

# **GEOTECHNICAL INVESTIGATION**

**PROPOSED ADDITION-REMODEL  
SANTA FE COUNTY HONDO FIRE STATION #2  
645 OLD LAS VEGAS HIGHWAY  
SANTA FE, NM**

**Submitted To:**

**Santa Fe County Public Works  
424 NM Highway 599, Bldg. H  
Santa Fe, NM 87505**

**Submitted By:**

**Kiva Technologies, LLC  
26 Sunset Blvd.  
Edgewood, NM 87015**

**May 2025  
Project No. 25-0173  
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# KIVA TECHNOLOGIES, LLC

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May 6, 2025

Santa Fe Co. Public Works  
#424 NM Highway 599, Bldg. H  
Santa Fe, NM 87507

Project No. 25-0173

Attn: Mike Romero

**RE: Proposed Addition- Remodel  
Santa Fe County Hondo Fire Station #2  
#645 Old Las Vegas Highway  
Santa Fe, NM**

As requested, Kiva Technologies, LLC conducted a geotechnical investigation at the referenced site. The report contains our findings, and earthwork recommendations for foundations and earthwork construction.

In order to verify compliance with the recommendations contained herein, we recommend that testing and observation services be provided by a qualified geotechnical engineer, during the construction of this project. In addition, the stated drainage recommendations must be adhered and maintained through the life of the structures, as moisture intrusion will result in foundation and structural damage.

If you have questions concerning this report or need additional information, please contact our office at your convenience.

Respectfully submitted,

Kiva Technologies, LLC



Guillermo A. Florentino, P.E.  
Geotechnical Engineer

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## **1.0 INTRODUCTION**

This report presents a geotechnical investigation for a proposed addition to the Santa Fe County Hondo Fire Station #2, located at #645 Old Las Vegas Highway in Santa Fe, New Mexico.

## **2.0 PROJECT DESCRIPTION**

The proposed development consists of the construction of a single-story addition, with slab on grade floors, and steel stud wall frame construction.

The maximum anticipated foundation loads are not to exceed 2 kip per foot for continuous footings, and 20 kips for isolated column loads.

## **3.0 SCOPE OF SERVICES**

The scope of services consisted of a field investigation during which, two (2) explorations were observed. The explorations were 8 feet in depth, and located within the site. The excavation locations are shown in the attached Site Plan. The excavations were logged, and soil samples were obtained at selected depths. The samples were analyzed in the laboratory to determine their classification and pertinent engineering characteristics. The results of these tests were the basis for the recommendations for:

- Building Foundations
- Lateral Loads
- Earthwork Construction

## **4.0 INVESTIGATION**

### **4.1 FIELD INVESTIGATION**

The field investigation included conducting two (2) explorations to depths of 8 feet below the existing surface. The approximate locations are shown in the attached Site Plan.

Continuous logs of the soil conditions were recorded, and samples were obtained during the field sampling program. Summaries of the subsurface conditions encountered are presented on the exploration logs. Field exploration and investigation procedures are further described in Appendix A.

### **4.2 LABORATORY TESTING**

Samples obtained during the field investigation were delivered to the laboratory and classified in accordance with ASTM D-2487, which is based on the Unified Soils Classification System. Representative samples were then selected for testing to determine physical and engineering properties. These tests included moisture content, density, swell potential, grain size distribution, and plasticity index.

The results of the laboratory tests are summarized on the enclosed tables presented in Appendix A. The soil samples presently stored in our laboratory will be discarded after 30 days, unless our office receives a specific request to retain the samples for a longer period.

## **5.0 SITE AND SUBSURFACE CONDITIONS**

### **5.1 SITE DESCRIPTION**

The site is within an approximately 2-acre parcel, with flat topography and barren cover. The site is bound by Old Las Vegas Highway to the east, by a gravel storage facility to the southwest, and by vacant land elsewhere. The project site is located south of the existing building and is presently utilized as a parking facility.

### **5.2 SUBSURFACE CONDITIONS**

The soil profile consisted of an upper 4 to 5 feet layer of medium brown silty sand (SM); non-plastic, medium moisture, and medium density. The upper soils were underlain by medium brown well graded sand (SW); non-plastic, medium moisture, and low density.

### **5.3 GROUNDWATER**

Groundwater was not encountered at the time of our investigation. Numerous factors contribute to fluctuations of groundwater levels, however, the valuation of these factors was beyond the scope of this investigation.

### **5.4 SEISMICITY AND LIQUEFACTION**

Based on the observed soil classification groundwater depth, the potential for liquefaction can be considered negligible. In addition, based on the observed soil profile, the site can be characterized as Seismic Site Class E with soil shear wave velocity less than 600 ft/s in accordance with IBC criteria.

## **5.0 GENERAL EVALUATION**

The site soils may be considered non-expansive, however, due to their relative low density, the soils may be considered compressible or collapsible under foundation loads. The site soil, however, **may be re-used as structural fill** if processed to comply with the structural fill requirements contained herein. Conventional spread shallow foundation systems can be utilized, provided that the recommendations contained herein are adhered to. However, if the drainage recommendations contained in this report and code guidelines can not be fully met, as determined by the grading and drainage engineer, the proposed structure shall be placed on a post-tensioned or normally reinforced rigid type foundation system.

## **7.0 RECOMMENDATIONS**

The following sections present a discussion of earthwork, foundations, and geotechnical related requirements for different aspects of the project. Specifications for earthwork acceptance and placement are provided herein. The earthwork and foundation recommendations are applicable to swimming pools and detached permanent structures.

### **7.1 GENERAL**

Based on the results of the field and laboratory investigations, the proposed structure may be established on conventional spread footings placed upon compacted and properly processed native soils or structural fill. The site shall be graded in accordance to an engineer designed grading and drainage plan.

### **7.2 SITE GRADING AND EARTHWORK**

Within the areas to be graded, the existing vegetation and debris should be removed, and any undocumented fill should be removed and stockpiled for later use if suitable. **Surface preparation or grubbing** should extend a minimum of **5 feet** beyond the exterior footings and a minimum of 2 feet beyond exterior flatwork and pavements.

Further requirements for earthwork suitability, placement, and compaction procedures are provided below:

1. All organic material, undocumented fill, debris and soft, firm, loose, or disturbed native soils should be removed from the proposed building and pavement areas.
2. Compacted fill placed for the support of footings, slabs-on-grade, post-tensioned slabs, exterior concrete flatwork, and pavements should be considered structural fill. Structural fill may consist of approved imported soils or processed on-site soils that meet the criteria provided herein.
3. The subgrade in all areas to receive fill, should be scarified to a minimum depth of **12 inches**, the soil moisture adjusted to within 3 percent of optimum, and compacted to at least 95 percent of the maximum laboratory dry density as determined by ASTM D-1557.
4. Structural fill shall be clean material, free of deleterious debris and/or organic material, and shall meet the following requirements:

<b><u>Sieve Size</u></b>	<b><u>% Passing</u></b>
3"	100
No.4	50 -100
No.200	10 - 45

*Plasticity Index – 10 Maximum*

5. During the earthwork phase, experienced personnel should be present to observe fill materials for suitability and consistency. A documented testing program should be conducted and approved by a Geotechnical Engineer to determine that soil compaction and earthwork procedures are in accordance with these requirements.
6. There will be material losses due to clearing and grubbing operations. Also, there will be shrinkage losses when excavating and compacting the on-site soils. An estimated shrinkage factor of 15 to 25 percent is applicable for the natural soils within 5 feet of the existing ground surface. A subsidence factor of 0.1 feet should be used in all areas where the exposed native soils are scarified to a depth of 12 inches and re-compacted.
7. Based on observations made during our field explorations, the upper site soils can be excavated with conventional earthwork equipment. However, specialized equipment may be required in areas with hard soils or bedrock. The Contractor should be aware of the potential for vibration damage to adjacent or nearby structures when using heavy impact equipment during removal of moderately hard to hard cemented materials.
8. Rubble or debris resulting from excavating soils should be considered undocumented fill.
9. Over-excavation and utility trenches should be laid back to safe slopes or properly shored. Trenching and shoring operations should be conducted in accordance with the *OSHA Standards* as currently amended. Safety of construction personnel is the responsibility of the Contractor.
10. Structural fill shall be compacted in horizontal uniform layers, less than 10 inches in loose thickness, and compacted to at least **95 percent** of the maximum dry density as determined by ASTM D1557, and at a moisture content within 3 percent of optimum.

### 7.3 FOUNDATION DESIGN

The proposed structures should receive adequate support from spread shallow type foundations placed upon on compacted structural fill. Foundations and slabs shall be steel reinforced and designed by a structural engineer in accordance with the recommendations contained herein. In addition, the concrete placement and materials shall comply with the (American Concrete Institute) ACI guidelines. Footing and slab compaction must be verified prior to concrete placement.

Footings designed for the recommended allowable bearing pressures, and in accordance to the outlined recommendations, are expected to experience total settlements less than 1-inch for the maximum column load of 20 kips. Differential settlements are expected to be on the order of one-half the total settlement. It is expected that the majority of the anticipated settlement will occur during construction. Specific design recommendations are provided as follows:

1. Footings shall be established on a minimum of **3 feet** of structural. The structural fill shall be compacted in accordance with the requirements contained herein. Prior to fill placement, the soils in the upper 12 inches shall be scarified moisture conditioned and compacted as previously indicated.
2. Footings shall be imbedded a minimum of 24 inches below the lowest adjacent grade for frost protection. The excavation shall extend a minimum of 3 feet beyond the edge of the footing.
3. Foundations constructed in accordance to the above recommendations can be designed for an allowable soil bearing pressure of **2,000 psf**, and can be increased by one-third to include wind or seismic forces. Minimum footing widths shall be 1.5 feet for continuous and 2 feet for isolated.
4. Total estimated settlement of properly constructed foundations should be less than 1 inch, with a maximum differential settlement less than  $\frac{3}{4}$  inch. Excessive moisture below the foundation may cause these values to be greater.
5. Due to the potential for damaging differential settlements, spread footings should not bear on both bedrock and fill. If both are present at the footing base, as determined in the field by a representative of this office, the bedrock should be overexcavated by a depth of 12 inches and replaced with structural fill.

## 7.4 SLABS-ON-GRADE

Building slabs shall be placed on a minimum of **3 feet** of structural fill. The soil should be compacted to at least 95 percent of the maximum laboratory dry density and within 3 percent of optimum moisture content as determined by ASTM D-1557.

Floor slabs may be designed utilizing a **Modulus of Subgrade Reaction (k) of 120 PCI**. Floor slabs shall be steel reinforced, and be designed by a structural engineer. In addition, to minimize concrete cracking, the mix design water/cement ratio should not be exceeded, and a 4-inch layer of crusher fines or similar granular material, may be placed under the slabs to minimize crack potential. In addition, a radon barrier should be properly installed beneath the interior floor slab.

Concrete placement, curing operations, and control joint spacing should be in accordance with American Concrete Institute (ACI) guidelines. The concrete mix for exterior slabs shall be air entrained to prevent freeze-thaw damage.

## 7.5 RETAINING WALLS

Retaining walls shall be placed on a minimum of 3 feet of structural fill, compacted as previously indicated. The retaining wall footings shall be embedded a minimum of 24 inches below lowest adjacent grade.

The following values for retaining wall design are recommended:

Equivalent Active Soil Pressure:	33 PCF
Equivalent Passive Soil Pressure:	303 PCF
At Rest Soil Pressure:	50 PCF
Coefficient of Friction:	0.32 (at concrete-soil interface)

The retaining wall backfill shall be placed and compacted as previously indicated. The retaining walls shall be provided with an adequate waterproofing, and an internal drainage system to prevent excessive hydrostatic pressures, and moisture seepage.

## 7.6 MOISTURE PROTECTION AND SURFACE DRAINAGE

Precautions should be taken during and after construction to prevent saturation of the foundation soils. Positive drainage should be established away from the exterior walls and slabs, **as moisture intrusion will result in foundation failure.**

1. Positive drainage shall be provided to maintain excess moisture away from foundations and slabs. The recommended minimum slope is 5 percent, and shall extend laterally a minimum distance of 10 feet away from building structure.
2. Cut and fill slopes shall be no steeper than 3:1 (H:V) with natural cover, and 2:1 if rock plated. Slopes shall be compacted as previously indicated.
3. Downspouts from roof drains should discharge a minimum distance of 10 feet from the exterior building wall or fill slope. In no case should downspouts from roof drains discharge immediately adjacent to the building.
4. Landscape trees and plants requiring regular watering should be planted at least 10 feet away from footings. Landscaping within 10 feet of the footings should be desert landscaping such as decorative rock or plants that do not need to be watered and have a shallow root system.
5. All utility trenches within the pad and extending 5 feet beyond the structure footings should be backfilled with structural fill consisting of on-site or similar soils. The backfill should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. French drains shall not be utilized within 20 feet from foundations or slabs.
6. Special care should be taken during installation of subfloor sewer and water lines to reduce the possibility of future leakage and subsoil saturation, which could result in foundation and slab settlement and/or failure.
7. Soils beneath foundations and slabs are susceptible to frost heave under moist conditions, therefore, to prevent frost heave damage, positive drainage must be provided, and soils shall be maintained well drained to a minimum distance of 10 feet from foundations and slabs.
8. Swimming pools and water ponds shall contain an impermeable liner, and an internal drainage system to prevent moisture seepage beneath foundations.

## **7.7 TRENCHES AND EXCAVATIONS**

Trenches greater than 4 feet in depth shall be sloped or braced in accordance to OSHA Construction and Safety Standards. The excavated material shall be placed a minimum of 2 feet from the edge of the excavation, and should not be allowed to fall into the excavations.

Temporary construction excavations less than 8 feet in depth shall be sloped no steeper than 2:1 (Horizontal to Vertical). Equipment and stockpiles shall be placed at a minimum distance of 5 feet from the edge of the excavation.

## **7.8 FOUNDATION REVIEW AND OBSERVATION**

This report has been prepared to aid in the evaluation of this site and to assist in the foundation design. This office should be provided the opportunity to review the final grading plans, design drawings and specifications in order to determine whether the assumptions and recommendations presented in this report are valid and have been implemented. Upon completion, the final grading shall be assessed by the design engineer to verify compliance with the grading and drainage plan, and with the recommendations in this report.

Variations in soil conditions may be encountered during construction of this project. In order to permit correlation between the field conditions encountered in this investigation and the actual conditions encountered during construction, and to confirm recommendations presented herein, this office should be retained to perform sufficient review during construction of this project. Observation and testing should be performed during construction to confirm that the recommended depth of over-excavation was achieved and that suitable fill soils are placed and properly compacted, and also that foundation elements are placed upon the recommended soils at the required depth.

## 8.0 CLOSURE

The recommendations given in this report are based on results of field and laboratory investigations, combined with interpolation of subsurface conditions between boring locations. The nature and extent of variations between the borings may not become evident until construction. If variations are then exposed, it will be necessary to re-evaluate the recommendations of this report. **This report does not address the effects of flooding, environmental issues, seismic events, and/or seasonal ground water variations.** If changes in the nature, design, or location of the facility are planned, the recommendations contained in this report shall not be considered valid unless the changes are reviewed and the recommendations of this report modified or verified in writing.

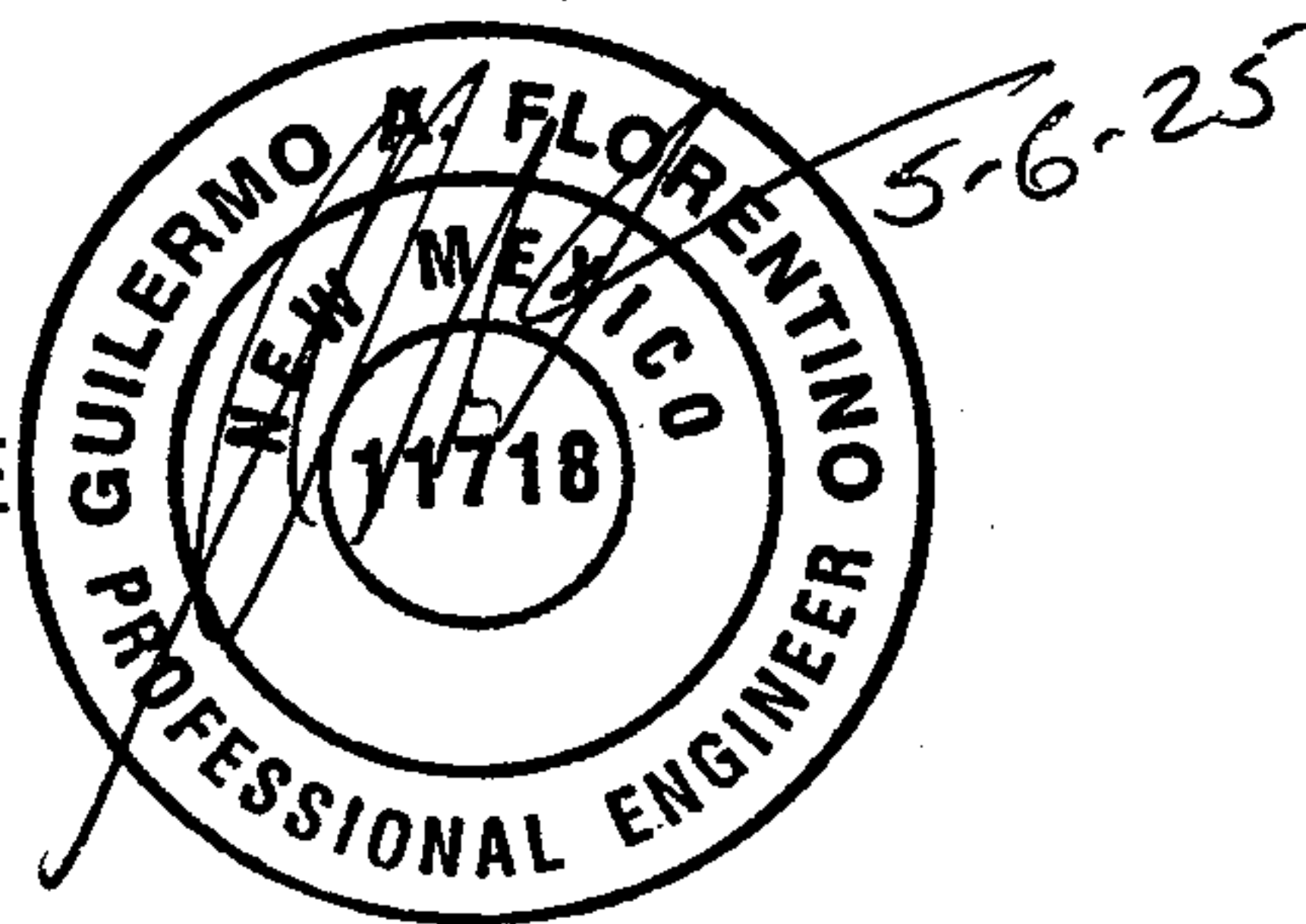
In addition, it is assumed that the site will be graded in accordance to an engineer designed grading and drainage plan, and that an adequate amount of tests and inspections by a qualified geotechnical engineer will be performed during site preparation and foundation construction.

**This report is intended primarily for design purposes.** However, if using this report as a bidding aid, the contractor should perform an independent site assessment, and/or make their own assumptions as to the conditions, unforeseen features to be encountered, and the procedures to be used in the performance of work on this project. Kiva Technologies, LLC is not responsible for unforeseen conditions, or conditions not encountered and described during our investigation. If conditions are encountered during construction that appear to be different than indicated by this report, our office shall be immediately be notified. Kiva Technologies, LLC shall not be held responsible for any damages to existing structures, due to the construction of the proposed development.

Respectfully submitted,

Kiva Technologies, LLC.

Guillermo A. Florentino, P.E.  
Geotechnical Engineer



# **APPENDIX A**

## **LABORATORY RESULTS**

## **APPENDIX A FIELD AND LABORATORY INVESTIGATIONS**

### **FIELD INVESTIGATION**

The subsurface soil conditions were explored by observing two (2) explorations to depths of 8 feet below the surface. The approximate exploration locations are shown on the site plan. Continuous logs of the subsurface conditions, as encountered in the explorations, were recorded at the time of exploration by our field personnel.

The subsurface conditions encountered were visually classified in accordance with ASTM D2487, which is based on the Unified Soil Classification System (UCS). Summaries of the subsurface conditions encountered are presented on the boring logs.

A representative portion of each sample was retained and carefully sealed in waterproof plastic containers for transport to the laboratory.

### **LABORATORY TESTING**

Laboratory tests were conducted on representative soil samples for the purpose of classification, and determination of their physical properties and engineering characteristics. The tests performed consisted of the following:

- Sieve Analysis (ASTM D-6913)
- Plasticity Index (ASTM D-4318)
- Moisture-Density (ASTM D-2216)
- Collapse Potential

A summary of the various laboratory tests results are presented in the Test Summary Table.

**TEST SUMMARY TABLE**

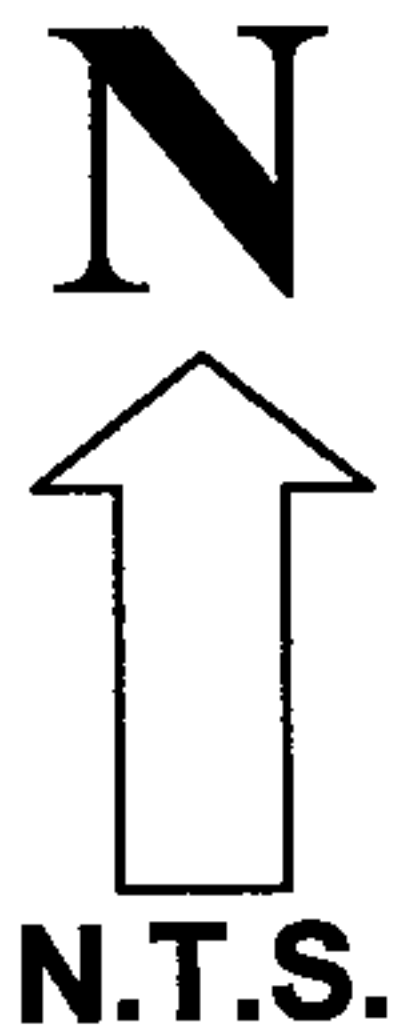
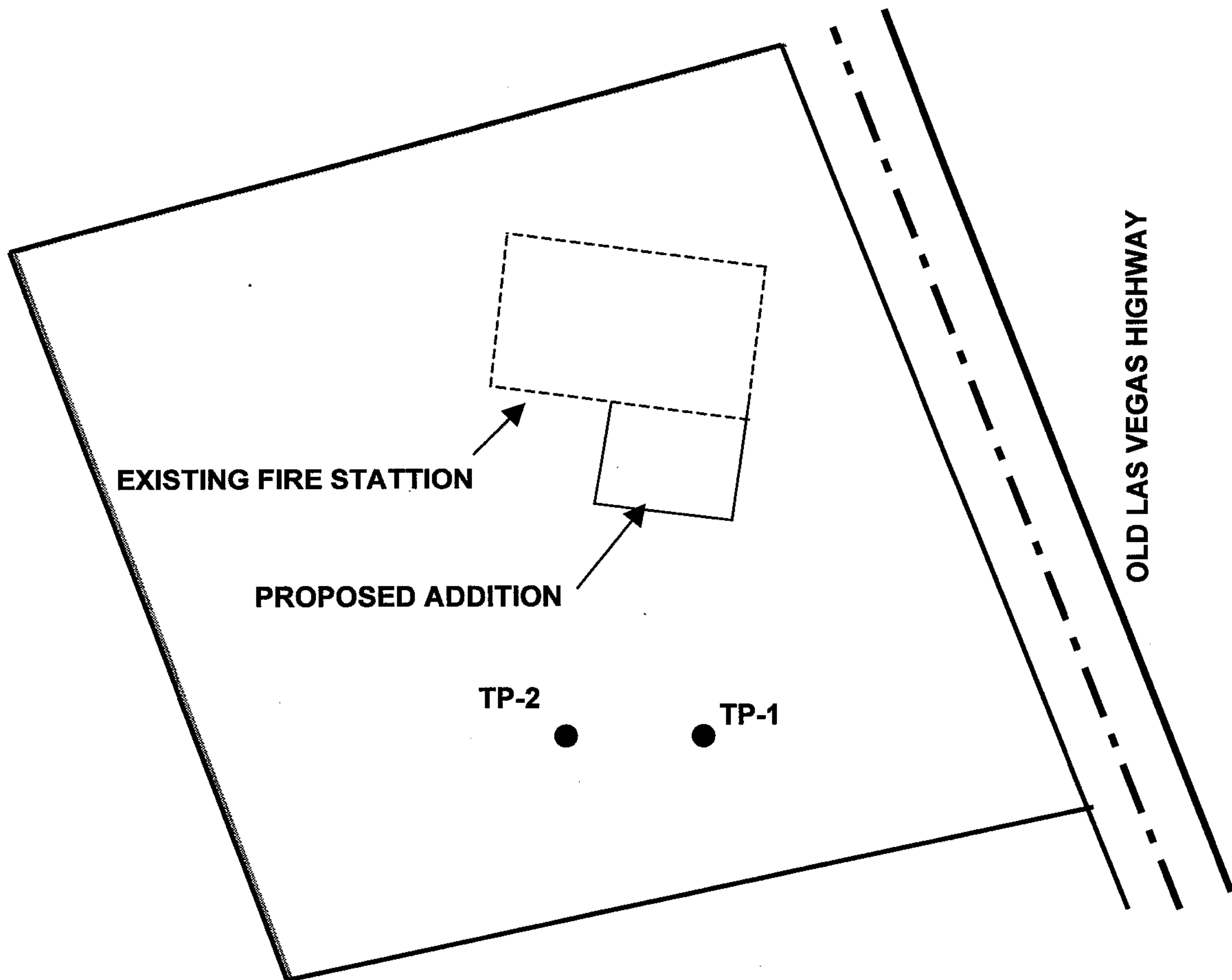
SAMPLE ID	DEPTH (FT.)	CLASS.	LL	PI	SIEVE ANALYSIS (% PASS.)								MOIST. (%)	DRY DENSITY (PCF)	COLLAPSE POTENTIAL* 60 PSF (%)
					#200	#100	#40	#10	#4	3/8"	3/4"	1"			
TP-1	0-5	SM	NV	NP	14	22	53	89	95	100			7.5		
TP-1	5-8	SW	NV	NP	3.1	4	18	65	80	90	96	100	2.8	101.9	5.6
TP-2	0-4	SM	NV	NP	21	34	64	88	96	100			8.7	103.6	4.7
TP-2	4-8	SW	NV	NP	4.7	8	20	59	80	88	98	100	4.9		

# **APPENDIX B**

## **SITE PLAN AND LOGS**

# SITE PLAN

SANTA FE COUNTY  
HONDO FIRE STATION #2 ADDITION REMODEL  
#645 OLD LAS VEGAS HIGHWAY  
SANTA FE, NM



● Indicates Approximate Exploration Location

# TEST PIT LOG

Project No. 25-0173

SANTA FE CO. HONDO FS #2 ADDITION

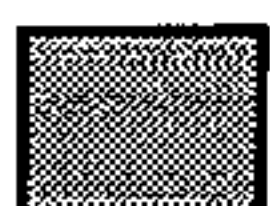
TEST PIT NO: 1

SANTA FE, NM

DATE: 4/28/2025

Depth (ft)	SAMPLES		Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Remarks
	Sample Type	Blows/ 12 In.				
1				SM	Medium brown silty sand; non-plastic, medium density, and medium moisture.	Moisture - 7.5% PI - NP
2						
3						
4						
5				SW	Medium brown well graded sand; non-plastic, medium moisture, and low density.	Moisture - 2.8% PI - NP
6						
7						
8					Test Pit Ends at 8 Ft. Groundwater Not Encountered	
9						
10						

**Legend:**



Ring Sample



Split Spoon Sample



No Recovery



Water Table

# TEST PIT LOG

Project No. 25-0173

SANTA FE CO. HONDO FS #2 ADDITION

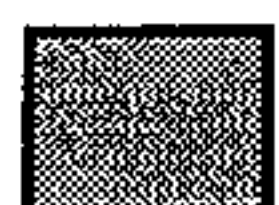
TEST PIT NO: 2

SANTA FE, NM

DATE: 4/28/2025

Depth (ft)	SAMPLES		Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Remarks
	Sample Type	Blows/ 12 In.				
1				SM	Medium brown silty sand; non-plastic, medium density, and medium moisture.	Moisture - 8.7% PI - NP
2						
3						
4				SW	Medium brown well graded sand; non-plastic, medium moisture, and low density.	Moisture - 4.9% PI - NP
5						
6						
7						
8					Test Pit Ends at 8 Ft. Groundwater Not Encountered	
9						
10						

**Legend:**



Ring Sample



Split Spoon Sample



No Recovery

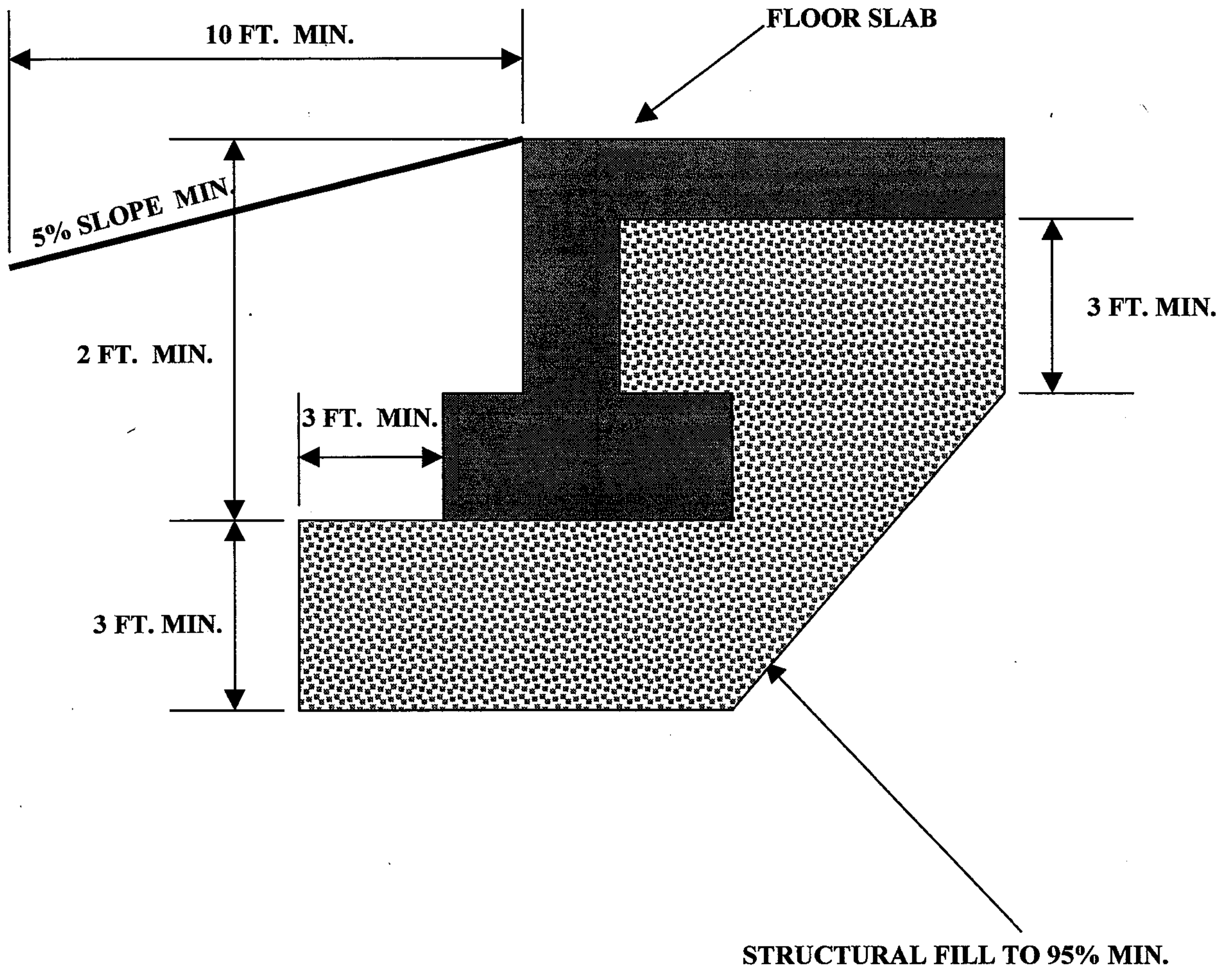


Water Table

# **APPENDIX C**

## **OVEREXCAVATION DETAIL**

# OVEREXCAVATION DETAIL



N. T. S