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October 25, 2004

CONSULTANTS IN DEVELOPMENT, DESIGN, AND CONSTRUCTION
GEOTECHNICAL
ENVIRONMENTAL
ARCHAEOLOGY
WETLANDS
CONSTRUCTION SERVICES

Mr. Mark Heyde
Spring Mill Valley, LLC
14662 Adgers Wharf Drive
Chesterfield, Missouri 63017

RE: Slope Stability Study
Spring Mill Valley - Lots 39 through 43
Jefferson County, Missouri
SCI No. 2003-2035.00

Dear Mr. Heyde:

At your request, SCI Engineering, Inc. (SCI) conducted a global stability study of the failed slope located on the east side of Lots 39 through 43 in the Spring Mill Valley Development. The purpose of our study was to determine what repair measures are required to achieve an adequate factor of safety for global stability. This study was performed following our site meeting on August 31, 2004.

PROJECT DESCRIPTION

The project site is the Spring Mill Valley development, located in House Springs, Missouri. More specifically, the development is located on the northwest side of Gravois Road between its two intersections with Oakcrest.

Lots 39 through 43 of the development are located on the east side of Erin Meadow. During the general grading of the site, fill was placed on these lots to establish the proposed building areas. SCI monitored the placement of fill material on these lots between March 24 and May 27, 2004, summarizing our observations in a letter dated July 7, 2004. The fill slope was constructed without the benefit of grade stakes. The undated development plan that you provided to SCI on December 18, 2003 depicts little to no proposed grading in the area of the constructed slope.

Our initial observation of the failed slope was made in conjunction with a site visit to observe an existing rock cut on August 13, 2004. At the time of our observation, the slope failure extended along the slope in the area of Lots 40 through 42. The upper portion of the slope had sloughed off, leaving no well defined scarp face. The slid soil mass appeared to be intermixed with mulch clippings that had been placed on the slope face at the completion of grading. The slope appeared to be steeper than the originally planned 3 horizontal to 1 vertical (3H:1V). The failed slope was re-observed, and appeared to be in a similar condition, during our August 31, 2004 site visit. The proposed development plan, including the pre-grading topography and proposed lot and road layouts of this portion of the development are shown on the Site Plan, Figure 1.

We have reviewed the *Preliminary Geotechnical Report* for the subject site, dated February 2003, and prepared by SCI. We have also reviewed our *Phase I and Phase II, Slope Stability* report dated January 29, 2004. This report did not address the fill slope that was subsequently constructed on Lots 39 through 44. In addition, we reviewed our *General Site Grading (Lots 39 through 44)* dated July 7, 2004. We are not aware of any other previous studies on this specific site, by SCI or others that would affect the preparation of this report.

ANALYSIS AND RECOMMENDATIONS

Our slope stability analysis was performed using the computer program STABL5M. We analyzed three sections for a minimum factor of safety (FS) of 1.5 since permanent, inhabited construction is located within the zone of critical failure arcs. The sections were located on Lots 40, 41, and 43 as shown on the Site Plan, Figure 1.

The original surface elevations along the modeled sections, for input into our analyses, were interpolated from the development plan that you provided to SCI on December 18, 2003. The existing surface elevations along the three sections were surveyed by SCI on September 3, 2004.

The subsurface stratigraphy along the sections was modeled based on the previous test pits completed on the site, and knowledge of the type of fill material placed during the general grading operation. Soil properties were estimated by modeling the observed failure at the site, and then adjusting (back calculating) the soil properties until a FS of approximately 1.0 (imminent failure) was calculated. Each of the sections was independently modeled to derive the soil properties at the time of failure. Generally, good correlation was achieved between the soil properties for the various existing conditions modeled.

SCI's analysis of the slope for the modeled section indicates that corrective measures are required to achieve an acceptable FS on the order of 1.5. This is based upon a proposed configuration consisting of a 2H:1V slope, with the toe of the slope located approximately 5 to 7 feet west of the intermittent creek, and the crest of the slope located at an elevation approximately 11 feet below the street grade. This configuration provides a relatively level backyard (2 feet of slope over a yard distance of approximately 15 to 20 feet, assuming a 30-foot-deep house footprint, and the front of the house established 45 feet from the centerline of the street).

Shot Rock Keyway

A shot rock keyway could be installed along the slope to establish global stability. The keyway would be of variable width ranging from a minimum width of 5 feet at Section A (which would require widening for constructability purposes), 20 feet wide at Section B, and 30 feet wide at Section C. The proposed configuration of the keyway is shown on the Site Plan. The keyway should extend to bucket refusal of a large trackhoe on competent bedrock. Our analyses of the modeled sections after the recommended improvements indicate acceptable FSs of the entire slope of approximately 1.5. We also checked for failure above and, where appropriate, below the proposed shot rock keyway. These analyses indicate acceptable FSs of approximately 1.5.

The key should be excavated with vertical sides as much as construction will allow. The length of the keyway would be approximately 370 feet, extending roughly from the north edge of Lot 39 to near the Lot 43/44 boundary. However, the actual extent of the required keyway may be somewhat longer or shorter, and should also be determined during construction. The uphill edge of the keyway should be constructed beginning at existing elevations ranging from about 565 to 540, decreasing from Section C to

Section A. The uphill edge elevations generally correspond to a location on the slope where the depth of the existing fill ranges from about 6 to 8 feet. As such, an average key depth of about 11 feet is anticipated, with somewhat deeper and shallower excavations at the uphill and downhill edges of the keyway, respectively. We would like to assist in defining the location of the keyway in the field, since minor adjustments may be appropriate. We estimate that the excavation would consist of approximately 3,000 cubic yards of soil.

A well graded shot rock with a maximum dimension of 18 inches should be used to backfill the excavation. SCI should approve the crushed rock source and gradation prior to its use. Compaction will be achieved with the tamping action of the trackhoe bucket. Compaction testing of these materials is not practical using conventional methods (nuclear density gauge or drive tubes), and is usually based on a performance guideline in the field.

The shot rock should be capped with approximately 12 inches of soil to reduce surface water infiltration. We recommend that filter fabric be installed between the top of the rock backfill and the bottom of the soil cap. For a coarser rock gradation, Mirafi 600X or equivalent should be acceptable. For a less coarse rock gradation, Mirafi 180N or equivalent should be acceptable. All filter fabric should be overlapped in accordance with the manufacturer's recommendations.

Concrete Keyway

Alternatively, a concrete keyway could be installed along the slope to establish global stability. The keyway should consist of a minimum 3-foot-thick, un-reinforced, lean concrete (minimum shear strength of 5,000 psf) section. The keyway should be installed near the uphill edge of the shot rock keyway option, as depicted on the Site Plan. The keyway should extend to bucket refusal of a large trackhoe on competent bedrock. Our analyses of the modeled sections after the recommended improvements indicate acceptable FSs of the entire slope of approximately 1.9 to 2.2. We also checked for failure above and, where appropriate, below the proposed concrete keyway. These analyses indicate acceptable FSs of at least 1.5.

Again, the length of the keyway would be approximately 370 feet, extending roughly from the north edge of Lot 39 to near the Lot 43/44 boundary. However, the actual extent of the required keyway may be somewhat longer or shorter, and should also be determined during construction. An average depth of about 12 feet is anticipated. We would like to assist in defining the location of the keyway in the field, since minor adjustments may be appropriate. We estimate that the excavation would consist of approximately 500 cubic yards of soil.

The concrete key can be capped with approximately 12 inches of soil if desired for aesthetic purposes. A filter fabric, such as that recommended for the shot rock keyway alternative, is not required.

Slope Flattening / Grade Reconfiguration

An alternative to a shot rock or concrete keyway is to reduce the grade of the existing slope to 3H:1V. However, with this option the crest of the slope would be located in the 45-foot-wide setback between the centerline of the street and the front of the building line, resulting in a 3H:1V slope across the building area.

Another option, for which we have not yet evaluated global stability, grade reconfiguration could be considered. This option would consist of lowering the planned finished floor elevations of the houses on Lots 39 through 43, by constructing a retaining wall between the street and houses and/or sloping the front yards downward. The finished floor elevations could potentially be established up to about one full level lower than planned, effectively reducing the overall height of the slope and allowing for the establishment of a 3H:1V slope with an approximately 15-foot-wide, relatively level back yard.

CONSTRUCTION RECOMMENDATIONS

A representative from SCI should be on site during keyway construction to monitor the progress, observe for instability of the slope, and to provide additional input and modifications to our recommendations, as needed. Additionally, SCI should check for proper location, bearing materials, and width.

Since continuous stability of the slope during installation of the recommended slope improvements is a concern, we recommend that they be installed in sections, rather than being completely excavated all at one time, with recommended maximum 20-foot-long sections. Alternately, and preferably, we recommend that the shear key be excavated in a continuous manner and that the rock or concrete backfill be placed immediately behind the excavated zone, with no more than 20 feet being left open at any time. During installation of the slope improvements, the excavated soils should be removed from the area or placed along the downslope side of the excavation for later re-establishment of a 2H:1V slope. Excavated soils should not be placed upslope of the excavation.

Once the keyway has been constructed, the regrading of the slope should involve destroying the old scarp faces or planes of weakness to avoid long term sloughing of the surface soils above the keyway, and establishment of a 2H:1V slope. The surface to receive fill should be horizontally benched, and the replaced soils should be compacted in lifts and controlled to achieve a minimum of 85 percent modified Proctor (ASTM D 1557). Some moisture adjustment (drying) of the soils may be required to achieve compaction.

Additionally, and because our analysis assumed the absence of groundwater, proper surficial drainage and vegetative cover of the slopes must be provided to reduce surface water infiltration on the slope face and the potential for saturation of the underlying soils.

LIMITATIONS

The recommendations provided herein are for the exclusive use of our client and only for the specific application to the project described. They are based on subsurface information obtained during our *Preliminary Geotechnical Report*; our understanding of the project as presented in the *Project Description*; and geotechnical engineering practice consistent with the standard of care. No other warranty is expressed or implied. SCI should be contacted if conditions encountered are not consistent with those described.

SCI should be retained to provide direct observation during construction, to observe that conditions actually encountered are consistent with those described in this report, and to assess the appropriateness of the analyses and recommendations contained herein. SCI cannot assume responsibility or liability for the adequacy of its recommendations without being retained to observe the construction of the slope.

We appreciate this opportunity to be of continued service. If you have any questions, please call.

Respectfully,

SCI ENGINEERING, INC.

Michael P. McMillen, P.E.
Project Engineer

MPM/TMM/alj/nlw

Enclosure: Figure 1 – Site Plan

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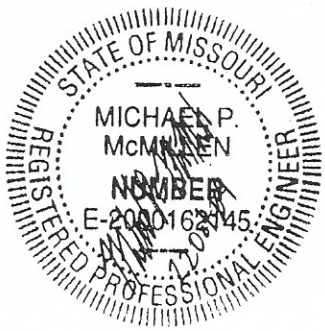

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February 26, 2003

CONSULTANTS IN DEVELOPMENT, DESIGN, AND CONSTRUCTION
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Mr. Mark Heyde
Broadwing LLC
4161A Shenandoah
St. Louis, Missouri 63110

RE: Preliminary Geotechnical Report
4301 Gravois Road Tract
House Springs, Missouri
SCI No. 2003-2035.10

Dear Mr. Heyde:

Attached is our "Preliminary Geotechnical Report" dated February 2003. It should be read in its entirety, and our recommendations applied to the design and construction of the project. Selected excerpts are highlighted below:

- Shallow foundations bearing in undisturbed, natural, low plastic, silty clay; remediated high plastic clay; newly placed structural fill; or competent bedrock is appropriate for support of the proposed development. Specific bearing values will require additional borings or test pits and field or laboratory testing.

- High plastic clay was encountered across the site and will require remediation depending upon foundation bearing elevations.

- Shallow rock was encountered across the site, and will require blasting for removal. We recommend that the presence and character of rock be better defined with additional borings or test pits, when site grading and development plans are finalized.

We appreciate the opportunity to be of service, and look forward to providing additional geotechnical services prior to construction of this project. If you have any questions or comments, please call.

Respectfully,

SCI ENGINEERING, INC.

Matt D. Masterson, E.I.T.
Staff Engineer

T. Michael McMillen, P.E.
Director of Geotechnical Services

MDM/TMM/eak

Two additional copies submitted.