GEO HYDRO ENGINEERS

# Air-Percussion Drilling Exploration Summary

**Veterans Park**
**Oconee County, Georgia**
**Geo-Hydro Project Number 170359.20**

*Prepared for Williams & Associates*
*May 3, 2017*

Mr. Michael Greenlee, P.E.
Williams & Associates
2470 Daniells Bridge Road, Suite 161
Athens, Georgia 30606

May 3, 2017

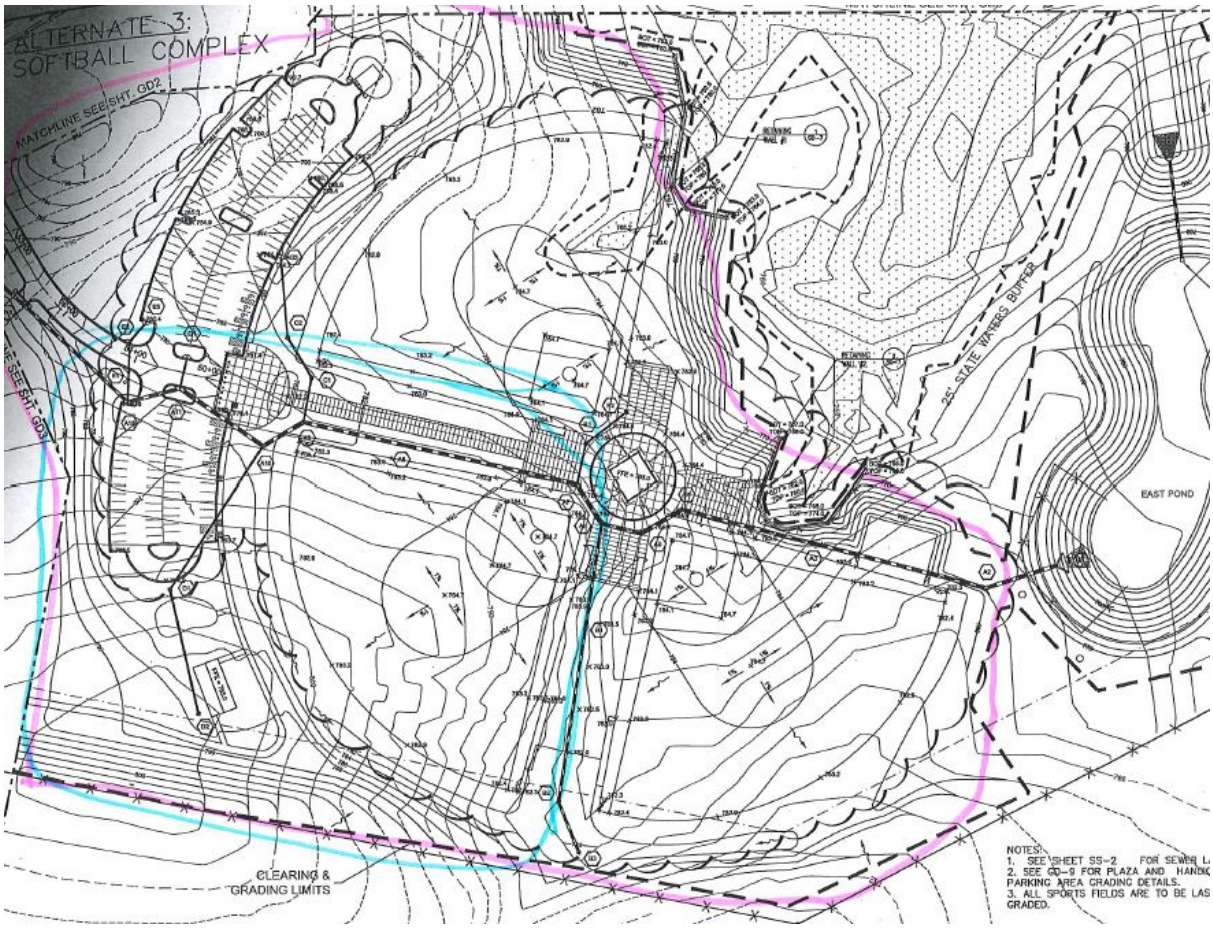
**Air-Percussion Drilling Exploration Summary**
**Veterans Park**
**Oconee County, Georgia**
**Geo-Hydro Project Number 170359.20**

Dear Mr. Greenlee:

Geo-Hydro Engineers, Inc. has completed the authorized subsurface exploration for the above referenced project. The scope of services for this project was outlined in our proposal number 20314.2 dated April 13, 2017.

## Project Information

To assist in the evaluation of the depth of rock within the ballfields, air-percussion drilling was performed. Geo-Hydro engaged Precision Blasting to perform the air-percussion drilling. The project surveyor established the field stakes identifying the point ID and existing ground surface elevation. The plan excerpt below illustrates the area of exploration outlined in blue.



## Exploration Summary

A total of 26 air-percussion holes were advanced. The summary table below shows the boring ID, ground surface elevation, and top-of-rock depth and elevation. The top-of-rock depth and elevation denote the top of continuous hard rock. Intermittent layers of soft rock were encountered at varying depths throughout the site. Fence diagrams B-B' and C-C' in the Appendix illustrate our interpretation of the subsurface profile in the areas where rock was encountered.

| Boring | Approx. Ground Elevation | Approx. Target Grade | Top of PWR | | Top of Rock | | Notes |
|---|---|---|---|---|---|---|---|
| | | | Depth (feet) | Approx. Elevation | Depth (feet) | Approx. Elevation | |
| **A.1** | 780 | 783 | NE | -- | NE | -- | |
| **A.2** | 781 | 783 | NE | -- | NE | -- | |
| **A.3** | 783 | 783 | NE | -- | NE | -- | |
| **A.4** | 784 | 783 | NE | -- | NE | -- | |
| **A.5** | 784 | 783 | NE | -- | NE | -- | |
| **B.1** | 782 | 783 | NE | -- | 9-10* | 773* | Rock was non-continuous from 7 to 25 feet with soil seams about every foot. |
| **B.2** | 783 | 783 | NE | -- | 10 | 773 | Continuous rock encountered at approximately 10 feet. Rock seems encountered at 8 feet. |
| **B.3** | 782 | 783 | NE | -- | NE | -- | |
| **B.4** | 784 | 783 | NE | -- | NE | -- | |
| **B.5** | 785 | 783 | NE | -- | 5 | 780 | |
| **C.1** | 791 | 783 | 13-18 | 778 | 22 | 769 | Continuous rock encountered at 22 feet. Minor rock seems encountered at about 19 feet. |
| **C.2** | 793 | 783 | NE | -- | 4 | 789 | |
| **C.3** | 797 | 783 | 4-7 | 793 | 7 | 790 | |
| **C.4** | 784 | 783 | NE | -- | NE | -- | |
| **C.5** | 785 | 783 | NE | -- | NE | -- | |
| **D.1** | 805 | 783 | NE | -- | NE | -- | |
| **D.2** | 805 | 783 | NE | -- | NE | -- | |
| **D.3** | 797 | 783 | NE | -- | NE | -- | |
| **D.4** | 787 | 783 | NE | -- | NE | -- | |
| **D.5** | 783 | 783 | NE | -- | NE | -- | |
| **CD.1** | - | 783 | 0-18 | -- | NE | -- | |
| **CD.2** | - | 783 | NE | -- | 18* | -- | Rock was very discontinuous from 18 to 25 feet. |
| **CD.3** | - | 783 | NE | -- | 7 | -- | |
| **AB.1** | - | 783 | NE | -- | NE | -- | |
| **AB.2** | - | 783 | NE | -- | NE | -- | |
| **AB.3** | - | 783 | NE | -- | NE | -- | |

## Evaluations and Recommendations

The following evaluations and recommendations are based on the information available on the proposed construction, the data obtained from the test borings, and our experience with soils and subsurface conditions similar to those encountered at this site. Because the test borings represent a very small statistical sampling of subsurface conditions, it is possible that conditions may be encountered during construction that are substantially different from those indicated by the test borings. In these instances, adjustments to the design and construction may be necessary.

### Excavation Characteristics

In general, the overburden soils at the site should be readily removable with conventional soil excavation equipment such as backhoes. However, denser soils and weathered rock (hard drilling) will require the use of track-mounted backhoes to facilitate excavation. It is possible that very hard soils may require ripping in some instances.

The term "rock" refers to materials as outlined in the previous summary table, rock will require blasting to achieve efficient excavation.

It is important to note that the depth to rock or partially weathered rock can vary drastically over relatively short distances. It would not be unusual for rock or partially weathered rock to occur at higher elevations between some of the air-percussion probeholes.

For reference, the following are typical mass rock and trench rock definitions used in lager grading and infrastructure projects:

- Mass Rock: Material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at 56,000 pounds (Caterpillar D-8K or equivalent), and occupying an original volume of at least one cubic yard.

- Trench Rock: Material occupying an original volume of at least one-half cubic yard which cannot be excavated with a hydraulic excavator having a minimum flywheel power rating of 123 kW (165 hp); such as a Caterpillar 322C L, John Deere 230C LC, or a Komatsu PC220LC-7; equipped with a short tip radius bucket not wider than 42 inches.

The foregoing definitions are based on large equipment typically utilized for mass grading. Subsequent excavations for building foundations, retaining walls, and underground utilities are often performed with smaller equipment such as rubber-tired backhoe/loaders or even mini-excavators. Depending on the depth of excavation, small equipment might encounter difficult excavation during building construction or during utility installation. Contractors will often request additional payment for mobilizing larger equipment than that which was anticipated during preparation of their construction bid. The amount of additional compensation, if any, and the minimum equipment size necessary to qualify for any additional compensation should be defined before the start of construction.

## Blasting

In most cases rock excavation is performed by blasting. Standard blasting procedures include drilling through the materials to be blasted to introduce the explosives and covering up the area to be blasted to prevent flying debris. The area to be blasted is typically covered with several feet of soil or a blast mat. Alternatively, the existing soil overburden can be left in place, which in most cases will eliminate the need for a soil cover or a blast mat.

Blasting generates ground vibrations that can be detrimental to adjacent structures. Research by the United States Bureau of Mines and other organizations provides limits for safeguarding adjacent structures during blasting operations. A peak particle velocity of 2 inches per second is generally recognized as a conservative limit, and is the maximum peak particle velocity allowed by the Georgia Blasting Standards Act of 1978.

State and local laws require that precondition surveys of neighboring properties be performed prior to conducting blasting activities. Typical requirements are to conduct a precondition survey of structures and facilities within a 1,000-foot radius of the blast site. Vibration monitoring is also required in all four compass directions at the nearest structure not owned by the developer/owner. Some municipalities have variations of these requirements, and the local requirements should be reviewed prior to beginning blasting activities.

## Reuse of Excavated Materials As Structural Fill

Based on the results of the test borings, excavated soils at the project site should be suitable for reuse as structural fill material. Routine adjustment of moisture content will be necessary to allow proper placement and compaction.

It is important to establish as part of the construction contract whether soils having elevated moisture content will be considered suitable for reuse. We often find this issue to be a point of contention and a source of delays and change orders. From a technical standpoint, soils with moisture contents wet of optimum as determined by the standard Proctor test (ASTM D698) can be reused provided that the moisture is properly adjusted to within the workable range. From a practical standpoint, wet soils can be very difficult to dry in small or congested sites and such difficulties should be considered during planning and budgeting. A clear understanding by the general contractor and grading subcontractor regarding the reuse of excavated soils will be important to avoid delays and unexpected cost overruns.

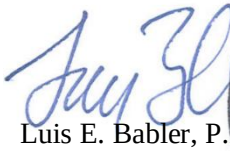
Partially weathered rock materials will be suitable for reuse as structural fill only if they break down into a reasonably well-graded material that can be satisfactorily compacted. The presence of cobble size or boulder size material, which does not break down under the action of compaction equipment, will limit the suitability of partially weathered rock materials. Engineering judgment will be required in the field to evaluate the acceptability of partially weathered rock materials for reuse as structural fill.

For planning purposes, blast rock should be considered as unsuitable for reuse as structural fill.

We appreciate the opportunity to serve as your geotechnical consultant for this project, and are prepared to provide any additional services you may require. If you have any questions concerning this report or any of our services, please call us.

Sincerely,

GEO-HYDRO ENGINEERS, INC.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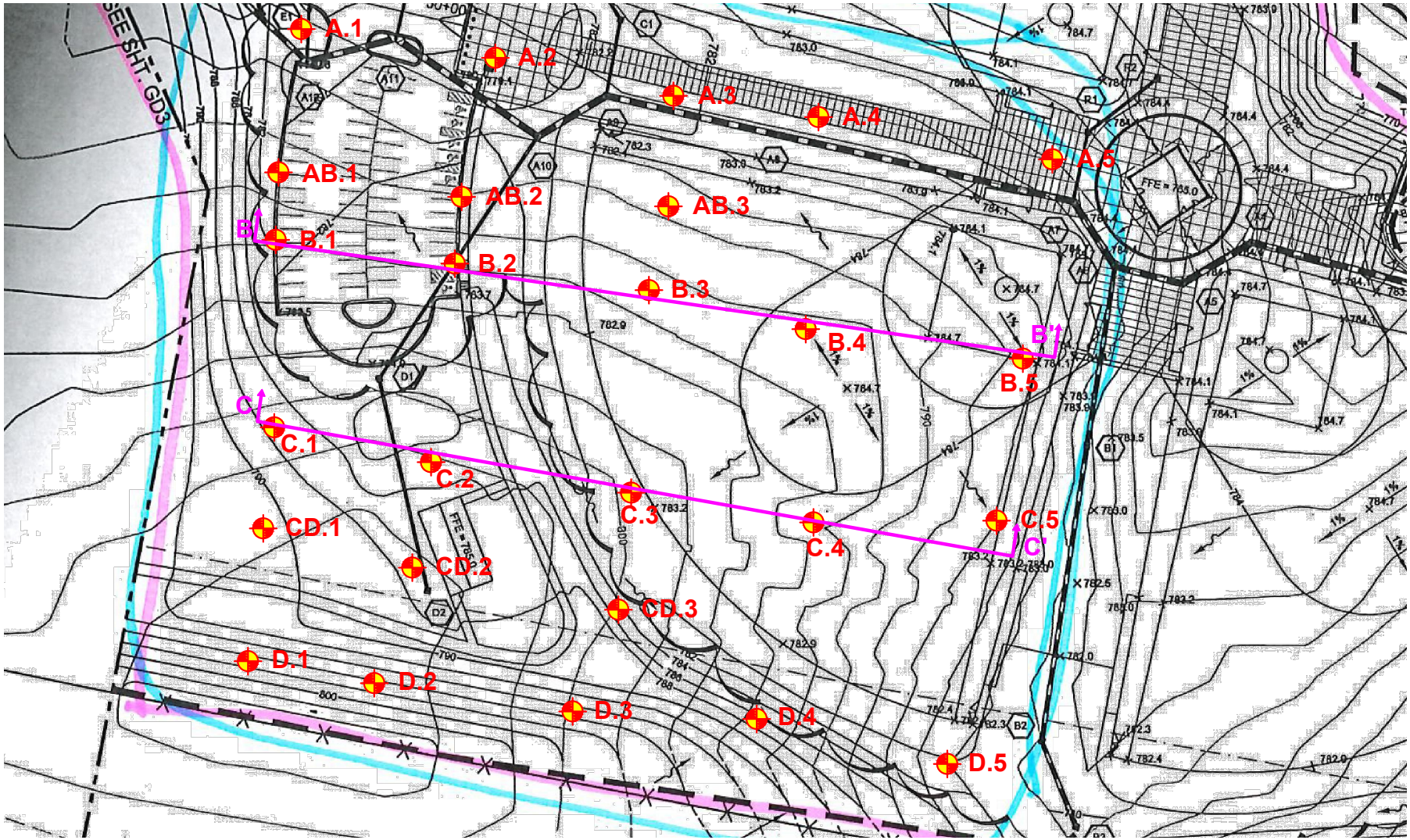
# APPENDIX

GEO HYDRO ENGINEERS




Approximate Scale: 1"=100'

| | | |
|---|---|---|
| LEGEND: Soil Test Boring | Figure 1: Boring Location Plan | Veterans Park<br>Oconee County, Georgia<br>Geo-Hydro Project Number 170359.20 |

Project Name: Veterans Park
Project Location: Oconee County, Georgia
Project Number: 170359.20

CROSS-SECTION
B-B'

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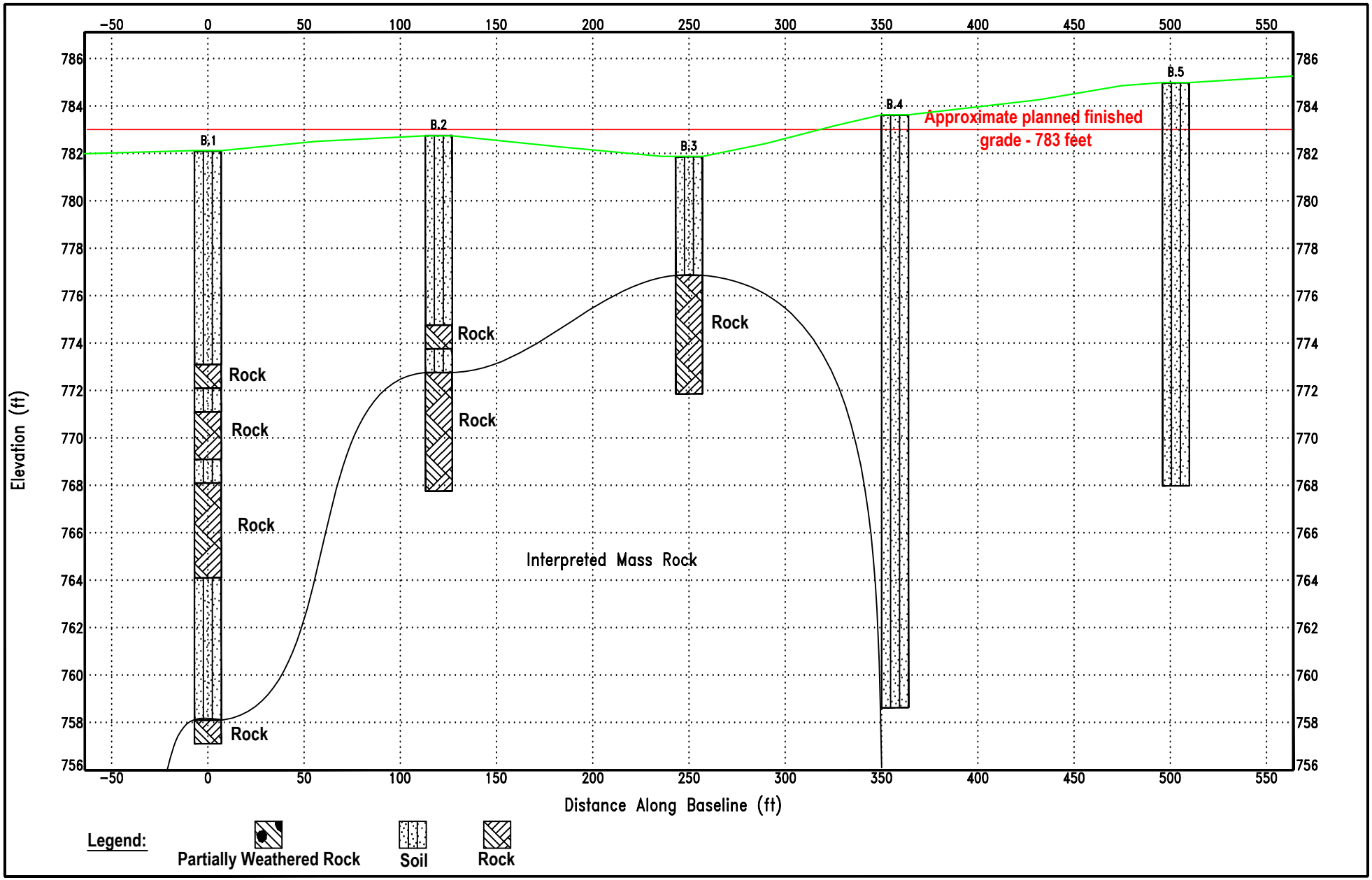


Note: This profile is an approximate representation based on information from soil test borings. The interface between different materials is intended to represent an idealized subsurface profile suitable for planning purposes only, and should not be considered to be a precise description of subsurface conditions.

Project Name: Veterans Park
Project Location: Oconee County, Georgia
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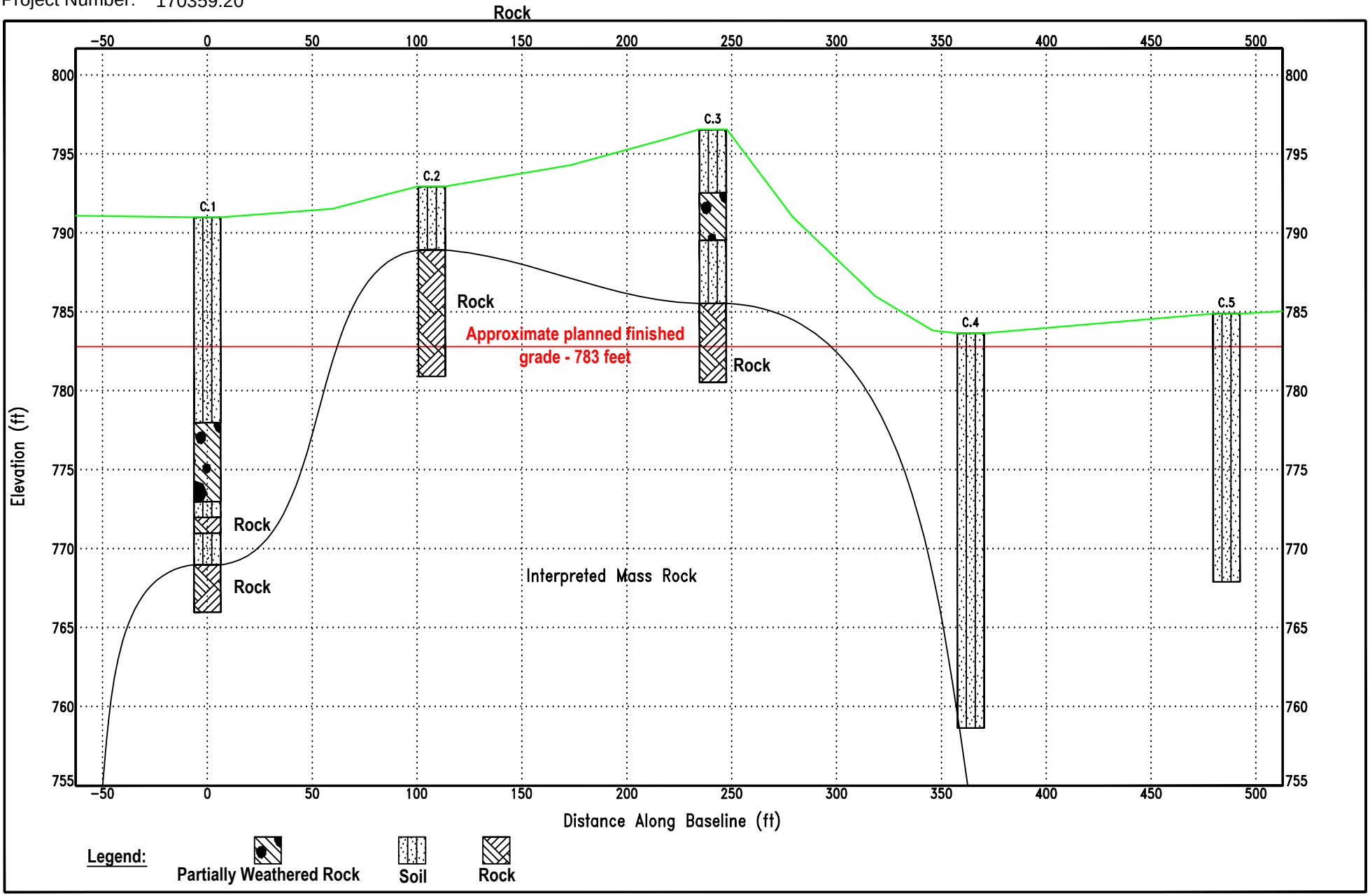
CROSS-SECTION
C-C'

GEO HYDRO ENGINEERS

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