GEOTECHNICAL ENGINEERING REPORT

PROPOSED ADDITION
2329 115TH AVENUE
GREELEY, COLORADO

NORTHERN COLORADO GEOTECH
PROJECT NO. 203-19
JANUARY 20, 2020

Prepared for:

Weld County Buildings and Grounds
1105 “H” Street
Greeley, Colorado 80631
Attn: Sterling Geesaman
January 20, 2020

Weld County Buildings and Grounds
1105 “H” Street
Greeley, Colorado 80631

Attn: Sterling Geesaman

Re: Geotechnical Engineering Report
Regional Crime Lab Building Addition
Northern Colorado Geotech Project No. 203-19

Northern Colorado Geotech has completed a geotechnical engineering exploration for the proposed building addition to be located at 2329 115th Avenue in Greeley, Colorado.

The subsurface soils at the site consisted of silty clayey sand to depths of 12 feet to greater than 15 feet. Sandstone bedrock was encountered in Test Bore 1 at a depth of 12 feet. The results of our field exploration and laboratory testing indicate that the soils have low expansive potential and low load bearing capabilities.

Based on the anticipated construction and the results of our engineering exploration, it is our opinion that the proposed building addition may be supported on a spread footing foundation system. Slab on grade may be utilized for the interior floor system.

If you have any questions concerning this report or any of our consulting services, please do not hesitate to contact us.

Sincerely,
NORTHERN COLORADO GEOTECH

Prepared by:

Doug Leafgren, P.G.
President

Reviewed by:

Gary G. Weeks, P.E.
Vice President

Copies to: Addressee (3)
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GEOTECHNICAL ENGINEERING REPORT

PROPOSED ADDITION
2329 115TH AVENUE
GREELEY, COLORADO

NORTHERN COLORADO GEOTECH
PROJECT NO. 203-19
JANUARY 20, 2020

SCOPE

This report contains the results of our geotechnical engineering exploration for the proposed addition to the regional crime lab located at 2329 115th Avenue in Greeley, Colorado.

This report includes descriptions of, and geotechnical engineering recommendations relative to:

- subsurface soil and bedrock conditions
- groundwater conditions
- foundation design and construction
- drainage
- floor slab design and construction
- earthwork

The recommendations contained in this report are based upon the results of field and laboratory testing, engineering analyses, and experience with similar soil conditions, structures and our understanding of the proposed project.

SITE CONDITIONS

The site is currently vegetated with grasses and weeds. Overall surface drainage is poor to the south. The property is bordered to the north and south by existing commercial structures and parking lots. A vacant lot is located to the west and the existing structure and 115th Avenue are located east of the addition.

PROPOSED CONSTRUCTION

The site occupied by the regional crime lab structure that appears to be a slab on grade structure. A second building, constructed with an approximate 2 foot separation from the original structure, will be built on the west side of the existing building. Final site grades were not available at the time of the exploration, although we assume the first floor of the addition will match the floor elevation of the existing structure.
SITE EXPLORATION

A total of two test borings were drilled on January 3, 2020. The borings were drilled to approximate depths of 15 feet at the locations shown on the Site Plan, Figure 1. The borings were advanced with a truck-mounted drilling rig, utilizing 4-inch diameter solid stem augers.

The borings were located in the field by pacing from property lines and/or existing site features. The accuracy of boring locations should only be assumed to the level implied by the methods used.

Lithologic logs of each boring were recorded by an engineering geologist during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving split-spoon and/or ring samplers. Standard penetration measurements were recorded while driving a split-spoon and/or ring sampler into the subsurface materials. The standard penetration test is a useful index in estimating the density of the materials encountered.

Groundwater conditions were evaluated in each boring at the time of subsurface exploration.

Laboratory Testing

The samples retrieved during the subsurface exploration were returned to our laboratory for observation by the project manager. The soils were classified in general accordance with the Unified Soil Classification System. At that time, the field descriptions were confirmed or modified and an applicable laboratory testing program was formulated. Boring logs were prepared and are attached with this report.

Laboratory tests were conducted on selected samples and are presented on the boring logs and attached laboratory test sheets. The test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations.

Selected samples were tested for the following engineering properties:

- Water Content
- Compressive Strength
- Dry Density
- Expansion
- Consolidation
SUBSURFACE CONDITIONS

Soil and Bedrock Conditions

Soils at the site generally consisted of silty clayey sand to depths of approximately 12 feet to greater than 15 feet. The upper 2 feet of soil appeared to be fill material related to construction of the existing structure. Sandstone bedrock was encountered in Test Bore 1 at a depth of 12 feet. Summary boring logs are attached with this report.

Groundwater Conditions

Groundwater was not observed in any test boring at the time of field exploration. These observations represent groundwater conditions at the time of the field exploration, and may not be indicative of other times, or at other locations. Groundwater conditions can be expected to fluctuate with varying seasonal and weather conditions, and other factors.

Field Test Results

Field test results indicate that the sand soils vary from loose to medium dense in relative density. The bedrock varies from soft to moderately hard in hardness.

Laboratory Test Results

Laboratory test results indicate that the soils have low expansive potential and low load bearing capabilities.

DESIGN RECOMMENDATIONS

Foundation Design

Based on the results of our subsurface exploration and the results of the laboratory testing, it is our opinion that a spread footing foundation system may be used for support of the proposed addition. The footings should be placed on undisturbed soils and/or engineered fill material.

Design and construction recommendations for foundation systems and other earth connected phases of the project are outlined below.

Footing Foundations

Based on the results of our subsurface exploration and laboratory testing, it is our opinion that a spread footing foundation system bearing upon undisturbed soil and/or engineered fill may be used for
Weld County Buildings and Grounds  
Regional Crime Lab Addition – 2329 115th Avenue  
Northern Colorado Geotech Project No. 203-19

support of the proposed addition. The footings may be designed for a maximum bearing pressure of 1,500 psf. The design bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions.

Existing fill that will be encountered on the site and adjacent to the existing structure should not be used for support of foundations without removal and recompa ction.

Exterior footings should be placed a minimum of 30 inches below finished grade for frost protection and to provide confinement for the bearing soils. Finished grade is the lowest adjacent grade for perimeter footings.

Footings should be proportioned to reduce differential foundation movement. Proportioning on the basis of equal total movement is recommended; however, proportioning to relative constant dead-load pressure will also reduce differential movement between adjacent footings. Total movement resulting from the assumed structural loads is estimated to be on the order of 3/4 inch or less. Differential movement should be on the order of 1/2 to 3/4 of the estimated total movement. Additional foundation movements could occur if water from any source infiltrates the foundation soils; therefore, proper drainage should be provided in the final design and during construction.

Foundations and masonry walls should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. The use of joints at openings or other discontinuities in masonry walls is recommended.

Foundation excavations should be observed by Northern Colorado Geotech. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations may be required.

**Surface Drainage**

Positive drainage should be provided during construction and maintained throughout the life of the proposed project. Infiltration of water into utility or foundation excavations must be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 10 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.
Downspouts, roof drains or scuppers should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems should not be installed within 5 feet of foundation walls. Landscaped irrigation adjacent to the foundation system should be minimized or eliminated.

**Floor Slab Design and Construction**

Some differential movement of slab-on-grade floor systems is possible should the subgrade soils become elevated in moisture content. To reduce potential slab movements, the subgrade soils should be prepared as outlined in the earthwork section of this report.

For structural design of concrete slabs-on-grade, a modulus of subgrade reaction of 125 pounds per cubic inch (pci) may be used for floors supported on existing or engineered fill consisting of on-site soils. A modulus of 200 pci may be used for floors supported on a minimum of two feet of engineered fill meeting the specifications outlined below.

Additional floor slab design and construction recommendations are as follows:

- Positive separations and/or isolation joints should be provided between slabs and all foundations, columns or utility lines to allow independent movement.

- Control joints should be provided in slabs to control the location and extent of cracking.

- Interior trench backfill placed beneath slabs should be compacted in accordance with recommended specifications outlined below.

- In areas subjected to normal loading, a minimum 4-inch layer of clean-graded gravel should be placed beneath interior slabs.

- Floor slabs should not be constructed on frozen subgrade.

Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some movement due to the volume change of the backfill. Potential movement could be reduced by:

- minimizing moisture increases in the backfill
- controlling moisture-density during placement of backfill
- using designs which allow vertical movement between the exterior features and adjoining structural elements
- placing effective control joints on relatively close centers
Weld County Buildings and Grounds  
Regional Crime Lab Addition – 2329 115th Avenue  
Northern Colorado Geotech Project No. 203-19

General Earthwork

All earthwork on the project should be observed and evaluated by Northern Colorado Geotech. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Strip and remove existing vegetation, debris, and other deleterious materials from proposed building and pavement areas. All exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

Stripped materials consisting of vegetation and organic materials should be wasted from the site, or used to revegetate landscaped areas or exposed slopes after completion of grading operations.

If unexpected fills or underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Materials and Placement

All exposed areas which will receive fill should be scarified to a minimum depth of eight inches, conditioned to near optimum moisture content, and compacted.

The placement of soils on the site should be observed by Northern Colorado Geotech. The fill should be assessed for suitability of use in the proposed fill and tested for placement including compaction percentage and moisture content.
Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Recommended compaction criteria for engineered fill materials are as follows:

Clean on-site soils or approved imported materials may be used as fill material.

On-site soils are not recommended for use as compacted fill beneath interior or exterior floor slabs.

Imported soils (if required) should conform to the following:

<table>
<thead>
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<th>Gradation</th>
<th>Percent fines by weight (ASTM C136)</th>
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<tbody>
<tr>
<td>6&quot;</td>
<td></td>
</tr>
<tr>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>No. 4 Sieve</td>
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<td>No. 200 Sieve</td>
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<table>
<thead>
<tr>
<th>Material</th>
<th>Minimum Percent (ASTM D698)</th>
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<tr>
<td>Scarified subgrade soils</td>
<td>95</td>
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<td>On-site and imported fill soils:</td>
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<tr>
<td>Beneath foundations</td>
<td>95</td>
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<td>Beneath slabs</td>
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</table>

On-site or imported granular soils should be compacted within a moisture range of 3 percent below to 3 percent above optimum unless modified by the project geotechnical engineer.

**GENERAL COMMENTS**

The analysis and recommendations presented in this report are based upon data obtained from borings performed to obtain representative subsurface conditions at the site. Variations in the soil
between borings will occur. Northern Colorado Geotech should be present during construction to observe the excavation and construction procedures and confirm or modify our recommendations.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site.

This report is intended exclusively for the use by the client. Any use or reuse of the findings and/or recommendations of this report by parties other than the client without the written consent of Northern Colorado Geotech is undertaken at said parties’ sole risk.

This report has been prepared in accordance with generally accepted geotechnical engineering practices in this area at this time. No warranties, either express or implied, are intended or made.
### LOG OF BORING No. 1

**CLIENT**  
Weld County Building and Grounds

**ARCHITECT/ENGINEER**

**SITE**  
2329 115th Avenue  
Greeley, Colorado

**PROJECT**  
Proposed Addition

<table>
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<tr>
<th>DEPTH (FT.)</th>
<th>GRAPHIC LOG</th>
<th>SAMPLES</th>
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<tr>
<td>0</td>
<td></td>
<td>10</td>
<td>SS</td>
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| 3.0         | FILL - Silty Clayey Sand  
Tan, moist, loose | 13 | RS | 12 | 10 | 98 | 9,000 | 0% Swell |
| 12.0        | SILTY CLAYEY SAND  
Tan, moist, loose | 5 | SS | 12 | 13 |
| 14.0        | WEATHERED SANDSTONE  
Tan, moist, soft | 35 | SS | 12 | 22 |
| 15.0        | SANDSTONE  
Tan, moist, moderately hard | 15 |

**WATER LEVEL OBSERVATIONS**

**None**  
None

**HOLE FILLED IN AFTER BORING**

**Northern Colorado Geotech**

2958 29th Street, Unit 21  
Greeley, Colorado 80631  
Phone: 970-506-9244  
Fax: 970-506-9242

**STARTED**  
1/3/20  
FINISHED  
1/3/20

**DRILL CO.**  
Drilling Eng

**DRILL RIG**  
CME-75

**LOGGED BY**  
TK

**APPROVED**  
DML

**NCG PROJECT NO.**  
203-19
## LOG OF BORING No. 2

**CLIENT**
Weld County Building and Grounds

**SITE**
2329 115th Avenue
Greeley, Colorado

### GRAPHIC LOG

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<th>DEPTH (FT.)</th>
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| 2.0         | FILL - Silty Clayey Sand  
Tan, moist, medium dense | |
| 15.0        | SILTY CLAYEY SAND  
Tan, moist, loose to medium dense | |

### WATER LEVEL OBSERVATIONS

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Hole Filled in After Boring

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**ARCHITECT/ENGINEER**

**PROJECT**
Proposed Addition

### LOG OF BORING No. 2

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**STARTED**
1/3/20

**FINISHED**
1/3/20

**DRILL CO.**
Drilling Eng

**DRILL RIG**
CME-75

**NCG PROJECT NO.**
203-19

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**Northern Colorado Geotech**
2956 29th Street, Unit 21
Greeley, Colorado 80631
Phone: 970-506-9244
Fax: 970-506-9242

LOGGED BY TK
APPROVED DML
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### CONSOLIDATION TEST

Client: Weld County Building and Grounds  
Number: 203-19  
Project: Proposed Addition  
Location: 2329 115th Avenue
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**CONSOLIDATION TEST**

Client: Weld County Building and Grounds  
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