Engineering, Inc.

# Geotechnical Investigation

Vance Residence

Lot 6, Block CT, Cedar Valley Acres

5003 North 4000 West

Near Cedar City, Iron, Utah

Prepared For:

**Ashley Vance**
237 North 400 West
Cedar City, Utah 84721

November 11, 2025

Report Number: 25-3143-RG4072

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November 11, 2025

**Ashley Vance**
237 North 400 West
Cedar City, Utah 84721

Subject: Vance Residence
Lot 6, Lot CT, Cedar Valley Acres
5003 North 4000 West
Near Cedar City, Iron, Utah

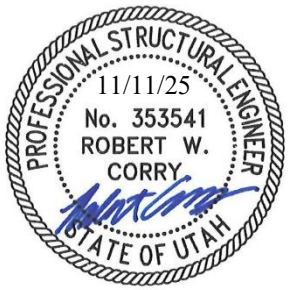
Enclosed is our geotechnical investigation report for the subject proposed residential structure to be constructed at the subject site near Cedar City, Utah.

The report details our field exploration and laboratory testing program and presents our analysis, opinions and recommendations for the proposed project.

Moderately collapsible/compressible soils were encountered which will need to be overexcavated and recompacted as outlined in this report.

We appreciate this opportunity to be of service on this phase of the project and look forward to being of service as the project progresses. If you have any questions, please contact this office at your convenience.

Sincerely,
GEM Engineering, Inc.




Brennan L. Stucker, E.I.T.
Field Engineer

Robert W. Corry, P.E., S.E.
President

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## APPENDICES

### Appendix A

# 1.0 INTRODUCTION

## 1.1 General

This report presents the results of a geotechnical investigation performed for a proposed residential structure at 5003 North 4000 West near Cedar City, Iron County, Utah. The study was conducted in accordance with the client's authorization.

The purposes of this investigation were to: (1) evaluate the general nature and engineering properties of the subsurface soils at the site; (2) identify the general site geologic conditions and (3) provide recommendations and opinions regarding general site grading and the design and construction of foundations, and concrete slabs-on-grade. The investigation included a site reconnaissance, subsurface exploration, representative soil sampling, laboratory testing, engineering analyses, review of existing geologic studies performed in the area and preparation of this report.

The recommendations contained in this report are subject to the limitations presented in the "Limitations" section of the report. We recommend that all individuals reading this report read the limitations section of this document.

## 1.2 Project Description

We understand that a proposed residential structure will be constructed at the location described near Cedar City, Utah. Structural loads are expected to be relatively low to moderate.

The site plan on Plate 1 shows the approximate trench location with respect to the approximate property lines.

## 2.0 FIELD EXPLORATION

The subsurface soil conditions were explored by excavating, 1 exploratory trench to a depth of approximately 11 feet below the existing site grade. The approximate location of this exploration is shown on Plate 1. Soils and subsurface conditions encountered in the exploration were classified, logged and recorded at the time of excavation by our field professional The results of the exploration are presented on the enclosed Plate 2. A key to soil symbols and terms is found on Plate 5.

## 3.0 LABORATORY TESTING

Representative soil samples from the exploration were tested in the laboratory to verify the field classifications and to evaluate other pertinent engineering characteristics. The soil samples were tested for solubility, Atterberg limits, maximum density, and consolidation behavior. Results are presented on Plates 3 and 4.

# 4.0 GEOLOGIC AND SEISMIC CONDITIONS

## 4.1 Geologic Setting

The Cedar Valley lies along the border between the Basin and Range and the Colorado Plateau physiographic provinces. Structurally, parts of the valley and the eastern upland represent a zone of transition between the two provinces, with some structural features of both. A small area of thrust faults is present in the southwest, but the valley is characterized by normal fault-block structure common to the Basin and Range Province. The uplands east of the valley have been elevated by displacement along the Hurricane fault zone. The fault zone is several miles wide and includes several structural units separated by major normal faults trending northward to northeastward. East of the fault zone, rock strata dip gently eastward; gently inclined strata characterize much of the Colorado Plateau Province (Geology of Eastern Iron County, Utah, Utah Geological and Mineralogical Survey, Bulletin No. 37, 1950). More locally the Fiddlers Canyon area lies upon alluvial fan deposits. The alluvial deposits consist of material ranging from Permian age Kaibab Formation up through Tertiary age Claron Formation and basalt flow debris of Quaternary age (GEM Engineering, field investigation.).

The geologic units exposed in the area attain a maximum total thickness of more than 16,000 feet. The oldest formation exposed is the Kaibab Limestone of Permian age. Formations overlying the Kaibab Limestone span geologic periods from Triassic through Tertiary. Igneous laccoliths of Tertiary age intrude formations west of Cedar City Valley. Deposits of alluvium, as valley fill, with some interbedded lava flows attain thicknesses of more than 1,000 feet in the Cedar City Valley (Bjorklund and others, 1977). Alluvial deposits, placed as valley fill derived from the adjacent hills and upland areas, range in size from clay to boulders. As the streams enter the valley and lose velocity with decreasing gradient, alluvial materials are deposited. Coarser material is deposited in the higher valley areas and progressively finer material is deposited toward the valley bottoms. Stream discharge and amounts are irregular and vary over a wide range. (Technical Publication No. 60, State of Utah Department of Natural Resources, 1978).

## 4.2 Faulting

The Cedar Valley lies within a zone of pronounced seismic activity. The Hurricane Fault Zone, a prominent north-south trending fault zone with suspected Quaternary displacement, extends through the eastern portion of Cedar City. This zone of fracture is about 200 miles long within which the displacement of the sedimentary beds ranges from 1,500 feet to as much as 8,000 feet (Geological and Mineralogical Survey, Bulletin No. 37, 1950).

## 4.3 Seismicity

The Cedar City Valley lies near the southern end of a zone of pronounced earthquake activity that extends from southwestern Utah to northwestern Montana (Christenson and Deen, 1983). A magnitude 5.9 earthquake occurred in 1992 approximately 5 miles southeast of Washington, Utah. An earthquake of at least that size could occur in this area.

The soil meets the 2021 International Building Code (IBC) requirements for a site class D. Residential structures at the site shall be constructed in accordance with the requirements of Seismic Design Category D1 per the 2021 edition of the International Residential Code (IRC).

## 4.4 Geologic Hazards

GEM Engineering reviewed the location for the presence of geologic hazards as required by the Iron County Geologic Condition Reporting Ordinance Chapter 17.59. The following table summarizes our findings based upon excavations, visual site observations and geologic hazard maps produced and/or provided by Iron County.

| Geologic Condition | Determination | Method | Site Within Hazard Area |
|---|---|---|---|
| Surface-Fault Ruptures | No evidence of know faults was found within 500 feet of the proposed structure location. | Visual observation and USGS Fault Maps | No |
| Landslide / Slope Instability | Evidence of landslide and/or slope instability was not encountered in the vicinity of the site. | Visual observation, aerial photograph(s) and Landslide Map of Utah | No |
| Rock Fall | No evidence of past rock falls was observed and proposed structure location is not within 22 degree shadow angle of rock-fall source area | Visual observation | No |
| Debris Flow | Structure is not located within a mapped debris flow study area. | Iron County Debris Flow Map | No |
| Liquefaction | Structure is not located within a mapped area where groundwater is within 50 feet of surface. | Iron County Groundwater Map and exploratory excavation | No |
| Land Subsidence & Earth Fissure | No know earth-fissures or land subsidence are located within ½ mile of proposed structure location. | Iron County Earth Fissures Map | No |

At the time of GEM Engineering's review and investigation the proposed site was not found to lie within a designated geologic hazard study area therefore, a Geologic Hazards Report is not required. It is GEM Engineering's opinion that the site is suitable to build upon provided the structure is constructed in accordance with all local building codes and ordinances and that all the recommendations and requirements contained within this geotechnical investigation report are followed.

# 5.0 SITE CONDITIONS

## 5.1 Surface Conditions

As stated previously the site is located at 5003 North 4000 West near Cedar City, Iron County, Utah, as shown on Plate 1. At the time of our investigation of the proposed building site it was found to have native grass and bushes throughout, was relatively flat, and approximately 1.2 acres in size. The site was bordered on the north, south, and west by similar undeveloped building lots, and on the east by 4000 West.

## 5.2 Subsurface Conditions

The on site soils encountered in the excavation generally consisted of medium stiff light brown silt with sand which extended to the bottom of the exploratory trench approximately 11 feet below the existing site grade. Pinhole voids were observed throughout the depths explored.

Numerous factors contribute to fluctuations in groundwater levels and locations. The evaluation of these factors was beyond the scope of this study. However, groundwater was not encountered during the exploration. The soils were in a slightly moist condition throughout the depths explored.

The encountered subsurface conditions are described in detail on the enclosed trench log, Plate 2. Due to the nature and depositional characteristics of the native soils, care should be taken in extrapolating subsurface conditions beyond the exploration location.

The laboratory tests results indicated that the on-site soils exhibited a relatively low solubility, low plasticity and a moderate to high collapse potential.

# 6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

## 6.1 General

Based on our investigation there are loose, soft and/or collapsible soils located at the site which will require stabilization and/or overexcavation prior to the placement of structural fill. However, it is our opinion that the subject site is suitable for the proposed construction provided that the recommendations contained in this report are followed.

The following sections of this report present our recommendations to reduce the potential for structural damage. They contain specific opinions and recommendations concerning construction considerations, site preparation and grading, structural fill, foundation design, retaining walls, concrete slabs-on-grade, soil corrosion, moisture protection and structural pavement sections.

One of the most critical recommendations to follow in order to reduce potential for structural damage is to set the finished floor slab elevations high enough to facilitate proper drainage away from the structure.

## 6.2 Construction Considerations

### 6.2.1 Foundation Systems

After overexcavation and recompaction are completed, the structures can be supported by conventional strip and/or spread footings founded on properly placed and compacted structural fill.

## 6.3 Earthwork

### 6.3.1 Site Preparation and Grading

Within the areas to be graded, existing vegetation, loose soils, and debris, should be removed and hauled off the site. Any undocumented fill soils, and soft, loose,

collapsible and/or disturbed native soils should be excavated to expose competent, dense or medium dense native soils.

Based upon soil types and laboratory consolidation tests, the required depth of overexcavation is as follows: A minimum of 4 feet below the bottom of footing elevation or 4 feet below the existing site grade, whichever is greater. Overexcavations should extend laterally beyond the edges of the footing, at each side, at least a distance equal to the depth of overexcavation. In no case shall the total width of excavation be less than the footing width plus 2 times the depth of overexcavation. (width of O.X. + ftg width + width of O.X.)

Slabs-on-grade, exterior concrete flatwork, and pavements should be supported by a zone of properly placed and compacted structural fill. Overexcavations on the order of 24 inches below the supportive gravel layer or 24 inches below the existing site grade, whichever is greater, are required. As an alternative to the above, 12 inches of Type 1 pit run gravel can be substituted for the 24 inches of recompacted native soils. Excavations shall extend laterally at least 2 feet beyond exterior flatwork and pavement areas.

If loose soft or pumping soils are encountered at the bottom of the overexcavations, stabilization and/or additional overexcavation will be required prior to the placement of structural fill. Overexcavations may be terminated if competent, medium-dense granular soils are encountered. A GEM Engineering representative should observe excavation and determine if it is acceptable to terminate the excavation or reduce the overexcavation depth.

The majority of on-site soils, free of organics and debris, should be suitable for reuse as structural fill. If using on-site soils for backfill or structural fill a shrinkage factor of up to 25 percent can be expected.

Following excavation of the unsuitable soils as described above, a representative of this office should observe the excavation bottoms prior to the continuance of grading to verify that unsuitable materials have been removed and that competent soils have been exposed. The native soils exposed after overexcavation should be scarified to a depth of 6 inches, brought to within 2 percent of the optimum moisture content for granular soils and slightly above optimum for fine-grained soils, and compacted to at least 90 percent of the maximum dry density for granular soils and 90 percent of the maximum dry density for fine grained soils as determined by ASTM D1557. The site should then be brought to the proper grade with structural fill as described in the Structural Fill section.

Subgrade materials supporting slabs-on-grade, exterior concrete flatwork, and pavements should be kept moist and not be allowed to dry out and crack. If the subgrade has been disturbed or dried out prior to placement of aggregate base, the exposed soils should be moisture-conditioned and recompacted as outlined in the Structural Fill section of this report.

We recommend that a GEM Engineering representative be allowed to review the grading plans when prepared to evaluate their compatibility with the recommendations of this report.

### 6.3.2 Excavations

The majority of the soils encountered in our explorations should be excavatable with conventional earthwork equipment. It is also possible that soft pumping soils may be encountered. Pumping soils will need to be stabilized prior to placing of structural fill. Safety of construction personnel is the responsibility of the Contractor.

### 6.3.3 Material Volume Changes

There will be shrinkage losses when excavating and compacting the on-site soils. An estimated average shrinkage factor of 25 percent is applicable for the loose to

medium-dense near-surface native soils. A subsidence factor of 0.1 should be used in all areas where the surficial soils are scarified and recompacted to a depth of 6 inches.

### 6.3.4 Structural Fill

All fill placed for the support of slabs-on-grade, exterior concrete flatwork, and pavements should be structural fill. Structural fill may consist of approved excavated on-site or imported fill materials. Structural fill should have a swell potential less than 4 percent under a 60 psf surcharge, have a solubility of less than 3 percent, be free of organics, salts, or inert materials larger than 4 inches nominal size, and be similar in gradation to the on-site soils.

Structural fill should be placed in maximum eight-inch loose lifts and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer. Soils in compacted fills should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557 for fine grained soils and 95 percent for granular soils. The moisture content should be within 2 percent of optimum for granular soils and at least 2 percent above optimum for fine-grained soils. Any imported fill materials should be approved prior to importing. Also, prior to placing any fill, the excavations should be observed by a GEM Engineering representative to observe that unsuitable materials have been removed.

Structural fill shall be tested for minimum density compliance by means of a moisture-density gauge in accordance with ASTM D6938 or other approved methods. Moisture-density testing shall be performed at the bottom of overexcavation and every 12 inches vertically until the bottom of footing is reached. Backfill material surrounding basement walls and stem walls moisture-density testing shall be performed beginning at the bottom of footing elevation and continue at intervals of 24 inches vertically until finished grade is reached.

## 6.4 Foundations

### 6.4.1 Conventional Foundations

**General:** Conventional shallow foundations consisting of strip and/or spread footings can be utilized for the support of the proposed building provided that overexcavation is completed in accordance with the requirements and recommendations of this report as described in the Earthwork section.

For frost protection the bottom of exterior conventional spread and strip footings shall be at least 30 inches below the lowest adjacent final compacted subgrade.

Foundations for structures constructed on soils, prepared in accordance with the recommendations and requirements of this report, may be designed for an allowable net bearing pressure of 1600 psf. This bearing pressure may be increased by one-third for load combinations containing seismic or wind loads.

The net allowable bearing pressure can be increased to 2000 psf if pit run gravel is utilized for replacement of all overexcavated soil beneath the structure instead of the native soils. The pit run gravel must have a maximum dry density of at least 135 pcf utilizing ASTM D1557. The pit run gravel must also meet all of the requirements contained in the Structural Fill section of this report.

Prior to constructing the foundations, the footing excavations should be observed by a GEM Engineering representative to confirm that the soil preparation has been completed in accordance with the requirements and recommendations of this report.

**Settlement:** Foundations established in accordance with the recommendations and requirements of this report are estimated to subject to 1 ½" or less of settlement if the soils beneath the overexcavation do not become moistened. Estimated differential settlement could be on the order of ½ the total settlement.

**Lateral Earth Pressures:** The following lateral earth pressure equivalent fluid densities shall be used in the design of the structure.

| Properly Compacted On-Site Soils | |
|---|---|
| Active Pressure | 35 pcf |
| At Rest Pressure | 53 pcf |
| Passive Pressure | 245 pcf |

Equivalent fluid densities presented above assume level backfill and that there will be no build-up of hydrostatic pressure. Any surcharge from adjacent structures or traffic loads should be added to this pressure. When passive pressure is used for resistance to lateral loads the top one foot of soil should be neglected. The maximum allowable passive pressure for lateral load resistance should not exceed 1,600 psf.

The seismic lateral earth pressure coefficient ($k_h$) is 0.19.

**Lateral Load Resistance:** Horizontal loads acting on foundations will be resisted by friction acting at the base of foundations and/or passive earth pressures acting against the side of footings and concrete walls. If design makes use of passive earth pressures, it is important that a GEM Engineering representative be present during backfill placement.

The friction force acting along the base of footings founded on suitable foundation soils may be calculated using a coefficient of friction of 0.40.

Lateral loads acting on buried utility lines may be resisted by thrust blocks reacting against undisturbed native soil or properly placed and compacted structural fill. The passive lateral earth pressure equivalent fluid density and coefficient of friction, previously listed, may be used for thrust block design.

## 6.5 Concrete Slabs-On-Grade

Satisfactory support for concrete slabs-on-grade and exterior concrete flatwork may be provided by a 6 inch layer of compacted gravel overlying properly placed and compacted structural fill as recommended in the Site Grading section of this report. The layer of compacted gravel may consist of road base or pit-run gravel with a 2-inch maximum particle size and not more than 12% fines passing the No. 200 sieve. The gravel layer should be compacted to at least 95% of the maximum dry density as determined by ASTM D1557.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Reinforcement requirements shall be provided by the Structural Engineer. Reinforcement should be installed at the mid-height of the slab unless directed otherwise by the Structural Engineer.

Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking or curling in the slabs. All concrete placement and curing operations shall be performed in accordance with the American Concrete Institute (ACI) Manual.

## 6.6 Soil Corrosion and Weathering Considerations

Based on similar studies performed in the area, the on-site soils contain salts in sufficient concentration to be considered corrosive to both concrete and metal. Therefore, all concrete in contact with the on-site soils and used in stem walls should contain Type 1L or equivalent sulfate-resistant cement, and should be placed with a maximum four inch slump. Furthermore concrete shall meet requirements specified in Table R402.2 of the 2021 International Residential Code (IRC) for severe weathering potential. Special protection to buried metal pipes and water lines should be considered for long term performance of these

underground utilities. Consideration should be given to cathodic protection of buried metal pipes, or to the use of PVC pipe where permitted by local building codes.

### 6.7 Moisture Protection and Drainage

It is imperative that precautions are taken during and after construction to eliminate, or at least minimize, wetting of foundation soils. Drainage and grading shall be constructed in accordance with the requirements of sections R401.3 and R801.3 of the 2021 International Residential Code (IRC). Positive drainage shall be established away from the exterior walls of the structure. The required minimum slope is five percent (5%) in landscape areas and two percent (2%) in pavement areas, for a minimum distance of 10 feet from the structure. Roof runoff and other sources of moisture should not be allowed to infiltrate the soils in the vicinity of, or upslope from, the structure. No roof moisture should infiltrate the soils beneath the foundations.

All utility trenches leading into the structures should be backfilled with compacted non-pervious fill. Special care should be taken during installation of sub floor sewer and water lines to reduce the possibility of future subsurface saturation.

Landscape watering adjacent to the structure should be eliminated. As an additional protection a concrete slab could be placed around the structure to facilitate drainage away from the structure as described above. Any planters adjacent to the structure should have sealed bottoms. It is recommended that desert landscaping techniques be utilized.

It is important that parking area grades be set to provide positive drainage to suitable drainage structures. A desirable slope for drainage in paved areas is two percent.

# 7.0 CLOSURE

## 7.1 Limitations

The recommendations contained in this report are based on the field exploration, laboratory tests, and our understanding of the proposed construction. The subsurface data used in the preparation of this report were obtained from the exploration made during this investigation. It is possible that variations in the soil and groundwater conditions could exist elsewhere on the site. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at the site which are different from those described in this report, GEM Engineering should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, GEM Engineering should likewise be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. Although some potential geologic hazards may be identified in this Geotechnical Investigation Report, this is NOT a Geologic Hazards Report and should not be regarded as such. No warranty, express or implied, is made. It is the Client's responsibility to see that all parties to the project, including the Designer, Contractor, Subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk. GEM Engineering will not accept the responsibility for damage caused by the uncontrolled action of water at the site.

## 7.2 Additional Services

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during the construction to verify compliance with the recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation, earthwork and structural fill placement
- Observations of footing excavations
- Consultation as may be required during construction

We also recommend that project plans and specifications be reviewed by us to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

# Appendix A

# SITE PLAN


Notes:

Key: Approximate Trench Location

Plan: Not to Scale

| | |
|---|---|
| **PROJECT:** | **Vance Residence**<br>**5003 North 4000 West, Cedar City, Utah** |
| **Client:** | Ashley Vance |
| **Report No:** | 25-3143-RG4072 |

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**Plate:**
**1**

# TRENCH LOG Trench No. 1



**Location:** See Site Plan | **Elevation:** Not Measured | **Date Excavated:** 10/21/2025

| Depth (ft) | Tests [1] | Sample | USCS Symbol [2] | Soil Description (Additional comments below) | Color | Relative Moisture [3] | Density [4] | Cementation [5] | Max size Particle [6] |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| 5 | At, M<br>Sol, C<br>P | | ML | - Silt with Sand<br>- Pinhole Voids | Light Brown | SM | MS | -- | MS |
| 10 | | | | | | | | | |
| | | | | Bottom @ 11' | | | | | |
| 15 | | | | | | | | | |
| 20 | | | | | | | | | |

Sample: Drive Sample | Bag Sample | Bucket Sample

1) At = Atterberg, M = Moisture, Sol = Solubility, E = Expansion, C = Consol, P = Proctor, CS =Coarse Sieve
2) See Plate 5 for explanation of Unified Soil Classification System
3) D = Dry, SM = Slightly Moist, M = Moist, VM = Very Moist, W = Wet
4) Coarse Grain: VL = Very Loose, L = Loose, MD = Medium Dense, D = Dense, VD = Very Dense
Fine Grain: VSF = Very Soft, SF = Soft, MS = Medium Stiff, S = Stiff, VS = Very Stiff, H = Hard
5) W = Weak cementation, M = Moderate cementation, S = Strong cementation
6) B=Boulder, C= Cobble, CG=Coarse Gravel (3" - 3/4"), FG=Fine Gravel (3/4" - 1/4"), CS=Coarse Sand (#10-#4), MS=Medium Sand (#40 - #10), FS=Fine Sand (#200 - #40), F=Fines

Notes:
Groundwater:
Not encountered

Caving of side walls:
None noted

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**Plate: 2**

# LABORATORY TESTS SUMMARY



| Trench / Boring No. | Sample Depth (ft) | UCSC Symbol | Soil Description | Field Moisture (%) | Field Dry Density (pcf) | Solubility (%) | Fine Sieve % Passing | | | | Atterberg Limits | | | Expansion | | Net Percent Consolidation | | Modified Proctor | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | #4 | #10 | #40 | #200 | Liquid Limit | Plastic Limit | Plasticity Index | Load | % | @ 1000 lb | @ $H_2O$ + 2000 lb | Dry Density | Optimum Moisture |
| T-1 | 4' | ML | Silt with Sand | 3.5 | 96.1 | 0.7 | 100.0 | 100.0 | 99.3 | 80.1 | NP | NP | NP | -- | -- | 0.1 | 6.1 | 122.5 | 11.0 |

Notes:

Key: NP = Non Plastic, -- indicates no test performed

Atterberg Limits are for classification of fine-grained and fine-grained fraction of coarse-grained soils

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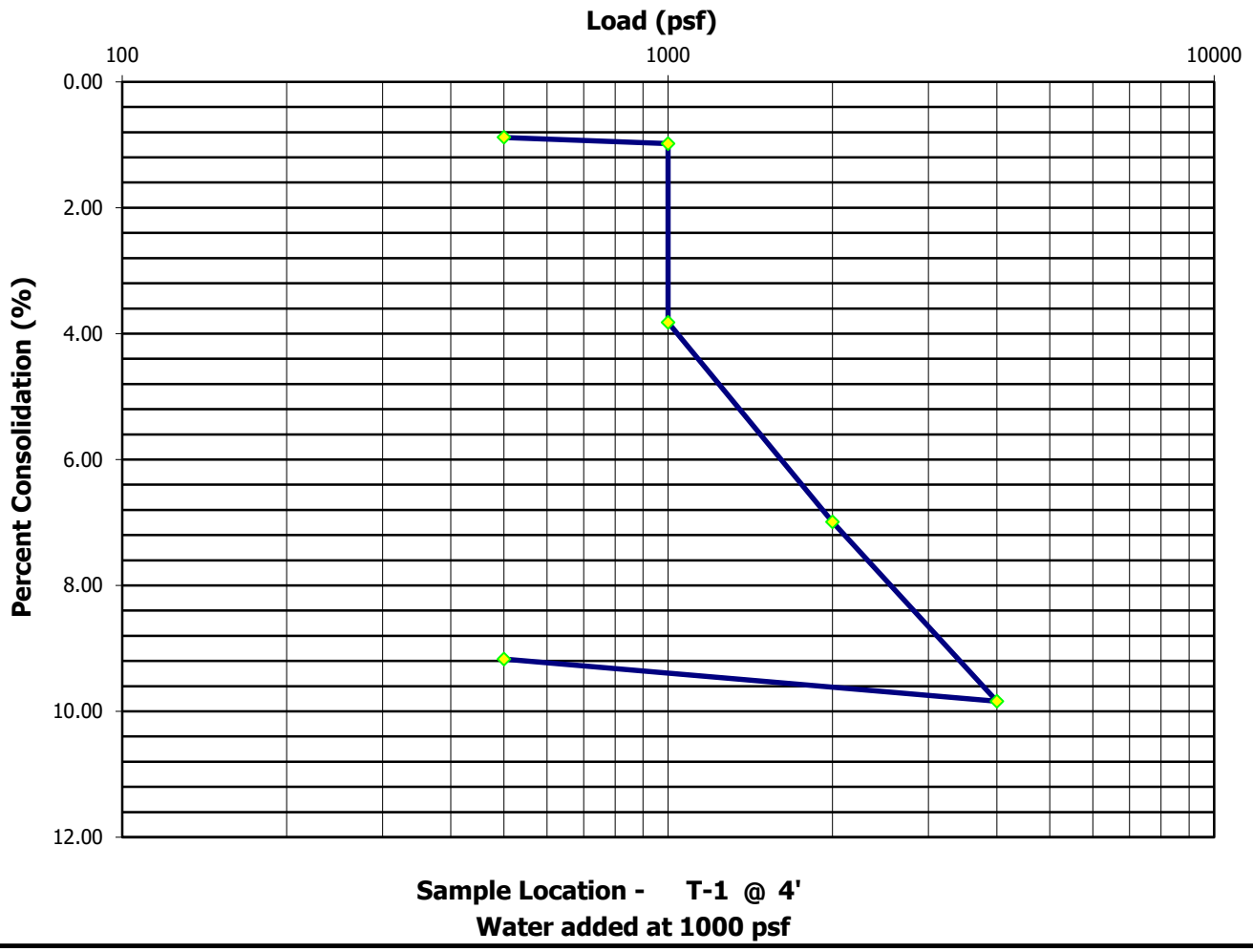
**Plate: 3**

# CONSOLIDATION TEST DATA




**Sample Location - T-1 @ 4'**
**Water added at 1000 psf**

| Load (psf) | Percent Consolidation | Net Percent Consolidation * |
|---|---|---|
| 500 | 0.88 | 0.00 |
| 1000 | 0.98 | 0.10 |
| 1000 + H20 | 3.82 | 2.94 |
| 2000 | 6.99 | 6.11 |
| 4000 | 9.84 | 8.96 |
| 500 | 9.17 | 8.29 |

* Net consolidation assumes that existing native pressure on soil is aproximately equal to 500 psf

| | | | |
|---|---|---|---|
| **PROJECT:** | **Vance Residence**<br>**5003 North 4000 West, Cedar City, Utah** | GEM ENGINEERING, INC. | **Plate:**<br>**4** |
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# THE UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

| Major Division | | | Symbol | Color | Typical Group Names |
|---|---|---|---|---|---|
| **COARSE GRAINED SOILS** 50% or more is retained (larger than) the No. 200 sieve. | **Gravels** | **Clean Gravels** | **GW** | | Well graded gravels, gravel sand mixtures, little or no fines |
| | More than 50 % of coarse part is larger than the No. 4 sieve. | Less than 5% fines | **GP** | | Poorly graded gravels/gravel sand mixtures |
| | | **Gravels with Fines** | **GM** | | Silty gravels, gravel-sand-silt mixtures |
| | | More than 12% fines | **GC** | | Clayey gravels, gravel-clay-sand mixtures |
| | **Sands** | **Clean Sands** | **SW** | | Well graded sands, gravely sands, little or no fines |
| | More than 50 % of coarse part is smaller than the No. 4 sieve. | Less than 5% fines | **SP** | | Poorly graded sands or gravely sands, little or no fines |
| | | **Sands w/ Fines** | **SM** | | Silty sands, sand-silt mixtures |
| | | More than 12% fines | **SC** | | Clayey sands, sand clay mixtures |
| **FINE GRAINED SOILS** 50% or more passes (smaller than) the No. 200 sieve. | **Silts and Clays** Liquid Limit less than 50 | | **ML** | | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with low plasticity |
| | | | **CL-ML** | | Inorganic clay-silt mixture and very fine sand, silty or clayey fine sands or clayey silts with low plasticity. |
| | | | **CL** | | Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays |
| | | | **OL** | | Organic silts and organic silty clays of low plasticity |
| | **Silts and Clays** Liquid Limit 50 or more | | **MH** | | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | | | **CH** | | Inorganic clays of high plasticity, fat clays |
| | | | **OH** | | Organic clays or medium to high plasticity, organic silts |
| | **Highly Organic Soils** | | **PT** | | Peat and other highly organic silts |

## PLASTICITY CHART

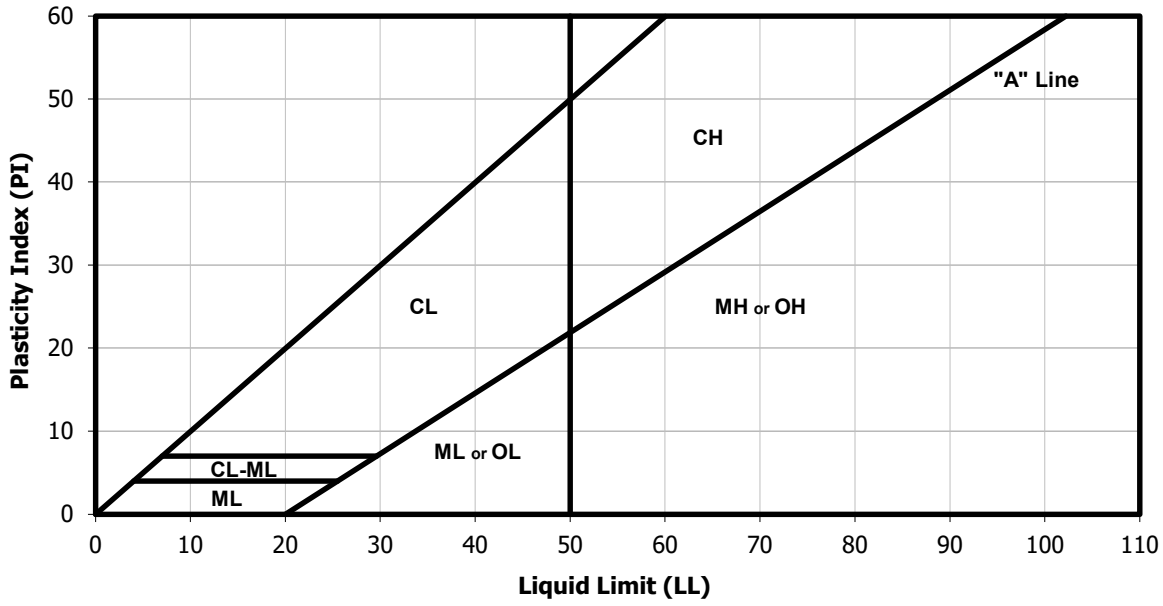


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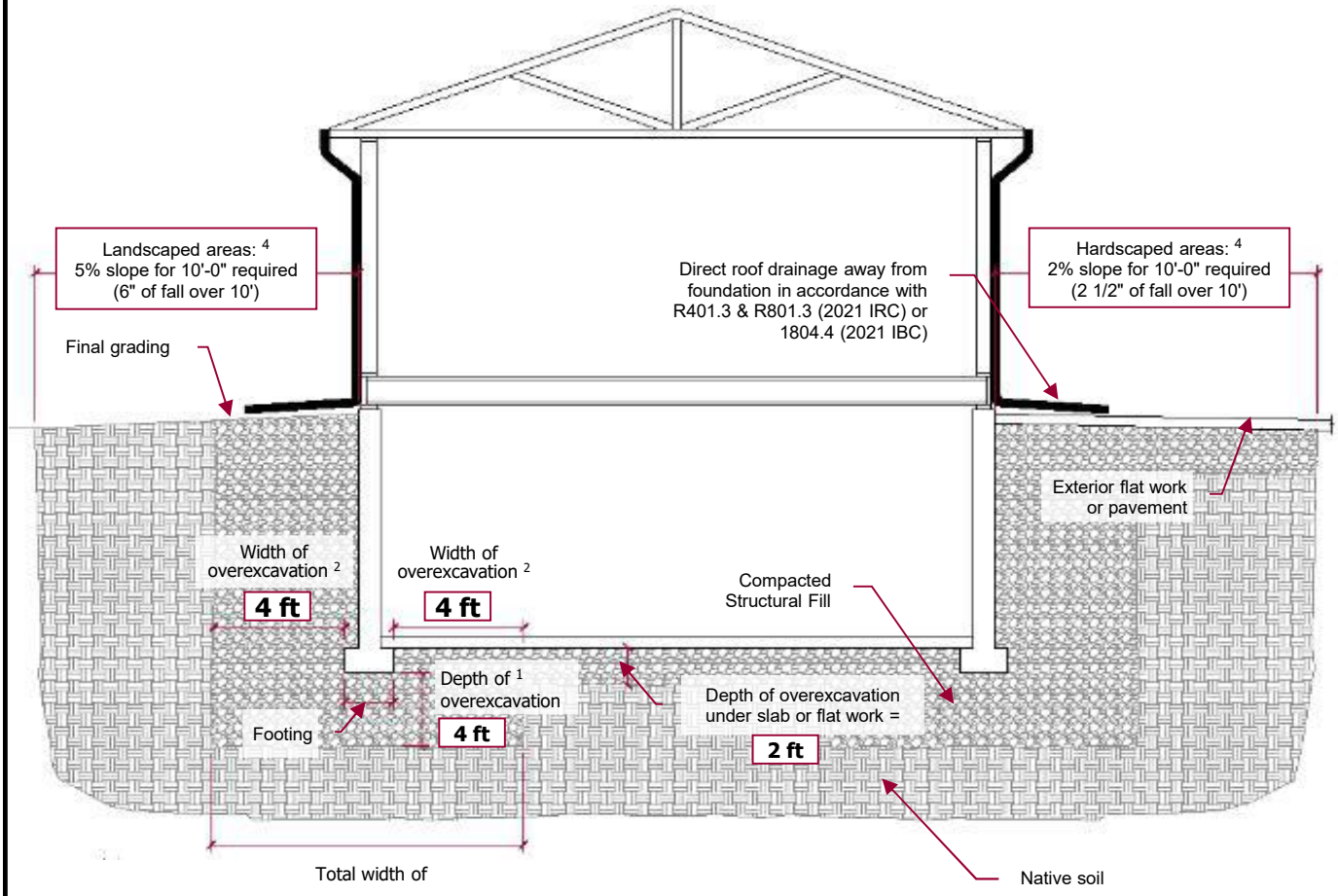
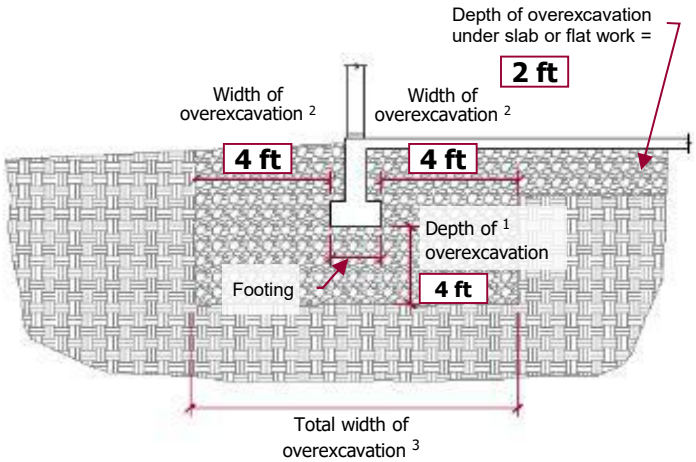
**Plate:** **5**

# OVEREXCAVATION, DRAINAGE AND MOISTURE PROTECTION DIAGRAM




## Basement Foundation




## Slab-On-Grade Foundation

1 The depth of overexcavation shall extend from the bottom of the footing or existing site grade whichever is **GREATER**.

2 The width of overexcavation is equal to 5ft past the edge of ftg or equal to the depth of overexcavtion which is **GREATER**.

In some casses GEM Engineering may approve a width of lateral overexcavation less than 5'-0" but it shall never be less than the required depth of overexcavation.

3 The total width of overexcavation is euqal to the width of the footing plus 2x the width of lateral overexcavation.

4 Drainage and gradation shall be constructed in accordance with the requirements of section R401.3 & R801.3 of the 2021 IRC or section 1804.4 of the 2021 IBC. Refer to geotechnical report for additional drainage & grading requirements & recommendations.

5 Refer to section 6.3.4 for moisture-density testing requirements.

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|---|---|---|---|
| **PROJECT:** | **Vance Residence**<br>**5003 North 4000 West, Cedar City, Utah** | GEM ENGINEERING, INC. | **Plate:**<br>**6** |
| **Client:** | Ashley Vance | | |
| **Report No:** | 25-3143-RG4072 | | |