Lee McEnery

From: Erika Shook
Sent: Tuesday, August 29, 2017 12:31 PM
To: 'Joe Brogan'
Cc: Lee McEnery; Linda Ann Kuller
Subject: Whaleback Geotechnical Peer Review
Attachments: Runstad Peer Review Letter.pdf

Hi Joe,
Here is the peer review of the Whaleback LLC geotechnical report. I think that the next step is for DCD to complete review of the permit applications. I need to discuss timeframes with staff next week. I'm happy to answer any questions you may have.

Erika Shook, Director - Direct Line (360) 370-7571
SAN JUAN COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT
360-378-2354 | 135 Rhone Street | PO Box 947 | Friday Harbor, WA 98250

GeoEngineers
600 Dupont Street
Bellingham, Washington 98225
360.647.1510

August 15, 2017

San Juan County
Department of Community Development
PO Box 947
Friday Harbor, Washington 98250

Attention: Erika Shook, Director

Subject: Geotechnical Peer Review
Runstad Bank Stabilization
Blakely Island
San Juan County, Washington
File No. 6740-008-00

INTRODUCTION AND SCOPE

This letter presents the results of GeoEngineers, Inc.'s (GeoEngineers') geotechnical peer review regarding the bank stabilization project that occurred on the Runstad property on Blakely Island. The project site is located along the southeastern shoreline of Blakely Island and adjacent to Thatcher Pass, situated in Northwest ¼ of section 10, Township 35 North, Range 01 West. Our services were performed in general accordance with Agreement 16CD.007 with San Juan County (SJC).

The purpose of GeoEngineers' services was to conduct a peer review of previous geotechnical submittals by others and a SJC code (SJCC) regulatory compliance review as it relates to the bank stabilization project. The scope of services included review of the documents submitted by others in support of the bank stabilization project, a site visit, review of the relevant sections of the SJCC, liaison activities with SJC, and preparation of this report. The purpose of the regulatory compliance review was to provide an opinion regarding whether the bank stabilization and geotechnical submittals meet the conditions of SJCC 18.50.210 and 18.35.130.

BACKGROUND

Our understanding of the site and project history is based on conversations with Erika Shook, Director of SJC Department of Community Development, and review of documents provided by SJC. We understand that a new beach house structure was constructed on the subject Runstad property in 2010-2011. Shoreline erosion reportedly occurred after heavy rains and storm events in the winter of 2010-2011. Shoreline hardening, which consisted of installation of about 500 feet of rock riprap bulkhead (referred to hereafter and in most submitted documents as a "bulkhead" or "bank stabilization"), was constructed

along the Runstad property, primarily east of the beach house structure and below the gravel driveway, which also serves as the utility corridor to the structure. Some of the bulkhead construction was performed by using heavy equipment accessing from the upland area, while some of the construction occurred by using heavy equipment accessing from the beach.

It appears that the bank stabilization was constructed above mean higher high water (MHHW) and above the ordinary high water mark (OHWM), based on review of applicant submittals from their consultant. Therefore, the bulkhead structure itself is not subject to United States Army Corps of Engineers (USACE) jurisdiction or Washington State Department of Fish and Wildlife (WDFW) jurisdiction. The documents reviewed suggest that USACE and WDFW are in concurrence with this conclusion. However, since heavy equipment operated below the OHWM and within the intertidal zone during construction, the project was subject to Hydraulic Permit Approval (HPA) from WDFW. The bank stabilization project is also subject to shoreline permits per the SJCC. We understand that the landowner is seeking an after-the-fact exemption or a Shoreline Substantial Development Permit from SJC to allow the bank stabilization to remain in place.

WDFW issued an enforcement action, and documentation reviewed indicates that the mitigation promulgated by WDFW included (a) revegetating the shoreline with native vegetation, (b) performing beach nourishment (the latter of which would be subject to USACE jurisdiction), and (c) removing some of the boulders located in the intertidal/beach area west of the bulkhead. It appears that the landowner's consultants performed evaluations and monitoring of the beach conditions and concluded that (1) the beach has naturally recovered and stabilized, (2) the bank stabilization has not adversely affected habitat or natural beach conditions, and (3) performing beach nourishment is not necessary. Some isolated large rocks may have been placed along the low bank and beach in front of the beach house. We understand that WDFW has requested removal of some or all of these large rocks in this area as an additional mitigation strategy. The landowner's consultant has submitted documents suggesting that this is not necessary and/or undesirable from a stability standpoint, and has proposed no removal or removal of only those large rocks that can be reached using upland equipment.

The following sections of this report provide our summary of the applicant consultants' conclusions and recommendations; a summary of GeoEngineers' site observations; and GeoEngineers' discussion and independent conclusions.

DOCUMENT REVIEW

San Juan County provided project documentation for our review. Two firms submitted technical documentation related to the bank stabilization: Coast and Harbor (C&H) and Hart Crowser (HC). Some of the documentation was primarily related to vegetation, fish and wildlife impacts, and mitigation which is not subject to this peer review. However, we did review the vegetation and fish and wildlife reports with respect to relevant geotechnical considerations for the project. A list of documents reviewed is included in the "References" section at the end of this report. We have provided a summary of significant relevant conclusions and recommendations from C&H and HC below.

C&H Review

- The 2012 memorandum included:
  - A description of site conditions including a scarp at the toe of the shoreline, suggesting it is the result of high tide impacts.
  - Design wave conditions for the site.
  - The following conclusions:
    - the bulkhead is appropriate to control bluff erosion because "serious erosion is threatening an established use of the adjacent uplands";
    - the bulkhead is the most reasonable method of stabilizing an existing beach condition;
    - nonstructural shoreline protection has been ineffective in similar marine shoreline circumstances and would be ineffective at this location because of the exposure and design wave conditions;
    - an open beach solution would be subject to littoral drift and would have to be replaced every 5 to 10 years, and
    - the shoreline protection meets SJCC 18.80.110(H) and standards specified in SJCC 18.50.210, Bulkheads.
- The April 23, 2015 memorandum included:
  - Analysis of historical shoreline erosion
  - The following conclusions:
    - evaluation of rate of shoreline erosion, estimated at 1 inch per year average based on literature review and "project prototypes";
    - the estimate of shoreline erosion does not account for the "...acute conditions and shoreline retreat, i.e., bank failures/scarps that occurred during the 2011-2012 storm period..."; and
    - the presence of the bank stabilization may reduce contribution of the bank to beach nourishment, and provided an assessment of the volume of material, and recommendations for a monitoring program.
- The December 17, 2015 memorandum included:
  - The conclusion that the bulkhead is an appropriate solution in response to sea level rise (SLR) which will increase the risk of future bank erosion.
  - An estimated rate of future erosion at essentially zero with the bulkhead for the next 30 years; an estimated 1 to 2 inches per year without the bulkhead, which does not include impacts from increased storm frequency and severity and SLR impacts.
  - The observation that the beach substrate has not changed significantly as a result of the bank stabilization.

HC Review

- The 2012 memorandum included the following observations, conclusions and recommendations:
  - "Apparently, overland stormwater flow had eroded portions of the bank which resulted in oversteepening portions of the slope. Wave runup at high tide is also a likely cause for the distress to the slope."
  - Observed oversteepened scarps, leaning and pistol butted trees as evidence of slope instability.

- Subsurface conditions consist of glacial till in the upland area and slope debris along the shoreline.
- The bulkhead is necessary because of oversteepened condition and "loss of mass and strength" at the toe. The bulkhead provides buttressing of the upland conditions to protect structures (in this case structures are defined as uphill residence, roadway, utilities and other appurtenances).

- The December 17, 2015 memorandum included:
  - An analysis of slope stability based on assumed subsurface conditions. However, the conclusions of this memorandum are updated in 2017.
  - The conclusion that wave action was the primary cause of the 2010-2011 shoreline erosion.
- The April 16, 2016 memoranda included the following analysis and conclusions:
  - An evaluation of partial or complete removal of the bank stabilization
  - The conclusion that it would be "technically inappropriate to consider removing all or a portion of the project." The reasons provided include:
    - numerous scarps are located between the road and beach representing localized unstable conditions that are now buttressed by the bulkhead;
    - the slope is calculated to be unstable and in danger of further erosion;
    - removal would oversteepen the slope and increase its vertical height;
    - the slope would continue to fail with periodic landslides, increasing the height and rate of instability; and
    - the slide activity would work its way back to road and utilities.
- The 2017 memorandum included the following observations, conclusions and recommendations:
  - Subsurface exploration program consisting of two borings near the shore in escarpment areas and one upland test pit:
    - Boring B-1 encountered fill from 0 to 5 feet below ground surface (bgs); medium dense clayey sand from 5 to 12½ feet bgs; and dense gravelly sand from 12½ to 15½ feet bgs. Groundwater was encountered at 12½ feet bgs (estimated to be about Elevation 2½ feet).
    - Boring B-2 encountered fill from 0 to 5 feet bgs; soft clay from 5 to 12½ feet bgs; and dense sand from 12½ to 15½ feet bgs. Groundwater was encountered at 12½ feet bgs (estimated to be about Elevation -2½ feet).
    - Test pit TP-1 encountered medium dense gravelly sand from 0 to 8½ feet bgs; medium dense to dense gravelly sand from 8½ to 12 feet bgs. Groundwater was encountered at 8 feet bgs (estimated to be Elevation 27 feet).
  - Description of slope stability analysis:
    - provides assumed soil parameters using the soil profile representing TP-1 and B-2 (soft clay);
    - a horizontal groundwater surface at Elevation 18 across the entire soil profile (accounts for "groundwater lag");
    - a factor of safety of 0.62 for shallow slope failure;
    - a factor of safety between 0.9 and 1.0 for the overall slope condition.
  - Concluded that the lower slope is in a failed condition and being retained by the buttressing action of the bulkhead.

- Absent the bulkhead, concluded that the lower slope would fail in "calving mechanism" and regression would occur as "slivers" with a progressive rate of instability.
  - While recognizing that it is impossible to predict the timeline, estimated that failures without the bulkhead would reach the road and utilities in 3 years.
- Provided a discussion of alternatives (primarily a sheet pile wall along the downslope edge of the driveway) and concluded that "... the use of riprap is both necessary and is the most reasonable, and by far, the most cost effective solution...."
- Evaluated drainage conditions and concluded that no additional drainage measures are necessary.

- The March 6, 2017 memorandum included:
  - Evaluation of partial removal of lower shoreline protection that appears to be related to boulders possibly placed on the lower beach area in front of the beach house (west of the bulkhead).
  - The conclusion that the beach condition appears to be stable.
  - The conclusion that removal of the boulders might result in disturbance of beach, erosion under some trees, and erosion of embankment in front of the house.

GEOENGINEERS OBSERVATIONS

J. Gordon of GeoEngineers visited the site on April 3, 2017 with Erika Shook of SJC. The purpose of the site visit was to briefly observe site conditions. No subsurface explorations were completed. A 3-foot steel "T" probe rod was used to probe the ground for indications of relative density. The following is a summary of GeoEngineers' observations:

- Surface conditions were generally consistent with HC descriptions.
- It appears that the general area of the beach house construction was excavated into the hillside. A maintained lawn area with a very shallow slope is located south and north of the beach house. We probed in the lawn area between the house and the beach and met abrupt refusal at about 6 inches. The refusal conditions are consistent with glacial till soils. We assume that the upper weathered soil horizon was removed as part of the grading for the beach house.
- We observed no evidence of surface erosion, seepage, or localized instability in the vicinity of the beach house or toward the beach in front (south) of the house.
- The bank in front of the house (along the beach) is relatively low (several feet) with a few scattered Douglas fir and hemlock trees along the bank and directly above the beach. Some large rocks appear to have been placed against the bank directly above the beach and below the trees. We were able to probe typically 1 to 1½ feet along the undisturbed steeper bank area down to the beach. Refusal was abrupt, similar to a glacial till-like soil condition. Dense silty sand, typically representative of glacial till, was exposed along the base of the low bank directly above the beach. This condition was also noted below two large Douglas fir trees located along the beach. The roots of the trees have clearly established a preferential growth path toward the upland direction and rocks appear to have been placed below the trees.

- The escarpments identified on the survey (see "References" section) are reasonably apparent in the field. Some additional observations are provided below. For purposes of discussion, we are referencing the escarpments from 1 to 4, with 1 being the westernmost escarpment:
  - Escarpment 1 is vegetated with grass and has a large Douglas fir at the top. The tree has a bend in the trunk suggesting at least some historical soil creep.
  - Escarpment 2 (location of HC Boring B-1) has some grass vegetation, with exposed jute netting in the escarpment suggesting this was likely installed recently as response to an erosion event/ slide. A 12- to 14-inch diameter cedar tree is located within the escarpment and appears to be surrounded by slide debris.
  - Escarpment 3 (location of HC boring B-2) has some grass and brush vegetation with a large Douglas fir tree that is bent backwards on the order of 25 degrees. This is very unusual and suggests that the tree and entire root mass may have rotated as part of a slide block or the slide block may have moved to this location. The tree is located directly above the rock buttress.
  - Escarpment 4 has grass, brush vegetation and "jack-strawed" alder trees within the escarpment suggesting historical movement within this escarpment area. There are some trees near the top of the slope that also have evidence of ground creep/movement.
- No groundwater seepage was observed along the slope through the escarpments. Groundwater seepage was observed in the "Existing Natural Drainage Area" identified on the site plan located immediately east of Escarpment 4.
- We did not observe active erosion anywhere along the slope above the rock buttress.
- No scour was noted along the toe of the rock buttress. The beach appears to be in a natural condition.

SJCC CODE REVIEW

We reviewed sections of SJCC 18.50.210 (Bulkheads) and SJCC 18.35.130 (Standards and Requirements for Shoreline Modifications) with regard to applicability to the construction of the rock bulkhead, with the understanding that the bulkhead construction occurred after the house (single-family residential) construction. The appropriate sections of the SJCC have been excerpted and included below:

18.50.210 Bulkheads.

A. Regulations.

2. Nonexempt bulkheads shall be permitted only when nonstructural shoreline protection, restoration, or modification techniques have been shown to be ineffective and it can be shown that one or more of the following conditions exists:

a. Serious erosion is threatening an established use on the adjacent uplands;

b. A bulkhead is needed and is the most reasonable method of stabilizing an existing beach condition

7. Applications for bulkhead permits shall include at least the following information:

a. Purpose of proposed bulkhead;

b. Low, normal, and high elevations, when appropriate;

c. Direction of net longshore drift, when appropriate;

d. Type of construction proposed; and

e. Elevation of the toe and crest of the proposed bulkhead with respect to water levels.

8. Bulkheads shall be prohibited for any purpose if it will cause significant erosion or beach starvation.

18.35.130 Protection standards for aquatic fish and wildlife habitat conservation areas (FWHCAs).

This subsection establishes protection standards for aquatic FWHCAs including a site-specific procedure for sizing buffers and tree protection zones.

3. Additional Standards for Shoreline Stabilization Measures.

a. In order to avoid the individual and cumulative net loss of ecological functions attributable to shoreline stabilization, the following standards shall apply to shoreline stabilization measures:

i. New development on bedrock shorelines should be located and designed to avoid the need for future shoreline stabilization to the extent feasible.

ii. New development on all shorelines other than bedrock shall be set back sufficiently to ensure that shoreline stabilization is unlikely to be necessary during the life of the structure (minimum 75 years), as demonstrated by a geotechnical analysis.

b. When structural shoreline stabilization measures are demonstrated to be necessary, the following are required:

i. The size of stabilization measures shall be limited to the minimum necessary. Measures designed to assure no net loss of shoreline ecological functions shall be used. Soft approaches shall be used unless they are demonstrated to be insufficient to protect primary structures, dwellings, and businesses.

e. New structural stabilization measures shall not be allowed except when necessity is demonstrated in the following manner:

i. To protect existing primary structures:

(A) New or enlarged structural shoreline stabilization measures for an existing primary structure, such as a residence, should not be allowed unless there is conclusive evidence, documented by a geotechnical analysis, that the structure is in danger and will suffer damage from shoreline erosion caused by tidal action, currents, or waves and where no alternatives, including relocation or reconstruction of existing structures, are found to be feasible and less expensive than the proposed stabilization measure.

(B) Normal sloughing, erosion of steep bluffs, or shoreline erosion itself, without a scientific or geotechnical analysis, is not demonstration of need.

(C) The geotechnical analysis should evaluate on-site drainage issues and address drainage problems away from the shoreline edge before considering structural shoreline stabilization.

(D) The shoreline stabilization structure, including any required mitigation, will not result in a net loss of shoreline ecological functions.

ii. To protect and support new non-water-dependent development including single-family residences, when all of the conditions below apply:

(A) The erosion is not being caused by upland conditions, such as drainage and the loss of vegetation.

(B) Nonstructural measures, such as placing the development further from the shoreline, planting vegetation, or installing on-site drainage improvements, are not feasible or not sufficient.

f. Application Requirements. In addition to applicable requirements of Chapter 18.50 SJCC, applications for approval of structural shoreline stabilization measures regulated by this section shall include the following:

vii. New, expanded and replacement structural stabilization measures require a geotechnical analysis and report, prepared by a qualified coastal geologic professional in accordance with SJCC 18.35.055 through 18.35.070, that includes the following:

(A) A description of the causes for the erosion;

(B) Past erosion rates over a period of at least 30 years;

(C) Projection of future rates of erosion over the next 30 years;

(D) Detailed topography from the proposed structure to the lower beach;

(E) Evaluation of the anticipated impact of sea level rise on the structural stabilization measure, ecological functions associated with critical salt water habitat, and the development being protected, considering the most recent sea level rise predictions used by the San Juan County public works department in planning road improvements;

(F) In the case of an application for hard structural stabilization measures, the report shall contain a determination that in the absence of such measures, there is a significant possibility that the structure to be protected will be damaged by shoreline erosion within three years;

(G) If the report shows that waiting until the need for stabilization is immediate would foreclose the opportunity to use measures that avoid impacts to ecological functions, the report may be used to justify the construction of soft structural stabilization measures;

(H) Analysis of slope stability and mechanism for slope failure in the vicinity;

(I) Estimate of when the structure to be protected will be undermined (including allowance for bank recession equal to the largest documented landslide in the vicinity);

(J) Summary of factors causing threat to the structure;

(K) Evaluation of potential effectiveness of corrective measures for on-site drainage issues as an alternative to installing hard or soft structural shoreline stabilization measures;

(L) Detailed evaluation of the potential for relocating the structure as an alternative to hard or soft structural shoreline stabilization measures;

(M) Description of any potential adverse impacts that may result from the proposal, including anticipated changes to the size or quantity of the substrate and/or sediment in the vicinity or downdrift from the site; and

(N) An evaluation of the conformance of the proposal with the requirements of this subsection (G) and Chapter 18.50 SJCC.

The SJCC requires that any bulkhead or shoreline stabilization not result in net loss of ecological functions and not result in changes to the substrate and/or sediment in the vicinity or downdrift from the site. While not part of the peer review, reports were submitted addressing these issues and appear to conclude that no significant loss of ecological functions or changes in substrate have occurred.

DISCUSSION AND CONCLUSIONS

In our opinion, the numerous C&H and HC reports have identified, discussed and addressed the SJCC requirements related to the bank stabilization project. Major points of discussion and GeoEngineers' conclusions are summarized below.

- The first HC memorandum states that the original instability/erosion that occurred in the winter of 2010/2011 was caused by upland stormwater flow (erosion) with influence by wave action during high tides/storm events. Subsequent memoranda suggest the primary cause is wave action. It is impossible for us to provide any relevant comment regarding initial causation, but seems likely to have been a combination of the two.
- The original 2015 slope stability analysis is not relevant because subsurface conditions were assumed at that time.
- The 2017 slope stability analysis included site specific subsurface conditions. HC used the soft clay to establish the soil profile, which is representative of the "worst case" soil condition of the two borings completed near the shoreline. They also assumed a horizontal groundwater surface at Elevation 18 feet in their slope stability model. In our opinion, this is very hard to justify considering that groundwater was observed in the borings at Elevation +2½ and -2½ feet and no evidence of seepage was noted on the slopes above the bulkhead. The water level assumption in the model (Elevation 18 feet) will result in low factors of safety that may not be representative of the site conditions. That being said, it is very likely that any slope stability analysis without the bulkhead would result in factors of safety well below desirable levels.
- We are not aware of the original bank conditions and the steepness of the "natural" bank may have been increased by construction of the bulkhead itself. However, it appears that the original bank was likely nominally stable and therefore subject to failures.
- In our estimation, the most compelling argument for the presence of the bulkhead is visual evidence of movement of the slope above the bulkhead (between the bulkhead and the driveway). It appears that movement has occurred on much of this slope as evidenced by the escarpments shown in the survey and pistol-butted and jack-strawed trees; in some cases even at the top of the slopes. We agree with the consultant's conclusion that removing the bulkhead now would greatly

increase the instability and result in failures because of the oversteepened condition and height of slope in this area.

- As stated by HC, it is not possible to predict the rate of bluff retreat/instability if the buttress were not present. It is our opinion that saying the "structures" (roadway and utilities) would be affected in three years is a difficult case to make. That being said, we concur that the presence of the soft clay, potential slope debris, and oversteepened condition would result in an increasingly unstable condition.
- It is our opinion that the conditions in front (south) of the beach house are very different than the area where the bulkhead was constructed.
  - We observed a low bank condition with what appears to be glacial till exposed along the bank above the beach.
  - It is our opinion that removing rocks in front of the beach house area would not result in a significant increase in bank erosion and retreat in this area.
  - Some of the trees (particularly Douglas firs) have been undermined, which has likely been the case for some time based on the way the roots have established themselves into the upland area, which is typical of shoreline area trees. Based on our observations, it is not clear that the rocks are providing significant protection for the trees.

REFERENCES

Foster Pepper, PLLC, "Supplemental Information – Runstad Bank Stabilization, Shoreline Substantial Development Permit Application", December 17, 2015. (includes Exhibits A – N as described in Foster Pepper cover letter)

Coast and Harbor, "Technical Memorandum: Runstad Property – Shoreline Erosion Protection", November 26, 2012 (Exhibit D to Foster Pepper Dec 17, 2015 Supplemental Information).

Coast and Harbor, "Technical Memorandum: Runstad Property Beach Nourishment", April 23, 2015 (Exhibit E to Foster Pepper Dec 17, 2015 Supplemental Information).

Coast and Harbor, "Technical Memorandum: Runstad Property – Supplemental Coastal Geologic Analysis" December 17, 2015 (Exhibit N to Foster Pepper Dec 17, 2015 Supplemental Information).

Hart Crowser, "Summary of Site Reconnaissance, Runstad Residence, Blakely Island", November 26, 2012 (Exhibit F to Foster Pepper Dec 17, 2015 Supplemental Information).

Hart Crowser, "Ordinary High Water at Runstad Property on Blakely Island", November 8, 2013 (Exhibit G to Foster Pepper Dec 17, 2015 Supplemental Information).

Hart Crowser, "Blakely Island Macrovegetation Monitoring Plan, San Juan County", December 30, 2013 (Exhibit J to Foster Pepper Dec 17, 2015 Supplemental Information).

Hart Crowser, "Riparian Enhancement Plan", August 8, 2014 (Exhibit L to Foster Pepper Dec 17, 2015 Supplemental Information).

Hart Crowser, "Forage Fish Spawning Survey, Runstad Residence Beach Repair", May 14, 2013; December 11, 2013; January 14, 2013; and February 13, 2014 (Exhibit H to Foster Pepper Dec 17, 2015 Supplemental Information).

Hart Crowser, "Fish and Wildlife Habitat Conservation Area Report, Runstad Property on Blakely Island, Sand Juan County, Washington", December 17, 2015 (Exhibit M to Foster Pepper Dec 17, 2015 Supplemental Information).

Hart Crowser, "Geotechnical Engineering Conclusions and Recommendations, Runstad Property, Blakely Island, Washington", December 17, 2015 (Exhibit L to Foster Pepper Dec 17, 2015 Supplemental Information).

Hart Crowser, "Potential Effects of Removal of New Shoreline Protection on Runstad Property on Blakely Island", April 6, 2016. (includes Attachment 1: Hart Crowser, "Ordinary High Water at Runstad Property on Blakely Island", November 8, 2013)

Hart Crowser, "Geotechnical Considerations Related to Removal of Bulkhead, Runstad Residence, Blakely Island, Washington", April 6, 2016.

Hart Crowser, "Geotechnical Engineering Conclusions and Recommendations, Runstad Property, Blakely Island, Washington", March 3, 2017.

Hart Crowser, "Potential Effects of Partial Removal of New Shoreline Protection on Runstad Property on Blakely Island", March 6, 2017.

San Juan Survey, "Topographic Survey for Jon Runstad on Blakely Island", December 17, 2015

San Juan County Code 18.50.210 (Bulkheads) and SJCC 18.35.130 (Standards and Requirements for Shoreline Modifications).

LIMITATIONS

We have prepared this letter for use by San Juan County Department of Community Development. Our services were provided solely to assist the County in evaluating permit considerations for the subject bank stabilization project on Blakely Island, and may be made available to parties associated with the project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood. This report may be made available to the property owner for their review.

We appreciate the opportunity to provide these services. Please call if you have any questions regarding this peer review letter.

Sincerely,
GeoEngineers, Inc.

J. Robert Gordon, PE
Principal

JRG:tln

One copy submitted electronically

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