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May 7, 2012

Pat Brewer
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SUBJECT: GEOTECHNICAL INVESTIGATION FOR LANDSLIDE STABILIZATION, 2636 SW BERTHA BOULEVARD, PORTLAND, OREGON

At your request, Foster Gambee Geotechnical, P.C., (Foster Gambee) has conducted a geotechnical investigation of a recent landslide at your above-referenced residential property. The subject property is located on the south side SW Bertha Boulevard approximately 0.25 miles west of its intersection with Beaverton-Hillsdale Highway. As you know, Foster Gambee performed a preliminary evaluation of the landslide, the results of which were provided in our March 26, 2012 letter to you entitled "Preliminary Landslide Evaluation, 2636 SW Bertha Boulevard, Portland, Oregon." The purpose of our study, described herein, was to investigate the cause(s) of the landslide, further evaluate the short- and long-term stability of the slide area, and develop cost-effective measures to stabilize the immediate slide area.

The scope of work for our investigation included:

- Background studies, including reviews of available topographic and geologic/geotechnical information for the property area.
- A detailed ground-level reconnaissance of the slide area to evaluate and document surface materials and conditions, including surface drainage conditions and signs of slope instability.
- The exploration of subsurface conditions in the slide area with hand-auger borings.
- The development of one landslide profile/cross section utilizing information from a topographic survey provided by you and from information obtained from the borings.
- Limited laboratory testing of samples obtained from the borings.
- Engineering studies and analyses.

The fee for this work and terms under which services were provided are in accordance with our March 26, 2012 proposal. This report describes the work accomplished and provides our conclusions and recommendations regarding the subject landslide.

12-139643-SD

BACKGROUND

The Site Plan, Figure 1, shows the layout of the subject property and the limits of the subject (recent) landslide. The Landslide Plan, Figure 2, shows an expanded view of the landslide and many of the other features discussed in this report.

Based on information provided by you, the landslide occurred late on March 14 or during the early morning hours of March 15, 2012. Based on our review of rainfall data as compiled by the National Climatic Data Center (NCDC), the landslide occurred following a period of relatively heavy rainfall. (Total rainfall for the four day period preceding the landslide was 2.41 in. as measured at the Portland International Airport station.) On March 16, 2012, to reduce the risk of additional landsliding and to minimize the transport of sediment away from the property, you covered the slide with 6 mm plastic sheeting (Visqueen) and hand-excavated sediment and vegetation that was obstructing a stormwater ditch in the Bertha Boulevard right-of-way just upslope of the landslide. You report no expansion of the landslide or significant transport of sediment away from the property since completing the above described temporary slope stabilization and sediment control measures. You also report no damage to either the existing residence at the property that, as shown on Figure 1, is located approximately 40 ft east of and lateral to the landslide, or to any other property improvements as a result of the landslide.

The location and approximate to-scale dimensions of the previously mentioned stormwater ditch, as surveyed on April 5, 2012 (about 3 weeks after the landslide and after you had excavated out the ditch), are shown on Figures 1 and 2. The approximate 28-ft-long ditch is about 15 to 20 ft north of the subject landslide and extends between the daylighted ends of buried stormwater pipes, the inverts of which are about 1 ft below the surrounding grade. On March 16, 2012, you observed that the ditch was almost completely filled/clogged with silty sediment and vegetation. The weather was fair on that date, and the small stream of water (estimated by you at about 10 gpm) exiting the upstream (eastern) pipe was ponding just downstream of the outfall. Only a small percentage of the water flowing from the upstream pipe was entering the downstream pipe. Most of the stormwater appeared to you to be seeping into the ground and migrating southward/downslope towards the subject landslide. As you began hand-excavating an approximate 1-ft-wide by 1-ft-deep (essentially vertical sided) channel along the ditch line, you observed water flowing rapidly back into the open ditch from its south side. When you completed the ditch excavation/clearing (removing what you estimate to be about 0.5-yd^3 of soil along with weeds and grass), the ditch began to flow freely without any ponding water. We have reviewed photographs and videotapes you took on that date, which appear to confirm/document your above-described observations. Based on your observations at the property and your work clearing the stormwater ditch, you believe that sediment and vegetation present in the ditch at the time of the slide impeded stormwater flow in the ditch, resulting in the general redirection of the stormwater towards the landslide area instead of the downstream stormwater pipe, which caused excessive soil saturation in the landslide area, which in turn caused the landslide.

SITE CONDITIONS

Geologic Setting and Hazards

A review of the available geologic literature indicates the property area is mantled by wind-deposited silt, referred to as Portland Hills Silt, which is underlain by Columbia River Basalt.[1] Portland Hills Silt consists of brown silt containing variable amounts of clay and fine-grained sand. Columbia River Basalt is a dense, fine-grained igneous rock that is typically dark gray where fresh and brown or reddish-brown where weathered. Severe weathering of the basalt results in a brown or reddish-brown, clayey silt residual soil that contains basalt gravels and cobbles near the contact with the underlying weathered bedrock.

Steep (generally 27° or steeper) hillsides underlain by residual soils that have developed over the Portland Hills Silt and the Columbia River Basalt, or silt fill deposited over such residual soils, are locally susceptible to landslides, especially along drainages where there is active stream erosion. The property is mapped within a potential landslide hazard area by the City of Portland. Recently published (2010) Landslide Inventory Maps of the Lake Oswego Quadrangle show no landslides mapped on or immediately adjacent the subject property.[2] An approximate 0.25-acre, "historic and/or active (movement less than 150 years ago)" landslide is mapped on a drainage slope about 300 ft south of the subject property.

On the Relative Earthquake Hazard Map of the Portland Metro Region, Clackamas, Multnomah, and Washington Counties, Oregon, the property is mapped in zone B.[3] (Range: A–D, with A being the highest relative hazard.) This designation is due primarily to the risk of ground motion amplification and, to a lesser degree, slope instability during a relatively strong seismic event. Based on our experience, this designation probably does not account for the presence of fill soils in the property area; the presence of fill would likely result in a higher hazard level designation. Although it is now widely accepted that damaging earthquakes much larger than any in the historical record are possible in the Portland area, accurately predicting their magnitude, location, and probability is difficult due to the lack of a complete historical record. For this reason, the Relative Earthquake Hazard Maps do not quantify the earthquake hazard at any given site but are limited to depicting general areas with relatively higher risk of earthquake damage due to local geologic and topographic conditions. The effect of such damaging earthquakes on local slope stability is beyond the scope of this investigation.

Surface Conditions

Ground-level reconnaissances of the landslide area were conducted on March 19 and April 19, 2012. The purpose of the reconnaissances was to observe and evaluate site topography, materials exposed at the ground surface, indications of slope instability, site drainage, and any other property conditions that might reflect or affect the stability of the landslide area. Site conditions were essentially the same on the two reconnaissance dates. Observations made during the site reconnaissances are summarized below.

- As shown on Figures 1 and 2, the property is located on the northeast side of a drainage that is a tributary to Fanno Creek. Cross Section A-A', Figure 3, shows a ground surface profile of the drainage slope in the area of the subject landslide. The overall drainage slope measures roughly 2H:1V (27°), but the slope is irregular with local flatter and steeper areas. Based on local topography and surface exposures, the natural drainage slope in the slide area is blanketed by several ft of fill that is part of a large embankment that was placed in the drainage to provide a crossing for SW Bertha Boulevard.

- The landslide measures about 30-ft-wide and 50-ft-long (plan view dimensions). The landslide's approximate 10-ft-high, very steep (50 to 70°, locally near-vertical) headscarp is located 5 to 10 ft inside (south of) the northern property line (which is also the south edge of the Bertha Boulevard right-of-way), and about 20 ft south of the south edge of the SW Bertha Boulevard pavement. The landslide has no prominent lateral scarps. The middle portion of the landslide is an essentially unvegetated scour zone. The toe of the landslide consists primarily of a low (less than 5-ft-high/thick) mound of landslide debris.

- Based on materials exposed in the landslide headscarp, the landslide appears to be largely contained to the steeply inclined, silty fill slope materials. Except for an approximate 1-ft-thick layer of apparent buried topsoil at its base, the landslide headscarp exposes fill generally comprised of brown and gray-brown silt with a trace to some clay and scattered gravel, cobbles, and pieces of wood. Based on probing with a steel rod and undrained shear strength values of 0.2 to 0.5 tsf obtained with a Torvane shear device, the consistency of the fill materials exposed in the headscarp is generally soft to medium stiff. The presence of a buried topsoil layer beneath the fill and the relatively soft consistency of the fill indicate that the native ground surface was not benched prior to the fill placement and that the fill was not systematically compacted as it was placed.

- The drainage slope in the area of the subject landslide is vegetated primarily with English ivy, blackberry vines, and scattered deciduous and evergreen trees. No significant groundwater seepage or surface water was observed in the immediate slide area at the time of our reconnaissances. Water was flowing in an unobstructed manner in the approximate 1-ft-wide by 1-ft-deep ditch that you excavated as discussed in the Background Section of this report. We estimate the flow volumes of about 10 and 100 gpm at the time of our March 19 and April 19, 2012 site visits, respectively.

- No indications of other active or recent landsliding were observed within about 100 ft of the subject landslide. Based on our observations at the time of our reconnaissances and as can be inferred by the topographic contours on Figures 1 and 2, a lobate-shaped mound of soil underlies the toe of the recent landslide and extends downslope to the base of the drainage which we interpret to be an "old" landslide. Although the age of the old landslide was not determined, based on the eroded nature of the slide mass and vegetation covering the slide, the old landslide appears to be at least 50 years old. Topographic features indicative of other old landsliding, such as eroded scarps and irregular topography, were observed across the drainage from the subject property. The presence of the subject landslide and older landslides indicates that existing drainage slopes in the general area of the subject landslide are marginally stable and subject to landsliding.

Subsurface Conditions

Subsurface conditions in the vicinity of the landslide were explored on April 19, 2012 with four hand-auger borings, designated B-1 through B-4 and drilled to depths of 5.2 to 6.0 ft. Approximate locations of the borings are shown on Figure 2. The relative consistency/hardness of subsurface materials was evaluated by observing auger cuttings and noting the relative ease of auger advancement. Detailed logs of conditions and materials encountered in the borings were maintained. Representative soil samples were obtained for further examination in our laboratory, where their physical characteristics were noted and field classifications modified where necessary. The natural moisture content of each soil sample was determined in our laboratory in substantial conformance with ASTM D 2216. Materials and conditions encountered in the borings are summarized in Table 1 and on Figure 3. Terms used to describe soils are defined in Table 2.

As disclosed by the subsurface explorations made as part of this investigation and as shown on Figure 3, several ft of fill material comprised primarily of silt mantle the landslide headscarp area and areas immediately upslope of the headscarp. The thickness of the fill decreases towards the northern property line/street right-of-way. Based on materials exposed in the headscarp, local topography, and our experience, it appears the fill also mantled most of the upper landslide area, but the slide removed and transported the fill downslope to form the low mound of debris at the toe of the landslide. As discussed in the Surface Conditions section of this report, fill exposed in the landslide headscarp consists primarily of soft to medium stiff, brown and gray-brown silt, and a shallow layer of similar fill was encountered in boring B-1.

Native soils encountered below the fill in the landslide headscarp area and upslope of the headscarp consist of an up to 1-ft-thick layer of buried, dark brown, organic-rich topsoil over intact, non-organic silt. The native silt is generally medium stiff in consistency, gray or gray-brown in color, and contains a trace to some clay. The natural moisture contents of two native silt samples are 28 and 30%. Borings B-1 and B-2 were terminated in the native silt.

Boring B-3, located at the toe of the landslide, encountered 4.8 ft of recent landslide debris at the ground surface consisting of very soft, gray-brown and brown silt containing a trace to some clay and scattered organics. A sample of the recent landslide debris obtained from a depth of 3.0 ft in boring B-3 has a moisture content of 32%.

Old landslide debris (debris from an earlier landslide that predates the subject, recent landslide) was encountered beneath the recent landslide debris at the toe of the recent landslide and mantling the ground surface downslope of the recent landslide. The old landslide debris generally consists of medium stiff, varicolored silt containing a trace to some clay. The natural moisture contents of two old landslide deposits are 29 and 31%. Borings B-3 and B-4 were terminated in the old landslide debris.

Groundwater was not encountered in any of the borings drilled as part of this investigation. Based on our experience, the regional groundwater table is at least 10 ft below the ground surface year-round. However, perched groundwater and saturated soil conditions are likely to develop within the fill, native silt, and landslide debris during periods of prolonged or intense precipitation.

SUMMARY AND CONCLUSIONS

After a period of relatively heavy rainfall, the recent landslide occurred in silt fill that mantels a steep drainage ravine slope. Temporary slope stabilization measures (including covering the landslide with plastic sheeting and removing sediment and vegetation that were obstructing a stormwater ditch just upslope of the landslide) were undertaken shortly after the landslide occurred. You have indicated that prior to your removal of soil, weeds and grass obstructed the ditch and the flow of stormwater in the ditch was visibly impeded by these obstructions. As a result, a significant portion of the stormwater appeared to be directed towards the landslide instead of the stormwater collection pipe at the downstream end of the ditch. Photographs and videotapes of the stormwater ditch taken by you shortly after the landslide appear to confirm your observations. There has been no significant additional ground movement in the landslide area since you completed the temporary slope stabilization measures.

The headscarp of the landslide forms a very steep, approximate 10-ft-high slope. The central portion of the slide is comprised of an unvegetated scour zone, and a low mound of landslide debris is present at the toe of the landslide. Topographic features indicative of old landslides, such as eroded, lobate-shaped deposits and scarps, and irregular topography were observed on the drainage slopes in the area of the recent landslide. The recent and older landslides indicate that existing drainage slopes in the general area of the recent landslide are marginally stable and subject to landsliding.

Based on the findings of our investigation, we conclude the following:

- The primary causes of the subject landslide are the steep configuration of the drainage slope, the presence of low strength fill blanketing the slope, relatively heavy precipitation preceding the landslide (which contributed to fill saturation), and additional (a larger area of) fill saturation from obstruction of stormwater flow in the ditch located upslope of the landslide. Based on the scope of our investigation and our findings, we are unable to rank or quantify the relative significance of these landslide causes. The primary evidence that fill saturation from the stormwater obstruction was a significant cause, and probably the triggering mechanism for the landslide, includes:

    1. The close proximity of the stormwater ditch to the landslide, and the similarity in the length of the ditch and the width of the landslide.

    2. The landslide occurred after a period of relatively heavy, but not extreme or record, rainfall. To our knowledge, there was no widespread landsliding in the Portland area on or around the time of the subject landslide. The lack of extreme rainfall or widespread landsliding on/around the subject landslide date implies that a localized, transient event

unique to the property (such as localized stormwater flooding) likely was a significant cause of the landslide. It also seems reasonable to conclude that the clogging of the ditch and the associated local fill saturation was progressive, meaning that the landslide would not necessarily have to occur during an extreme rainfall event.

- If long-term remedial measures are not undertaken to stabilize the landslide headscarp area, there is a significant risk of the landslide headscarp retrograding (expanding) upslope towards the street right-of-way, primarily during future wet seasons, and increasing the risk of erosion and transport of sediment from the property. Based on local topography and surface and subsurface conditions, there appears to be less risk of significant loss of ground or erosion from the middle and toe areas of the landslide in the near future.

RECOMMENDATIONS

General

When considering various possible slope stabilization schemes for drainage slopes in Portland's West Hills, it is important to recognize that the landsliding on these slopes is generally a natural process. While fill placement and drainage alterations have locally increased the frequency of landsliding, it is evident that landslides have occurred along these slopes in the past and will continue to occur in the future. Based on our understanding of the geologic history of the West Hills, the drainages were formed in large part by landslides; the evolution of the drainages is an ongoing, dynamic process. Although this process could be checked by a continuous system of man-made buttresses and retaining walls, it is our opinion that such a slope management strategy is neither practical (from an economic standpoint) nor consistent with our understanding of the City of Portland's overall goal of maintaining natural drainage systems. An alternative, more passive, slope management strategy would be to enhance drainage slope stability by more passive methods (such as slope regrading and re-vegetation, and surface drainage control), geared more towards letting nature take its course. During discussions with you, you have indicated your preference for the latter, more passive, drainage slope management approach. With this in mind, we recommend that the stability of slopes in the immediate area of the recent landslide headscarp be increased through:

- Regrading the landslide headscarp area.
- Revegetating unvegetated or poorly vegetated ground in the landslide area (primarily the regraded headscarp and the central landslide scour areas).
- Improving and maintaining the existing stormwater ditch.

The following paragraphs provide detailed recommendations for this slope management strategy. These landslide stabilization measures should be completed as soon as practicable and prior to the upcoming wet season (i.e., by mid-September).

Regrading the Landslide Headscarp Area

The regrading work should at a minimum consist of flattening the headscarp (the approximate upper 10 ft or so of the slope) to no steeper than 2H:1V (27°) or as flat as practical to gradually transition the regraded slopes to existing, steeper drainage slopes lateral to the landslide headscarp. The approximate limits of the recommended headscarp regrading are shown on Figures 2 and 3. The slope regrading work will require the removal or realignment of an existing landscape path just east of the landslide headscarp. Due to slope stability considerations, we recommend the offsite disposal of all excavation spoils resulting from slope regrading. Disturbance and the removal of vegetation should be minimized in areas outside of the slope regrading area. Prior to the start of slope regrading, the regrading contractor should locate underground utilities in the regrading area and address related conflicts.

Revegetating the Landslide Area

Upon completion of the slope flattening, all regraded or otherwise unvegetated slopes should be covered with 3 to 4 in. of mulch. Mulched slopes steeper than 2H:1V (where 2H:1V slopes transition to steeper drainage slopes adjacent to the landslide) should be covered in Geojute erosion control fabric. The edges of the Geojute should be overlapped, and the Geojute should be staked to the hillside in accordance with the manufacturer's recommendations. To establish a vegetative cover prior to the onset of the next rainy season, the mulched slopes should be replanted or reseeded as soon as practical.

Improving and Maintaining the Existing Stormwater Ditch

As discussed in the Background and Surface Conditions sections of this report, the current drainage ditch measures about 1-ft-wide and 1-ft-deep with vertical sides. For the purposes of increasing the stability of the ditch side slopes and decreasing ditch erosion, we recommend that the ditch side slopes be sloped back (flattened) to 1H:1V or flatter. We recommend that the stormwater ditch be periodically inspected to ensure it is unobstructed and that excessive sediment, vegetation or other obstructions be removed as necessary so as to maintain a free-flowing channel.

CLOSING COMMENTS AND LIMITATIONS

To observe compliance with the above grading, erosion control and drainage improvement recommendations, such operations should be periodically observed by a qualified geotechnical engineer. In addition, a qualified geotechnical engineer should periodically monitor property conditions during the upcoming wet season for evidence of additional earth movement, significant erosion, or other conditions that could impact site slope stability. A geotechnical engineer should also observe the landslide area the following summer to evaluate the success of the replanting plan and to assess whether additional planting is warranted.

This report has been prepared to aid the property owner and excavation contractor in the stabilization of the subject landslide area. Detailed investigation was limited to the immediate landslide area.

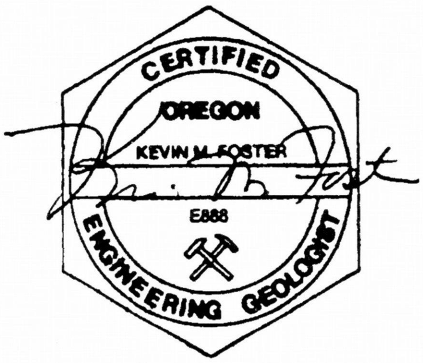
Recommendations provided herein to increase the stability of the landslide area are intended to allow for the reduction, but not elimination, of the risk of potential injury or property damage resulting from future ground movements. As discussed in this report, existing drainage slopes away from the immediate, recent landslide area are marginally stable and there is a long-term risk of additional, similar landsliding on other areas of the drainage ravine. Predicting where or when additional landsliding will occur is difficult and, due to variations in site topography and subsurface conditions, remedial measures presented in this report may not be applicable to other areas of the property susceptible to landsliding. The long-term stability of the subject drainage slopes away from the immediate, recent landslide area can only be evaluated by a more detailed investigation and analysis of elements and conditions away from the landslide area.

Our conclusions and recommendations are based on our observations at the site, data obtained from the subsurface explorations made at the locations indicated on Figure 2, and other sources of information discussed herein. In the performance of subsurface investigations, specific information is obtained from specific locations at specific times. It is acknowledged that variations in soil conditions may exist away from the exploration locations. This report does not reflect variations that may occur, the nature and extent of which may not be evident until the recommended slope regrading work is underway. During slope regrading, if subsurface conditions are observed or encountered that differ from those found in the explorations, we should be advised at once so that we can observe and review those conditions and reconsider our recommendations where necessary.

Please contact us if you have any questions.

Sincerely,
FOSTER GAMBEE GEOTECHNICAL, P.C.

Expires: 6/30/13



Expires: 5/31/12

John E. Gambee, P.E., G.E.
Principal

Kevin M. Foster, P.G., C.E.G., P.E., G.E.
Principal

REFERENCES

1 Madin, Ian P., Earthquake-Hazard Geology Maps of the Portland Metropolitan Area, Oregon, Open File Report 0-90-2, State of Oregon Department of Geology and Mineral Industries, 1990.

2 Burns, William J. and Duplantis, Serin, Landslide Inventory Maps of the Lake Oswego Quadrangle, Clackamas, Multnomah, and Washington Counties, Oregon, IMS-32, State of Oregon Department of Geology and Mineral Industries, 2010.

3 Mabey, Matthew A. and others, Relative Earthquake Hazard Map of the Lake Oswego Quadrangle, Clackamas, Multnomah, and Washington Counties, Oregon, GMS-91, State of Oregon Department of Geology and Mineral Industries, 1995.

Table 1
SUBSURFACE MATERIALS AND CONDITIONS

Boring No.	Depth Range, ft	Material Description	Moisture Content (ASTM D 2216)
B-1	0 to 1.0	FILL: Soft, dark brown SILT; trace clay, organic-rich, rooted	
	1.0 to 2.2	FILL: Medium dense, silty GRAVEL; trace clay	
	2.2 to 3.0	FILL: Soft to medium stiff, brown and gray-brown SILT; trace to some clay, scattered gravel and pieces of wood	
	3.0 to 3.7	Soft, dark brown SILT; trace to some clay, organic-rich (buried topsoil)	
	3.7 to 6.0	Medium stiff, gray-brown SILT; trace to some clay, scattered roots ....stiff, gray-brown mottled rust below 4.5 ft	w = 30% @ 5.0 ft
		Bottom of boring 6.0 ft (4/19/12). Groundwater not encountered.	
B-2	0 to 6.0	Medium stiff, gray-brown SILT; trace to some clay, scattered roots in upper 1.2 ft ....stiff, gray-brown mottled rust 1.2 to 3.7 ft	w = 28% @ 5.5 ft
		Bottom of boring 6.0 ft (4/19/12). Groundwater not encountered.	
B-3	0 to 4.8	RECENT LANDSLIDE DEBRIS: Very soft, gray-brown and brown SILT; trace to some clay, scattered roots and organics	w = 32% @ 3.0 ft
	4.8 to 5.5	OLD LANDSLIDE DEBRIS: Medium stiff, multicolored (gray-brown, brown and rust-brown) SILT; some clay, scattered roots and organics	w = 31% @ 5.0 ft
		Bottom of boring 5.5 ft (4/19/12). Groundwater not encountered.	

Table 1 Continued

SUBSURFACE MATERIALS AND CONDITIONS

Boring No.	Depth Range, ft	Material Description	Moisture Content (ASTM D 2216)
B-4	0 to 5.2	OLD LANDSLIDE DEBRIS: Medium stiff, multicolored (gray-brown, brown and rust-brown) SILT; some clay, scattered roots and organics	w = 29% @ 5.0 ft
		Bottom of boring 5.2 ft (4/19/12). Groundwater not encountered.	

Table 2

GUIDELINES FOR CLASSIFICATION OF SOIL

Description of Relative Consistency for Fine-Grained (Cohesive) Soils

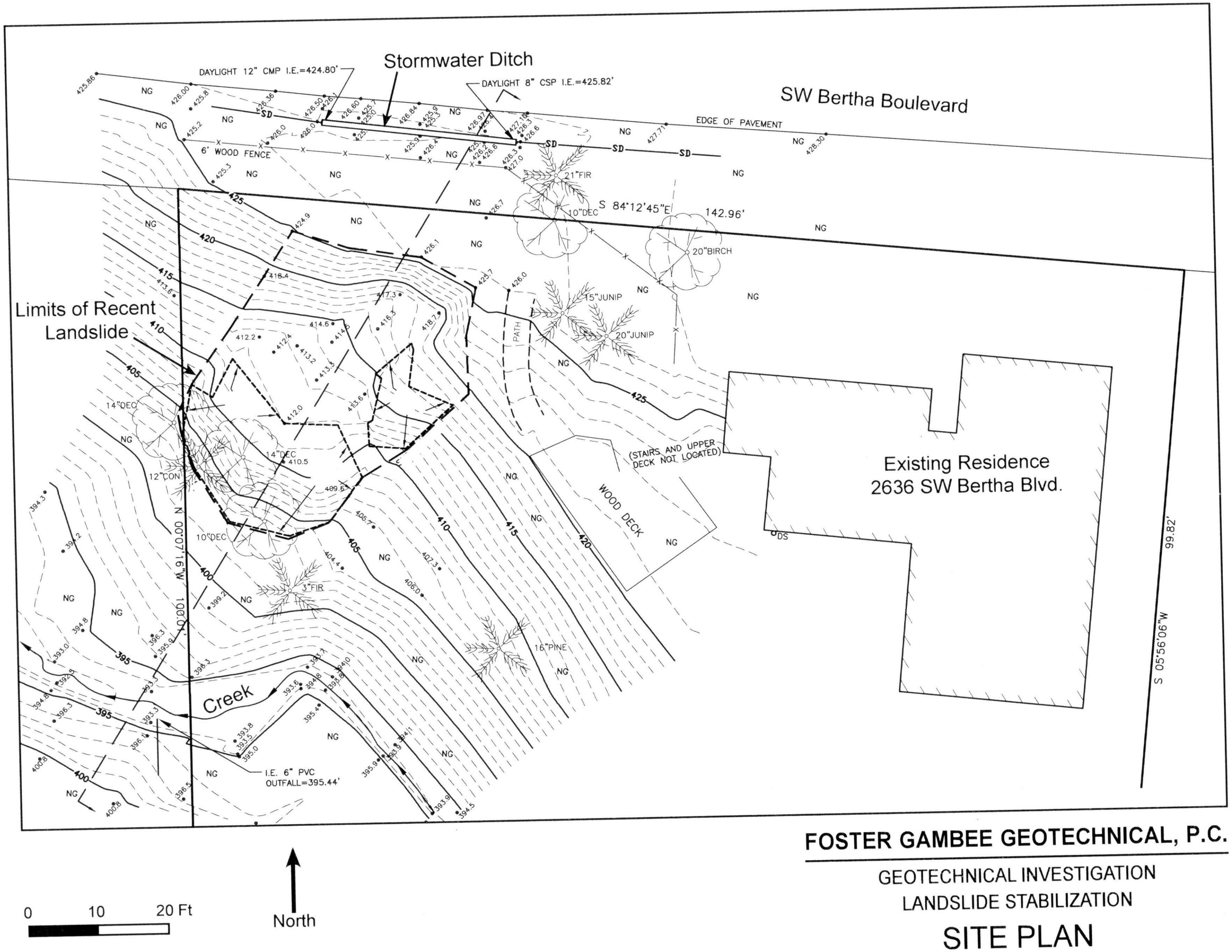
Relative Consistency	Standard Penetration Resistance (N-values), blows/ft	Torvane Undrained Shear Strength, tsf
Very soft	2	Less than 0.125
Soft	2 to 4	0.125 to 0.25
Medium stiff	4 to 8	0.25 to 0.50
Stiff	8 to 15	0.50 to 1.0
Very stiff	15 to 30	1.0 to 2.0
Hard	Over 30	Over 2.0

Sandy silt materials that exhibit general properties of granular soils are given relative density description.

Description of Relative Density for Granular Soils

Relative Density	Standard Penetration Resistance (N-values), blows/ft
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very dense	over 50

Grain-Size Classification	Modifier For Subclassification	
Boulders		**Percentage of**
12 to 36 in.		**Other Material**
Cobbles	**Adjective**	**In Total Sample**
3 to 12 in.	Clean	0 to 2
Gravel	Trace	2 to 10
¼ to ¾ in. (Fine)	Some	10 to 30
¾ to 3 in. (Coarse)	Sandy, Silty	30 to 50
Sand	Clayey, etc.	
No. 200 to No. 40 sieve (Fine)		
No. 40 to No. 10 sieve (Medium)		
No. 10 to No. 4 sieve (Coarse)		
Silt/Clay		
Pass No. 200 sieve		



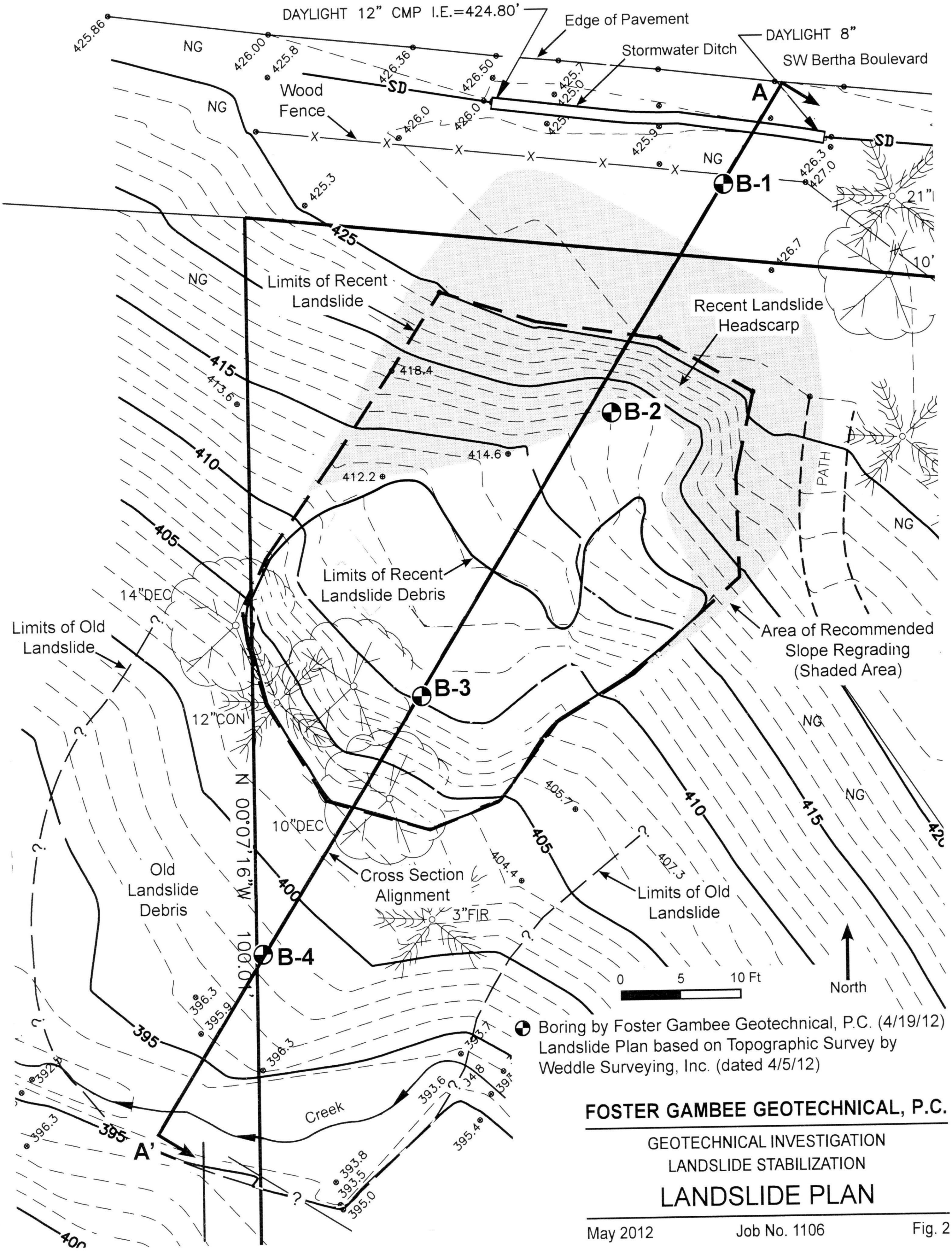
Site Plan based on Topographic Survey by Weddle Surveying, Inc.
(dated 4/5/12)

FOSTER GAMBEE GEOTECHNICAL, P.C.

GEOTECHNICAL INVESTIGATION
LANDSLIDE STABILIZATION

SITE PLAN

May 2012 | Job No. 1106 | Fig. 1



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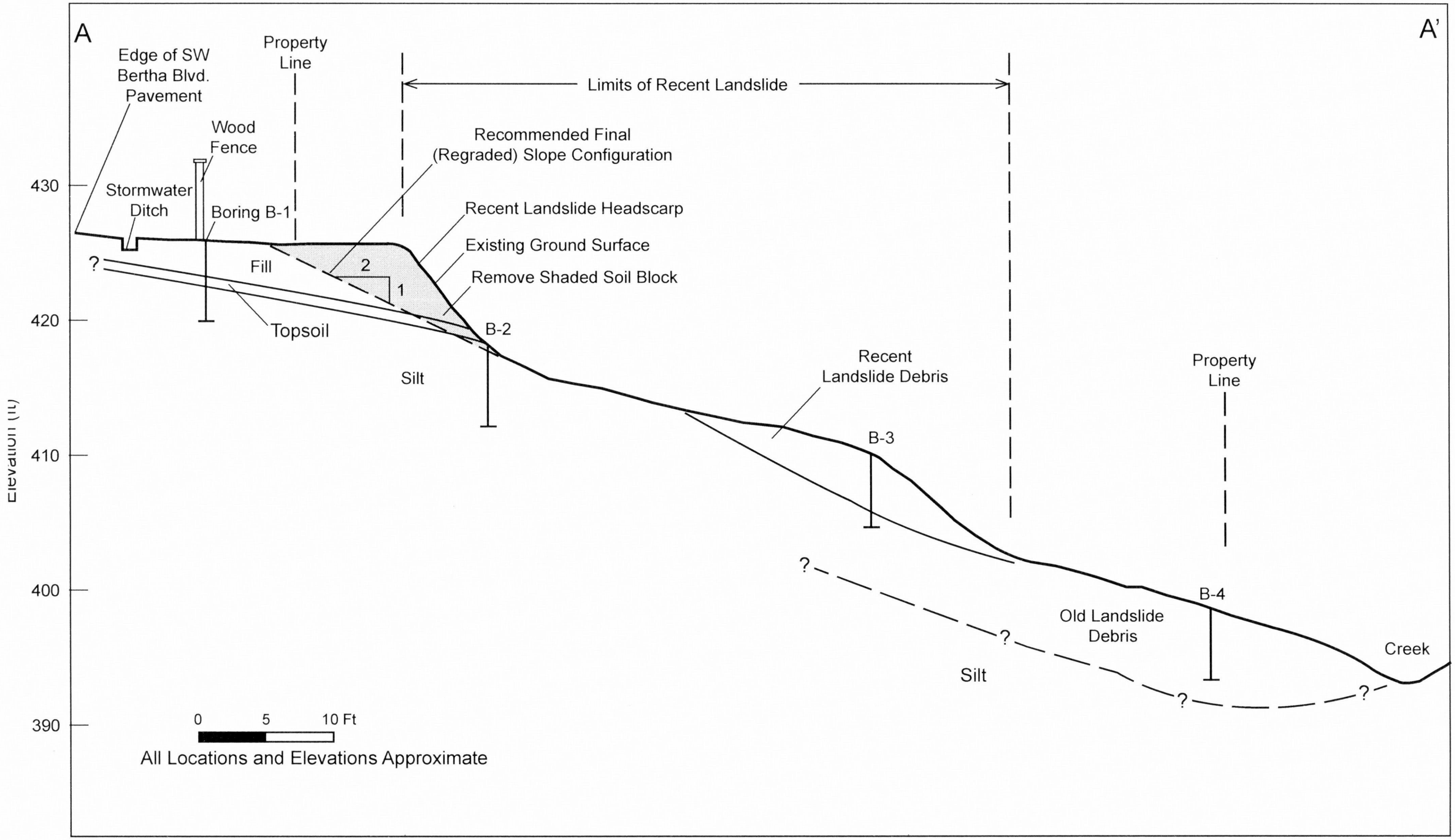
GEOTECHNICAL INVESTIGATION
LANDSLIDE STABILIZATION

LANDSLIDE PLAN

May 2012 Job No. 1106 Fig. 2



FOSTER GAMBEE GEOTECHNICAL, P.C.

GEOTECHNICAL INVESTIGATION
LANDSLIDE STABILIZATION

CROSS SECTION A-A'

May 2012 | Job No. 1106 | Fig. 3