	SURFICIAL ORGANIC SOIL	1-1-3	0.0		GROUNDWATER DATA: 0 hrs: 27.3' inside PVC 24 hrs: 24.3' inside PVC
		FILL: Very Loose to Loose, Orange-Tan and Brown, Moist, Silty Clayey Fine to Medium SAND (SM) with Trace Roots	3-3-4	1.5 2.0	4	
201.0	3.5	COASTAL PLAIN: Medium Dense, Orange-Brown, Moist, Clayey Fine to Medium SAND (SM)	5-7-9	3.5	7	
				5.0	16	
				6.5		
196.0	8.5	Loose to Dense, Orange-Tan-Gray, Moist, Silty Fine to Medium SAND (SM)	9-14-17	8.0 8.5	19	
				10.0	31	
				13.5		
			6-5-4	15.0	9	
				18.5		
			4-5-5	20.0	10	
181.0	23.5	Very Loose, Orange, Saturated, Clayey Silty Fine to Coarse SAND (SM) with Trace Fine Gravel	1-2-1	23.5		
				25.0	3	
176.0	28.5	Stiff, Dark Gray, Wet, Fine Sandy CLAY (CH) with Trace Mica	3-5-7	28.5		
174.5	30.0	Boring Terminated at 30 Feet		30.0	12	

BORING_LOG_66C-0159 BORING LOGS.GPJ F&R.GDT 2/13/25

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.



Project No: 66C-0159

Elevation: 209.5 ±

Drilling Method: 2.25" I.D. HSA

Client: Kimley-Horn

Total Depth: 30.0'

Hammer Type: Automatic

Project: Tryon Dr. Drainage Improvements

Boring Location: See Boring Location Plan

Date Drilled: 1/24/25

City/State: Fayetteville, NC

Driller: S. Davis

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
209.2	0.3	SURFICIAL ORGANIC SOIL	1-2-3	0.0		GROUNDWATER DATA: 0 hrs: Dry, Caved at 24.0' Backfilled Immediately After Drilling
207.5	2.0	FILL: Loose, Brown-Orange, Moist, Clayey Fine to Medium SAND (SC) with Trace Roots	2-3-3	1.5	5	
				2.0		
203.0	6.5	COASTAL PLAIN: Firm, Orange-Brown, Moist, Fine to Medium Sandy CLAY (CL)	3-4-4	3.5	6	
				5.0	8	
				6.5		
				8.0	14	
196.0	13.5	Medium Dense, Orange-Brown, Moist, Silty Fine to Medium SAND (SM)	5-6-8	8.5	18	
				10.0		
				13.5	13	
191.0	18.5	Stiff, Mottled Gray and Red, Wet, CLAY (CH)	5-6-7	15.0		
				18.5	12	
186.0	23.5	Medium Dense, Gray-Tan-Orange, Moist, Silty Fine SAND (SM)	4-6-6	20.0		
				23.5	6	
179.5	30.0	Loose, Tan-Orange, Wet, Silty Fine to Medium SAND (SM) with Trace Gravel	3-3-3	25.0		
				28.5	10	
				30.0		
		Boring Terminated at 30 Feet				

BORING_LOG_66C-0159 BORING LOGS.GPJ F&R.GDT 2/13/25

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

Table of Soil Parameters - Boring C-1
Tryon Drive Drainage Improvements - Additional Borings
F&R Project No. 66C-0159
Fayetteville, NC

Depth Below Ground (feet)	Elevation at Top of Stratum (feet)	Soil Description	Cohesion C (psf)	Friction Angle ϕ (degrees)	Moist Unit Weight γ_m (pcf)	Buoyant Unit Weight γ_b (pcf)	Active Earth Pressure k_a	At-Rest Earth Pressure k_o	Passive Earth Pressure k_p
0.0	197.1	Loose Fill and Very Loose CP Sands (SM)	25	27	120	58	0.38	0.55	2.66
3.5	193.6	Loose to Medium Dense Silty and Clayey Sands (SM/SC)	100	32	120	58	0.31	0.47	3.25
18.5	178.6	Soft Wet Clay (CH)	450	18	90	28	0.53	0.69	1.89
23.5	173.6	Stiff to Very Stiff Wet Clay (CH)	1800	22	95	33	0.45	0.63	2.20

*Groundwater assumed at a depth of 22.2-ft below the existing ground surface, for evaluation purposes by others.

** The above parameters are based on geotechnical correlations with SPT N-values and are not derived from laboratory testing. As such, designers should use their engineering judgement as to the applicability of the above parameters for use in design.

Table of Soil Parameters - Boring C-2
Tryon Drive Drainage Improvements - Additional Borings
F&R Project No. 66C-0159
Fayetteville, NC

Depth Below Ground (feet)	Elevation at Top of Stratum (feet)	Soil Description	Cohesion C (psf)	Friction Angle ϕ (degrees)	Moist Unit Weight γ_m (pcf)	Buoyant Unit Weight γ_b (pcf)	Active Earth Pressure k_a	At-Rest Earth Pressure k_o	Passive Earth Pressure k_p
0.0	204.1	Very Loose to Loose Fill Sands (SM)	25	28	120	58	0.36	0.53	2.77
3.5	200.6	Loose to Dense Clayey and Silty Sands (SC/SM)	100	33	120	58	0.29	0.46	3.39
23.5	180.6	Very Loose Saturated Silty Sand (SM)	25	27	110	48	0.38	0.55	2.66
28.5	175.6	Stiff Wet Clay (CH)	1600	21	95	33	0.47	0.64	2.12

*Groundwater assumed at a depth of 24.3-ft below the existing ground surface, for evaluation purposes by others.

** The above parameters are based on geotechnical correlations with SPT N-values and are not derived from laboratory testing. As such, designers should use their engineering judgement as to the applicability of the above parameters for use in design.

Table of Soil Parameters - Boring C-3
Tryon Drive Drainage Improvements - Additional Borings
F&R Project No. 66C-0159
Fayetteville, NC

Depth Below Ground (feet)	Elevation at Top of Stratum (feet)	Soil Description	Cohesion C (psf)	Friction Angle ϕ (degrees)	Moist Unit Weight γ_m (pcf)	Buoyant Unit Weight γ_b (pcf)	Active Earth Pressure k_a	At-Rest Earth Pressure k_o	Passive Earth Pressure k_p
0.0	209.2	Loose Clayey Fill Sand (SC) and Firm CP Clay (CL)	800	28	110	48	0.36	0.53	2.77
6.5	202.7	Medium Dense Silty Sand (SM)	25	32	120	58	0.31	0.47	3.25
13.5	195.7	Stiff Wet Clay (CH)	1600	21	95	33	0.47	0.64	2.12
18.5	190.7	Loose to Medium Dense Wet Silty Sands (SM)	25	30	115	53	0.33	0.50	3.00

*Groundwater assumed at a depth greater than 30-ft below the existing ground surface, for evaluation purposes by others.

** The above parameters are based on geotechnical correlations with SPT N-values and are not derived from laboratory testing. As such, designers should use their engineering judgement as to the applicability of the above parameters for use in design.



APPENDIX III

LABORATORY TEST RESULTS

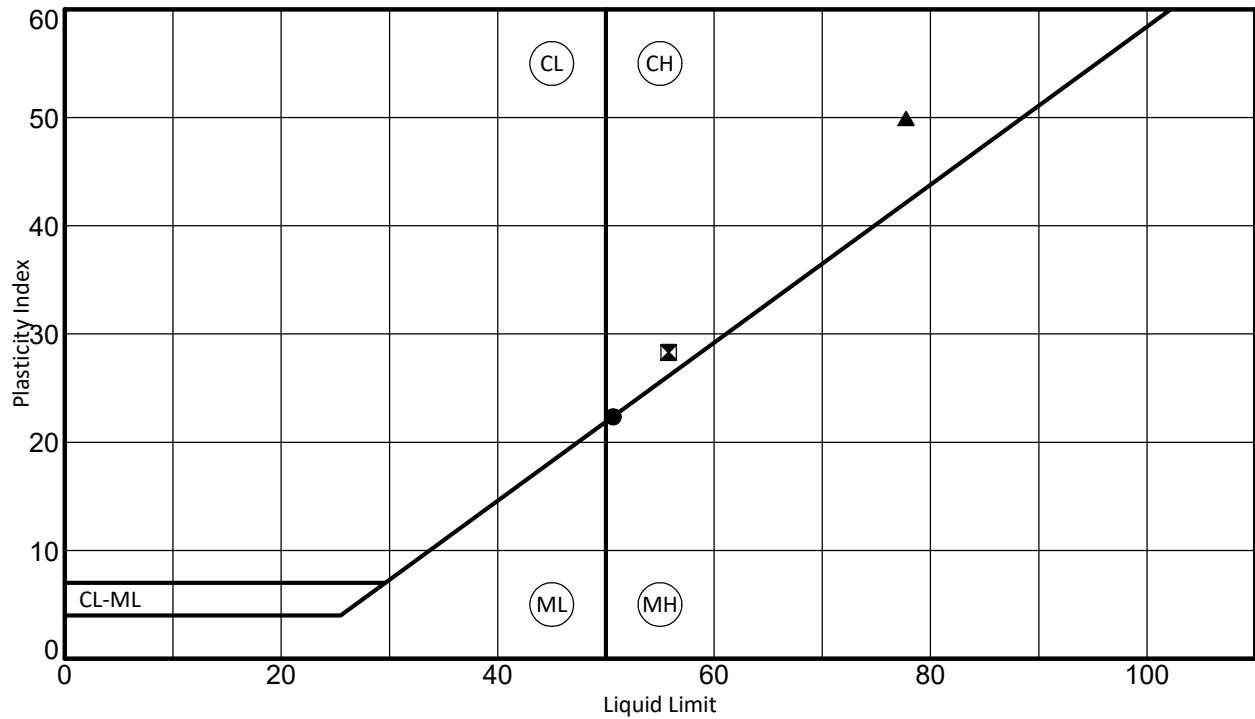


Project No: 66C-0159

Client: Kimley Horn

Project: Tryon Drive Drainage Improvements

City/State: Fayetteville, NC



Boring No.	Depth	LL	PL	PI	% PASSING #200	Classification	% Natural Water Content
● C-1	23.5' - 25.0'	51	28	23	77.9	FAT CLAY with SAND (CH)	23.1
⊠ C-2	3.5' - 5.0'	56	27	29	45.4	CLAYEY SAND (SC)	16.1
▲ C-3	13.5' - 15.0'	78	28	50	93.2	FAT CLAY (CH)	32.4

2/6/2025

Froehling & Robertson, Inc. (Raleigh)
Dave Morse
310 Hubert St.
Raleigh, NC, 27603

Ref: Analytical Testing
Lab Report Number: 25-028-0006
Client Project Description: Tron Drive Drainage Improvements - Addit
Fayetteville, NC

Dear Dave Morse:

Waypoint Analytical, LLC (Charlotte) received sample(s) on 1/28/2025 for the analyses presented in the following report.

The above referenced project has been analyzed per your instructions. The analyses were performed in accordance with the applicable analytical method.

The analytical data has been validated using standard quality control measures performed as required by the analytical method. Quality Assurance, method validations, instrumentation maintenance and calibration for all parameters were performed in accordance with guidelines established by the USEPA (including 40 CFR 136 Method Update Rule May 2021) unless otherwise indicated.

Certain parameters (chlorine, pH, dissolved oxygen, sulfite...) are required to be analyzed within 15 minutes of sampling. Usually, but not always, any field parameter analyzed at the laboratory is outside of this holding time. Refer to sample analysis time for confirmation of holding time compliance.

The results are shown on the attached Report of Analysis(s). Results for solid matrices are reported on an as-received basis unless otherwise indicated. This report shall not be reproduced except in full and relates only to the samples included in this report.

Please do not hesitate to contact me or client services if you have any questions or need additional information.

Sincerely,



Angela D Overcash
Senior Project Manager

Laboratory's liability in any claim relating to analyses performed shall be limited to, at laboratory's option, repeating the analysis in question at laboratory's expense, or the refund of the charges paid for performance of said analysis.

Certification Summary

Laboratory ID: WP CNC: Waypoint Analytical Carolina, Inc. (C), Charlotte, NC

State	Program	Lab ID	Expiration Date
North Carolina	State Program	37735	07/31/2025
North Carolina	State Program	402	12/31/2025
South Carolina	State Program	99012	07/31/2025
South Carolina	State Program	99012	12/31/2024

Laboratory ID: WP MTN: Waypoint Analytical, LLC., Memphis, TN

State	Program	Lab ID	Expiration Date
Alabama	State Program	40750	02/28/2025
Arkansas	State Program	88-0650	02/07/2025
California	State Program	2904	06/30/2025
Florida	State Program - NELAP	E871157	06/30/2025
Georgia	State Program	C044	11/14/2025
Georgia	State Program	04015	06/30/2025
Illinois	State Program - NELAP	200078	10/31/2025
Kentucky	State Program	KY90047	12/31/2025
Kentucky	State Program	80215	06/30/2025
Kentucky	State Program	KY90047	12/31/2025
Louisiana	State Program - NELAP	LA037	12/31/2025
Louisiana	State Program - NELAP	04015	06/30/2025
Mississippi	State Program	MS	11/14/2025
North Carolina	State Program	47701	07/31/2025
North Carolina	State Program	415	12/31/2025
Pennsylvania	State Program - NELAP	68-03195	05/31/2025
South Carolina	State Program	84002	06/30/2025
Tennessee	State Program	02027	11/14/2025
Texas	State Program - NELAP	T104704180	09/30/2025
Virginia	State Program	00106	06/30/2025
Virginia	State Program - NELAP	460181	09/14/2025

Sample Summary Table

Report Number: 25-028-0006
Client Project Description: Tron Drive Drainage Improvements - Addit Fayetteville, NC

Lab No	Client Sample ID	Matrix	Date Collected	Date Received	Method	Lab ID
91198	C-1, 8.5'-10'	Solids	01/23/2025	01/28/2025 11:00		
91198	C-1, 8.5'-10'	Solids	01/23/2025	01/28/2025 11:00	ASTM-G57-95	WP MTN
91198	C-1, 8.5'-10'	Solids	01/23/2025	01/28/2025 11:00	SM-2580	WP MTN
91198	C-1, 8.5'-10'	Solids	01/23/2025	01/28/2025 11:00	SW-9034	WP MTN
91199	C-2, 13.5-15'	Solids	01/23/2025	01/28/2025 11:00		
91199	C-2, 13.5-15'	Solids	01/23/2025	01/28/2025 11:00	SM-2580	WP MTN
91199	C-2, 13.5-15'	Solids	01/23/2025	01/28/2025 11:00	ASTM-G57-95	WP MTN
91199	C-2, 13.5-15'	Solids	01/23/2025	01/28/2025 11:00	SW-9034	WP MTN
91200	C-3, 18.5-20'	Solids	01/24/2025	01/28/2025 11:00		
91200	C-3, 18.5-20'	Solids	01/24/2025	01/28/2025 11:00	SW-9034	WP MTN
91200	C-3, 18.5-20'	Solids	01/24/2025	01/28/2025 11:00	SM-2580	WP MTN
91200	C-3, 18.5-20'	Solids	01/24/2025	01/28/2025 11:00	ASTM-G57-95	WP MTN

Summary of Detected Analytes

Project: Tron Drive Drainage Improvements - Addit
Report Number: 25-028-0006

Client Sample ID	Lab Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
C-1, 8.5'-10'	V 91198					
9045D	pH	5.62	s.u.		01/31/2025 11:57	
ASTM-G57-95	Resistivity (soil)	8130	ohm-cm		02/06/2025 15:05	
SM-2580	Oxidation Reduction Potential	380	mV	-800	02/03/2025 10:00	
SW-DRYWT	Moisture	8.83	%		01/29/2025 10:29	
C-2, 13.5-15'	V 91199					
9045D	pH	4.73	s.u.		01/31/2025 11:57	
ASTM-G57-95	Resistivity (soil)	7810	ohm-cm		02/06/2025 15:05	
SM-2580	Oxidation Reduction Potential	400	mV	-800	02/03/2025 10:00	
SW-DRYWT	Moisture	5.75	%		01/29/2025 10:29	
C-3, 18.5-20'	V 91200					
9045D	pH	5.13	s.u.		01/31/2025 11:57	
ASTM-G57-95	Resistivity (soil)	9620	ohm-cm		02/06/2025 15:05	
SM-2580	Oxidation Reduction Potential	411	mV	-800	02/03/2025 10:00	
SW-DRYWT	Moisture	7.04	%		01/29/2025 10:29	

Client: Froehling & Robertson, Inc. (Raleigh)
Project: Tron Drive Drainage Improvements - Addit
Lab Report Number: 25-028-0006
Date: 2/6/2025

CASE NARRATIVE

Anions by Ion Chromatography Method 9056A

Sample 91198 (C-1, 8.5'-10')

Analyte: Chloride

QC Batch No: V56045/V56027

Matrix spike/matrix spike duplicate recoveries are outside of control limits. Acceptable LCS recovery indicates the system was in control, but the reported result could be affected by matrix interference.

01083

Froehling & Robertson, Inc. (Raleigh)
Dave Morse
310 Hubert St.
Raleigh , NC 27603

Project Tron Drive Drainage Improvements - Addit
Information :

Report Date : 02/06/2025
Received : 01/28/2025

Report Number : **25-028-0006**

REPORT OF ANALYSIS

Lab No : **91198**

Matrix: **Solids**

Sample ID : **C-1, 8.5'-10'**

Sampled: **1/23/2025 00:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Resistivity (soil)	8130	ohm-cm		1	02/06/25 15:05	VVP	ASTM-G57-95
Oxidation Reduction Potential	380	mV	-800	1	02/03/25 10:00	TKM	SM-2580
Moisture	8.83	%		1	01/29/25 10:29	CJR	SW-DRYWT
Chloride	<274	mg/Kg - dry	274	10	02/05/25 17:06	MLW	9056A
pH	5.62	s.u.		1	01/31/25 11:57	GOB	9045D
Sulfate	<384	mg/Kg - dry	384	10	02/05/25 17:06	MLW	9056A
Sulfide	<27.4	mg/Kg - dry	27.4	1	01/31/25 11:55	JAAT	SW-9034

**Qualifiers/
Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit

01083

Froehling & Robertson, Inc. (Raleigh)
Dave Morse
310 Hubert St.
Raleigh , NC 27603

Project Tron Drive Drainage Improvements - Addit
Information :

Report Date : 02/06/2025
Received : 01/28/2025

Report Number : **25-028-0006**

REPORT OF ANALYSIS

Lab No : **91199**

Matrix: **Solids**

Sample ID : **C-2, 13.5-15'**

Sampled: **1/23/2025 00:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Resistivity (soil)	7810	ohm-cm		1	02/06/25 15:05	VVP	ASTM-G57-95
Oxidation Reduction Potential	400	mV	-800	1	02/03/25 10:00	TKM	SM-2580
Moisture	5.75	%		1	01/29/25 10:29	CJR	SW-DRYWT
Chloride	<265	mg/Kg - dry	265	10	02/05/25 17:43	MLW	9056A
pH	4.73	s.u.		1	01/31/25 11:57	GOB	9045D
Sulfate	<371	mg/Kg - dry	371	10	02/05/25 17:43	MLW	9056A
Sulfide	<26.5	mg/Kg - dry	26.5	1	01/31/25 11:55	JAAT	SW-9034

**Qualifiers/
Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit

01083

Froehling & Robertson, Inc. (Raleigh)
Dave Morse
310 Hubert St.
Raleigh , NC 27603

Project Tron Drive Drainage Improvements - Addit
Information :

Report Date : 02/06/2025
Received : 01/28/2025

Report Number : **25-028-0006**

REPORT OF ANALYSIS

Lab No : **91200**

Matrix: **Solids**

Sample ID : **C-3, 18.5-20'**

Sampled: **1/24/2025 00:00**

Test	Results	Units	MQL	DF	Date / Time Analyzed	By	Analytical Method
Resistivity (soil)	9620	ohm-cm		1	02/06/25 15:05	VVP	ASTM-G57-95
Oxidation Reduction Potential	411	mV	-800	1	02/03/25 10:00	TKM	SM-2580
Moisture	7.04	%		1	01/29/25 10:29	CJR	SW-DRYWT
Chloride	<269	mg/Kg - dry	269	10	02/05/25 17:56	MLW	9056A
pH	5.13	s.u.		1	01/31/25 11:57	GOB	9045D
Sulfate	<377	mg/Kg - dry	377	10	02/05/25 17:56	MLW	9056A
Sulfide	<26.8	mg/Kg - dry	26.8	1	01/31/25 11:55	JAAT	SW-9034

**Qualifiers/
Definitions**

DF

Dilution Factor

MQL

Method Quantitation Limit

Quality Control Data

Client ID: Froehling & Robertson, Inc. (Raleigh)
Project Description: Tron Drive Drainage Improvements - Additional Bori
Report No: 25-028-0006

QC Analytical Batch: V55912
Analysis Method: 9045D
Analysis Description: pH in Solids

Laboratory Control Sample LCS

Parameter	Units	Spike Conc.	LCS Result	LCS %Rec	% Rec Limits
pH	s.u.	6.86	6.86	100	3.54-101.4

Duplicate V 91198-DUP

Parameter	Units	Result	DUP Result	RPD	Max RPD	Analyzed
pH	s.u.	5.62	5.57	0.8	20.0	01/31/25 11:57

Quality Control Data

Client ID: Froehling & Robertson, Inc. (Raleigh)
Project Description: Tron Drive Drainage Improvements - Additional Bori
Report No: 25-028-0006

QC Prep: V56027 **QC Analytical Batch(es):** V56045
QC Prep Batch Method: SW-9056A (PREP) **Analysis Method:** 9056A
Analysis Description: Anions by Ion Chromatography

Lab Reagent Blank LRB-V56027 Matrix: SOL
Associated Lab Samples: 91198, 91199, 91200

Parameter	Units	Blank Result	MQL	Analyzed
Chloride	mg/Kg	<250	250	02/05/25 10:41
Sulfate	mg/Kg	<350	350	02/05/25 10:41

Laboratory Control Sample LCS-V56027

Parameter	Units	Spike Conc.	LCS Result	LCS %Rec	% Rec Limits
Chloride	mg/Kg	400	381	95.0	80-120
Sulfate	mg/Kg	400	385	96.0	80-120

Matrix Spike & Matrix Spike Duplicate V 91198-MS-V56027 V 91198-MSD-V56027

Parameter	Units	Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS %Rec	MSD %Rec	%Rec Limits	RPD	Max RPD
Chloride	mg/Kg	<250	400	394	605	605	151*	154*	80-120	0.0	15
Sulfate	mg/Kg	<350	400	394	415	423	104	107	80-120	1.9	15

Quality Control Data

Client ID: Froehling & Robertson, Inc. (Raleigh)
Project Description: Tron Drive Drainage Improvements - Additional Bori
Report No: 25-028-0006

QC Analytical Batch: L798494
Analysis Method: ASTM-G57-95
Analysis Description: Resistivity

Duplicate V 91198-DUP

Parameter	Units	Result	DUP Result	RPD	Max RPD	Analyzed
Resistivity (soil)	ohm-cm	8130	8130	0.0	20.0	02/06/25 15:05

Quality Control Data

Client ID: Froehling & Robertson, Inc. (Raleigh)
Project Description: Tron Drive Drainage Improvements - Additional Bori
Report No: 25-028-0006

QC Analytical Batch: L797782
Analysis Method: SM-2580
Analysis Description: ORP

Laboratory Control Sample LCS

Parameter	Units	Spike Conc.	LCS Result	LCS %Rec	% Rec Limits
Oxidation Reduction Potential	mV	200	195	98.0	90-110

Duplicate L 83856-DUP

Parameter	Units	Result	DUP Result	Criteria	Analyzed
Oxidation Reduction Potential	mV	179	179	+/- 20	02/03/25 10:00

Quality Control Data

Client ID: Froehling & Robertson, Inc. (Raleigh)
Project Description: Tron Drive Drainage Improvements - Additional Bori
Report No: 25-028-0006

QC Prep: L797552 **QC Analytical Batch(es):** L797697
QC Prep Batch Method: SW-9030B **Analysis Method:** SW-9034
Analysis Description: Sulfide by Titration

Lab Reagent Blank LRB-L797552 Matrix: SOL
Associated Lab Samples: 91198, 91199, 91200

Parameter	Units	Blank Result	MQL	Analyzed
Sulfide	mg/Kg	< 25.0	25.0	01/31/25 11:55

Laboratory Control Sample LCS-L797552

Parameter	Units	Spike Conc.	LCS Result	LCS %Rec	% Rec Limits
Sulfide	mg/Kg	262	152	58.0	32-85

Duplicate V 91199-DUP-L797552

Parameter	Units	Result	DUP Result	RPD	Max RPD	Analyzed
Sulfide	mg/Kg	< 25.0	<25.0	0.0	20.0	01/31/25 11:55

Matrix Spike V 91199-MS-L797552

Parameter	Units	Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS %Rec	%Rec Limits	Max RPD
Sulfide	mg/Kg	< 25.0	105		67.2		64.0	25-75	

Quality Control Data

Client ID: Froehling & Robertson, Inc. (Raleigh)
Project Description: Tron Drive Drainage Improvements - Additional Bori
Report No: 25-028-0006

QC Analytical Batch: V55845
Analysis Method: SW-DRYWT
Analysis Description: Dry Weight Determination

Duplicate V 91199-DUP

Parameter	Units	Result	DUP Result	RPD	Max RPD	Analyzed
Moisture	%	5.75	6.05	5.0	20.0	01/29/25 10:29

Shipment Receipt Form

Customer Number: **01083**
 Customer Name: **Froehling & Robertson, Inc. (Raleigh)**
 Report Number: **25-028-0006**

Shipping Method

Fed Ex US Postal Lab Other :
 UPS Client Courier Thermometer ID:

Shipping container/cooler uncompromised?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	
Number of coolers/boxes received	<input type="text" value="1"/>		
Custody seals intact on shipping container/cooler?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> Not Present
Custody seals intact on sample bottles?	<input type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> Not Present
Chain of Custody (COC) present?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	
COC agrees with sample label(s)?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	
COC properly completed	<input checked="" type="radio"/> Yes	<input type="radio"/> No	
Samples in proper containers?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	
Sample containers intact?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	
Sufficient sample volume for indicated test(s)?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	
All samples received within holding time?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	
Cooler temperature in compliance?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> Not Present
Cooler/Samples arrived at the laboratory on ice. Samples were considered acceptable as cooling process had begun.	<input checked="" type="radio"/> Yes	<input type="radio"/> No	
Water - Sample containers properly preserved	<input type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> N/A
Water - VOA vials free of headspace	<input type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> N/A
Trip Blanks received with VOAs	<input type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> N/A
Soil VOA method 5035 – compliance criteria met	<input type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> N/A
<input type="checkbox"/> High concentration container (48 hr)		<input type="checkbox"/> Low concentration EnCore samplers (48 hr)	
<input type="checkbox"/> High concentration pre-weighed (methanol -14 d)		<input type="checkbox"/> Low conc pre-weighed vials (Sod Bis -14 d)	
Special precautions or instructions included?	<input type="radio"/> Yes	<input checked="" type="radio"/> No	

Comments:

Signature:

Date & Time:



CHAIN OF CUSTODY RECORD

Waypoint Analytical LLC
 449 Springbrook Road • P.O. Box 240543 • Charlotte, NC 28224-0543
 Phone: 704/529-6364 • Fax: 704/525-0409

Client Company Name: Froehling & Robertson, Inc.
 Report To / Contact Name: Dave Morse (D.Morse@frandf.com)
 Reporting Address: 310 Hubert Street, Raleigh, NC 27603
 Phone: 361.876.2118 (cell) / 704.409.7261 (office)
 Fax (Yes, no): no
 EOD Type (PDF, Excel, Other): PDF
 Site Location Name: Fayetteville, NC
 Site Location Physical Address: Swann Street

Project Name: Tron Drive Drainage Improvements - Additional Borings
 Short Hold Analysis Needed (Yes or No): No
 UST Project (Yes or No): No
 Invoice To: Froehling & Robertson, Inc.
 Address: 310 Hubert Street, Raleigh, NC 27603
 Purchase Order No./Billing Reference: 66C-0159-00001
 Requested Due Date (day): 1
 "Working Day" requested: 6-9
 Samples received after 15:00 will be processed the next business day.
 Turnaround time is based on business days, excluding weekends and holidays.
 Please ATTACH any project specific reporting (QC LEVEL III III W) provisions and/or QC Requirements

LAB USE ONLY	Yes	No	N/A
Samples intact upon arrival?	<input checked="" type="checkbox"/>		
Received on WET ICE?	<input checked="" type="checkbox"/>		
PROPER PRESERVATIVES?	<input checked="" type="checkbox"/>		
RECEIVED WITHIN HOLDING TIMES?	<input checked="" type="checkbox"/>		
CUSTOMER SEAL INTACT?	<input checked="" type="checkbox"/>		
VOLATILES rec'd W/OUT HEADSPACE?	<input checked="" type="checkbox"/>		
PROPER CONTAINERS used?	<input checked="" type="checkbox"/>		

TO BE FILLED IN BY CLIENT/SAMPLING PERSONNEL
 Certification: NELAC _____ USACE _____ FI _____
 Water Chlorinated (Yes or No) / N: _____
 Sample Used Upon Collection (Yes or No): _____

Client Sample Description	Date Collected	Time Collected (Military Time)	Matrix (Soil, Water, Sludge, Other)	Soil Type Below (in Order of Analyses)	Sample Container					Analyses Requested	Remarks	Print Lab ID No.					
					Seal Type	Seal Broken (in)	No.	Slits (in Order of Analyses)	Preservation (in Order of Analyses)								
C-1, 8.5-10'	1/23/2025		soil	G						Moisture	X	X	X	X	X		
C-2, 13.5-15'	1/23/2025		soil	G						Chloride	X	X	X	X	X		
C-3, 18.5-20'	1/24/2025		soil	G						pH	X	X	X	X	X		
										Sulfide	X	X	X	X	X		
										Sulfate	X	X	X	X	X		
										Resistivity	X	X	X	X	X		
										Oxidation	X	X	X	X	X		

Upon relinquishing, this Chain of Custody is your authorization for Waypoint to proceed with the analysis as connected above. Any changes must be requested by (Signature) *Ms. A. Mue* 1/21/2025

Relinquished By (Signature) *Phillip Peiser*

Relinquished By (Signature) *Phillip Peiser*

Received (Print Name) *Phillip Peiser* Date *1-27-25* Time (Military/Hours) *13:01*

Received By (Signature) *Phillip Peiser* Date *1-27-25* Time (Military/Hours) *15:37*

Received for Waypoint Analytical By: *Phillip Peiser* Date *1/28/25* Time (Military/Hours) *1100*

Site Arrival Time: _____
 Site Departure Time: _____
 Field Tech Fee: _____
 Mileage: _____

Method of shipment: NOTE: ALL SAMPLE COOLERS SHOULD BE TAPED SHUT WITH CUSTOMER SEALS FOR TRANSPORTATION TO THE LABORATORY. SAMPLES ARE NOT ACCEPTED AND

FedEx _____ UPS _____ Waypoint Field SERVICES _____ OTHER _____

Drinking Water: NC _____ Other _____
 RCM: NC _____ Other _____
 UST: NC _____ Other _____
 Landfill: NC _____ Other _____

Log in Group No. _____

SEE REVERSE FOR TERMS & CONDITIONS.

25-028-0006
 01083
 01-28-2025
 12:26:02



APPENDIX IV
GBA DOCUMENT

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, clients can benefit from a lowered exposure to the subsurface problems 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 below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs 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. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project 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.*

This Report May Not Be Reliable

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

- for a different client;
- for a different project;
- 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, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been 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 your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

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

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment 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 from project start to project finish, so the individual can provide 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 judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed 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 full-time 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 on hand quickly 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 observation.

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 informational 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, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. 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. 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 relate any 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 yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

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, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled 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*.



Telephone: 301/565-2733

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VIRGINIA • NORTH CAROLINA • SOUTH CAROLINA • MARYLAND • DISTRICT OF COLUMBIA

A Minority-Owned Business

VACUUM EXCAVATION TEST HOLE REPORT

PROJECT NUMBER: KHAI00222		TEST HOLE NUMBER: 5	
CLIENT NAME: Kimley Horn		SOIL TYPE: Sandy Clay	
PROJECT TITLE: Tryon St Test Holes		SURFACE MATERIAL: Pavement	
LOCATION: Swann St & Tryon Rd (Fayetteville, NC)		PAVEMENT TYPE: Asphalt	
DATE: 5/27/2022		PAVEMENT THICKNESS: 0.5'	
UTILITY #:	1	UTILITY #:	
TYPE:	Water	TYPE:	
SIZE:	9" OD ±	SIZE:	
MATERIAL:	AC	MATERIAL:	
DEPTH:	3.18'	DEPTH:	
DIRECTION:	W	DIRECTION:	
UTILITY #:		UTILITY #:	
TYPE:		TYPE:	
SIZE:		SIZE:	
MATERIAL:		MATERIAL:	
DEPTH:		DEPTH:	
DIRECTION:		DIRECTION:	
		SITE PERSONNEL: CJH, JM, RC	
		METHOD USED: Vacuum Excavation	
		OTHER NOTES: Moved hole closer to intersection for GPR visibility.	
		SURVEY PROVIDED BY:	
		SURVEY COORDINATES:	
		ELEVATION:	
		NORTH:	
		EAST:	

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map



VACUUM EXCAVATION TEST HOLE REPORT

PROJECT NUMBER:	KHA100222		TEST HOLE NUMBER:	6	
CLIENT NAME:	Kimley Horn		SOIL TYPE:	Sandy Clay	
PROJECT TITLE:	Tryon Rd Test Holes		SURFACE MATERIAL:	Pavement	
LOCATION:	Swann & Tryon (Fayetteville, NC)		PAVEMENT TYPE:	Asphalt	
DATE:	5/25/2022		PAVEMENT THICKNESS:	0.4'	
UTILITY #:	1	UTILITY #:	SITE PERSONNEL: CJH, JM, RC, NJ		
TYPE:	Water	TYPE:	METHOD USED: Vacuum Excavation		
SIZE:	9" OD ±	SIZE:	OTHER NOTES:		
MATERIAL:	AC	MATERIAL:			
DEPTH:	5.92'	DEPTH:			
DIRECTION:	N	DIRECTION:			
UTILITY #:		UTILITY #:	SURVEY PROVIDED BY:		
TYPE:		TYPE:	SURVEY COORDINATES:		
SIZE:		SIZE:	ELEVATION:		
MATERIAL:		MATERIAL:	NORTH:		
DEPTH:		DEPTH:	EAST:		
DIRECTION:		DIRECTION:			

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map

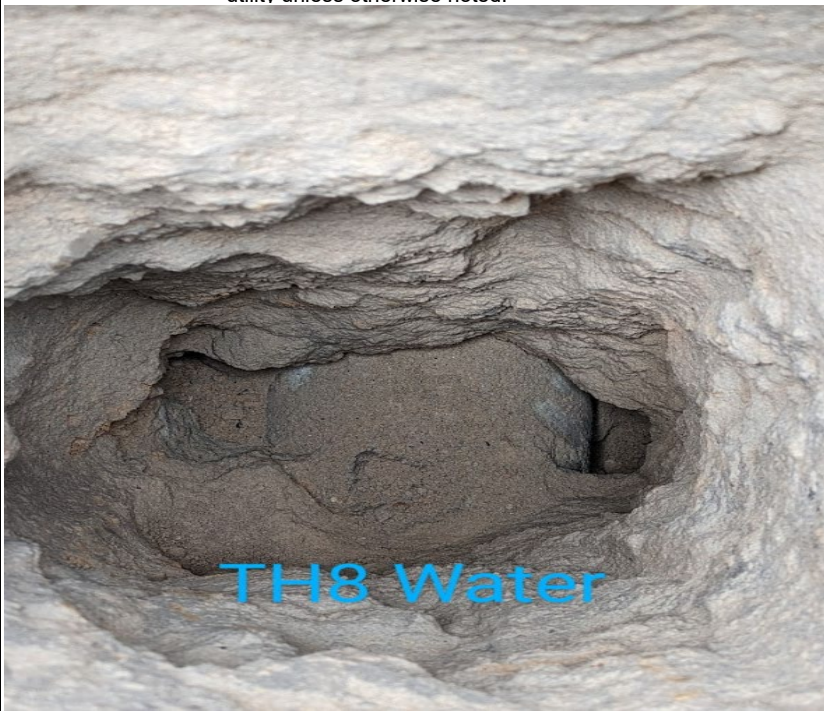


VACUUM EXCAVATION TEST HOLE REPORT

PROJECT NUMBER: KHA100222		TEST HOLE NUMBER: 8	
CLIENT NAME: Kimley Horn		SOIL TYPE: Sandy Clay	
PROJECT TITLE: Tryon Dr Test Holes		SURFACE MATERIAL: Pavement	
LOCATION: Tryon Dr (Fayetteville, NC)		PAVEMENT TYPE: Asphalt	
DATE: 5/24/2022		PAVEMENT THICKNESS: 0.4'	
UTILITY #:	1	UTILITY #:	
TYPE:	Water	TYPE:	
SIZE:	9" OD ±	SIZE:	
MATERIAL:	AC	MATERIAL:	
DEPTH:	3.97'	DEPTH:	
DIRECTION:	W	DIRECTION:	
UTILITY #:		UTILITY #:	
TYPE:		TYPE:	
SIZE:		SIZE:	
MATERIAL:		MATERIAL:	
DEPTH:		DEPTH:	
DIRECTION:		DIRECTION:	
		SITE PERSONNEL: CJH, JM, RC	
		METHOD USED: Vacuum Excavation	
		OTHER NOTES:	
		SURVEY PROVIDED BY:	
		SURVEY COORDINATES:	
		ELEVATION:	
		NORTH:	
		EAST:	

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map



VACUUM EXCAVATION TEST HOLE REPORT

PROJECT NUMBER:	KHA100222		TEST HOLE NUMBER:	7	
CLIENT NAME:	Kimley Horn		SOIL TYPE:	Sandy Clay	
PROJECT TITLE:	Tryon Dr Test Holes		SURFACE MATERIAL:	Pavement	
LOCATION:	Tryon Dr (Fayetteville, NC)		PAVEMENT TYPE:	Asphalt	
DATE:	5/25/2022		PAVEMENT THICKNESS:	0.3'	
UTILITY #:	1	UTILITY #:	SITE PERSONNEL: CJH		
TYPE:	Water	TYPE:	METHOD USED: Vacuum Excavation		
SIZE:	9" OD ±	SIZE:	OTHER NOTES:		
MATERIAL:	AC	MATERIAL:			
DEPTH:	3.08'	DEPTH:			
DIRECTION:	W	DIRECTION:			
UTILITY #:		UTILITY #:	SURVEY PROVIDED BY:		
TYPE:		TYPE:	SURVEY COORDINATES:		
SIZE:		SIZE:	ELEVATION:		
MATERIAL:		MATERIAL:	NORTH:		
DEPTH:		DEPTH:	EAST:		
DIRECTION:		DIRECTION:			

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map



VACUUM EXCAVATION TEST HOLE REPORT

PROJECT NUMBER:	KHA100222		TEST HOLE NUMBER:	9	
CLIENT NAME:	Kimley Horn		SOIL TYPE:	Sandy Clay	
PROJECT TITLE:	Tryon Dr Test Holes		SURFACE MATERIAL:	Pavement	
LOCATION:	Swann St (Fayetteville, NC)		PAVEMENT TYPE:	Asphalt	
DATE:	5/24/2022		PAVEMENT THICKNESS:	0.4'	
UTILITY #:	1	UTILITY #:	SITE PERSONNEL: CJH, JM, RC		
TYPE:	Water	TYPE:	METHOD USED:		
SIZE:	9" OD ±	SIZE:	OTHER NOTES:		
MATERIAL:	AC	MATERIAL:			
DEPTH:	2.33'	DEPTH:			
DIRECTION:	W	DIRECTION:			
UTILITY #:		UTILITY #:	SURVEY PROVIDED BY:		
TYPE:		TYPE:	SURVEY COORDINATES:		
SIZE:		SIZE:	ELEVATION:		
MATERIAL:		MATERIAL:	NORTH:		
DEPTH:		DEPTH:	EAST:		
DIRECTION:		DIRECTION:			

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map



VACUUM EXCAVATION TEST HOLE REPORT

PROJECT NUMBER:	KHA100222		TEST HOLE NUMBER:	10	
CLIENT NAME:	Kimley Horn		SOIL TYPE:	Sandy Clay	
PROJECT TITLE:	Tryon Dr Test Holes		SURFACE MATERIAL:	Pavement	
LOCATION:	Daisy Ln & Webster (Fayetteville, NC)		PAVEMENT TYPE:	Asphalt	
DATE:	5/24/2022		PAVEMENT THICKNESS:	0.6'	
UTILITY #:	1	UTILITY #:	SITE PERSONNEL: CJH, JM, RC		
TYPE:	Water	TYPE:	METHOD USED: Vacuum Excavation		
SIZE:	9" OD ±	SIZE:	OTHER NOTES: Moved hole roughly 10 ft to the West.		
MATERIAL:	AC	MATERIAL:			
DEPTH:	5.95'	DEPTH:			
DIRECTION:	W	DIRECTION:			
UTILITY #:		UTILITY #:	SURVEY PROVIDED BY:		
TYPE:		TYPE:	SURVEY COORDINATES:		
SIZE:		SIZE:	ELEVATION:		
MATERIAL:		MATERIAL:	NORTH:		
DEPTH:		DEPTH:	EAST:		
DIRECTION:		DIRECTION:			

Notes: All measurements obtained from top/center of associated utility unless otherwise noted.

Test Hole Location Map



Electronic Transmittal
U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. SAW-2023-01308 County: Cumberland U.S.G.S. Quad: NC-Fayetteville

GENERAL PERMIT (REGIONAL AND NATIONWIDE) VERIFICATION

Permittee: City of Fayetteville
Abha Dwivedy
Address: 433 Hay Street
Fayetteville, NC 28301
Telephone Number: 910-433-1027
E-mail: AbdhaDwivedy@FayettevilleNC.gov

Size (acres)	<u>2.84 acres</u>	Nearest Town	<u>Fayetteville</u>
Nearest Waterway	<u>Cross Creek</u>	River Basin	<u>Cape Fear</u>
USGS HUC	<u>03030004</u>	Coordinates	Latitude: <u>35.091891</u> Longitude: <u>-78.935314</u>

Location description: The project is located on Tryon Drive near the intersection with Swann Street in Fayetteville, Cumberland County, North Carolina.

Description of projects area and activity: This verification authorizes the discharge of fill material within 184 linear feet (736 square feet) of stream for the purpose of improving the existing drainage features to handle higher flows. The improvements include bank stabilization and culvert replacement and extension.

Applicable Law(s): Section 404 (Clean Water Act, 33 USC 1344)
 Section 10 (Rivers and Harbors Act, 33 USC 403)

Authorization: **Nationwide Permit 3- Maintenance**

SEE ATTACHED NWP GENERAL, REGIONAL, AND/OR SPECIAL CONDITIONS

***Note: These impacts are below the reporting threshold for the NWP 3- a tear sheet is issued upon the request of the agent. Verification under the NWP 3 was communicated by email on 7/11/2023 and the 401 Water Quality Certification was issued on 8/3/2023.**

Your work is authorized by the above referenced permit provided it is accomplished in strict accordance with the attached Conditions, your application signed and dated 6/22/2023, and the enclosed plans Permit Drawings Figure 5, 5.1, 5.2, and 5.3 dated June 2023. Any violation of the attached conditions or deviation from your submitted plans may subject the permittee to a stop work order, a restoration order, a Class I administrative penalty, and/or appropriate legal action.

This verification will remain valid until the expiration date identified below unless the nationwide and/or regional general permit authorization is modified, suspended or revoked. If, prior to the expiration date identified below, the nationwide and/or regional general permit authorization is reissued and/or modified, this verification will remain valid until the expiration date identified below, provided it complies with all requirements of the modified nationwide permit. If the nationwide and/or regional general permit authorization expires or is suspended, revoked, or is modified, such that the activity would no longer comply with the terms and conditions of the nationwide permit, activities which have commenced (i.e., are under construction) or are under contract to commence in reliance upon the nationwide and/or regional general permit, will remain authorized provided the activity is completed within twelve months of the date of the nationwide and/or regional general permit's expiration, modification or revocation, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend or revoke the authorization.

Activities subject to Section 404 (as indicated above) may also require an individual Section 401 Water Quality Certification. You should contact the NC Division of Water Resources (telephone 919-807-6300) to determine Section 401 requirements.

For activities occurring within the twenty coastal counties subject to regulation under the Coastal Area Management Act (CAMA), prior to beginning work you must contact the N.C. Division of Coastal Management **Morehead City, NC, at (252) 808-2808.**

This Department of the Army verification does not relieve the permittee of the responsibility to obtain any other required Federal, State or local approvals/permits. If there are any questions regarding this verification, any of the conditions of the Permit, or the Corps of Engineers regulatory program, please contact **Katharine Elks at (910) 251-4567 or katharine.b.elks@usace.army.mil.**

Corps Regulatory Official: _____ Date: **09/18/2023**

Expiration Date of Verification: **3/14/2026**

Email copies furnished:

Emma Radford, Kimley-Horn (agent)

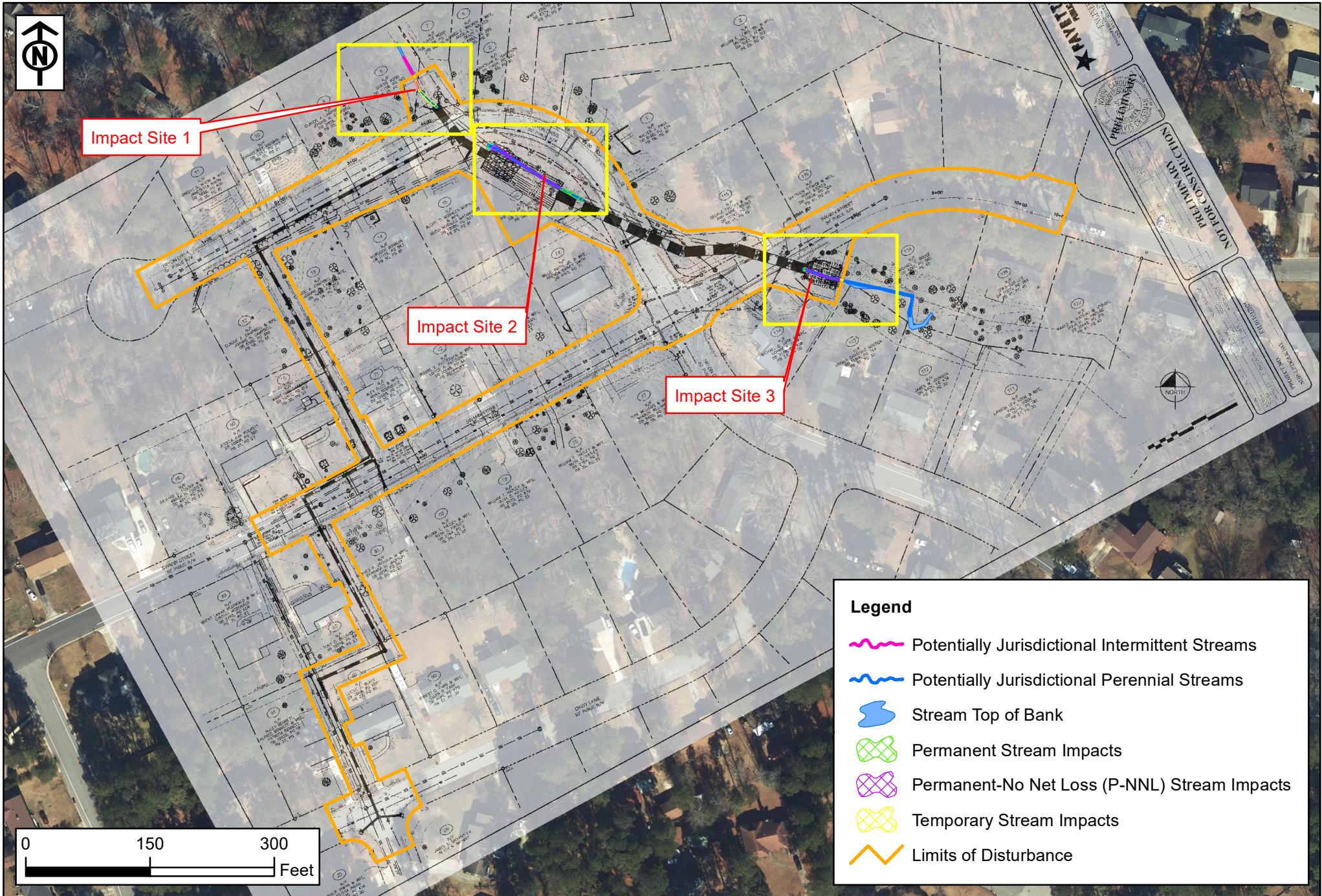
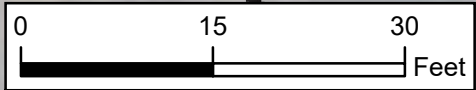


Figure 5: Permit Drawings - Overview Map
 Tryon Road Drainage Improvements
 Fayetteville, Cumberland County, NC
 June 2023



Impact Site 1:
Permanent Stream Impacts - 3 LF (0.0002 acre)
Temporary Stream Impacts - 46 LF (0.0013 acre)



Legend

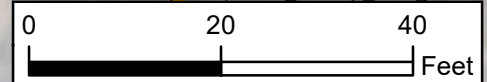
- Potentially Jurisdictional Intermittent Streams
- Potentially Jurisdictional Perennial Streams
- Stream Top of Bank
- Permanent Stream Impacts (ac.)
- Permanent-No Net Loss (P-NNL) Stream Impacts (ac.)
- Temporary Stream Impacts (ac.)
- Limits of Disturbance



Impact Site 2:
Permanent Stream Impacts - 37 LF (0.0038-acre)
Permanent No Net Loss Stream Impacts (P-NNL) - 96 LF (0.0067-acre)

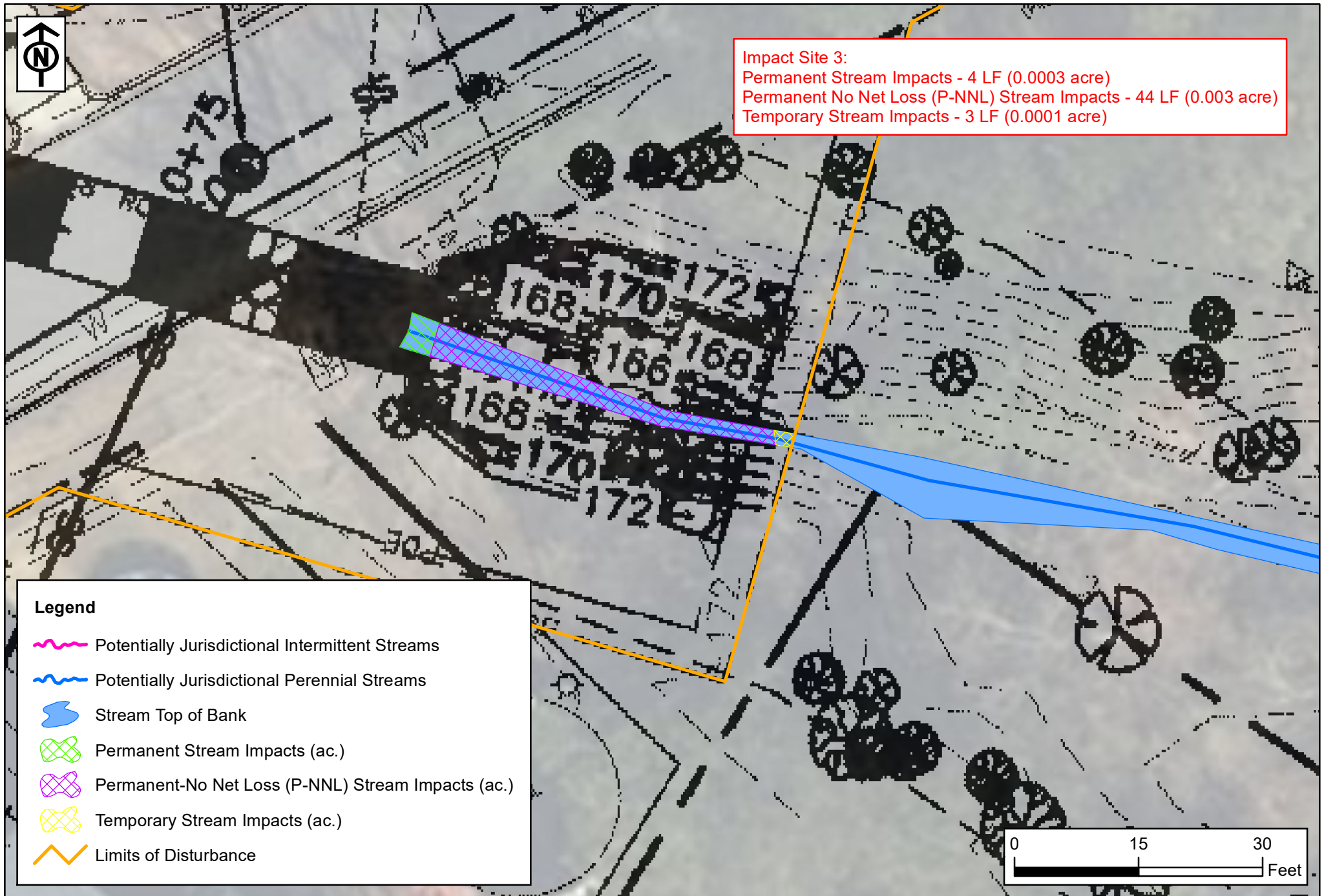
Legend

- Potentially Jurisdictional Intermittent Streams
- Potentially Jurisdictional Perennial Streams
- Stream Top of Bank
- Permanent Stream Impacts (ac.)
- Permanent-No Net Loss (P-NNL) Stream Impacts (ac.)
- Temporary Stream Impacts (ac.)
- Limits of Disturbance





Impact Site 3:
Permanent Stream Impacts - 4 LF (0.0003 acre)
Permanent No Net Loss (P-NNL) Stream Impacts - 44 LF (0.003 acre)
Temporary Stream Impacts - 3 LF (0.0001 acre)



Legend

- Potentially Jurisdictional Intermittent Streams
- Potentially Jurisdictional Perennial Streams
- Stream Top of Bank
- Permanent Stream Impacts (ac.)
- Permanent-No Net Loss (P-NNL) Stream Impacts (ac.)
- Temporary Stream Impacts (ac.)
- Limits of Disturbance

Figure 5.3: Permit Drawings - Site 3 Map
Tryon Road Drainage Improvements
Fayetteville, Cumberland County, NC
June 2023



NORTH CAROLINA
Environmental Quality

ROY COOPER
Governor

ELIZABETH S. BISER
Secretary

RICHARD E. ROGERS, JR.
Director

August 3, 2023

DWR # 20230909
Cumberland County

City of Fayetteville
Attn: Abha Dwivedy
433 Hay Street
Fayetteville, NC 28301

Subject: Approval of Individual 401 Water Quality Certification
Tryon Drive Drainage Improvements
USACE Action ID. No. SAW-2023-01308

Delivered via email to: AbhaDwivedy@FayettevilleNC.gov

Dear Ms. Dwivedy:

Attached hereto is a copy of Certification No. WQC006153 issued to the City of Fayetteville and Abha Dwivedy, dated August 3, 2023. This approval is for the purpose and design described in your application. The plans and specifications for this project are incorporated by reference as part of this Water Quality Certification. If you change your project, you must notify the Division and you may be required to submit a new application package with the appropriate fee. If the property is sold, the new owner must be given a copy of this Certification and is responsible for complying with all conditions. [15A NCAC 02H .0507(d)(2)].

This Water Quality Certification does not relieve the permittee of the responsibility to obtain all other required Federal, State, or Local approvals before proceeding with the project, including those required by, but not limited to, Sediment and Erosion Control, Non-Discharge, Water Supply Watershed, and Trout Buffer regulations.

This Water Quality Certification neither grants nor affirms any property right, license, or privilege in any lands or waters, or any right of use in any waters. This Water Quality Certification does not authorize any person to interfere with the riparian rights, littoral rights, or water use rights of any other person and does not create any prescriptive right or any right of priority regarding any usage of water. This Water Quality Certification shall not be interposed as a defense in any action respecting the determination of riparian or littoral rights or other rights to water use. No consumptive user is deemed by virtue of this Water Quality Certification to possess any prescriptive or other right of priority with respect to any other consumptive user.

Upon the presentation of proper credentials, the Division may inspect the property.



North Carolina Department of Environmental Quality | Division of Water Resources
Fayetteville Regional Office | 225 Green St., Suite 714 | Fayetteville, North Carolina 28301-5043
910.433.3300

This Water Quality Certification shall expire on the same day as the expiration date of the corresponding Section 404 Permit. The conditions shall remain in effect for the life of the project, regardless of the expiration date of this Water Quality Certification.

Non-compliance with or violation of the conditions herein set forth may result in revocation of this Water Quality Certification for the project and may also result in criminal and/or civil penalties.

If you are unable to comply with any of the conditions of this Water Quality Certification you must notify the Fayetteville Regional Office within 24 hours (or the next business day if a weekend or holiday) from the time the permittee becomes aware of the circumstances.

The permittee shall report to the Fayetteville Regional Office any noncompliance with, and/or any violation of, stream or wetland standards [15A NCAC 02B .0200] including but not limited to sediment impacts to streams or wetlands. Information shall be provided orally within 24 hours (or the next business day if a weekend or holiday) from the time the permittee became aware of the non-compliance circumstances.

This approval and its conditions are final and binding unless contested [G.S. 143-215.5].

This Certification can be contested as provided in Chapter 150B of the North Carolina General Statutes by filing a Petition for a Contested Case Hearing (Petition) with the North Carolina Office of Administrative Hearings (OAH) **within sixty (60) calendar days**. Requirements for filing a Petition are set forth in Chapter 150B of the North Carolina General Statutes and Title 26 of the North Carolina Administrative Code. Additional information regarding requirements for filing a Petition and Petition forms may be accessed at <http://www.ncoah.com/> or by calling the OAH Clerk's Office at (919) 431-3000.

A party filing a Petition must serve a copy of the Petition on:

William F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699-1601

If the party filing the Petition is not the permittee, then the party must also serve the recipient of the Certification in accordance with N.C.G.S 150B-23(a).

This letter completes the Division's review under section 401 of the Clean Water Act and 15A NCAC 02H .0500. Please contact Chad Turlington at (910) 433-3320 or chad.turlington@ncdenr.gov if you have any questions or concerns.



Sincerely,

DocuSigned by:

Trent Allen

5189C2D3DD5C42B...

Trent Allen

Regional Supervisor

Division of Water Resources

Water Quality Regional Operations Section

Electronic cc: Emma Radford, WPIT, CA – Kimley-Horn (via email)
Katherine Elks - USACE Wilmington Regulatory Field Office (via email)
DWR 401 & Buffer Permitting Branch Electronic file



NORTH CAROLINA 401 WATER QUALITY CERTIFICATION

CERTIFICATION #WQC006153 is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to North Carolina’s Regulations in 15 NCAC 02H .0500 and 15A NCAC 02B .0200, to Abha Dwivedy and the City of Fayetteville, who have authorization for the impacts listed below, as described within your application received by the N.C. Division of Water Resources (Division) on June 22, 2023 and by Public Notice issued by the Division on June 27, 2023 .

The State of North Carolina certifies that this activity will comply with water quality requirements and the applicable portions of Sections 301, 302, 303, 306, 307 of the Public Laws 92-500 and PL 95-217 if conducted in accordance with the application, the supporting documentation, and conditions hereinafter set forth.

The following impacts are hereby approved. No other impacts are approved, including incidental impacts. [15A NCAC 02H .0506(b)]

Type of Impact	Amount Approved (units) Permanent	Amount Approved (units) Temporary
Perennial Stream		
S1 – culvert extension	3 (linear feet)	(linear feet)
S2 – temp. const. access	(linear feet)	26 (linear feet)
S4 – culvert extension	37 (linear feet)	(linear feet)
S5 – channel realignment	96 (linear feet)	(linear feet)
S6 – culvert extension	4 (linear feet)	(linear feet)
S7 – bank stabilization	44 (linear feet)	(linear feet)
S8 – temp. const. access	(linear feet)	3 (linear feet)
Intermittent Stream		
S3 - temp. const. access	(linear feet)	20 (linear feet)

This approval requires you to follow the conditions listed in the certification below.

CONDITIONS OF CERTIFICATION [15A NCAC 02H .0507(c)]:

1. The permittee shall report to the DWR Fayetteville Regional Office any noncompliance with, and/or any violation of, stream or wetland standards [15A NCAC 02B .0200], including but not limited to sediment impacts to streams or wetlands. Information shall be provided orally within 24 hours (or the next business day if a weekend or holiday) from the time the permittee became aware of the non-compliance circumstances.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

Justification: Timely reporting of non-compliance is important in identifying and minimizing



detrimental impacts to water quality and avoiding impacts due to water pollution that precludes any best use on a short-term or long-term basis.

2. No waste, spoil, solids, or fill of any kind shall occur in wetlands or waters beyond the footprint of the approved impacts (including temporary impacts).

Citation: 15A NCAC 02H .0506; 15A NCAC 02H .0507(c)

Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule (including, at minimum: aquatic life propagation, survival, and maintenance of biological integrity; wildlife; secondary contact recreation; agriculture); and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis.

3. When applicable, all construction activities shall be performed and maintained in full compliance with G.S. Chapter 113A Article 4 (Sediment and Pollution Control Act of 1973). Regardless of applicability of the Sediment and Pollution Control Act, all projects shall incorporate appropriate Best Management Practices for the control of sediment and erosion so that no violations of state water quality standards, statutes, or rules occur.

Design, installation, operation, and maintenance of all sediment and erosion control measures shall be equal to or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*, or for linear transportation projects, the *North Carolina Department of Transportation Sediment and Erosion Control Manual*.

All devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) sites, including contractor-owned or leased borrow pits associated with the project. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.

For borrow pit sites, the erosion and sediment control measures shall be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*. Reclamation measures and implementation shall comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC02B .0200; 15A NCAC 02B .0231

Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (12) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses; and (21) turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units



(NTU) in streams not designated as trout waters and 10 NTU in streams, lakes, or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased. As cited in Wetland Standards: (c)(1) Liquids, fill or other solids, or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses; and (3) Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.

4. Sediment and erosion control measures shall not be installed in wetland or waters except within the footprint of temporary or permanent impacts otherwise authorized by this Certification. If placed within authorized impact areas, then placement of such measures shall not be conducted in a manner that results in dis-equilibrium of any wetlands, streambeds, or streambanks. Any silt fence installed within wetlands shall be removed from wetlands and the natural grade restored within two (2) months of the date that DEMLR or locally delegated program has released the specific area within the project to ensure wetland standards are maintained upon completion of the project.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (12) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses; and (21) turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes, or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased. As cited in Wetland Standards: (c)(1) Liquids, fill or other solids, or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses; and (3) Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.

5. Erosion control matting that incorporates plastic mesh and/or plastic twine shall not be used along streambanks or within wetlands.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

Justification: A project that affects waters shall not be permitted unless the existing uses (including aquatic life propagation and biological integrity), and the water quality to protect such uses, are protected. Protections are necessary to ensure any remaining surface waters or wetlands, and any surface waters or wetlands downstream, continue to support existing uses during and after project completion. The Division must evaluate if the activity has avoided and



minimized impacts to waters, would cause or contribute to a violation of standards, or would result in secondary or cumulative impacts.

6. If the project is covered by NPDES Construction Stormwater Permit Number NCG010000 or NPDES Construction Stormwater Permit Number NCG250000, full compliance with permit conditions including the erosion & sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (12) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses; and (21) turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes, or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased. As cited in Wetland Standards: (c)(1) Liquids, fill or other solids, or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses; and (3) Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.

7. All work in or adjacent to streams shall be conducted so that the flowing stream does not come in contact with the disturbed area. Approved best management practices from the most current version of the NC Sediment and Erosion Control Manual, or the NC Department of Transportation Construction and Maintenance Activities Manual, such as sandbags, rock berms, cofferdams, and other diversion structures shall be used to minimize excavation in flowing water.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200

Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (12) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses; and (21) turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes, or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased.



8. Culverts shall be designed and installed in such a manner that the original stream profiles are not altered and allow for aquatic life movement during low flows. The dimension, pattern, and profile of the stream above and below a pipe or culvert shall not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed culvert shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. If the width of the culvert is wider than the stream channel, the culvert shall include multiple boxes/pipes, baffles, benches and/or sills to maintain the natural width of the stream channel. If multiple culverts/pipes/barrels are used, low flows shall be accommodated in one culvert/pipe and additional culverts/pipes shall be installed such that they receive only flows above bankfull.

Placement of culverts and other structures in streams shall be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20% of the culvert diameter for culverts having a diameter less than or equal to 48 inches, to allow low flow passage of water and aquatic life. If the culvert outlet is submerged within a pool or scour hole and designed to provide for aquatic passage, then culvert burial into the streambed is not required.

For structures less than 72" in diameter/width, and topographic constraints indicate culvert slopes of greater than 2.5% culvert burial is not required, provided that all alternative options for flattening the slope have been investigated and aquatic life movement/connectivity has been provided when possible (e.g. rock ladders, cross-vanes, sills, baffles etc.). Notification, including supporting documentation to include a location map of the culvert, culvert profile drawings, and slope calculations, shall be provided to DWR 30 calendar days prior to the installation of the culvert.

When bedrock is present in culvert locations, culvert burial is not required, provided that there is sufficient documentation of the presence of bedrock. Notification, including supporting documentation such as a location map of the culvert, geotechnical reports, photographs, etc. shall be provided to DWR a minimum of 30 calendar days prior to the installation of the culvert. If bedrock is discovered during construction, then DWR shall be notified by phone or email within 24 hours of discovery.

Installation of culverts in wetlands shall ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. When roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges shall be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.

The establishment of native woody vegetation and other soft stream bank stabilization techniques shall be used where practicable instead of rip-rap or other bank hardening methods.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that



precludes any best use on a short-term or long-term basis. Ensuring that structures are installed properly in waters will ensure that surface water quality standards are met and conditions of waters are suitable for all best uses.

9. Application of fertilizer to establish planted/seeded vegetation within disturbed riparian areas and/or wetlands shall be conducted at agronomic rates and shall comply with all other Federal, State and Local regulations. Fertilizer application shall be accomplished in a manner that minimizes the risk of contact between the fertilizer and surface waters.

Citation: 15A 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (12) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses. As cited in Wetland Standards: (c)(1) Liquids, fill or other solids, or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses; and (3) Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.

10. If concrete is used during construction, then all necessary measures shall be taken to prevent direct contact between uncured or curing concrete and waters of the state. Water that inadvertently contacts uncured concrete shall not be discharged to waters of the state.

Citation: 15A 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (12) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses. As cited in Wetland Standards: (c)(1) Liquids, fill or other solids, or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses; and (3) Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.

11. All proposed and approved temporary fill and culverts shall be removed and the impacted area shall be returned to natural conditions within 60 calendar days after the temporary impact is no longer necessary. The impacted areas shall be restored to original grade, including each stream's original cross-sectional dimensions, planform pattern, and longitudinal bed profile. All temporarily impacted sites shall be restored and stabilized with native vegetation.

Citation: 15A NCAC 02H.0506(b); 15A NCAC 02H .0507(c)



Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Protections are necessary to ensure any remaining surface waters or wetlands, and any surface waters or wetlands downstream, continue to support existing uses after project completion.

12. All proposed and approved temporary pipes/culverts/rip-rap pads etc. in streams or wetlands shall be installed as outlined in the most recent edition of the *North Carolina Sediment and Erosion Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* or the *North Carolina Department of Transportation Best Management Practices for Construction and Maintenance Activities* so as not to restrict stream flow or cause dis-equilibrium during use of this Certification.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. Ensuring that structures are installed properly in waters will ensure that surface water quality standards are met and conditions of waters are suitable for all best uses.

13. Any rip-rap required for proper culvert placement, stream stabilization, or restoration of temporarily disturbed areas shall be restricted to the area directly impacted by the approved construction activity. All rip-rap shall be placed such that the original streambed elevation and streambank contours are restored and maintained and shall consist of clean rock or masonry material free of debris or toxic pollutants. Placement of rip-rap or other approved materials shall not result in de-stabilization of the stream bed or banks upstream or downstream of the area or be installed in a manner that precludes aquatic life passage.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. The Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards, or would result in secondary or cumulative impacts.

14. Any rip-rap used for stream or shoreline stabilization shall be of a size and density to prevent movement by wave, current action, or stream flows, and shall consist of clean rock or masonry material free of debris or toxic pollutants. Rip-rap shall not be installed in the streambed except in specific areas required for velocity control and to ensure structural integrity of bank stabilization measures.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0201

Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. The Division must evaluate if the



activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards, or would result in secondary or cumulative impacts.

15. All mechanized equipment operated near surface waters shall be inspected and maintained regularly to prevent contamination of surface waters from fuels, lubricants, hydraulic fluids, or other toxic materials. Construction shall be staged in order to minimize the exposure of equipment to surface waters to the maximum extent practicable. Fueling, lubrication, and general equipment maintenance shall be performed in a manner to prevent, to the maximum extent practicable, contamination of surface waters by fuels and oils.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231

Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (12) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses. As cited in Wetland Standards: (c)(1) Liquids, fill or other solids, or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses; and (3) Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.

16. In accordance with 143-215.85(b), the permittee shall report any petroleum spill of 25 gallons or more; any spill regardless of amount that causes a sheen on surface waters; any petroleum spill regardless of amount occurring within 100 feet of surface waters; and any petroleum spill less than 25 gallons that cannot be cleaned up within 24 hours.

Citation: 15A NCAC 02H .0507(c); N.C.G.S 143-215.85(b)

Justification: Person(s) owning or having control over oil or other substances upon notice of discharge must immediately notify the Department, or any of its agents or employees, of the nature, location, and time of the discharge and of the measures which are being taken or are proposed to be taken to contain and remove the discharge. This action is required in order to contain or divert the substances to prevent entry into the surface waters. Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule (including, at minimum: aquatic life propagation, survival, and maintenance of biological integrity; wildlife; secondary contact recreation; agriculture); and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis.

17. The permittee and their authorized agents shall conduct all activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act), and any other appropriate requirements of State and Federal Law.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)



Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. The Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards, or would result in secondary or cumulative impacts.

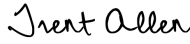
18. The permittee shall require its contractors and/or agents to comply with the terms and conditions of this certification in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this Water Quality Certification. A copy of this Water Quality Certification shall be available at the project site during the construction and maintenance of this project.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)

Justification: Those actually performing the work should be aware of the requirements of this 401 Water Quality Certification to minimize water quality impacts.

This approval to proceed with your proposed impacts or to conduct impacts to waters as depicted in your application shall expire upon expiration of the 404 Permit. The conditions in effect on the date of issuance shall remain in effect for the life of the project, regardless of the expiration date of this Certification. [15A NCAC 02H .0507(c)]

This, the 3rd day of August, 2023

DocuSigned by:

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Trent Allen
Regional Supervisor
Division of Water Resources
Water Quality Regional Operations Section

