Geotechnical Soils Investigation
For
City of Lovington Fire Station #2 on 17th Street
in
Lovington, New Mexico

March 29, 2017

Prepared For:
WDG Architects
% Joseph Fuemmeler, AIA

Dyess-Peterson Testing Laboratory, Inc.
Texas Registered Engineering Firm F-1773
1700 S.E. 22nd Avenue
Amarillo, Texas 79103
(806) 372-4911 (Office)
(806) 372-5552 (Fax)

Report No. 2588

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March 29, 2017

WDG Architects
1014 S. Main Street, Suite A
Las Cruces, New Mexico 88005

Attn: Mr. Joseph Fuemmeler, AIA

Subject: Geotechnical Soils Investigation
CITY OF LOVINGTON FIRE STATION #2 ON 17TH STREET
Lovington, New Mexico
DPTL Report No. 2588

Dear Mr. Fuemmeler:

Dyess-Peterson Testing Laboratory, Inc. (DPTL) has completed the authorized subsurface exploration and geotechnical engineering report for the above mentioned project as authorized by yourself on February 21, 2017. The following report briefly presents our understanding of the project, reviews our exploration procedures, describes existing site and subsurface conditions, and summarizes our evaluations, conclusions, and recommendations relative to the geotechnical aspects of the project.

The primary issue at this particular site is the need to provide in-situ soils conditions as they relate to the design of structural foundations for the proposed fire station facility project. The most common methods of construction practices for a project of this nature are discussed in detail in the attached report.

If you have any questions regarding this report or we can be of further service please do not hesitate to call us at (806) 372-4911. We look forward to working with you in the future.

Sincerely,
Dyess-Peterson Testing Laboratory, Inc.

Michael D. Copeland, P.E.
Texas License No. 72032
Texas Engineering Firm No. F-1773

Robert C. Lydick, P.E.

GENERAL SUMMARY

The following is a brief summary of the information detailed in the following report. All issues summarized in this section are discussed in more detail in the report. This report must be read in its entirety prior to the implementation into design and construction of this project.

1. DPTL has performed four (4) geotechnical borings at this site for design. The subject site is located East of 17th Street between the North and South alleyways of W. Dogwood Avenue in Lovington, Lea County, New Mexico. The borings were proposed to be extended to a depth of 5 or 20 feet below existing grade depending on boring in question. However, due to encountering a strata of hard, dense rock borings #1 & #3 were terminated at the 3' depth and borings #2 & #4 at the 2' depth. The borings were extended utilizing a Geoprobe 7822 DT drilling unit.

2. According to the United States Department of Agriculture (USDA) "Soil Survey for Lea County" the subsurface materials encountered at this site should be Kimbrough-Lea complex, 0 to 3 percent slopes. The parent material for the Kimbrough-Lea complex consists of loamy eolian deposits derived from sedimentary rock. The typical profile of the Kimbrough-Lea complex from the surface to 3 inches is gravelly loam, 3 to 10 inches is loam, and 10 to 80 inches is cemented material. This soil has a natural drainage class of well drained. This soil is not flooded or ponded. The soil has a shrink-swell potential of low.

3. Groundwater was not encountered on the drilling tools (augers) or in the open boreholes upon completion of the four (4) borings drilled. Groundwater at this deepest 3' depth is uncommon for this area and is not expected to be encountered even during wet seasons. No excessive moistures were encountered near the surface during drilling at this site based on the soil types.

4. Laboratory test results indicate that the soils encountered in the upper three (3) feet of the four (4) borings are low to moderate in plasticity. A Potential Vertical Rise (PVR) of less than 0.50" in the top three (3) feet of existing soils has been estimated for the current conditions and anticipated for the fire station facility project not including design loads for the proposed structure if no improvements are made to the existing soils or if the soils are allowed to become saturated over a depth of ten feet from the existing moisture content.

These and other design and construction recommendations are discussed in more detail in the attached report.

1.0 INTRODUCTION

1.1 Project Information

This report presents the findings of our subsurface exploration and geotechnical engineering evaluation for the proposed fire station facility. The subject site is located East of 17th Street between the North and South alleyways of W. Dogwood Avenue in Lovington, Lea County, New Mexico. Information for this project was provided by Joseph Fuemmeler, AIA of WDG Architects and Stubbs Engineering personnel.

This project will consist of the construction of a one (1)-story but varying heights, 11' or 20', fire station facility. The fire station facility will be approximately 10,000 square feet (ft^2) in size. Exterior structural framing for the structure will be of Concrete Masonry Unit (CMU) block wall for the apparatus bay area and lightweight metal stud framing for the residential portion. The interior framing will consist of lightweight metal studs and sheetrock. The exterior finish will be a combination of CMU veneer and metal panels. The roof system for the structure will be a Thermoplastic Polyolefin (TPO) membrane. Once the vegetation and gravel have been removed approximately 30-36 inches of select fill material placement is estimated in order to provide proper site drainage and establish the 3936.0' finished floor elevation for the structure. Along with the proposed structure will be the associated drive/parking areas which we believe will be Portland Cement Concrete.

Design loading provided at the time of the report completion indicated a value of 2,000 pounds per linear foot (plf) for the wall supporting footings and column loads of 40 kips.

1.2 Purpose of Exploration

The objective of this exploration was to explore the general subsurface conditions at the site and to evaluate and analyze these conditions as they relate to foundation design and construction. The field exploration has been accomplished by securing subsurface soil samples from widely spaced test borings performed across the expanse of the site. The analyses have been used to develop geotechnical engineering design parameters for the support foundations and slab to be constructed for the project.

Recommendations provided in this report have been developed from information obtained in the test borings which depict subsurface conditions only at the specific boring locations and at the particular time designated on the logs. Subsurface conditions at the other locations may differ from those observed at the boring locations. This scope of work is not intended to fully define the variability of subsurface materials which may be present on the site. The nature and extent of variations may not become evident until construction. If significant variations then appear our office should be contacted to re-evaluate our recommendations after performing on-site observations and tests.

Recommendations presented in this report should not be used for design of any other structure except that specifically described in this report. Subsurface conditions can change with passage of time. Recommendations contained herein are not considered applicable for an extended period of time after the completion date of this report. It is recommended that our office be contacted for a review of the contents of this report for construction commencing more than one (1) year after completion of this report.

If the client notes any deviation from the facts about project characteristics our office should be contacted immediately since this may materially alter the recommendations. If the recommendations stated in this report are not followed, Dyess-Peterson Testing Laboratory, Inc. (DPTL) is not responsible for damages resulting from workmanship of designers or contractors and it is recommended that DPTL be retained by the owner to verify work is performed in accordance with plans and specifications.

1.3 Scope of Exploration

The scope of work included a site reconnaissance, soil test borings, sampling, laboratory testing, engineering evaluation of the field and laboratory data, and the preparation of this report. Specifically, this report addressed the following:

1. Description of the existing site conditions.
2. A description of the area, site evaluation and subsurface conditions.
3. Subsurface soil, rock stratigraphy and groundwater observations.
4. Recommendations for foundation design (structure and pavement) including allowable bearing capacities, estimated bearing levels, and PVR. Frost penetration depth is also provided.
5. Recommendations for structural support below existing soil grade.
6. Recommendations for site preparation, earthwork, groundwater, proof rolling control as required. This includes a maximum Plasticity Index for select fill materials and analysis of the effect of weather and construction equipment on soil during construction.
7. Analysis of soils to evaluate presence of potentially expansive or deleterious conditions.

2.0 INVESTIGATION PROCEDURES

2.1 Visual Inspection

The site and surrounding areas were evaluated visually by an employee of DPTL. The observations were utilized during the determination of recommendations and in relating known geologic conditions in the area to site specific conditions.

2.2 Scope of Field Investigation

The four (4) geotechnical borings were advanced at the approximate locations shown on the attached Location of Borings Map (Figure 2 in Appendix A). Exact sea-level elevations were not provided for the boring locations so an elevation of 3933.0' provided by WDG Architects personnel for existing soil grade was utilized for each boring location due to the levelness of the site and the elevation of each boring location visibly being nearly the same. There were no restrictions encountered by underground utilities as they were located and cleared before drilling began by New Mexico 811 (NM811) as arranged by DPTL personnel. Please note, the borings were advanced in the approximate locations shown on the Location of Borings map. The boring locations were determined by Stubbs Engineering personnel but located in the field by Dyess-Peterson personnel based on the site map provided by Stubbs Engineering personnel.

Representative soil samples of the subsurface materials were obtained utilizing a split-spoon sampling method as per ASTM D1586. A standard 2-inch O.D. split-spoon sampler was driven 18-inches into subsurface materials using a 140-pound hammer with a fall of 30-inches to obtain relatively undisturbed samples at selected depths during drilling procedures. The number of blows to drive the split-spoon sampler the final 12-inches of penetration, known as N-Value, is recorded in the appropriate column on the log. The samples were removed from the sampler and placed in sealable plastic bags to prevent moisture loss or gain and to be used in further testing. The borings were backfilled with on-site materials and bentonite pellets upon completion.

The soil classifications and descriptions are based on visual examination, as outlined in ASTM D2487-92, the Unified Soil Classification System in conjunction with Munsell Soil Color Charts, and should be considered approximate. Subsurface materials encountered are recorded on the boring logs, which depict soil classifications, descriptions, and penetration resistance and are included in Appendix B. The soil stratigraphy lines shown on the boring logs represent the approximate boundary between soil types and the transition may be gradual.

2.3 Scope of Laboratory Testing

Minus #200 sieve analysis (ASTM D1140-92), existing moisture content (ASTM D2216), and Atterberg Limits test (ASTM D4318-84) were performed on selected samples to assist in classification of subsurface materials and determination of engineering characteristics of the materials. All laboratory results are described on the Log of Borings located in Appendix B.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Descriptions

The subject site is located on the East side of 17th Street between the North & South alleyways of W. Dogwood Avenue in Lovington, Lea County, New Mexico.

Ground vegetation on the subject site consists of native grasses and weeds with large areas of bare soils. Portions of the site are covered with pea gravel. Also on the site are four (4) stockpiles of rock & soil all of which will have to be removed prior to construction.

The topographical conditions at this site appear to be fairly level thus resulting in the site being poorly drained in its existing state.

3.2 Subsurface Conditions

All data interpreted from the geotechnical borings is detailed in the Log of Borings located in Appendix B. As previously mentioned, the location of the test borings are pictured on Figure 2 in Appendix A.

The subsurface conditions discussed in the following paragraphs and those depicted in the Log of Borings are based solely on the information obtained from the geotechnical borings drilled at the site and represents an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgements.

The soil borings encountered only Clayey Sand soils. This soil type is discussed in the following paragraph. No excessive moisture contents were encountered near the surface based on the soil type. Also, as mentioned previously hard, dense rock was encountered at the 2' or 3' depth depending on boring in question thus causing auger refusal and boring termination. The soils appear to be in a dry moisture state from the surface to 3' depth in the upper 3' of the borings drilled.

3.2.1 Clayey Sand (SC)

Clayey Sands were encountered in borings #1 and #3 from the surface to full 3' depth and in borings #2 and #4 from the surface to full 2' depth. The colors of this soil were Brown, Pinkish White, Light Brown and Very Pale Brown.

The Plasticity Index (PI) of the Clayey Sands ranged from 8 to 13 which results in a degree of plasticity of lot to moderate while the moisture contents ranged from 2.7 to 9.6 percent with the density varying from dense to very dense.

The Standard Penetration Test value (blow counts) for the Clayey Sands existing in the borings varied from 40 blows for 12 inches of penetration to 82 blows for 12 inches of penetration.

3.2.2 Rock

As mentioned earlier, a hard, dense rock strata was encountered in all four (4) borings at depths of either 2' or 3' depending on boring in question thus causing auger refusal. Signs (pieces) of the rock were evident in shallower depths. It would not be unexpected if rock was encountered at shallower depths than what was encountered during our drilling/sampling process. If the solid rock stratas are encountered at depth shallower than what was encountered during our drilling/sampling process then the excavation of the rock might be required in order to construct the support foundations.

3.2.3 Groundwater

As mentioned previously, groundwater was not noted on the drilling tools (augers) or in the open boreholes upon completion of the four (4) borings drilled. Groundwater at this deepest 3' depth is uncharacteristic for this area. It is unlikely that groundwater would be encountered during excavations such as turn-down footings, spread footings or spot column spread footings for the building which will be detailed later in this report.

The amount of water is expected to vary with seasonal rainfall, other climatic conditions, surface runoff, permeability of on-site soils, continuity of pervious soils, irrigation practices, and other factors. Once again, the excavation of turn-down footings, spread footings or spot column spread

footings which will be detailed later in this report are not expected to be affected by any groundwater.

These observations do not constitute a groundwater study nor was such a study authorized as a part of the scope of investigation. Several days of observation will be required to evaluate actual groundwater levels within the depth explored.

3.2.4 Frost Depth

The design frost depth for Lea County, New Mexico is 12 inches. Because of this a minimum foundation depth of 18 inches is recommended.

3.2.5 Seismic Zone

According to the 2012 International Building Code (IBC) the site soil profile based on existing soil properties to the total depth of the borings would be S_C for the surface to 3' depth therefore a site soil profile of S_C should be utilized for design.

3.2.6 Settlement

Total settlement for this project should be of the magnitude of 1" or less if constructed as recommended with differential settlement estimated to be as low as 50% of total settlement and probably will not exceed 75% of total settlement. Approximately 50-60% of the expected settlement could occur during construction.

3.2.7 Shrink/Swell Potential

The tendency for a soil to shrink and swell with changes in soil moisture content is a function of the clay content and the type of clay material. These are reflected in soil consistency as indicated by the Liquid Limit and Plasticity Index of the Atterberg Limits tests. A generalized relationship between shrink/swell potential and the soil Plasticity Index (P.I.) is shown as follows:

General Relationship Between P.I. and Shrink/Swell Potential

P.I. Range	Shrink/Swell Potential
0 to 15	Low
15 to 25	Medium
25 to 35	High
>35	Very High

The soils at this site possess a low shrink/swell potential.

Swelling Characteristics: An estimate of the magnitude of the possible ground surface movement caused by shrinking and swelling of the clay containing soils has been made through the use of the PVR procedure. As previously mentioned a PVR of less than 0.50" is expected if no modifications are made to the existing soils. The anticipated ground movements due to the possible swelling of the underlying soils at the site were estimated using existing moisture conditions. It is still recommended that the final grade be such that positive drainage exist away from the foundations. This could be achieved by select fill material placement. It is estimated that after the vegetation and gravel have been removed that 30-36 inches of select fill material placement will be necessary, based on the existing ground elevations, to achieve final soil elevation in order to provide positive drainage away from the structure. We estimate the PVR value will be reduced by about 1/8" for each foot of select fill material placed above the existing ground surface.

The low to moderate clay containing soils in the upper 3' of the four (4) borings have potential for volume change with changes in the soils moisture content. The volume change is normally evidenced by the heaving and cracking of the concrete floor slab and/or foundations. The PVR at this site is on the order of less than 0.50" assuming the in-place soils are allowed to increase in moisture content from an existing condition to a relatively wet condition over a depth of 10 feet. It is not uncommon to assume differential movement as half of the PVR. Controlling the moisture content variation of a soil will reduce its variation in volume. A number of measures may be increased to attain a reduction in subsoil moisture content variations, thus reducing the shrink/swell potential. Some of the measures are listed below:

1) During construction, a positive surface drainage scheme should be implemented to prevent ponding of water on the subgrade.
2) The structure subgrade should not be allowed to dry out.

3) Positive surface drainage should be maintained around the structure through a roof/gutter system connected to piping or a paved surface around the structure, transmitting water away from the foundation perimeter, in addition to positive grades sloping away from the foundation. Proper grading and drainage in the foundation areas to prevent ponding of water is essential. In no instance should water be allowed to pond in the foundation vicinities either during or after construction. The final ground surface should be sloped down and away from the edge of the foundations at a minimum of five percent (5%) slope (six inches drop in ten feet of run) to make sure water drains away from the foundations area during the life of the structure. The slope should extend at least ten feet from the foundation perimeter. Splash blocks are also required for hose bibs and water spigots.

4) Utility trenches should be backfilled with borrow materials having PI values of 15-20 to reduce the potential of the trenches acting as aqueducts and transmitting water beneath the structure due to excessive surface water infiltration. Another option would be the use of flowable fill.

5) Shrubbery and flower beds (if any) surrounding the structure should be planned to insure that bedding soils drain away from the structure. All planters should have impermeable bases with weep holes directed away from the structure.

6) A paved surface (mow strip) should extend beyond the structure line a minimum of 3' to serve as a barrier to soil moisture evaporation and infiltration. However, such surfaces should be structurally isolated from the foundation to prevent the transfer of stresses to the foundation from the paved surfaces.

7) Trees or other vegetation (if any) whose root systems have the ability to remove excessive moisture from the subgrade and foundation soils should not be planted next to the structure. Planted and landscaped areas adjacent to the structure should not be covered with impermeable sheeting, commonly used to reduce weed growth. Trees and shrubbery should be kept away from the exterior edge of the foundation elements a distance of at least equal to 1.5 times their expected mature height. Trees can remove soil moisture through their root system, therefore creating significant soil moisture differences between the structure and consequently aggravating expansive soil activity. Root growth beneath a foundation can also cause damage by pushing against a foundation element.

8) Differential movements should be expected between the foundation and adjoining structure, such as sidewalks or other appurtenances. Flexible joints should be used which account for such movement without adversely affecting the aesthetics and integrity of the joint and without allowing stress transfer.

9) Irrigation systems for landscaping around the foundations should be designed for minimal water use. No saturation of soils or excessive drying should be allowed to occur.

This method utilizes correlations between Atterberg Limits test data to estimate the swell potential and as such, the result must be considered as giving approximate values of the shrink-swell potential. It should be noted that these PVR estimates are indicative of the relative magnitude of probable movement under seasonal moisture changes in the soil moisture content. Movements in excess of these values may be expected if increases in soil moisture occur as the result of broken water or sewer lines or improper drainage of surface water. The client is cautioned that the strength of soils can vary significantly with moisture content. When soils are dry the strength can be relatively high while the soils can lose their strength when they are wet.

Care must be taken not to create an excavation which traps water. Once again it is our belief and recommendation that select fill placement would need to be utilized to achieve final soil grade to provide positive drainage away from the foundation. The select fill material should extend out from foundation elements a distance at least equal to 5 feet. The select fill material should meet the specification and compaction requirements provided in a following subsection. Select fill material not under the structure should be covered around the structure perimeter with a relatively

impermeable cover to minimize water infiltration into the select fill material. It is highly recommended that positive drainage exist away from the structure in order to prevent subjecting the foundation to a moisture increase. It is also important to prevent a significant moisture decrease. This would result in a shrinkage effect.

4.0 DESIGN RECOMMENDATIONS

The following design recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes in the project criteria, this office should be notified immediately and a review made by DPTL to determine if any modifications in our recommendations would be required. The following conclusions and recommendations are based on our observations at the site, interpretation of the field data obtained during this exploration, and our experience with subsurface conditions. Subsurface conditions in unexplored locations may vary somewhat from those encountered in our investigation. If the structure location is changed from the previously mentioned understood proposed location, we request that we be notified immediately so that we may reevaluate our recommendations.

4.1 Proposed Construction

As mentioned previously, our understanding and knowledge of this project is based on information provided by Joseph Fuemmeler, AIA of WDG Architects and Stubbs Engineering personnel. We were issued a site plan of this project prior to drilling and sampling.

We understand this project consists of the construction of structural foundations for the fire station facility structure. It is our belief that the typical construction of a structure of this nature should be supported by turn-down or spread footings for the exterior walls and spot column spread footings for the columns. Information concerning structural loads provided at the time this report was prepared indicated a value of 2,000 plf for the walls and 40 kips for columns.

4.2 Turn-Down Footings, Spread Footings or Spot Column Spread Footings

For maximum sustained load to be 2,000 plf for the walls and 40 kips for the columns the turn-down footings, spread footing and spot column spread footings for the fire station facility structure may be founded at elevation 3934.0' and be sized based on an allowable in-place bearing capacity value of 2000 psf or at elevation 3931.00' and be sized based on an allowable in-place bearing capacity value of 3000 pounds per square foot (psf).

4.3 General Conclusions

The most significant soil related factors for design of the light to moderately loaded structure at this site are the bearing capacities of the soil layers and their expansion. The soils present at the site are low to moderate in plasticity and shallow foundations supported on these soils could be subject to movements due to moisture fluctuations in these soils. The most positive means to reduce the potential for foundation movement would be to support the proposed structure on a foundation system bearing below the freeze/thaw zone which for this area is considered 12-inches and on the recommended select fill material. It is recommended that the minimum depth for a foundation bearing depth be 18-inches below the finished exterior grade to protect against freeze/thaw only.

5.0 CONSTRUCTION RECOMMENDATIONS

All areas around the structure should be designed to prevent migration of water into the soils beneath the structure and other flatwork sensitive to movement. No excessive saturation or drying of soils around the foundations should be allowed to occur.

5.1 Site Preparation

A. This site should be prepared by removing and clearing any grass, weeds, stockpiles, loose soils and organic topsoils.

5.2 Subgrade Preparation

A. The top 6-inches of in-place soil should be plowed or scarified, processed to near optimum moisture content (±2%), and compacted to at least 95% of maximum dry density as determined by a standard proctor (ASTM Designation D698) when tested in accordance with ASTM Designation D6938.

B. The site should be proof rolled to detect soft areas which should be removed and properly replaced, processed, and recompacted to 95% of standard proctor maxi-

mum dry density (ASTM D698) and ±2% of optimum moisture content when tested in accordance with ASTM Designation D6938.

C. Subgrade should be tested by a qualified laboratory technician under the supervision of a licensed professional engineer specializing in geotechnical stu-dies.

5.3 Foundation Preparation

A. All select fill material should have a Plasticity Index of 4-15 and should be placed in 8-inch loose to 6-inch maximum compacted lifts. All soil for select fill material should be free of large rock (larger than 2") or other deleterious material and should be processed to near optimum moisture content (+/-2%) and compacted to a minimum of 95% of maximum dry density as determined by a standard proctor (ASTM Designation D698) and when tested in accordance with ASTM Designation D6938. Each lift must be tested and accepted prior to placing the next lift. The Plasticity Index and Liquid Limit of material used as select, less-expansive fill should be routinely verified during fill placement using laboratory tests. Visual observation and classification should not be relied upon to confirm the material to be used as select, less-expansive fill satisfies the above Atterberg Limits criteria.

B. The site should be proof rolled to detect soft areas which should be removed and properly replaced to 95% of standard proctor maximum dry density (ASTM D698) and ±2% of optimum moisture content when tested in accordance with ASTM Designation D6938.

C. Due to the placement of select fill material, differing amounts of settlement can occur. This settlement can be as low as ½ percent (1/2%) for shallow amounts less than 3 feet to as much as 1 ½ percent (1 ½%) for thicknesses greater than 3 feet. Due to the amount of soil placement the designer should take into account measures necessary to reduce the amount of settlement.

D. Each lift should be tested by a qualified laboratory technician under the supervision of a licensed professional engineer specializing in geotechnical studies.

E. The top 2-inches of fill should be sand, or other free draining soil, in the area beneath the slab. The sand cushion or other free draining soil, should be damp and compacted prior to placing the fresh concrete, and should have a Plasticity Index of 8 or less.

F. Structural concrete should be placed as soon as possible when the soil preparation is completed.

5.4 Recommended Minimum Sampling and Testing Frequencies

It is recommended that the site preparation, foundation construction, floor slab construction and pavement sections be monitored by the geotechnical engineer or his representative. Following are recommended minimum sampling and testing frequencies.

Earthwork

- At least one moisture-density (proctor) test, Atterberg Limits test and percent finer than #200 sieve test should be performed per each soil type such as subgrade, and select fill material.
- In the proposed structure areas at least 1 density and moisture content test per 2,000 square feet of surface area should be performed on the subgrade soils and at least 1 density and moisture content test per 2,000 square feet of surface area should be performed for each compacted 6-inch thick layer of select fill material. Testing backfill trenches should be at least 1 density and moisture content test per 100 linear feet of trench per 6-inch com-pacted backfill thickness.
- A minimum of five (5) density and moisture content tests should be performed in the proposed structure area on the subgrade soils and a minimum of five (5) density and moisture content tests should be performed per 6-inch compacted thickness of select fill material in the structure area. Testing of backfilled trenches should be at least 1 density and moisture content test per 100 linear feet of trench per 6-inch compacted backfill thickness.

- It is imperative that a qualified field technician be on-site during all soil processing and placement.

Concrete

- At least 1 slump, air content and temperature test should be performed per 50 cubic yards of each type of concrete placed each day including when concrete test cylinders are molded.
- At least 1 set of 4 concrete test cylinders should be molded for each type of concrete per 50 cubic yards or fraction thereof placed in a day.
- Each set of cylinders should be tested for compressive strength with 2 of the cylinders tested at 7 days and 2 of the cylinders tested at 28 days.
- Reinforcing steel should be checked for size of placement prior to concrete placement.

Foundations

- The dimensions of each foundation including reinforcing steel size and placement should be checked.
- The bearing material at each foundation should be checked to verify that the materials are suitable for foundation support.

6.0 PAVEMENT

The material encountered near the existing ground surface will probably constitute the subgrade for the parking and drive areas if the civil drawings do not include fill material over the pavement areas of the site before flexible base is placed. It is our belief fill material will not be required over the site for the pavement areas to achieve proper drainage due to the existing grades. Therefore, it is recommended these materials need not be improved prior to construction of the pavement areas. If, as not expected, fill material placement is necessary it is recommended that it be select fill type material. If it is not select fill type material, the top 6" (before flexible base) should be stabilized with enough Cement Kiln Dust (CKD) or lime to reduce the PI to 15 or less. Due to the wide spacing of the borings, division of the site into areas with similar subgrade conditions was not possible. Delineation of areas with similar subgrade conditions, if required, should be performed during construction after the subgrade material has been exposed. The specific type of improvement procedures required in given drive and parking areas will be dependent upon the type of material present after final elevation has been achieved.

Recommendation for the required pavement thickness are based only on the physical and engineering properties of the materials and conventional thickness determination procedures. Pavement joining the structure should be constructed with a curb and the joint between the structure and curb should be sealed. Related civil design factors such as subgrade drainage, shoulder support, cross-sectional configurations, surface elevations, joint design and environmental factors will significantly affect the service life and must be included in preparation of the construction drawings and specifications, but were not included in the scope of this study. Normal periodic maintenance will be required for all pavement to achieve the design life of the pavement system.

If after achieving final soil elevation in the parking and drive areas before flexible base placement the soils possess PI values greater than 15, it is recommended the exposed surface of the soil be scarified to a depth of 6 inches and mixed with hydrated lime or CKD. The actual amount of lime or CKD required should be confirmed by additional laboratory testing but should be enough to reduce the PI to less than 15.

1. It is recommended the stabilization procedures extend at least 1 foot beyond the edge of the pavement to reduce effects of seasonal shrinking and swelling upon the extreme edges of pavement. The soil stabilization mixture should be compacted to at least 100 percent of standard proctor maximum dry density (ASTM D 698) and within the range of 0 to +4 percentage points above the mixture's optimum moisture content. Joints in concrete pavement should not exceed 15 feet.

2. In all areas where stabilization is used to stabilize the final soil, routine Atterberg Limit tests should be performed to assure the resulting Plasticity Index of the mixture is at/or below 15.

	Light Duty PCC Pavement
6.0 inches	Portland Cement Concrete (15-foot joint spacing)
4.0 inches	Flexible Base – NMDOT Division 303
6.0 inches	Scarified, Stabilized (if necessary) and Recompacted Subgrade

OR

	Heavy-Duty PCC Pavement (Truck Traffic Area)
6.0 inches	Portland Cement Concrete (15-foot joint spacing)
10.0 inches	Flexible Base - NMDOT Division 303
6.0 inches	Scarified, Stabilized (if necessary) and Recompacted Subgrade

6.1 Portland Cement Concrete Specifications

Pavement should be specified, constructed and tested to meet the following requirements:

1. Portland Cement Concrete: NMDOT Division 450. Specify a minimum compressive strength of 4,000 pounds per square inch (psi) at 28 days. Concrete should be designed with 5±1 percent total air content.
2. The subgrade should be compacted to at least 100% of standard proctor maximum dry density (ASTM D698) and within ±2% if not stabilized or 0-+4% if stabilized of the material's optimum moisture content.
3. The flexible base should be placed in two (2) equal lifts for the heavy-duty section but only one (1) lift for the light-duty. Each lift should be compacted to a minimum of 100% and within ±2% of optimum moisture content as determined by ASTM D698. The first lift must be tested and accepted prior to placement of the next lift.

Pavement and other flat work will have the same potential for movement as slabs constructed directly on the existing soils. Therefore, good perimeter surface drainage with a minimum slope of 2 percent away from the pavement is recommended. Normal maintenance of pavement should be expected over the life of the structures. Pavement surfaces should be maintained to help minimize surface ponding and to provide rapid sealing of any developing cracks. These measures will help reduce infiltration of surface water downward through the pavement section.

7.0 EXCAVATION SAFETY CONSIDERATIONS

If utility trenches or other excavations extend to or below a depth of 5-foot below construction grade, the contractor or others shall be required to develop a trench safety plan to protect personnel entering the trench or trench vicinity. The collection of specific geotechnical data and the development of such a plan which could include designs for sloping, benching or various types of temporary shoring, is beyond the scope of the current study. Any such designs and safety plans shall be developed in accordance with current OSHA guidelines and other applicable industry standard. The soils at the depths needed for excavation are classified as cohesive. The maximum allowable slope for excavations less than 20-feet are 1H:1V for a short term.

It is important for the design geotechnical engineer to be allowed to observe the excavations to make a determination as to the quality and competency of the soil materials. If sandy or clayey material is observed not to be stable at a 1 horizontal to 1 vertical slope or if large pockets of non-cohesive soils are encountered, the excavations may require being sloped even more gentle. If any sloughing subsidence or tension cracks are observed in the soil, the contractor should stop all work and notify the design geotechnical engineer.

8.0 QUALIFICATION OF RECOMMENDATIONS

The recommendations in this report were developed from the information obtained from the test borings which give subsurface conditions only at the specified depths, the specified times of the boring logs and that there are no pre-existing deep excavated areas that have been backfilled on this site. It is also assumed that the moisture levels encountered at this site will not be permitted to materially increase over those shown on the logs. In addition, the laboratory test results for selected soil and rock samples relate only to the samples tested. Rock and soil conditions at other

locations may vary from the indicated conditions and the nature and extent of the variations may not become noticeable until the course of construction. If variations do appear, it will be necessary to re-evaluate the recommendations of this report after making notes of all the variations. Also, if any changes occur in the proposed construction, including site location, this office should be notified so a review can be made.

It is important that a geotechnical engineer be retained to review the specifications and plans and also for testing and observations during the foundation construction and earthwork phases of the proposed construction to help confirm the design requirements are fulfilled.

Our professional geotechnical services have been performed, our findings logged and our report prepared in accordance with generally accepted geotechnical engineering practices. This warranty is in lieu of all other written warranties either expressed or implied. This report shall not be reproduced except in its entirety and with the express written permission of Dyess-Peterson Testing Laboratory, Inc.

APPENDICES

APPENDIX A – TEXT FIGURES

Figure 1 Site Location Map
Figure 2 Location of Borings Map

APPENDIX B – FIELD RESULTS

Records of Subsurface Exploration Sheets
Key to Symbols and Classifications – Soil and Rock

APPENDIX A – TEXT FIGURES

Figure 1	Site Location Map
Figure 2	Location of Borings Map

Figure 1 **Site Location Map**

Project: City of Lovington Fire Station #2 on 17th Street – Lovington, New Mexico

DPTL No.: 2588

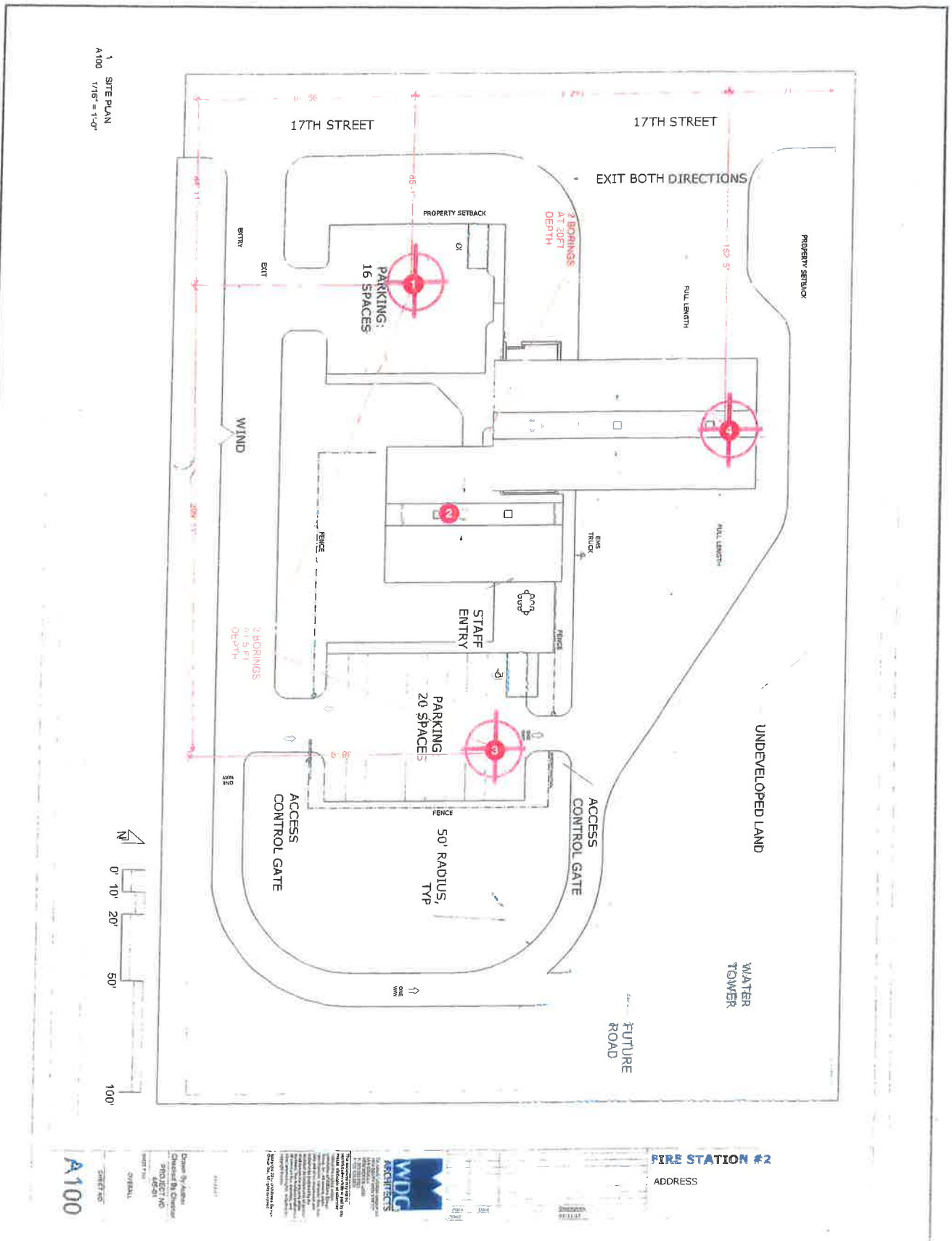


Figure 2 **Location of Borings Map**

Project: City of Lovington Fire Station #2 on 17th Street – Lovington, New Mexico

DPTL No.: 2588

APPENDIX B – FIELD RESULTS

Records of Subsurface Exploration Sheets
Key to Symbols and Classification – Soils and Rock

BORING: 1

Dyess-Peterson Testing Laboratory, Inc.

PROJECT: City of Lovington Fire Station #2 on 17th Street
CLIENT: WDG Architects % Joseph Fuemmeler, AIA
DRILLED DATE: March 17, 2017
DRILLING METHOD: Geoprobe 7822DT

LOCATION: Lovington, New Mexico
LOGGED BY: R. Perkins
DRILLED BY: W. Perkins
ELEVATION: 3933.0'

Depth	Sample	Soil Log	Description	SPT Blows/Ft	Moisture Percent	Dry Density (pcf)	LL	PL	PI	Unconfined Compressive Strength (TSF)	Passing 200 Sieve
0			Brown Clayey Sand (SC) 4/2 7.5YR	6 6" 14 12" 26 18"	9.6		25	17	8		21.4
			Pinkish White Clayey Sand with Rock (SC) 8/2 7.5YR		7.5		28	16	12		29.7
5			* Total Depth - 3' * Auger Refusal - Hard, Dense Rock								
10											
15											
20											
25											
30											
35											
40											

BORING: 2

Dyess-Peterson Testing Laboratory, Inc.

PROJECT: City of Lovington Fire Station #2 on 17th Street
CLIENT: WDG Architects % Joseph Fuemmeler, AIA
DRILLED DATE: March 17, 2017
DRILLING METHOD: Geoprobe 7822DT

LOCATION: Lovington, New Mexico
LOGGED BY: R. Perkins
DRILLED BY: W. Perkins
ELEVATION: 3933.0'

Depth	Sample	Soil Log	Description	SPT Blows/Ft	Moisture Percent	Dry Density (pcf)	LL	PL	PI	Unconfined Compressive Strength (TSF)	Passing 200 Sieve
0			Brown Clayey Sand with Rock (SC) 5/2 7.5YR	9 6" 30 12" 50 18"	6.2		25	14	11		25.0
			* Total Depth - 2' * Auger Refusal - Hard, Dense Rock								
5											
10											
15											
20											
25											
30											
35											
40											

BORING: 3

Dyess-Peterson Testing Laboratory, Inc.

PROJECT: City of Lovington Fire Station #2 on 17th Street
CLIENT: WDG Architects % Joseph Fuemmeler, AIA
DRILLED DATE: March 17, 2017
DRILLING METHOD: Geoprobe 7822DT

LOCATION: Lovington, New Mexico
LOGGED BY: R. Perkins
DRILLED BY: W. Perkins
ELEVATION: 3933.0'

Depth	Sample	Soil Log	Description	SPT Blows/Ft	Moisture Percent	Dry Density (pcf)	LL	PL	PI	Unconfined Compressive Strength (TSF)	Passing 200 Sieve
0			Light Brown Clayey Sand (SC) 6/3 7.5YR	9 6" 32 12"	7.4		26	14	12		24.0
			Very Pale Brown Clayey Sand with Rock (SC) 8/2 7.5YR	50 18"	2.7		29	16	13		31.4
			* Total Depth - 3' * Auger Refusal - Hard, Dense Rock								
5											
10											
15											
20											
25											
30											
35											
40											

Dyess-Peterson Testing Laboratory, Inc.

BORING: 4

PROJECT: City of Lovington Fire Station #2 on 17th Street
CLIENT: WDG Architects % Joseph Fuemmeler, AIA
DRILLED DATE: March 17, 2017
DRILLING METHOD: Geoprobe 7822DT

LOCATION: Lovington, New Mexico
LOGGED BY: R. Perkins
DRILLED BY: W. Perkins
ELEVATION: 3933.0'

Depth	Sample	Soil Log	Description	SPT Blows/Ft	Moisture Percent	Dry Density (pcf)	LL	PL	PI	Unconfined Compressive Strength (TSF)	Passing 200 Sieve
0			Brown Clayey Sand with Rock (SC) 4/2 7.5YR	12 6" 20 12" 45 18"	5.5		32	19	13		25.6
			* Total Depth - 2' * Auger Refusal - Hard, Dense Rock								
5											
10											
15											
20											
25											
30											
35											
40											

PROJECT: **Lovington Fire Station # 2**
WDG PROJECT NO: **445-01**
DATE: **July 10, 2018**

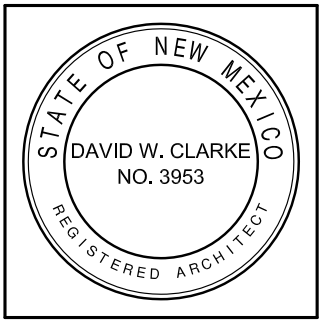
ADDENDUM NO. 4

NOTICE TO PROPOSERS: This Addendum forms a part of the Contract Documents and modifies the original Specifications and Drawings for Lovington Fire Station # 2, dated June 30, 2017 (drawings) and July 5th, 2018 (specifications.)

Acknowledge receipt of this Addendum in the space provided in the Proposal Form. Failure to do so may disqualify the Bidder.

David W. Clarke

July 10, 2018
Date



CLARIFICATION:

A) None

SPECIFICATIONS:

A) Add Specification Section 003132 Geotechnical Data. Refer to attached Geotechnical Data report.

DRAWINGS:

A) None

Substitution Request:

1. Resilient Sheet Flooring 09 65 16: Drop zone, Speckle, Tarkett Sports. Resilient rubber flooring for Fitness Area: **Approved.**
2. Communications Division 27: Belden Cable and products approved on the condition that it is a complete end-to-end Belden system in order to achieve Belden's Extended Warranty. **Approved.**
3. Communications Division 27: Mohawk Category 6 cable, is approved on the condition that it is a complete end-to-end Belden system in order to achieve Belden's Extended Warranty. **Approved.**

Attachment:

1. Geotechnical Data Report, Dyess-Peterson Testing Laboratory, inc. Dated March 29, 2017

END OF ADDENDUM NO. 4