NorthWest Colorado Consultants, Inc.
Geotechnical / Environmental Engineering • Materials Testing

November 16, 2022

Thunderstruck Adventures
Clay Hockel
93525 HWY 71
Windom, MN 56101

Job Number: 22-12817

Subject: Subsoil and Foundation Investigation, Proposed Thunderstruck Adventures Storage Building, County Road 80, Routt County, Colorado.

Bob,

This report presents the results of the Subsoil and Foundation Investigation for the proposed cold storage building to be constructed within a parcel located on the east side of County Road 80 (CR-80) in Routt County, Colorado. The approximate location of the project site is shown in Figure #1.

NWCC, Inc.'s (NWCC) scope of work included obtaining data from cursory observations made at the site, logging of two test pits, sampling of the probable foundation and pavement subgrade soils and laboratory testing of the samples obtained. This report presents recommendations for economically feasible and safe type foundations, as well as allowable soil pressures and other design and construction considerations that are advisable, but not necessarily routine to quality design and building practices.

Proposed Construction: NWCC understands an unheated building for storing snowmobiles, a groomer, trucks and a trailer will be constructed at the site as well as a concrete parking apron. NWCC assumes the storage building will be constructed utilizing concrete slab-on-grade floor systems placed from 2 feet above to 4 feet below the existing ground surface.

For design purposes, NWCC has assumed that building loads will be light to moderate typical of this type of commercial construction. If loadings or conditions are significantly different from those above, NWCC should be notified to reevaluate recommendations in this report.

Site Conditions: The proposed building site is located east of CR-80 and approximately 1 mile north of CR-70 in Routt County, Colorado. The building site was vacant at the time of our investigation. Vegetation consisted of grasses and occasional weeds.

The topography of the site slopes moderately down to the northeast. A maximum elevation difference of approximately 5 to 7 feet appears to exist across the proposed building site.

Subsurface Conditions: To investigate the subsurface conditions at the site, two test pits were advanced at the site on October 13, 2022, with a mini trackhoe provided by client. A site plan showing the approximate test pit locations is presented in Figure #2.

Subsurface conditions encountered were somewhat variable and generally consisted of a layer of topsoil and organic materials overlying clays which extended to the maximum depth excavated, 5 feet beneath existing ground surface (bgs). It should be noted that refusal was encountered on hard clays at 5 feet bgs in Test Pit 1. Graphic logs of the exploratory test pits, along with associated Legend and Notes, are presented in Figure #3.

A layer of natural topsoil and organic materials was encountered at the ground surface and was approximately 8 to 9 inches in thickness. Natural clays were encountered beneath the topsoil and organic materials and extended to 5 feet bgs in both test holes. Natural clays were nil to slightly sandy, moderately to highly plastic, fine grained, very stiff to hard, slightly moist to moist, blocky, calcareous and brown in color. Samples of the clays classified as CH soils in accordance with the Unified Soil Classification System.

A swell-consolidation test conducted on a sample of the clays indicates the materials tested exhibited a high swell potential when wetted under a constant load. Swell-consolidation test results are shown in Figure #4, and all other laboratory results are summarized in the attached Table 1.

Based on anticipated geologic site conditions, NWCC recommends a **Site Class C** designation be used in structural design calculations in accordance with Table 20.3-1 in Chapter 20 of ASCE 7-10.

Groundwater was not encountered in the test pits at the time of our investigation and no signs of a seasonal high groundwater level were encountered. It should be noted that groundwater conditions at the site can be expected to fluctuate with seasonal changes in precipitation and runoff.

Foundation Recommendations: Based on the results of the field and laboratory investigations and our experience with other projects in this part of Routt County, NWCC believes a safe foundation system will consist of straight shaft skin friction/end bearing piers drilled into underlying natural clays. Foundation movement should be within tolerable limits if the following design and construction precautions are observed.

1) A minimum pier diameter of 12 inches and a minimum pier length of 20 feet are recommended. A maximum pier length to diameter ratio of 25 is also recommended.

2) Piers should be designed using allowable skin friction value of 900 psf for the portion of pier drilled into the natural clays. The upper 5 feet of pier penetration should be neglected in skin-friction calculations. A drill rig of sufficient size, type and operating condition should be used so bottom of the piers can be cleaned out properly and minimum length requirements can be met. If

bottoms of piers are properly cleaned and approved by an engineer from this office, then an allowable end bearing pressure of 3,500 psf for the natural clays may be used in the design.

3) Piers should be reinforced their full length with at least one #5 reinforcing rod for each 16 inches of pier perimeter.

4) Piers should be properly cleaned and dewatered prior to steel and concrete placement.

5) A 4-inch void should be provided beneath grade beams to prevent swelling soils from exerting uplift forces on grade beams and to concentrate pier loadings. A void should also be provided beneath necessary pier caps.

6) NWCC strongly recommends at least one test hole or test pier be drilled at the building site prior to starting the pier drilling operations. Test holes/piers should be drilled to evaluate deeper subsoil/bedrock conditions and verify recommendations given above.

7) A representative of NWCC must observe the test hole and pier drilling operations.

Alternate Foundation Recommendations: An alternative type of foundation system would consist of helical screw piles advanced into the underlying clays. The helical screw pile foundations will place the bottom of the foundation in a zone of relatively stable moisture content and mitigate the risk of foundation movement from swelling of the natural clays.

Utilizing this type of foundation, each column is supported on a single or group of screw piles, and the structures are founded on grade beams or pile caps supported by a series of piles. Load applied to the piles is transmitted to the natural soils through the end bearing pressure at the helices of the screw pile. Foundation movement should be less than ½-inch if the following design and construction conditions are observed.

The helical screw pile foundation system should be designed by a qualified engineer, using industry standards and be installed by a licensed/certified installer. If pile groups are required, we recommend a minimum pile spacing of 3 times the largest helix to achieve the maximum capacity of each individual pile. Lateral loads should be resisted using battered piles or tiebacks or through passive soil pressures against foundation walls or grade beams.

We strongly recommend at least two test piles be advanced at the site to confirm subsoil conditions and establish torque versus depth relationships to determine the proper shaft and helix size and type. In addition, load testing of the helical screw piles is strongly recommended to verify the design capacity of the piles. A representative of this office should observe the test piles, load test and helical screw pile installations.

NWCC also recommends the following:

- Minimum 6-inch diameter helix;
- Minimum installation torque of 4,000 ft-lbs;
- Minimum penetration of 8 feet between upper helix and ground surface;
- Full-time installation observation by a qualified special inspector;
- Review of the Contractor's quality control plan regarding instrumentation calibration and testing, materials QC and pile installation procedures.

Floor Slabs: NWCC has assumed the lower levels of the building will be constructed with concrete slab-on-grade floor systems, placed from 2 feet above to 6 feet below the existing ground surface. On-site soils, with the exception of the topsoil and organic materials, are capable of supporting slab-on-grade construction. However, floor slabs present a very difficult problem where swelling materials are present near floor slab elevation because sufficient dead load cannot be imposed on them to resist the uplift pressure generated when the materials are wetted and expand. Based on the moisture-volume change characteristics of the clays encountered at this site, we recommend that structural floor systems over well-ventilated crawlspaces or void form be used in the proposed residence. If the client elects to construct concrete slab-on-grade floor systems, we recommend that the following special design and construction precautions be followed so that the amount of movement in the floor slabs can be reduced, if the clays become wetted.

The following measures must be taken to reduce damage, which could result from movement should the underslab soils be subjected to moisture changes.

1) Floor slabs must be separated from all bearing walls, columns and their foundation supports with a positive slip joint. NWCC recommends the use of ½-inch thick cellotex or impregnated felt.

2) Interior non-bearing partition walls resting on the floor slabs must be provided with a slip joint, preferably at the bottom, so in the event the floor slab moves, this movement is not transmitted to the upper structure. This detail is also important for wallboard and doorframes and is shown in Figure #5.

3) A minimum 6-inch gravel layer must be provided beneath all floor slabs to act as a capillary break and to help distribute pressures. Prior to placing the gravel, excavation should be shaped so that if water does get under the slab, it will flow to the low point of the excavation. In addition, all topsoil and organic materials should be removed prior to placement of the underslab gravels or new structural fill materials.

4) Floor slabs must be provided with control joints placed a maximum of 10 to 12 feet on center in each direction to help control shrinkage cracking. Locations of the joints should be carefully checked to assure that natural, unavoidable cracking will be controlled. Depth of the control joints should be a minimum of ¼ the thickness of the slab.

5) Underslab soils must be kept as close as possible to their in-situ moisture content. Excessive wetting or drying of these soils prior to placement of floor slab could result in differential movement after slabs are constructed.

6) It has been NWCC's experience that the risk of floor slab movement can be reduced by removing at least 3 feet of the expansive materials and replacing them with a well compacted, non-expansive fill. If this is done or if fills are required to bring underslab areas to the desired grade, the fill should consist of non-expansive, granular materials. Fill should be uniformly placed and compacted in 6 to 8 inch lifts to at least 95% of the maximum standard Proctor density at or near the optimum moisture content, as determined by ASTM D-698.

Following the above precautions and recommendations will not prevent floor slab movement in the event the soils beneath the floor slabs undergo moisture changes. However, they should reduce the amount of damage if such movement occurs. The only way to eliminate the risk of all floor slab movement is to construct a structural floor over a well-vented crawl space or void form materials.

Underdrain System: Any floor levels or crawl space areas constructed below the existing or finished ground surfaces and the foundations should be protected by underdrain systems to help reduce the problems associated with surface and subsurface drainage during high runoff periods.

Localized perched water or runoff can infiltrate the lower levels of the structures at the foundation levels. This water can be one of the primary causes of differential foundation and slab movement, especially where expansive soils are encountered. Excessive moisture in crawl space areas or lower levels can also lead to rotting and mildewing of wooden structural members and the formation of mold and mold spores. Formation of mold and mold spores could have detrimental effects on the air quality in these areas, which in turn can lead to potential adverse health effects.

Drains should be located around entire perimeter of the lower levels and be placed and at least 12 inches below any floor slab or crawl space levels and at least 6 inches below the foundation voids and bottom of the foundation walls. NWCC recommends the use of perforated PVC pipe for the drainpipe, which meets or exceeds ASTM D-3034/SDR 35 requirements, to minimize potential for pipe crushing during backfill operations. Holes in the drainpipe should be oriented down between 4 o'clock and 8 o'clock to promote rapid runoff of water. Drainpipe should be surrounded with at least 12 inches of free draining gravel and should be protected from contamination by a filter covering of Mirafi 140N subsurface drainage fabric or an equivalent product. Drains should have a minimum slope of 1/8 inch per foot and be daylighted at positive outfalls protected from freezing or be led to sumps from which water can be pumped. The use of interior laterals, multiple daylights or sumps may be required for the proposed structure. Caution should be taken when backfilling so as not to damage or disturb the installed underdrain. NWCC recommends the drainage system include a cleanout every 100 feet, be protected against intrusion by animals at outfalls and be tested prior to backfilling. NWCC also recommends the client retain our firm to observe the underdrain systems during construction to verify that they are being installed in accordance with recommendations provided in this report and observe a flow test prior to backfilling the system.

In addition, NWCC recommends an impervious barrier be constructed to keep water from infiltrating through the voided areas and/or under foundation walls. The barrier should be constructed of an impervious material, which is approved by this office and placed below the perimeter drain and up against the sides of the foundation walls. A typical perimeter/underdrain detail is shown in Figure #7.

Placement of and impervious membrane and/or properly compacted clays in crawl space areas to a point at least 12 inches above the top of the foundation voids or bottom of the foundation walls should help reduce the moisture problems in these areas.

Foundation Walls and Retaining Structures: Foundation walls and retaining structures, which are laterally supported and can be expected to undergo only a moderate amount of deflection, may be designed for a lateral earth pressure computed on the basis of an equivalent fluid unit weight of 45 pcf for imported, free draining granular backfill and 65 pcf for on-site soils.

Cantilevered retaining structures at the site can be expected to deflect sufficiently to mobilize full active earth pressure condition. Therefore, cantilevered structures may be designed for a lateral earth pressure computed based on an equivalent fluid unit weight of 35 pcf for imported, free draining granular backfill and 55 pcf for on-site soils.

Foundation walls and retaining structures should be designed for appropriate hydrostatic and surcharge pressures such as adjacent buildings, traffic and construction materials. An upward sloping backfill and/or natural slope will also significantly increase earth pressures on foundation walls and retaining structures and the structural engineer should carefully evaluate these additional lateral loads when designing foundation and retaining walls.

NWCC recommends imported granular soils for backfilling foundation walls and retaining structures because their use results in lower lateral earth pressures. Imported granular materials should be placed to within 2 to 3 feet of the ground surface. Imported granular soils should be free draining and have less than 5 percent passing the No. 200 sieve. Granular soils placed behind foundation and retaining walls should be sloped from the base of the wall at an angle of at least 45 degrees from the vertical. The upper 2 to 3 feet of fill should be a relatively impervious soil or pavement structure to prevent surface water infiltration into the backfill.

Wall backfill should be carefully placed in uniform lifts and compacted to at least 95 percent of the maximum standard Proctor density and near the optimum moisture content. Care should be taken not to overcompact backfill since this could cause excessive lateral pressure on the walls. Some settlement of foundation wall backfill materials will occur even if the backfill materials are placed correctly.

Surface Drainage: Proper surface drainage at this site is of paramount importance for minimizing infiltration of surface drainage into wall backfill and bearing soils, which could result in increased wall pressures, differential foundation and slab movement. The following drainage precautions should be observed during construction and at all times after the structures have been completed:

1) Ground surface surrounding structures should be sloped (minimum of 1.0 inch per foot) to drain away from structures in all directions to a minimum of 10 feet. Ponding must be avoided. If necessary, raising top of foundation walls to achieve a better surface grade is advisable.

2) Non-structural backfill placed around structures should be compacted to at least 95% of the maximum standard Proctor density at or near the optimum moisture content in order to minimize future settlement of the fill. Backfill should be placed immediately after the braced foundation walls are able to structurally support the fill. Puddling or sluicing must be avoided.

3) Top 2 to 3 feet of soil placed within 10 feet of foundations should be impervious in nature to minimize infiltration of surface water into wall backfill.

4) Roof downspouts and drains should discharge well beyond the limits of all backfill. Roof overhangs, which project two to three feet beyond foundation walls, should be considered if gutters are not used.

5) Landscaping, which requires excessive watering and lawn sprinkler heads, should be located a minimum of 10 feet from the foundation walls of the structures.

6) Plastic membranes should not be used to cover ground surface adjacent to foundation walls.

Site Grading: Slopes on which the proposed structure is proposed could become unstable as a result of the proposed construction. Design and construction considerations must be addressed to avoid and/or limit the potential for slope instability at the site. Although a detailed slope stability analysis is beyond the scope of this report, some general guidelines are provided below for initial planning and design. Our office should review the construction plans as they are being prepared so that we can verify that our recommendations are being properly incorporated into the plans. Additional recommendations and/or investigations may be warranted to provide additional information for the design and construction of temporary or permanent shoring and slope stabilization structures. Slope reinforcement should be designed and constructed by engineers and contractors experienced in earth retention systems.

1) Slopes greater than 25 percent should be avoided whenever possible for construction of permanent roads and structures.

2) Temporary cuts for foundation construction should be constructed to OSHA standards for temporary excavations. Permanent, unretained cuts for driveways or building sites should be kept as shallow as possible and should not exceed a 3(Horizontal) to 1(Vertical) configuration for the topsoil and organic materials and a 2(Horizontal) to 1(Vertical) configuration for the clays. We recommend these cuts be limited to 10 feet in height or less unless stable bedrock is encountered. The risk of slope instability will be significantly increased if groundwater seepage is encountered in the cuts. NWCC office should be notified immediately to evaluate the site, if seepage is

encountered or deeper cuts are planned and determine if additional investigations and/or stabilization measures are warranted.

3) Excavating during periods of low runoff at the site can reduce potential slope instability during excavation. Excavations should not be attempted during the spring or early summer when seasonal runoff and groundwater levels are typically high.

4) Fills up to 15 feet in height can be constructed at the site and should be constructed to a 2(Horizontal) to 1(Vertical) or flatter configuration. The fill areas should be prepared by stripping any existing fill materials and topsoil and organics, scarification and compaction to at least 95% of the maximum standard Proctor density and within 2% of optimum moisture content as determined by ASTM D698. The fills should be properly benched/keyed into the natural hillsides after the existing fill materials, natural topsoil and organic materials, silts and clays have been removed. The fill materials should consist of the on-site soils (exclusive of topsoil, organics or silts) and be uniformly placed and compacted in 6 to 8 inch loose lifts to the minimum density value and moisture content range indicated above.

5) Proper surface drainage features should be provided around all permanent cuts and fills and steep natural slopes to direct surface runoff away from these areas. Cuts, fills and other stripped areas should be protected against erosion by revegetation or other methods. Areas of concentrated drainage should be avoided and may require the use of riprap for erosion control.

6) A qualified engineer experienced in this area should prepare site grading and drainage plans. The contractor must provide a construction sequencing plan for excavation, wall construction and bracing and backfilling for the steeper and more sensitive portions of the site prior to starting the excavations or construction.

Pavement Recommendations: Based on the subsurface conditions encountered at the site and our assumption of the traffic loadings, we recommend that the gravel section to be constructed for the driveway and parking areas consist of a minimum of 4 inches of base course aggregates overlying a minimum of 8 inches of pit run sands and gravels (subbase aggregates). If future plans call for asphalt pavement on the driveway/parking areas, we recommend a minimum of 3 inches of hot mix asphalt (HMA). We strongly recommend that the asphalt not be placed for a minimum of 2 spring/summer cycles to allow for settlement and regrading of the road base surface materials prior to placement of the HMA.

NWCC recommends the parking apron and any areas subjected to heavy truck traffic turning movements, such as in the apron areas in front of the trash dumpster approach areas, be paved with a rigid pavement section consisting of at least 7 inches of Portland cement concrete (PCC). Sidewalks subjected to pedestrian traffic should be paved using at least 4 inches of PCC. Areas where occasional emergency or snow removal vehicle traffic is anticipated should be paved using at least 5 inches of PCC.

The asphalt pavement materials should consist of a hot bituminous plant mix material meeting the job mix formula established by a qualified engineer and which meets Colorado Department of Transportation (CDOT) specifications.

Placement and compaction of the HMA should generally conform to CDOT guidelines outlined in Section 401 of the Standard Specifications for Road and Bridge Construction. Base course materials should consist of a well-graded aggregate base course material that meets Class 6 grading and durability requirements. Base course materials should consist of a well-graded aggregate base course materials that meet CDOT Class 6 ABC grading and durability requirements. Base course and subbase materials (Class 2 Subbase) should be uniformly placed and compacted in 4 to 6-inch loose lifts to at least 95 % of the maximum modified Proctor density and within +/- 2 % of the optimum moisture content as determined by ASTM D1557.

Concrete pavement materials shall be based on a mix design established by a qualified engineer. Concrete should have a minimum 28-day compressive strength of 4,500 psi, be air entrained with approximately 6 percent air and have a maximum water/cement ratio of 0.42. Concrete should have a maximum slump of 4 inches and should contain control joints not greater than 12 feet on centers. The depth of the control joints should be at least ¼ of the slab thickness.

Prior to placement of subbase materials or concrete pavement, any topsoil and organics materials and topsoil fill materials should be removed. NWCC recommends the exposed subgrade soils be uniformly mixed, moisture treated to within 2 % of the optimum moisture content and then be recompacted to at least 95 % of the maximum standard Proctor density. Depending on the time of year when subgrade preparation is considered, moisture conditioning including drying and/or moistening of subgrade materials will most likely be required in order to attain uniform compaction. NWCC also recommends that the properly moisture conditioned and recompacted subgrade soils be proofrolled with a loaded tandem dump truck or water truck prior to placing the subbase gravels. Areas exhibiting deflection and rutting will most likely require deeper stabilization. The depth and type of stabilization should be determined at the time of construction.

Any subgrade fill materials placed beneath the parking areas may consist of on-site clays. Clays should be constructed in 6 to 8 thick inch lifts and be compacted to at least 95% of the maximum Standard Proctor density and within 2% of the optimum moisture content determined in accordance with ASTM D698. We recommend all topsoil and organic materials be removed from beneath the parking areas/driveways prior to fill placement.

The collection and diversion of surface and subsurface drainage away from the paved areas is extremely important to satisfactory performance of the pavement. The design of the surface and subsurface drainage features should be carefully considered to remove all water from paved areas and to prevent ponding of water on and adjacent to paved areas. NWCC recommends subgrade areas be graded to drain if feasible so that surface runoff is not allowed to pond on the subgrade surface.

Limitations: The recommendations provided in this report are based on the subsurface conditions encountered at this site and NWCC's understanding of the proposed construction. NWCC believes this information gives a high degree of reliability for anticipating behavior of the proposed structures; however, NWCC's recommendations are professional opinions and cannot control nature, nor can they assure the soils profiles beneath those or adjacent to those observed. No warranties expressed or implied are given on the content of this report.

Expansive soils were encountered at this site. These soils are stable at their natural moisture content but can shrink or swell with changes in moisture. The behavior of expansive soils is not fully understood. The swell or consolidation potential of any particular site can change erratically both in lateral and vertical extent. Moisture changes also occur erratically, resulting in conditions which cannot always be predicted. Recommendations presented in this report are based on the current state of the art for foundations and floor slabs on swelling soils. As noted previously, the owner must be made aware there is a risk in construction on these types of soil. The performance of the structures will depend on following the recommendations and in proper maintenance after construction is complete. As water is the main cause for volume change in the soils, it is necessary that the changes in moisture content be kept to a minimum. This requires judicious irrigation and providing positive surface drainage away from the structures. Any distress noted in the structures should be brought to the attention of NWCC.

This report is based on the investigation at the described site and on specific anticipated construction as stated herein. If either of these conditions is changed, the results would also most likely change. Therefore, NWCC strongly recommends that our firm be contacted prior to finalizing the construction plans so that we can verify our recommendations are being properly incorporated into the construction plans. Man-made or natural changes in the conditions of a property can also occur over a period of time. In addition, changes in requirements due to state-of-the-art knowledge and/or legislation do from time to time occur. As a result, the findings of this report may become invalid due to these changes. Therefore, this report is subject to review and not considered valid after a period of 3 years or if conditions as stated above are altered. It is the responsibility of the owner or his representative to ensure that the information in this report is incorporated into the plans and/or specifications and construction of the project.

If you have any questions regarding this report or if NWCC may be of further service, please do not hesitate to contact us.

Sincerely,
NWCC, INC.

Erika K. Hill, P.E., P.G.
Project Engineer

COLORADO LICENSED
BRIAN D. LEN
11/17/2022
25750
PROFESSIONAL ENGINEER

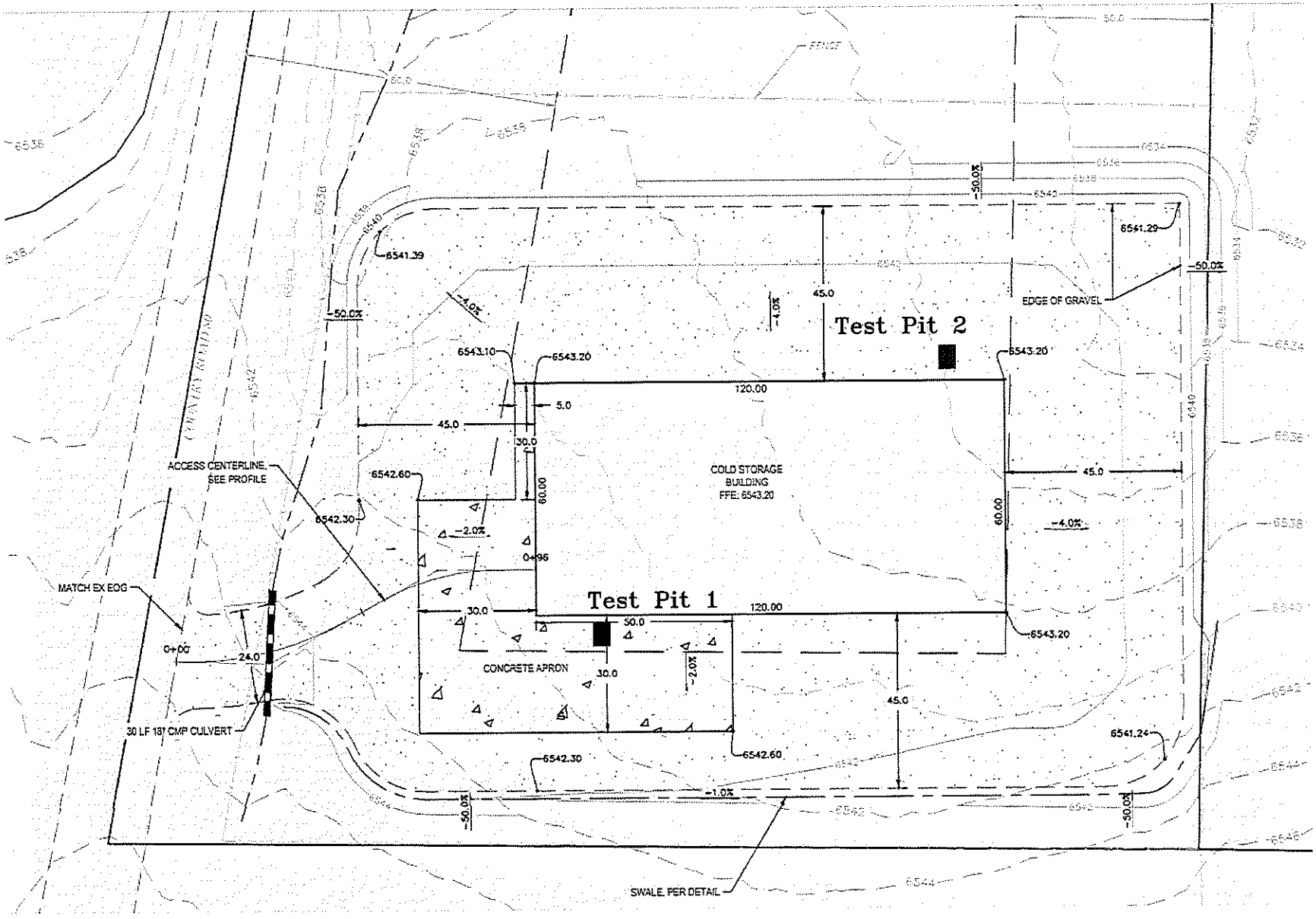
Reviewed by Brian D. Len, P.E.
Principal Engineer

N

NOT TO SCALE

PROJECT SITE

Title: VICINITY MAP		**Date:** 11/14/22	NWCC North West Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing
Job Name: Thunderstruck Adventures Storage Building		**Job No.** 22-12817	(970)879-7888 · Fax (970)879-7891 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Location: County Road 80, Routt County, Colorado		**Figure** #1	

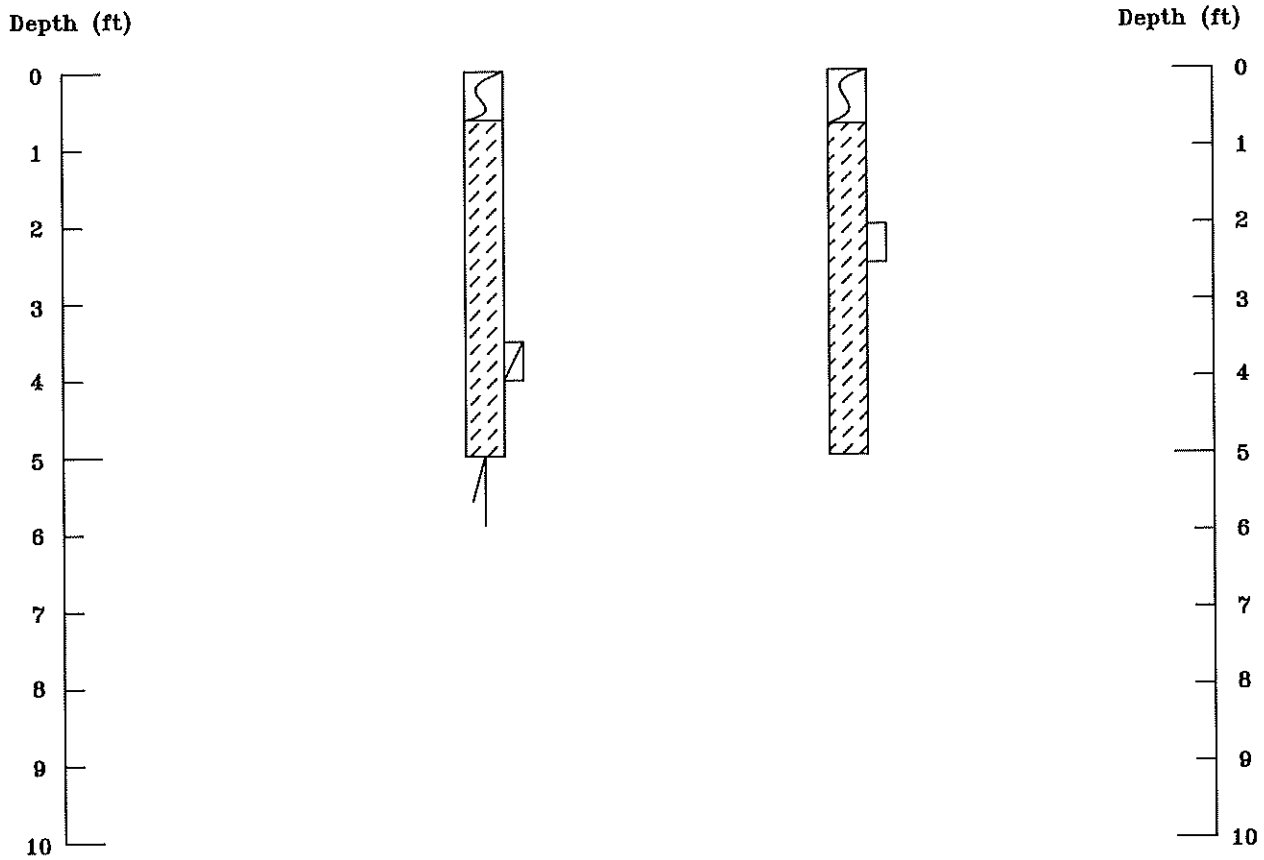


Title:	SITE PLAN/LOCATION OF TEST HOLES	**Date:**	11/15/22
Job Name:	Thunderstruck Adventures Storage Building	**Job No.**	22-12817
LOCATION:	County Road 80, Routt County, Colorado	**Figure**	#2

NWCC
North West Colorado Consultants, Inc.
Geotechnical / Environmental Engineering - Materials Testing
(970)879-7888 Fax (970)879-7891
2580 Copper Ridge Drive
Steamboat Springs, Colorado 80487

Test Pit 1

Test Pit 2



LEGEND:

Topsoil and Organics.

CLAYS: Nil to slightly sandy, moderately to highly plastic, fine grained, very stiff to hard, slightly moist to moist, blocky, calcareous and brown in color.

Hand Drive Sample–2" California Liner.

Small Disturbed Bag Sample.

Indicates refusal in hard clays.

NOTES:

1) Test pits were excavated on October 13, 2022 with a mini trackhoe.

2) Test pit locations were determined by pacing from existing features.

3) Elevations of the test pits were not measured and the logs are drawn to the depths investigated.

4) The lines between materials shown on the test pit logs represent the approximate boundaries between material types and transitions may be gradual.

Title: LOGS, LEGEND AND NOTES		Date: 11/15/22
Job Name: Thunderstruck Adventures Storage Building		Job No. 22-12817
Location: County Road 80, Routt County, Colorado		Figure #3

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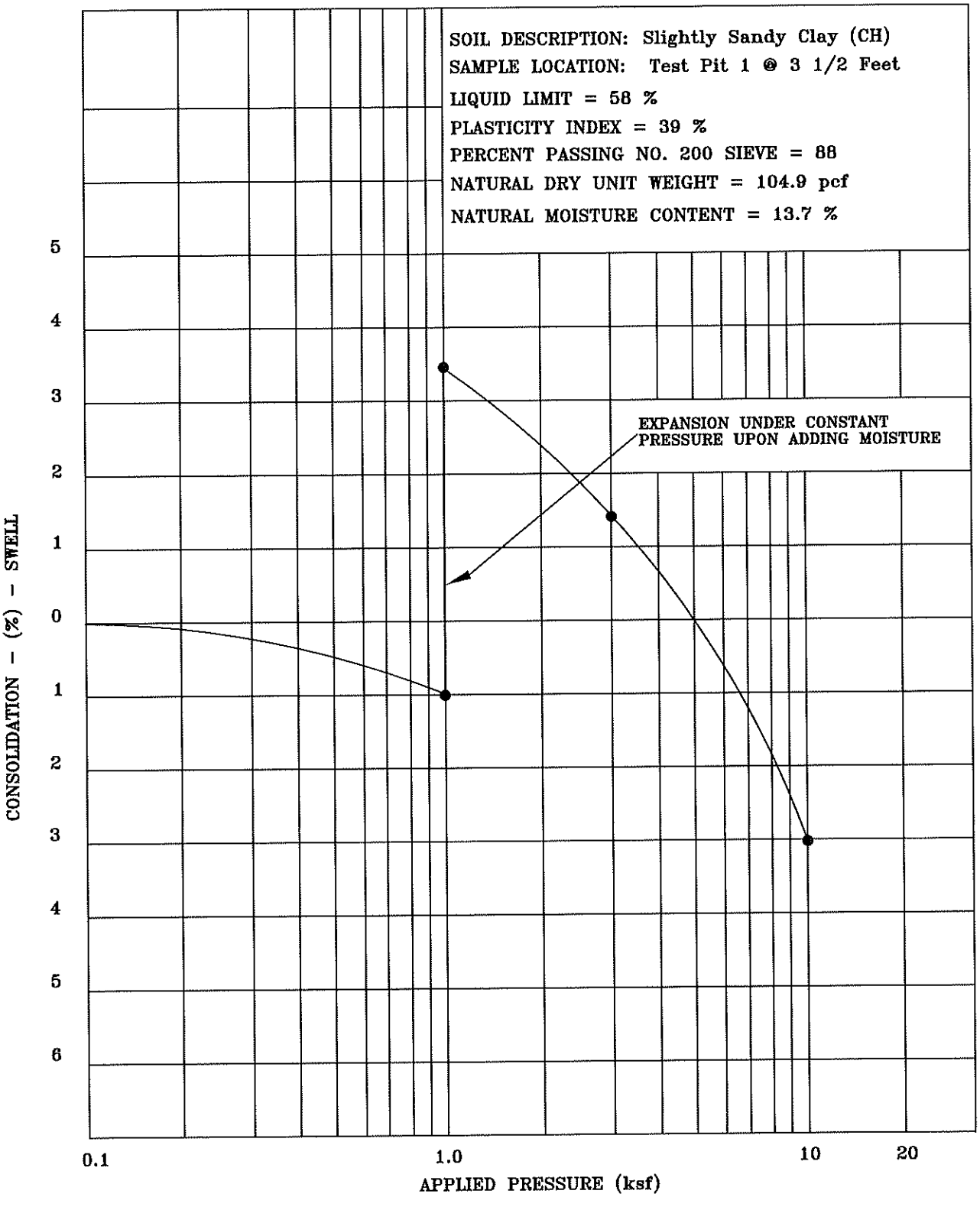
North West Colorado Consultants, Inc.
Geotechnical / Environmental Engineering - Materials Testing
(970)879-7888 - Fax (970)879-7891
2580 Copper Ridge Drive
Steamboat Springs, Colorado 80487



Title: SWELL-CONSOLIDATION TEST RESULTS		Date: 11/15/22	
Job Name: Thunderstruck Adventures Storage Building		Job No. 22-12817	
Location: County Road 80, Routt County, Colorado		Figure #4	

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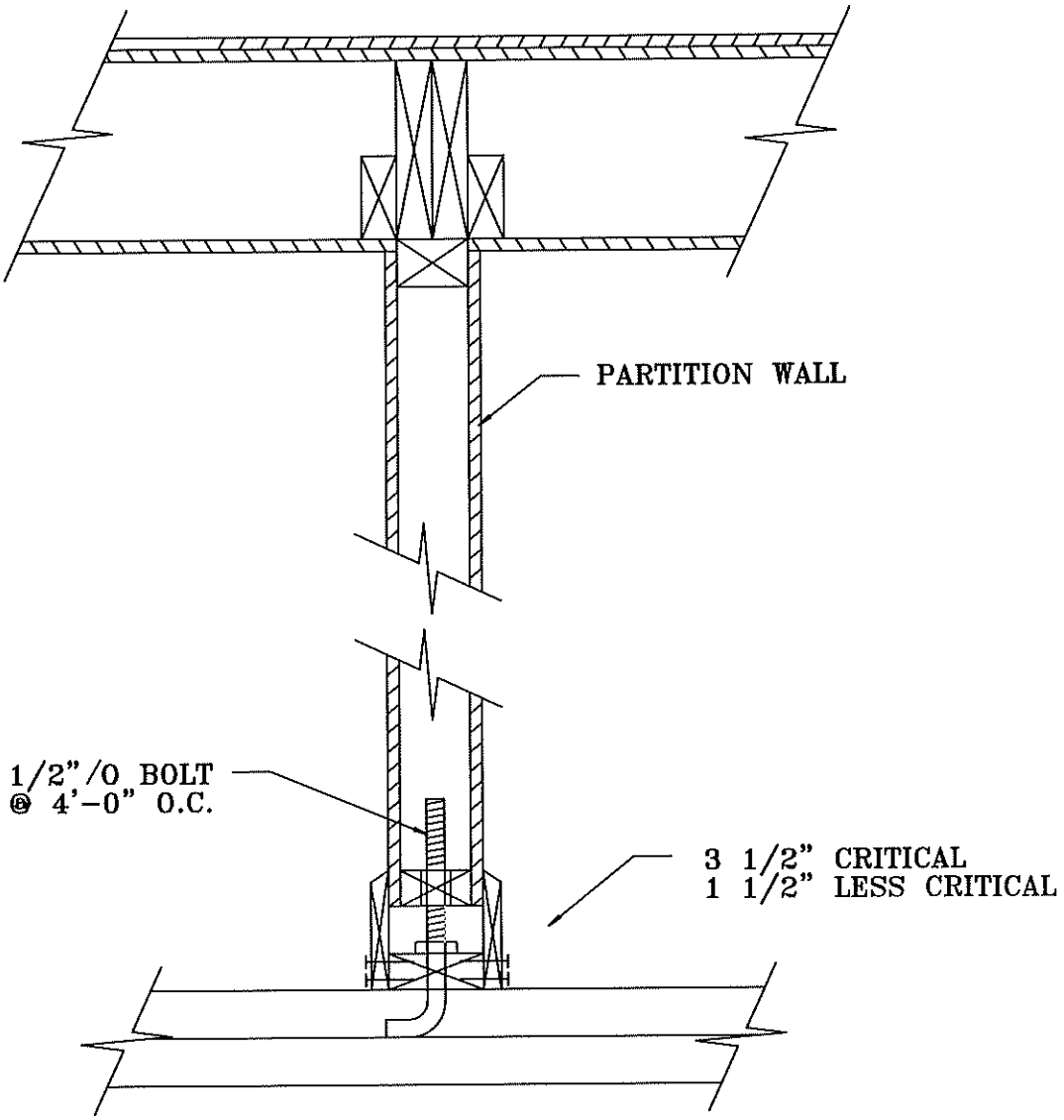
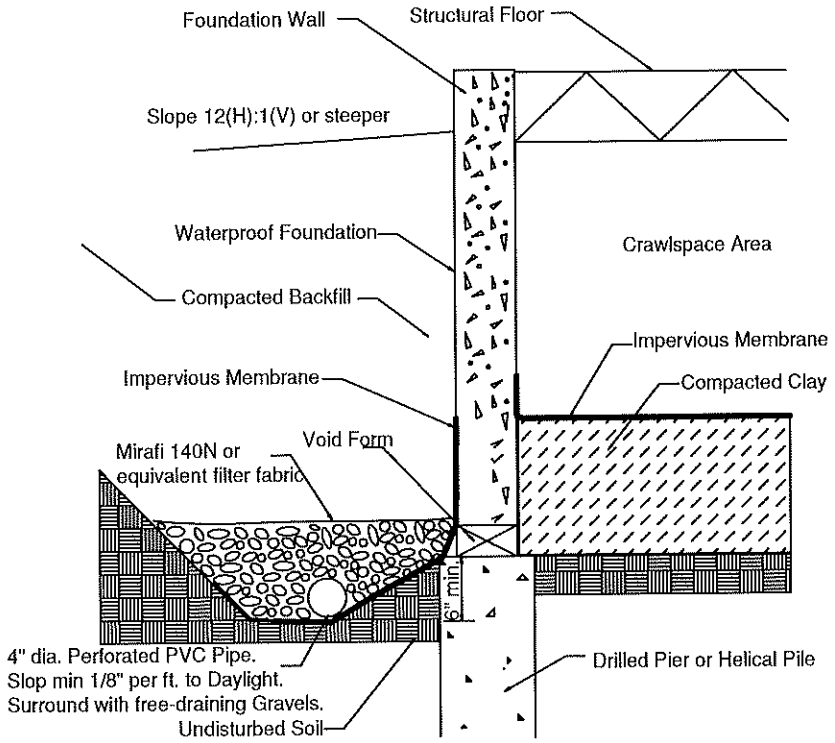
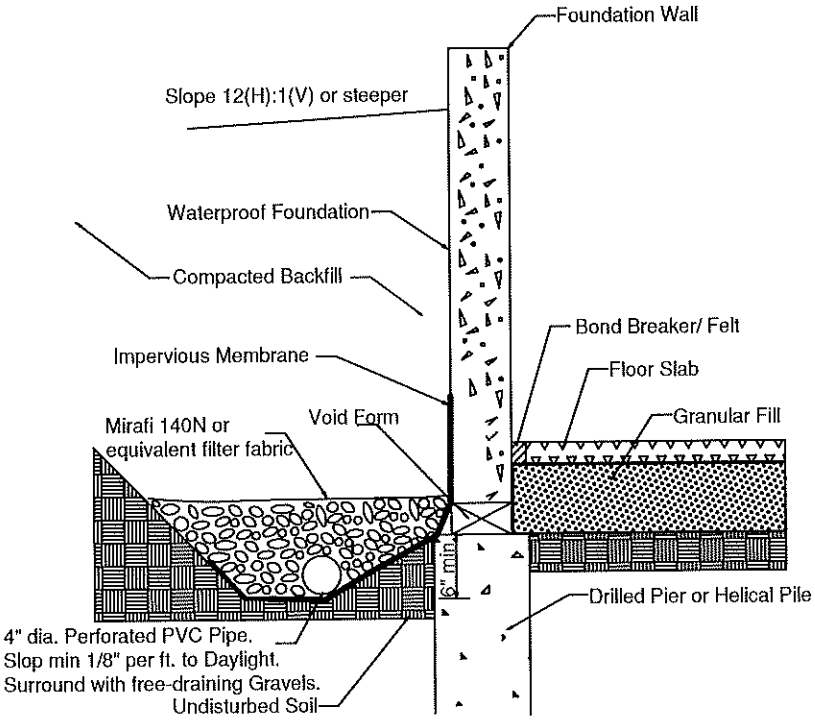
North West Colorado Consultants, Inc.
Geotechnical / Environmental Engineering - Materials Testing
(970)879-7888 - Fax (970)879-7691
2589 Copper Ridge Drive
Steamboat Springs, Colorado 80487



Title: HUNG PARTITION WALL DETAIL		Date: 11/15/22	NWCC North West Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing (970)879-7888 · Fax (970)879-7891 2586 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: Thunderstruck Adventures Storage Building		Job No. 22-12817	
Location: County Road 80, Routt County, Colorado		Figure #5	



Crawlspace Area



Lower Level with
Floor Slab

Title: PERIMETER/UNDERDRAIN DETAIL	**Date:** 11/15/22	NWCC North West Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing
Job Name: Proposed Helt Residence	**Job No.** 22-12748	(970)879-7888 - Fax (970)879-7891 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Location: County Road 41, Routt County, Colorado	**Figure** #7	

NWCC, Inc.

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	ATTERBERG LIMITS		GRADATION		PERCENT PASSING No. 200 SIEVE	UNCONFINED COMPRESSIVE STRENGTH (psf)	SOIL or BEDROCK DESCRIPTION	UNIFIED SOIL CLASS.
TEST PIT	DEPTH (feet)			LIQUID LIMIT (%)	PLASTICITY INDEX (%)	GRAVEL (%)	SAND (%)				
1	3 1/2	13.7	104.9	58	39	0	12	88		Slightly Sandy Clay	CH
2	2	14.8		56	35	0	3	97		Clay	CH

JOB NUMBER: 22-12817