ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical ◦ Construction Materials ◦ Environmental

July 26, 2001

Mr. Bob Personette
8800 Aquary Court
Springfield, Virginia 22153

ECS Job No. 7195

Reference: Report of Subsurface Exploration Services for Personette Tennis Courts, Springfield, Fairfax County, Virginia

Dear Mr. Personnette:

As authorized by your acceptance of our proposal No. 12588-GPR, Engineering Consulting Services, Ltd. has completed the subsurface exploration for the above referenced project. The subsurface exploration consisted of performing six hand augers at various locations around the two tennis courts in Springfield, Virginia. In conjunction with the hand augers Dynamic Cone Penetrometer Tests (DCP) were performed at various depths to determine the relative density of the in-place soils. This exploration was performed to determine the possible causes of the cracks of the existing pavement along the tennis courts. The approximate location of the exploration points are shown on the Boring Location Diagram provided in the Appendix.

Background

The above referenced site consists of two tennis courts as well as a basketball court off of Arley Drive in Springfield, Virginia. Upon initial observation of the tennis courts, cracking was evident throughout the pavement of the tennis court. Based on the existing site topography, fill was most likely placed for constructing the tennis courts. Based on the information provided to us, it is understood that the tennis court has received several overlays in recent years. However, the cracking of the tennis court continues to occur. In order to better evaluate the subsurface conditions, a series of six hand augers were performed.

Exploration Procedure

A hand auger probe consists of a four inch diameter hole drilled with a portable auger bucket. Each of the hand auger probes were extended to bucket refusal within the existing soil matrix. The soil samples recovered were visually classified in the field on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS). The group symbols for each soil type are indicated in parenthesis following the soil description on the hand auger logs. A brief description of the USCS is included with this letter. The stratification lines designating the interfaces between earth materials on the hand auger logs and profiles are

approximate; in-situ, the transitions may be gradual. Hand auger results are include with this letter.

Additionally, Dynamic Cone Penetrometer (DCP) tests were performed in accordance with ASTM STP-399 at selected depths in each of the hand auger probes to evaluate the relative strength of the anticipated foundation bearing soils. The DCP tests consist of dropping a 15 pound weight over a distance of 20 inches. The number of blows required to advance the cone 1.75 inches, determines the DCP blow count. The blow counts can be empirically correlated to the Standard Penetration Test (SPT) and subsequently the bearing capacity and relative density can be evaluated for specific soil types. The results of the DCP testing are also included in the text of this report.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications, moisture content tests, and Atterberg Limits. All data obtained from the laboratory tests are attached with this letter report.

An experienced soil engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the tables in the following section.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposition.

Results of Subsurface Exploration

The exploration points encountered approximately 4 to 5 inches of asphalt pavement followed by 3 to 5 inches of stone. Beneath the pavement and subbase material, existing fill soils were encountered to depths of 2 to 5 feet below the existing ground surface. The fill soils consisted of CLAY (CL, CH), and SAND and Asphalt fragments (GP, SP). Natural soils were encountered in only two of the hand augers and consisted of primarily Sandy CLAY and CLAY (CL, CH). In addition to the soils found in our hand augers, perched water was noted in the vicinity of Hand Auger No. 6 at a depth of approximately 3 feet. A graphical log of each of the hand augers is in the attached Appendix.

Engineering Recommendations

The presence of medium to highly plastic clay under the majority of the existing tennis court, indicates that the cracking is most likely a result of the high shrink-swell potential of the soils.

In addition, the presence of perched water underneath the tennis court is also a contributing factor.

Due to the presence of medium to highly plastic soils and the possibility of perched groundwater, we are recommending the following of two options. The first involves complete removal of the existing asphalt and gravel subbase followed by a 2-foot undercut of the existing soils and replacement with properly placed low plasticity, preferably granular engineered fill. The second involves only a limited undercut utilizing lime stabilization in the upper 1 foot of soils. Regardless of the alternative chosen we recommend the installation of a french drain system around the existing tennis court. Each of the two options are discussed in detail in subsequent paragraphs.

The first and most conservative of these options is to completely remove the existing asphalt and stone subbase. Following the removal, we recommend that 2 feet of existing soil, most notably the high plasticity clay, be undercut and removed. Following the removal we recommend the area be thoroughly proofrolled to identify any soft or unsuitable material. Proofrolling involves using a loaded dump truck, having an axle weight of at least 10 tons, over the exposed subgrade to identify any localized soft or unsuitable material which should be removed. Once a stable subgrade is achieved, fill should be placed in order to achieve the existing finished tennis court elevation. We recommend that fill used to support any of the proposed tennis court should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within 2% of the optimum moisture content, and compacted to at least 95% of the dry density obtained from ASTM D-698, Standard Proctor Method. However, we recommend that the upper 1 foot be compacted to at least 100% of the aforementioned maximum dry density.

It is critical that any soil placed as fill should be of an approved material, free of organic matter or debris, be a non-frost susceptible soil, and have a liquid limit and plasticity index less than 40 and 15, respectively. The surficial soils encountered in our hand auger do not appear suitable for reuse as engineered fill. We recommend that SM or more granular soils be utilized for backfill and establishing the proposed subgrade.

As an alternative to a complete 2 foot undercut of the existing clay soils, we recommend the use of lime stabilization. Lime stabilization would involve the removal of the asphalt and stone subbase and applying hydrated lime to the upper 1 foot of the exposed subgrade. We recommend treating the subgrade soils to a depth of 1 foot with an estimated 4% to 6% hydrated lime. Following lime stabilization fill placement can proceed as detailed in the previous paragraph.

Regardless of either scenario chosen we recommend that a french drain be installed around the tennis court that will serve to drain water away from the tennis courts. A french detail is attached with this letter.

Pavement Considerations

Once the subgrade has been properly remediated or stabilized, replacement of the existing tennis court can begin. With the appropriate routine maintenance a new pavement section should have a serviceable lifespan of 20 years. We recommend that a minimum 2 inches of surface course asphalt in conjunction with a 4 inch subbase aggregate (21A) be used to restore the pavement section. In addition, geogrid reinforcement may be applicable underneath the subgrade aggregate. A geogrid reinforcing layer would serve to reduce the potential for differential settlement in areas of the court where some localized soft material may still exist. Tensar BX1100 geogrid is typically used in this application. If used, the geogrid should be placed in accordance with the manufacturer's recommendations. It should be noted that a final pavement design should be performed based on the CBR value of the final subgrade soils.

Closing

This report has been prepared for your use and for the use of other design professionals in design and construction planning for the proposed improvements to the existing tennis court in Springfield, Virginia. Any changes in the design or additional information regarding the history of the existing tennis court, should be brought to our attention in order to determine any affect on the recommendations presented in this report. We also recommend that we be given the opportunity to assist you in reviewing the prospective bids so that we can determine whether or not the contractors have properly interpreted the project requirements. Additionally, we recommend that you contact us prior to the construction phase, so that we can coordinate the field observations and testing during the execution of the proposed improvements.

We have enjoyed being of service to you. If you have any questions with regard to the information and recommendations presented in this report, or if we can be of further assistance, please do not hesitate to contact us.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

Chadd W. Yeatts, E.I.T.
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