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April 27, 2024

Mr. Elam Swary
6996 County Road FF
La Jara, Colorado, 81149

Subject: Soil investigation and soil evaluation for an Onsite Wastewater Treatment System (OWTS), both for a proposed residence on a 61.85 acre plot of land located at 32755 Routt County Road #5, in Routt County, Colorado on the south side of the road.

Dear Mr. Swary,

Per your request, we performed a soil investigation on the subject site earlier in April of this year. The investigation was performed for the purpose of providing soil design parameters for the construction of the for a new single family residence, and the evaluation was performed in order to determine the design parameters for an Onsite Wastewater Treatment System to serve said residence..

The proposed structure is anticipated to be of typical, single story, wood framed construction, founded on a thickened edge reinforced concrete slab on grade with appropriate insulation to provide for frost protection. The site is located on the south side of Routt County Road #5, approximately one and one half miles southwest of the town of Toponas.

The vegetation on the site consists of grass and sage brush. The site is nearly level. A test pit was advanced near the building site and a profile hole was advanced approximately 60 feet east from the building site, both using a rubber track mounted mini-excavator.

The two pits revealed very similar conditions. The pit and the profile hole both revealed a slightly moist, dark brown silty, sandy

topsoil approximately 2 feet thick, which overlay a very slightly moist, medium brown, moderately moist silty, sandy soft clay approximately 18 inches thick, which, in turn overlay a grayish, very slightly moist, very dense slightly silty gravelly sand which extended to the maximum depth explored in both pits, four feet in the test pit and eight feet in the profile hole. Experience with similar soils taken together with our observations in both pits, have led us to form the opinion that the exposed sand subsoil will provide stable bearing for the foundation of the type described above for a structure of the proposed type, with moderate bearing loads. No free water was observed in either the test pit or the profile hole.

It will be necessary to strip all of the topsoil and clay from an area extending a minimum of two feet beyond the footprint of the proposed building. Because you intend to construct a larger residence in the future adjacent to the northwest side of the proposed residence, it will be necessary to extend the above described over excavation a minimum of five feet beyond the southeast side of the proposed foundation in order to avoid undermining the currently proposed foundation when the foundation for the proposed larger, adjoining residence is constructed in the future.

The entire over excavation must be backfilled with granular material compacted in maximum 8 inch thick lifts to 98 % of its standard Proctor density, up to the subgrade for the slab and its thickened edges.

Because of the large distance to the nearest gravel pit, our recommendation is that the underlying sandy gravel material be borrowed from a pit located somewhere on the extensive adjoining property which is under your control. The underlying gravelly sand, in our opinion, is actually a higher quality material than what is available from the nearest commercial gravel pit.

The bottom of the thickened edges of the slab on grade foundation should be designed to bear on the granular backfill with a maximum net bearing pressure of 2.0 KSF. No minimum dead load will be necessary on these thickened edges or on the rest of the slab.

Because of the pervious nature of the underlying sandy gravel and of the proposed fill, no footer drain will be required. The top of the slab on grade must be set a minimum of 1 foot above the prevailing (near level) native grade of the site. The bottom of the thickened edges

of the slab must extend a minimum of 24 inches below the top of the slab. The finish grade surrounding the building must be held a minimum of 6 inches below the grade of the top of the slab, and the finish grade must slope away from the perimeter of the building at a minimum slope of 2% for a minimum of 10 feet.

Frost protection for the thickened edge slab must be provided by means of minimum 2 inch thick rigid foam insulation extending from 6 inches above the top of the slab to the bottom of the thickened edges (a total of 30 inches) and outward from the bottom of the thickened edges 24 inches past the perimeter of the building on all sides.

In order to control moisture as well as to minimize heating costs for the proposed residence, as well as to provide for proper curing of the concrete, the slab on grade (except at the thickened edges) must be placed directly on top of a minimum 2 inch thick layer of rigid foam insulation, which, in turn must be place over a six mil thick sheet of visquene. The slab on grade and its thickened edges must be adequately reinforced.

All of the above mentioned rigid foam insulation must be extruded EPS with a minimum density of 1.6 pounds pre cubic foot. An acceptable (and highly recommended) alternative to the rigid foam over visquene under the slab as described above would be to spray 2 inch thick layer of closed cell foam directly onto the granular fill underlying the slab, and to place the slab directly on top of this foam.

We highly recommend the use of hydronic radiant heating in a building of this type via installation of p-pex tubing (with an O2 barrier) in the slab. It is convenient to anchor this tubing to the foam underlying the slab using landscaping staples. This type of heat is well proven to provide adequate and comfortable heat in this type of a building for approximately 30% less energy input (and thus lower cost) than any other type of heating.

Because there are no below grade spaces in the proposed building, no means of collection and dispersal of radon gas will be needed.

The slightly silty, gravelly sand subsoil observed in the profile hole is suitable for the construction of a conventional leach field. This subsoil classifies as a Type 1 soil per Table 10.1 in the CDOPH&E Regulation #43. Therefore, the proposed OWTS should be designed

based on a Long Term Acceptance Rate (LTAR) of 0.80 gallons per square foot per day. No free ground water was observed in either the profile hole or in the test pit, and the observed subsoil in the profile hole extended more than four feet below the expected design elevation of the absorption surface without encountering bedrock.

Thank you for the opportunity to have been of professional service to you in this matter.

Sincerely,
Bear Valley Design, Ltd.

Gregory H. Hermann
Colorado P. E. #17422