GEOMET ENGINEERING

Geotechnical and Construction Services

November 4, 2024

Attn: Paul Ondr
Timberline Fire Department
19126 CO-119
Black Hawk, CO 80422

Project: 24253

Dear Paul:

On October 18, 2024, a representative of GeoMet Engineering, Inc. observed the digging of two (2) test pits, dug for the proposed addition to the Timberline Fire Department located at 19126 Colorado Highway 119 in Gilpin County, Colorado. The test pits were dug near or within the footprint of the proposed addition. Attached to this report is a site plan that shows the approximate test pit locations (figure 1).

Test pit one revealed a ½-foot-thick layer of topsoil at the surface consisting of brown sand and gravel with organics. Brown granite sand was encountered beneath the topsoil and extended to a depth of approximately 1½ feet. Red brown to gray, decomposed granite was encountered beneath the sand and continued to a depth of approximately 2½ feet. Test pit one was terminated at approximately 2½ feet due to digging refusal on competent granite bedrock.

Test pit two revealed a ½-foot-thick layer of topsoil at the surface consisting of brown sand and gravel with organics. Red brown to gray, decomposed granite was encountered beneath the topsoil and continued to a depth of approximately 2 feet. Test pit two was terminated at approximately 2 feet due to digging refusal on competent granite bedrock.

Granitic soils and decomposing granite bedrock are very stable and have excellent bearing capacity. Therefore, it is our opinion that the addition can be supported on footings, either continuous spread footings or isolated pad footings, founded on the granitic soils or decomposed granite utilizing a uniform soil bearing pressure not to exceed 3,000 psf (pounds per square foot). Footings founded directly on the hard and competent granite bedrock could have a bearing capacity much higher than this if needed (over 5,000 psf on clean, competent granite bedrock). The loadings should be based on the dead load plus 100% of the maximum anticipated live load. It is possible that blasting

will be required to complete the excavation, in some areas, if the excavation is deep. Please note that we do not recommend that any footings be placed on over-blasted, displaced materials. Any over-blasted, displaced materials should be removed, down to the native, undisturbed bedrock prior to placing any footings. Also note that we do not recommend that any footings be placed on topsoil or any areas where root masses may be present.

The footing lines should be carefully inspected by an engineer from our office prior to placement of the footings. All footings should be placed below any fill, topsoil, or clayey soils (as discussed above). The footings should also be placed deep enough for frost protection. Any areas of soft or loose soil, which are present at the proposed footing level, should be removed down to acceptable undisturbed soils. Footings can then be placed directly upon the acceptable soils, or the excavation can be backfilled to the desired footing elevation with compacted, select granular fill placed in lifts not to exceed 9 inches in thickness and compacted to a minimum of 100% of maximum density as determined by the moisture/density relationship ASTM D698.

Foundation walls supported by footings should be designed as grade beams capable of spanning a minimum distance of 12 feet. The amount of reinforcing steel used should not be less than two #5 bars, both top and bottom of the foundation walls. Reinforcement should be continuous around corners. Differential settlement will be minimized by proper reinforcement of foundation walls

The soils anticipated to be beneath any slabs-on-grade are anticipated to be very stable and we have no recommendations for any special considerations. Any topsoil or root masses and any clayey soil should be stripped out, as these are the only materials that we identified that could have stability problems.

Standard practice in this area is to found driveways and other exterior slabs on native soils, with a small depth of moisture treatment.

Prior to pouring any slab it is essential that all debris, topsoil, and organic materials be removed and all loose fill either removed or compacted to 95% of maximum density as determined by the standard moisture/density relationship test ASTM D698-78. If any fill is required beneath the proposed slab, we recommend using a granular fill compacted in 12" maximum lifts to the standard referenced above.

If below grade space (such as a crawl space or walkout basement) is utilized, it is our opinion that the foundation system and the below grade space should be protected by the installation of a perimeter drainage system. The perimeter drainage system should consist of 4-inch rigid perforated pipe surrounded by ¾ to 1½ inch washed rock. The drains should be placed a minimum of 12 inches below the surface of the adjacent concrete slab or the crawlspace level and should drain to a positive gravity discharge or to a sump from which water can be pumped. An illustration detailing a recommended perimeter drainage system is attached to this letter (Figure 2). If below grade space is not utilized, a perimeter drainage system is not required.

Walls, which are to retain soil, must be designed as retaining walls to resist lateral earth pressures. This applies to basement walls, garden level walls or freestanding walls. On this site we recommend that the walls be designed using a lateral earth pressure equivalent to that developed by a fluid weighing 50 pcf (pounds per cubic foot).

Use of the above value assumes that on-site soils are utilized as backfill and that the soil behind the wall will not be allowed to become saturated at any time during the life of the wall. Proper site grading and drainage and the installation of appropriate drainage systems will help to prevent saturation. These recommendations are valid for walls up to 8 feet in height.

Groundwater was not noted during our inspection and is not anticipated to be a design or construction consideration. However, please note that this area is known for water retention in the upper soils during the spring runoff, due to the shallow bedrock, which can lead to some water infiltration problems unless the site grading and drainage is properly handled. Please carefully observe the recommendations contained in the following section…

Satisfactory long-term performance of any foundation system depends on prevention of infiltration of water into the foundation system. Therefore, the following recommendations are given to prevent the wetting of foundation soils.

1. Mechanically compact all fill around the building, including the backfill. Compaction by ponding or saturation must not be permitted. The backfill should be compacted to not less than 85% of maximum density as determined by the standard moisture/density relationship ASTM D698-78. Note that some moisture may need to be added to the soils in order to obtain the proper compaction.

Improper backfill compaction can cause settlement of exterior slabs such as walks, patios and driveways.

2. Provide an adequate grade for rapid runoff of surface water away from the structure (10 percent minimum for the first 10 feet away from the structure is recommended or 2 percent if paved).

3. A well-constructed, leak-resistant series of gutters, or other roof drainage system, is recommended.

4. Discharge roof downspouts and all other water collection systems well beyond the limits of the backfill.

5. Avoid heavy watering of any foundation plantings.

6. Observe and comply with any other precautions that may be indicated during design and construction.

Please note that the bedrock in this area is granitic but has some variability in the mineral constituents in the rock, with varying feldspar and quartz content. This results in some differential weathering with the areas of higher feldspar content weathering more deeply than those areas with higher quartz content. In fact, this can result in harder, less weathered layers, which are underlain by softer, more deeply weathered layers. This can be observed in some of the road cuts near this area.

It should be noted that the test pits are believed to represent the soils that will be exposed by the excavation for the new residence and attached garage. No expansive material was encountered during the investigation. However, it is possible that unanticipated changes in the soils may be encountered. It will be very important that a representative of this office be contacted to observe the finished excavation. At that time, we will make any necessary additional recommendations or confirm that the preliminary recommendations contained in this report are valid.

Thank you for consulting with us on this phase of the project. If you have any questions concerning this report, please do not hesitate to contact us.

Sincerely,

GEOMET ENGINEERING, INC.

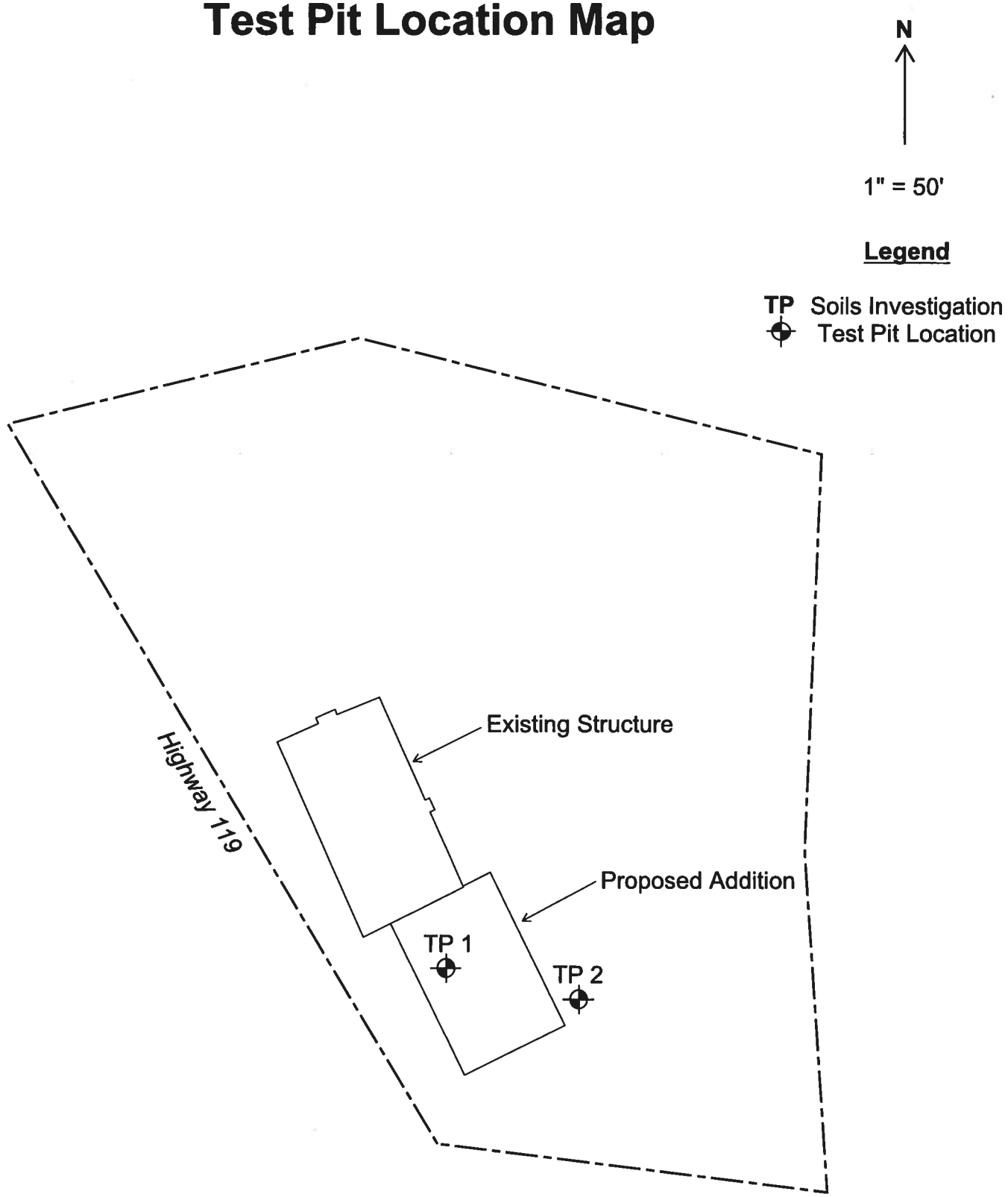
By: _____
Owen S. Van de Graaf

Reviewed

By: _____
Ryne Mettler, P.E.

Attachments

Test Pit Location Map



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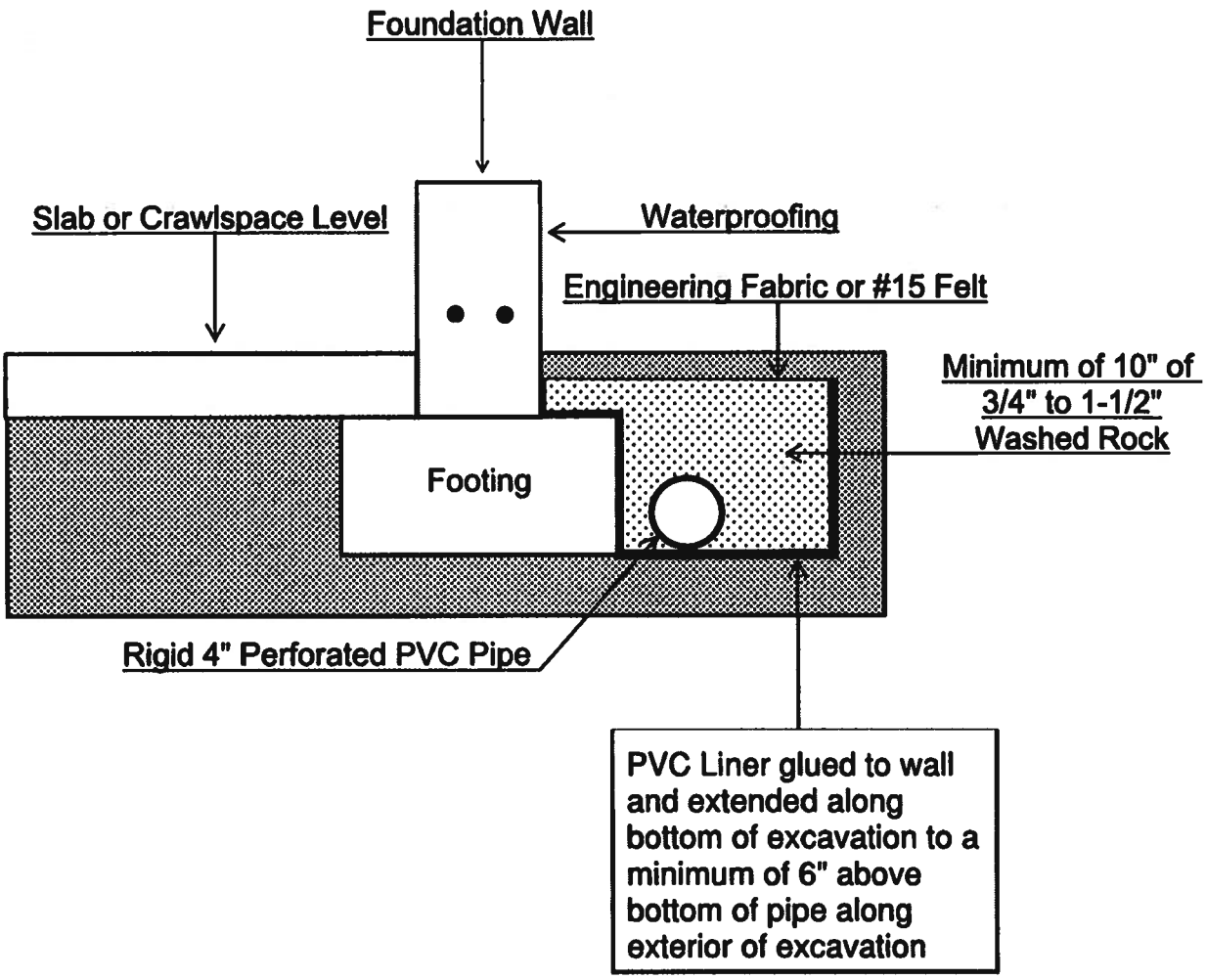
Project No. 24253

Figure 1

Typical Perimeter Drain Installation
Footing Foundation System



Notes:

1. Slope drain and pipe at a minimum of 1/8 inch per foot to suitable outfall (sump pit or daylight outfall).
2. Glue all vertical T's and standpipes.
3. Install non-perforated pipe from perimeter pipe into sump pit.

Figure 2

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