GEOTECHNICAL REPORT
RESIDENTIAL PROPERTY
179 WALLACE ROAD
CHEHALIS, WASHINGTON

PREPARED FOR
AARON FULLER

BY
ALL AMERICAN GEOTECHNICAL, INC.
OLYMPIA, WASHINGTON

DECEMBER 17, 2020

CONTACT INFORMATION

PREPARER INFORMATION

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SITE ADDRESSES:	179 WALLACE ROAD CHEHALIS, WASHINGTON
PARCEL:	010811001002
GPS LOCATION:	46.643158 -122.925843 (DD)

ALL AMERICAN GEOTECHNICAL

SCOPE OF UNDERSTANDING

AARON FULLER
FULLER DESIGNS
1101 KRESKY AVENUE
CHEHALIS, WA 98531
DECEMBER 17, 2020

RE: GEOTECHNICAL REPORT
179 WALLACE ROAD
CHEHALIS, WASHINGTON
PN 010811001002
46.643158 -122.925843 (DD)

Dear Aaron Fuller:

Aaron Fuller (client) hired All American Geotechnical, Inc. (AAG) in November of 2020 on behalf of Gay Groce to prepare a geotechnical report for the above-named property located off Wallace Road in Chehalis, Washington. A single-family residence will be constructed on a 0.48-acre parcel located in the lower part of the uplands that rise to the east of the urban areas.

The slope on which the parcel lies is mapped as landslide deposits. These are from an early low-angle mass-wasting that is now eroded and cut by drainages which indicates it has been stable for some time. The parcel is on the north side of a drainage mapped on the Lewis County GIS which is seen to be mainly-off property. The parcel has been cleared except possibly for some trees along the southeastern property line corresponding to the drainage. The remainder of the property is in grass and some low scrub.

The project involves building a pad with import material in the northeastern part of the property. As there is no landslide hazard identified, this report has been written to address the landslide deposits and the modeling of the building pad.

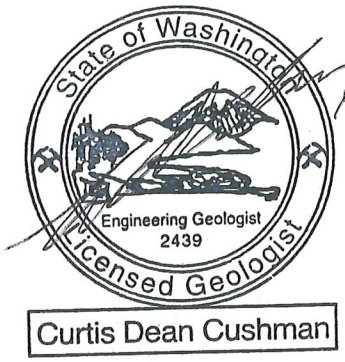
There is nothing presently developed on the site.

The pad of import material is geotechnically suitable for development as described in this report. Earthwork will be needed to prepare the building site, to key in the imported fill, build the pad, and improve the access road. No other major grading is expected.

As per client request, we have conducted a soils exploration and slope stability analyses for the above-mentioned parcel. The results of this investigation are to be found in the following report. We will provide the report in PDF form.

The services described in this evaluation were prepared under the responsible charge of Curtis Cushman, L.E.G. Curtis Cushman verifies the accuracy of this report as well as all assumptions relied upon in the report. We appreciate this opportunity to be of service to you and we look forward to working with you in the future. If you have any questions concerning the above items, the procedures used, or if we can be of any further assistance please call us at a phone number listed below.

Respectfully Submitted,
ALL AMERICAN GEOTECHNICAL, INC.



12-17-2020

Curtis D Cushman, L.G., L.E.G.
Senior Engineering Geologist

INTRODUCTION

This report summarizes the results of our geotechnical consulting services for the proposed residence on the parcel herein described. The parcel is located off Wallace Road southeast of Chehalis, Washington. From Interstate 5 it is accessed by the Main Street Exit to S Market Street which becomes the Jackson Highway. Wallace Road turns off of Jackson Highway. The parcel is a rectangle long to the southwest-northeast. It is entered from Wallace Road by a narrow panhandle extending to the southwest from the parcel's western corner. The parcel lies on a slope that ascends to the north and northeast.

The site is registered with Lewis County as located in Chehalis, Washington. The location of the site is shown relative to the surrounding area on the Vicinity Map, *Figure 1*. Our understanding of the project is based on information from the client.

The location proposed for construction is on landslide deposits derived from the Quaternary Logan Hill Formation. These will be described in "Geology," below. Grading will be for levelling the building site to accommodate the building pad and key in the import material. The access will be developed without further major grading. The approximate layout of the site is shown on the Site Plan, *Figure 2* based upon data from the Lewis County GIS. The cross-section for the post-construction model was adapted from the survey by Butler surveying.

The purpose of our services is to evaluate the surface and subsurface conditions at the site in order to satisfy the requirements of the Lewis County Critical Areas Ordinance and as a basis for providing geotechnical recommendations and design criteria for the project. All American Geotechnical is therefore providing geologic and hydrogeologic services for the project. Specifically, our scope of services for this project includes the following:

1. A review of the available geologic, hydrogeological and geotechnical data for the site area.
2. A geologic reconnaissance of the site area and surrounding vicinity.
3. Investigation and identification of shallow subsurface conditions at the site by characterizing the exposed soil, reviewing published well logs, examining the column on the hillside in roadcuts and pits, and soil sampling.
4. Comparison of the sites to published geologic maps, previous field investigations, and open file reports. Inspection of aerial photographs to determine the geomorphology of the sites.
5. Evaluation of the landslide, erosion, and seismic hazards at the site per the Lewis County Critical Areas Ordinance.
6. Geotechnical recommendations for site grading including site preparation, subgrade preparation, fill placement criteria temporary and permanent cut and fill slopes, drainage, and typical erosion control measures (*Figure 3*).

There are no critical slopes near the building site. The site is on landslide deposits and is steep enough the require analysis for the placement of a pad of imported fill. The steep slope of 10 feet or so on the parcel to the northeast is itself due to a building pad.

SITE CONDITIONS

SURFACE CONDITIONS

The proposed residence is located in an area of mixed scattered single family residences, small farms, and small neighborhoods on the outskirts of Chehalis, Washington. The area is of an ascending landscape to the east cut extensively by numerous dendritic streams. According to the Lewis County Assessor the parcel is 0.48 acres and is and is a rectangle with an access panhandle connecting it to Wallace Road. The building site is in the northeastern part which has adequate room for the residence and road access with all the required setbacks. There is no stream buffer and the stream appears to dissipate on reaching the lower end of the property. What flow there is shall be captured at this point by a diversion culvert. Water is from off-parcel. The proposed residence is proposed to be on a platform of imported common borrow and structural fill to provide the building area. Retaining walls may be needed, depending on design criteria. The site is open to the south. Drainage will be to the south and east. The highest part of the parcel rises to approximately 320 feet at its northern tip descending to approximately 302 feet for the southernmost part of the building area near the southern tip and just above the culvert intake. The entrance to the property at the tip of the panhandles is at approximately 286 feet.

The site was visited by Curtis D Cushman L.G., L.E.G. and Blaise Jelinek E.I.T. on December 4, 2020. The purpose of a site visit is to physically observe the property and adjacent properties in order to identify any recognized geologic conditions. Surficial exploration and sampling were performed in two hand-auger holes, one near the lower end of the proposed pad, the other nearer the top and under the area of the proposed residential footprint. Sampling provides representative material for evaluation; soils were evaluated on site. Visual observations were documented. A site map has been prepared identifying features of the property.

Chehalis City ordinance 17.24.010

None of these are applicable. There is no landslide hazard area associated with this property (See below in Site Geology))

17.24.020

As there are no hazard areas, A through D are not applicable.

The proposed development is mapped as being on landslide deposits. These are derived from low-angle slides from Logan Hill deposits.

SITE GEOLOGY

The mapping on the Washington Portal has the site mapped as:

Geologic Unit Label: Qls
Geologic Age: Quaternary
Lithology:mass-wasting deposits, mostly landslides
Named Units:---
Symbology: Quaternary mass-wasting deposit

These are seen on site as compact mixes of sand, gravel and silt. These are best designated as **SP-SM** *Poorly graded silty sand with gravel* using the ASTM classification.

Fiksdal in the Slope Stability of the Centralia - Chehalis Area, Lewis County Washington (DNR 1978) described these deposits as **Qls** – *Old landslides, Areas considered generally stable, but engineering studies recommended for slope over 30 percent.*

Although this site does not qualify as a Landslide Hazard Area, this study addresses specific geotechnical issues related to the padconstruction.

17.24.050.B

To the north, above the current residence built above the client property, slopes of 30% and greater are seen along the natural drainage. These line the drainage with the nearest approximately 170 feet away and about 10 feet in height. The closest that appears to be over 10 feet in height is approximately 300 feet away. None of these would influence the client property and no construction of the client property will alter or influence these stream-banks.

Seismic activity occurs in the region due to the ongoing Cascadian Orogeny.

17.24.030

At the time of the latest site visit, there was no significant erosion seen at the residential site. There are no wetlands. There are no mapped streams or buffers. (From site inspection and/or Lewis County GIS.)

SITE SOILS

The USDA Web Soil Survey has mapped the soil in the building site as follows (from the USDA WSS):

Building Site Soil

132—Melbourne loam, 15 to 30 percent slopes

Map Unit Setting

- *National map unit symbol:* 2h93
- *Elevation:* 200 to 1,200 feet
- *Mean annual precipitation:* 40 to 70 inches
- *Mean annual air temperature:* 50 to 54 degrees F

- *Frost-free period:* 150 to 200 days

Map Unit Composition

- *Melbourne and similar soils:* 90 percent
- *Minor components:* 2 percent

Description of Melbourne

Setting

- *Landform:* Mountain slopes, ridges
- *Parent material:* Residuum from siltstone

Typical profile

- *H1 - 0 to 4 inches:* loam
- *H2 - 4 to 18 inches:* clay loam
- *H3 - 18 to 42 inches:* clay
- *H4 - 42 to 60 inches:* clay loam

Properties and qualities

- *Slope:* 15 to 30 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Available water capacity:* High (about 11.6 inches)

It states in the soils survey of Lewis County that in the Melbourne loam, 15 to 30 percent slopes, the "hazard of water erosion is moderate."

The soils on site correspond to this description with the exception that the soils appear to have a higher silt content than clay and they locally are dominantly sand. Clay may be locally present.

LiDAR Imagery

The LiDAR from the Interactive Map of Washington shows some detachment features in the higher areas near the client property, but these appear quite old, following the mapping by Fiksdal. The 1:100,000 scale of the geologic mapping does not correspond in large part with the LiDAR and needs some refinement.

Sample Locations

No laboratory samples were taken for this study, but the described units were seen at the site and in the two test holes. Hand samples were field classified by Curtis D Cushman, L.G., L.E.G.

SUBSURFACE EXPLORATIONS

The site locally has a few exposed deposits on and near it. The exposed material is Melbourne loam and landslide deposits. Two sample holes were hand-augered to a depth of four feet, AAGB-1 near the base of the proposed fill, and AAGB-2 near the top (see *Figure 2*).

These holes encountered silty sand with possible clay immediately below a thin surface loam. Gravel was scattered sparsely in the samples. In AAGB-2, mottling was noted at -2½ feet. In AAGB-1, there was lesser mottling nearer -4 feet. Samples were moist.

Deposits were field classified by Curtis D Cushman L.G., L.E.G.

SUBSURFACE CONDITIONS

The underlying soil has been characterized and modelled along line A - A′ in the Slope Stability Analysis, below.

14.28.040

GEOSEISMIC SETTING

According to the Seismic Zone Map of the United States (Figure 1613.3.1(1)) contained in the 2015 International Building Code (IBC), the project site is located where the maximum spectral response acceleration is greater than 45 percent of gravity (g).

We recommend following seismic factors for design purposes.

- Site Class: D
- Spectral response acceleration, short period (S_{MS}): 1.189g ($F_a = 1.0$)
- Spectral response acceleration, 1-second period (S_{M1}): 0.742g ($F_v = 1.5$)
- Peak Ground Acceleration 0.489

SEISMIC LIQUEFACTION HAZARD

The *Liquefaction Susceptibility Map of Lewis County, Washington* by Palmer, Magsino, Poelstra, Bilderback, Folger, and Niggemann (September 2004) maps liquefaction hazard of the site as **Low to Moderate.**

Soil liquefaction is an episode in which saturated, cohesionless, or granular soils experience a significant drop in strength due to additional build-up of pore water pressure during cyclic loading such as that induced by earthquakes.

SEISMIC SITE CLASS

The *Site Class Map of Lewis County, Washington* by Palmer, Magsino, Bilderback, Poelstra, Folger, and Niggemann (September 2004) maps the site area as site class **C to D**. Class C is Very Dense Soil, Soft Rock and Class D is Stiff Soil.

SLOPE PROFILES

Four slope profiles are attached to this report as the model output of lines **A–A'**. The fist two show the slope as it is at this time. The second set models the slope with the added fill to test the stability of the fill and the underlying material with the load.

SLOPE STABILITY AND ANALYSIS

Factors of safety were determined using the Bishop (semi-circular) method. The site was modeled in both a pre-construction condition and a post-construction condition. The analyses in the pre-construction condition are modeled monolithically with information from the glacial unit described in the literature and as seen on-site. The post-construction model includes an overlying unit of import material and a keyway that is four feet deep and four feet wide. The parameters used in this modeling were based on experience with the surroundings and the types of materials encountered on site. A continuous load of 1800-lb per foot was placed across the intercept of the proposed footprint of the home on the post construction cross-sections. No groundwater was included in the model, based upon field observations.

Slope stability was modeled using the GALENA 6.1 program in both static and dynamic conditions (c_a = 0.245). "Static" condition refers to an "as is" state of a given slope. "Dynamic" puts seismic acceleration into the model for earthquake conditions. The factor for ground acceleration (c_a) was determined from the Peak Ground Acceleration from the USGS Seismic Design Maps, included in the Appendix.

The depositional material was field identified as **Silty sand.** This contains varying amounts of silt and sand with possible clay locally. This classification requires selecting conservative values in the interests of safety. The parameters of the import are those of common fill and assuming compaction.

The site was modeled with the **Fill on the Qls** as a two-component unit. The unit was modeled using the following soil parameters presented in ***Table 1. Geologic Modeling Values***.

Table 1. Geologic Modeling Values

Geologic Unit	Unit Weight	Cohesion	Phi Angle
Qls - Quaternary Landslide Deposits	122	300	38
Fill	125	300	36

Four analyses were calculated along the A-A' cross-section, itemized on ***Table 2. Modeling Parameters and Findings.*** The Analysis Number corresponds to the output presented on pages 22-25. The existing slope was modeled based upon observations, field measurements, and available mapping. Cross-section A-A′ is located through the steepest slope intercepting the building envelope. Initial positions were selected based upon the placement of the structure and the shape of the slopes. The initial points were varied over the analysis range indicated; with 50 different positions tested across these ranges. A total of 125,001 calculations were performed for each. Calculated Factors of Safety are presented in *Table 2.*

Table 2. Modeling Parameters and Findings

Analysis Number	Load Across Building Envelope	Analysis Type	Slope to Building	Initial Positions (Analysis Range)			Configurations Analyzed	Factor of Safety
				Lower	Upper	Radius		
Cross-Section A-A' Pre-Development								
Analysis 1	No Load	Static	--	87 (45)	219 (70)	297 (50)	125,001	7.00
Analysis 2	No Load	Dynamic	--	87 (45)	219 (70)	297 (50)	125,001	2.98
Cross-Section A-A' Post-Development								
Analysis 3	1800# 127-156	Static	Below	95 (10)	127 (5)	40 (10)	125,001	2.00
Analysis 4	1800# 127-156	Dynamic	Below	95 (10)	127 (5)	40 (10)	125,001	1.41

Under static conditions, the slopes generally did not show susceptibility to deep-seated failure that would cause damage to the proposed residence. Under dynamic loading (Ca=0.245), the computations demonstrated that the slope is safe and not susceptible to a deep-seated movement.

These calculated Factors of Safety (FoS) meet the requirements set forth by Lewis County for static conditions (1.50) and meet the requirement (1.20) for dynamic loading scenarios. The site appears stable based on our slope models representing critical slopes at the subject site.

Slope Models

The slope models are included in the appendix. The location of the surcharge is as close to the steep slope as realistically possible.

Grading

The grading and import of fill is for others.

Site Plan

A site plan is attached as *Figure 2* at the end of this report identifying important geological and development features.

BOUNDARIES AND SETBACKS

The area of the proposed development, are demarcated on *Figure 2* Site Plan at the end of this report. Appropriate geology is labeled on this figure.

EARTHWORK

RECOMMENDATIONS FOR SITE PREPARATION

All areas to be excavated should be cleared of deleterious matter including any debris, duff, and vegetation. Any soils material that is excavated may be stockpiled and later used for erosion control and/or landscaping. Surficial material unsuitable for these tasks should be removed from the project site. No foundation elements shall be constructed on "untested" fill material.

The material immediately on site may not be suitable for structural fill or borrow due to the silty nature of the material. Where placement of fill material is required, the exposed natural slope should have the top loam layer removed to solid cut and/or should be compacted to a firm and unyielding surface prior to placement of the fill. The fill shall be common borrow, topped with structural fill compacted to the density requirements described in the "Structural Fill" section of this report.

RECOMMENDATIONS FOR STRUCTURAL FILL

Common borrow may be used to construct the pad, topped with structural fill. Top fill material shall be placed as structural fill. In general, all fill should be placed in horizontal lifts of 12 inches to allow adequate and uniform compaction of each lift. Fill should be compacted to at least 95 percent of MDD (maximum dry density as determined in accordance with ASTM D-1557) to grade.

The final appropriate lift thickness will depend on the fill characteristics and compaction equipment used. We recommend that a field inspector and tester evaluate the appropriate lift thickness during construction. Material placed for structural fill should be free of debris, organic matter, trash, and cobbles greater than 6 inches in diameter. The moisture content of the fill material should be adjusted as necessary for proper compaction.

RECOMMENDATIONS FOR SUITABILITY OF ONSITE SOILS AS FILL

Onsite soils may be considered for use as structural fill only if industry standards are satisfied. Fill material requirements are found on page 9-26 to 9-30 of the WSDOT Standard Specifications 2010. In general, a native soil (sand, silt, and gravel) encountered on a site must have less than 10 percent fines (material passing the US No. 200 sieve) to be suitable for use as structural fill. To qualify, a soil must be tested in a geotechnical laboratory for gradation. On-site soils are likely not be acceptable as structural fill. Testing would be required.

RECOMMENDATIONS FOR FOUNDATION SUPPORT

The residence will rest on a standard footing.

LATERAL EARTH PRESSURES

Lateral loads may be resisted by friction on the bases of footings and floor slabs and as passive pressure on the sides of footings. An allowable coefficient of friction of 0.40 may be used to calculate friction between the concrete and the underlying native soil. We recommend the following be used to determine the lateral earth pressures considering the onsite SP (representing soil/ash):

- ϕ (soil friction angle) 36 degrees
- K_o (at rest earth pressure coefficient) 0.384
- K_a (active earth pressure coefficient) 0.238
- K_p (passive earth pressure coefficient) 4.20

RECOMMENDATIONS FOR CUT AND FILL SLOPES

All job site safety issues and precautions are the responsibility of the contractor providing services and/or work. The following cut/fill slope guidelines are provided for planning purposes.

As a general guide, temporary slopes of 1 to 1 (horizontal to vertical) or flatter may be used for temporary cuts in the upper few feet of the soils, if present, that are weathered to a loose/medium-dense condition.

Surface drainage should be directed away from all steep slope faces. Straw, hay, or jute matting shall be used to cover the exposed soils until permanent vegetation is established. All slopes should be seeded as soon as practical to facilitate the development of a protective vegetative cover, or otherwise protected.

RECOMMENDATIONS FOR RETAINING WALLS

If retaining walls are to be used, they must conform to Lewis County requirements for permitting and engineering of said walls. Any retaining wall over four feet in height is required by Lewis County to be permitted and engineered. Lower retaining walls with surcharges are also required to be engineered. An engineer should be consulted before any retaining wall is constructed. When constructing retaining walls on a slope, there must be a setback between walls. If a four-foot wall is being constructed with a second four-foot wall behind it, we recommend that the distance between the two walls be no less than twice the wall height or as per the engineer's design.

EROSION CONTROL AND DRAINAGE

SURFACE WATER CONTROL

RECOMMENDATIONS FOR EROSION CONTROL

These erosion control methods are applicable wherever earthmoving or excavation is done. The final determination of requirements is with the County authorities.

Even though the erosion hazard is moderate, temporary and permanent erosion control measures should be implemented and maintained as needed during placement and/or as soon as practical thereafter to limit influx of water to exposed areas and protect potential receiving waters. Revegetation should occur immediately following construction. All barren construction areas on slopes should be protected with jute, sisal, or a synthetic mix of degradable netting and replanted as soon as possible. Surface water should be confined and/or directed away from the immediate downslope area. No concentration of water should flow over and unto the LHA slopes.

Erosion control measures should include, but not be limited to, silt fences, berms, and swales with ground cover/protection in exposed areas. Typical erosion control notes and a silt fence detail are included on *Figure 3 Erosion Control*. The drain feature on *Figure 3* is considered possible for drainage control at this site (see Site Drainage below).

Recommendations for Site Drainage

In general, all ground surfaces, pavements and sidewalks should be sloped away from the residence and associated structures. Surface water runoff should be controlled by a system of curbs, berms, drainage swales, and/or catch basins and tightlined into the appropriate drainage facilities. We recommend that conventional roof drains be installed following the recommendations of the manufacturer. Roof water may be dispersed by discharge pipes at a distance of 10 feet or more from the residence and these should be equipped with splash blocks or a similar system to reduce outflow energy.
Otherwise, water needs to be captured and directed into a tightline to transport it away from the structure and downslope to a suitable drainage facility such as a trench or drywell. Due to the nature of the topography, dispersal of water into a natural drainage is possible.

Vegetative Management

The vegetation at the building site is primarily of grass and shrub. There are trees and heavier shrub at the natural drainage. These may be removed for construction. Extensive removal of vegetation including trees outside of the areas of construction for the residence and its support facilities is not required. The area of residential development will be revegetated as needed. When residential plantings or any plantings on the periphery of the residential area and the slopes are planned, native species should be considered as the primary vegetation in areas away from lawn and ornamental plantings. Shallow rooted species, such as grass, should be planted closer than 10 feet from underground drainages. Any area shorn of vegetation should be immediately protected and revegetated to prevent erosion. No vegetation in the LHA will be disturbed.

Densely rooted evergreen shrubs are preferable than tree species on slopes greater than 15% gradient. Tall trees may become unstable in wet soils under high wind conditions. Planting of tall growth trees should be avoided on such slopes.

To summarize, in order to manage and reduce the potential for erosional processes, we recommend the following:

- No drainage of concentrated surface water or significant sheet flow onto steeper sloped areas
- Use vegetation to maximize erosion control.

SITE DEVELOPMENT ALTERNATIVES

The proposed location is suitable. The site will accept the load of the import fill. The erosion hazard is manageable and the slope stability models indicate deep-seated failures are unlikely.

RECOMMENDATIONS FOR STRUCTURAL MITIGATION

There is no structural mitigation for this project.

ON- AND OFF-SITE IMPACT

None is foreseen.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our site reconnaissance, subsurface observations, and our experience in the area, it is our opinion that the site is suitable for the proposed project. With proper design, the proposed building location is stable relative to deep-seated instability. The building pad and the underlying materials are stable and will not be affected by the proposed structure. The structure will not undermine adjacent slopes. Proper drainage control measures should eliminate the potential for erosion.

The project will cause no significant environmental impact for the life of the project.

As a general rule, we recommend that earthwork be undertaken during favorable weather conditions. This is certainly true here, but the existing access likely can be made all-weather, so construction may proceed as long as safety is not compromised. Conventional construction equipment may be utilized for work at the site. Slab on grade or standard footings may be utilized at the site. A vapor barrier is recommended for all slabs-on-grade.

Revegetation should be done as per recommendations in the text, above.

REPORT LIMITATIONS AND GUIDELINES FOR USE

We have prepared this report for the exclusive use of Aaron Fuller and his authorized agents for the proposed residence location on Wallace Road in Lewis County, Washington. Site inspections, research, and mapping have culminated in this report. This report is intended to meet the requirements of the Lewis County Critical Areas Ordinance. This report does not specify setbacks for: line-of-sight setbacks, FWHCA setbacks, eagle tree setbacks, wetland setbacks, or property line setbacks. 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, expressed or implied, should be understood.

CONTRACTORS ARE RESPONSIBLE FOR SITE SAFETY ON THEIR OWN CONSTRUCTION PROJECTS

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to onsite personnel and to adjacent properties.

READ THESE PROVISIONS CLOSELY

Some clients, design professionals, and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. All American Geotechnical, Inc. includes these explanatory "limitations" provisions in our reports to help reduce such risks.

Clients and property owners must understand that, while a slope may be found to have an acceptable Factor of Safety related to deep-seated mass wasting, surficial failure and landslides can and do occur on steep slopes. The property owners should monitor the stability of their property following construction.

Moreover, acceptable Factors of Safety do not guarantee there cannot be failures. It is the responsibility of the property owners to understand that there are always risks in building on or near steeply sloped areas.

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, geotechnical engineering or geologic reporting does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

APPENDIX

References

2015 IBC Design Summary

Computer Models

Figure 1. Vicinity Map

Figure 2. Site Map

Figure 3. Erosion Control Notes

REFERENCES

MAPS

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WEBSITES

Lewis County Government Information Services
(http://www.co.lewis.wa.us)

Puget Sound Lidar Consortium (Through the Washington Geologic Portal)
(http://pugetsoundlidar.ess.washington.edu/lidardata/index.html)

Slope Stabilization Erosion Control Using Vegetation A Manual of Practice for Coastal Bluff
(http://www.ecy.wa.gov/biblio/9330.html)

United States Department of Agriculture Natural Resource Conservation Service
(http://soildatamart.nrcs.usda.gov)

Washington Administrative Code
(http://apps.leg.wa.gov/wac/)

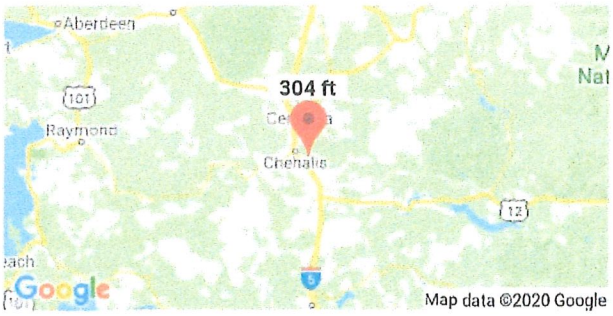
Washington Department of Ecology
(http://apps.ecy.wa.gov/welllog)
(https://fortress.wa.gov/ecy/coastalatlas/viewer.htm)

USGS SEISMIC DESIGN SUMMARY – IBC – 2015

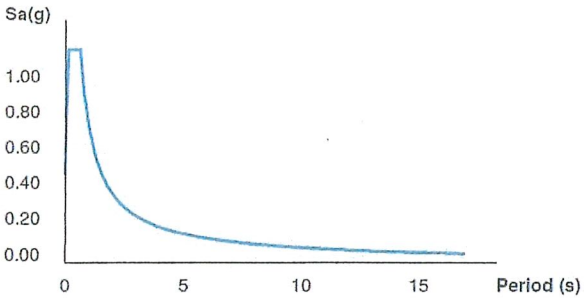
ATC Hazards by Location

Search Information

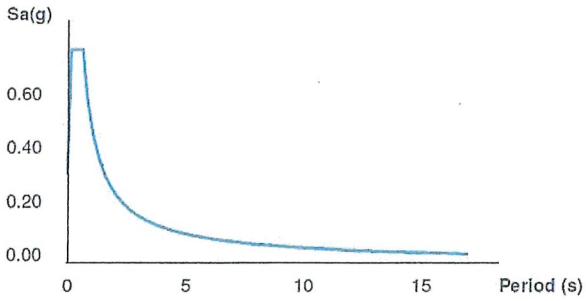
Coordinates:	46.643178, -122.925856
Elevation:	304 ft
Timestamp:	2020-12-17T17:00:59.120Z
Hazard Type:	Seismic
Reference Document:	IBC-2015
Risk Category:	III
Site Class:	D



MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	1.138	MCE_R ground motion (period=0.2s)
S_1	0.492	MCE_R ground motion (period=1.0s)
S_{MS}	1.189	Site-modified spectral acceleration value
S_{M1}	0.742	Site-modified spectral acceleration value
S_{DS}	0.793	Numeric seismic design value at 0.2s SA
S_{D1}	0.495	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	1.045	Site amplification factor at 0.2s
F_v	1.508	Site amplification factor at 1.0s
CR_S	0.948	Coefficient of risk (0.2s)
CR_1	0.905	Coefficient of risk (1.0s)

USGS SEISMIC DESIGN SUMMARY – IBC – 2015 CONTINUED

PGA	0.489	MCE_G peak ground acceleration
F_{PGA}	1.011	Site amplification factor at PGA
PGA_M	0.495	Site modified peak ground acceleration
T_L	16	Long-period transition period (s)
SsRT	1.138	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.2	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.492	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.544	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.6	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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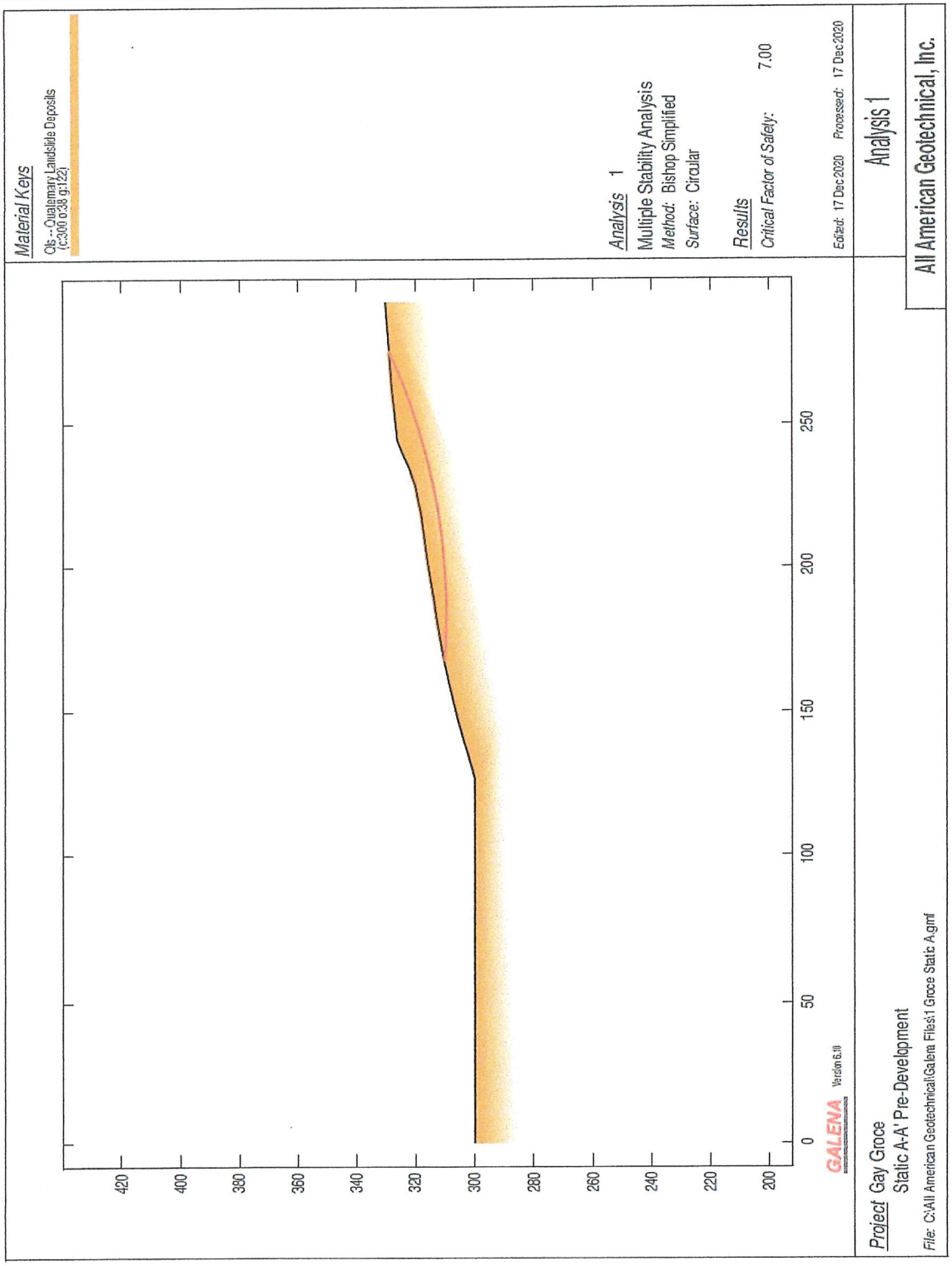
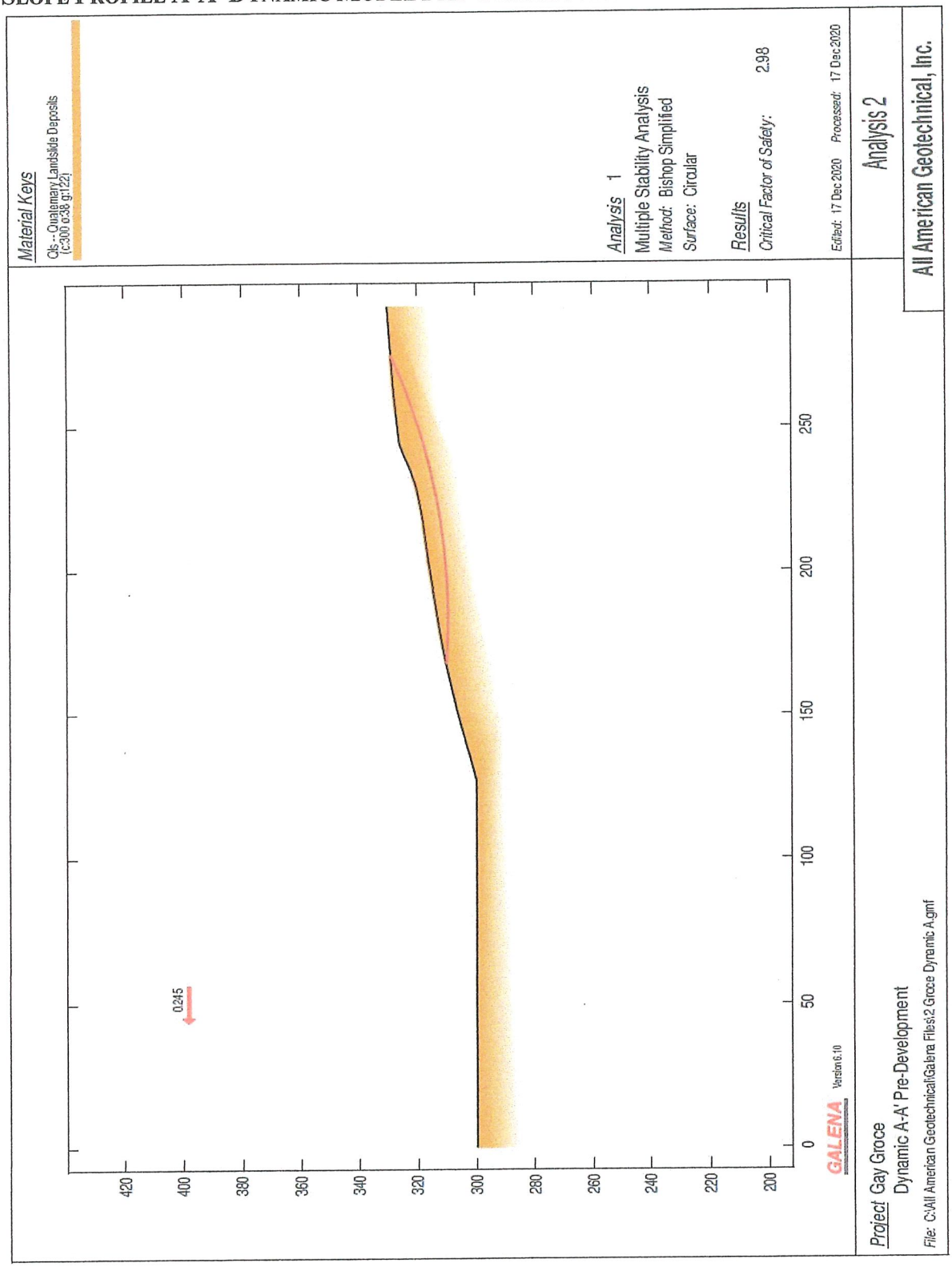
COMPUTER MODELS

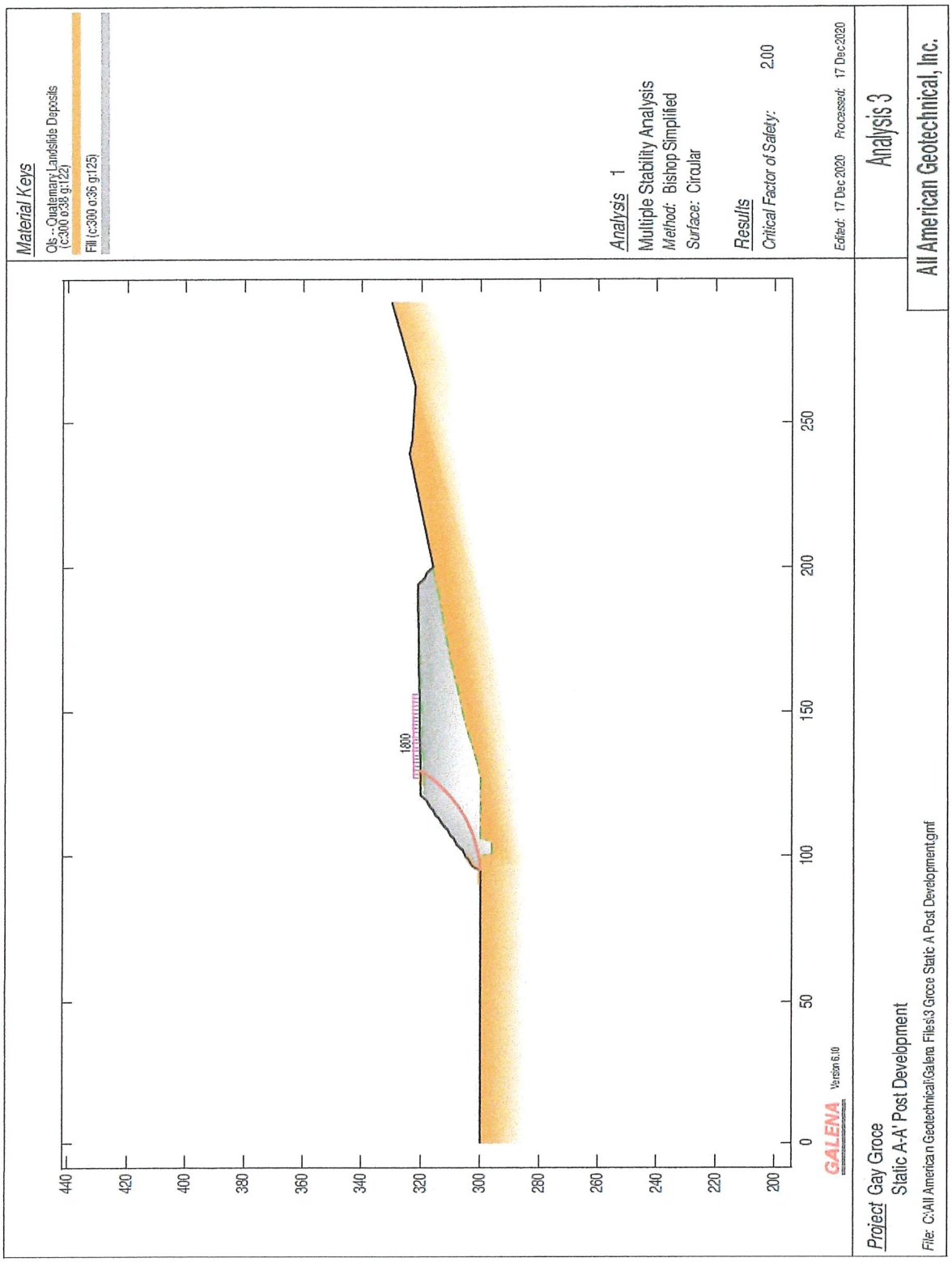
SLOPE PROFILE A-A' STATIC MODEL PRE-CONSTRUCTION



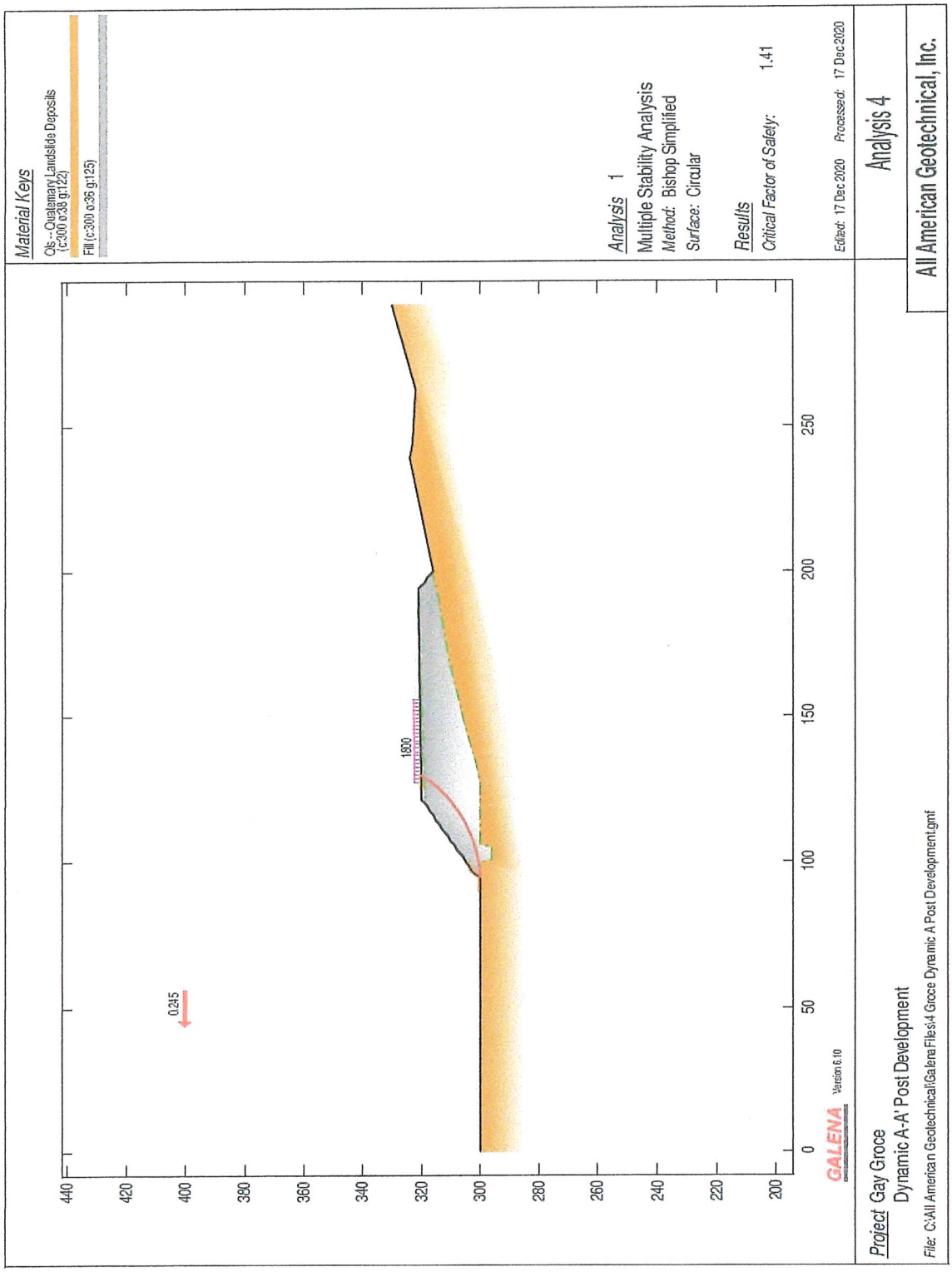
SLOPE PROFILE A-A' DYNAMIC MODEL PRE-CONSTRUCTION



SLOPE PROFILE A-A' STATIC MODEL POST-CONSTRUCTION



SLOPE PROFILE A-A' DYNAMIC MODEL POST-CONSTRUCTION



FIGURES

FIGURE 1. VICINITY MAP

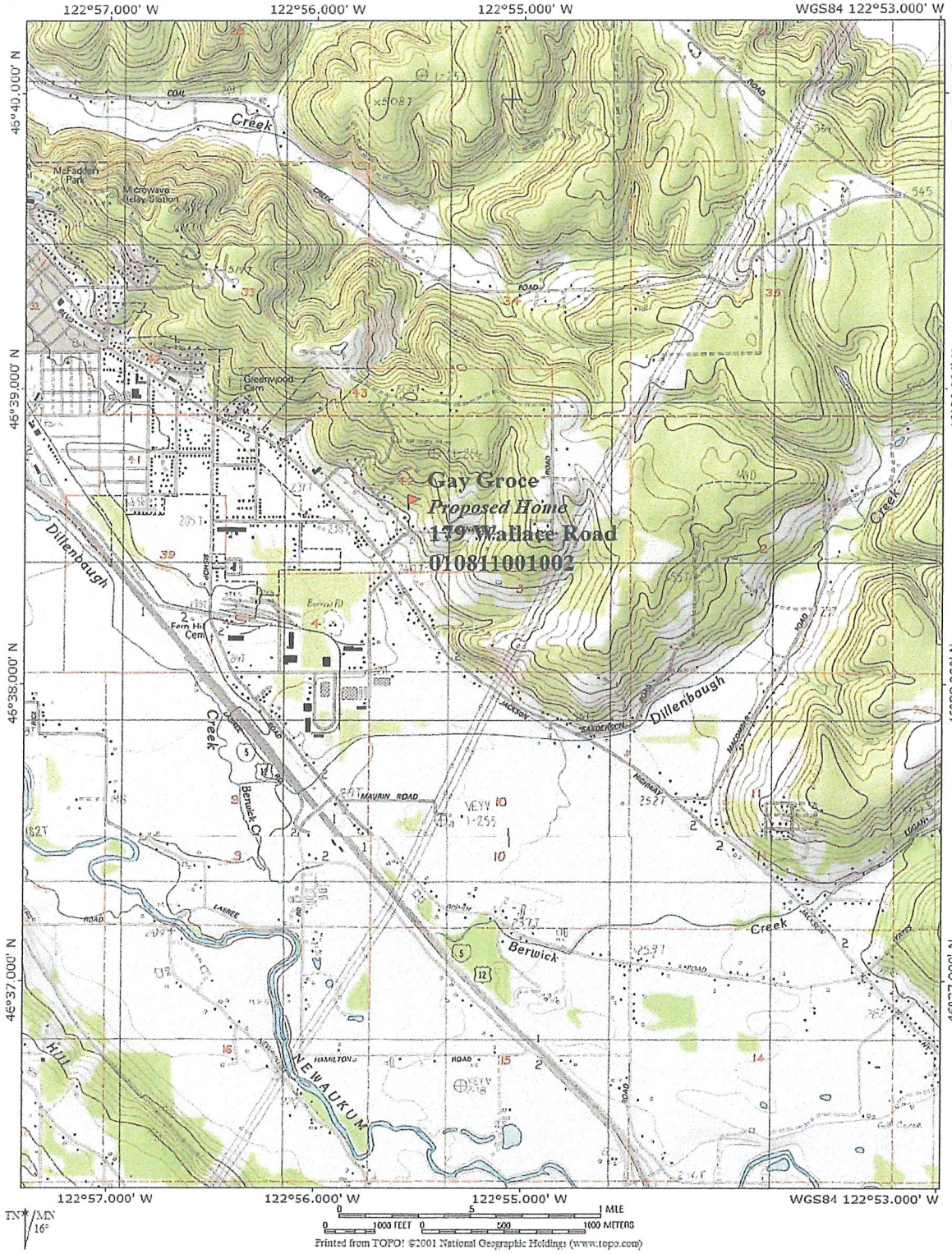
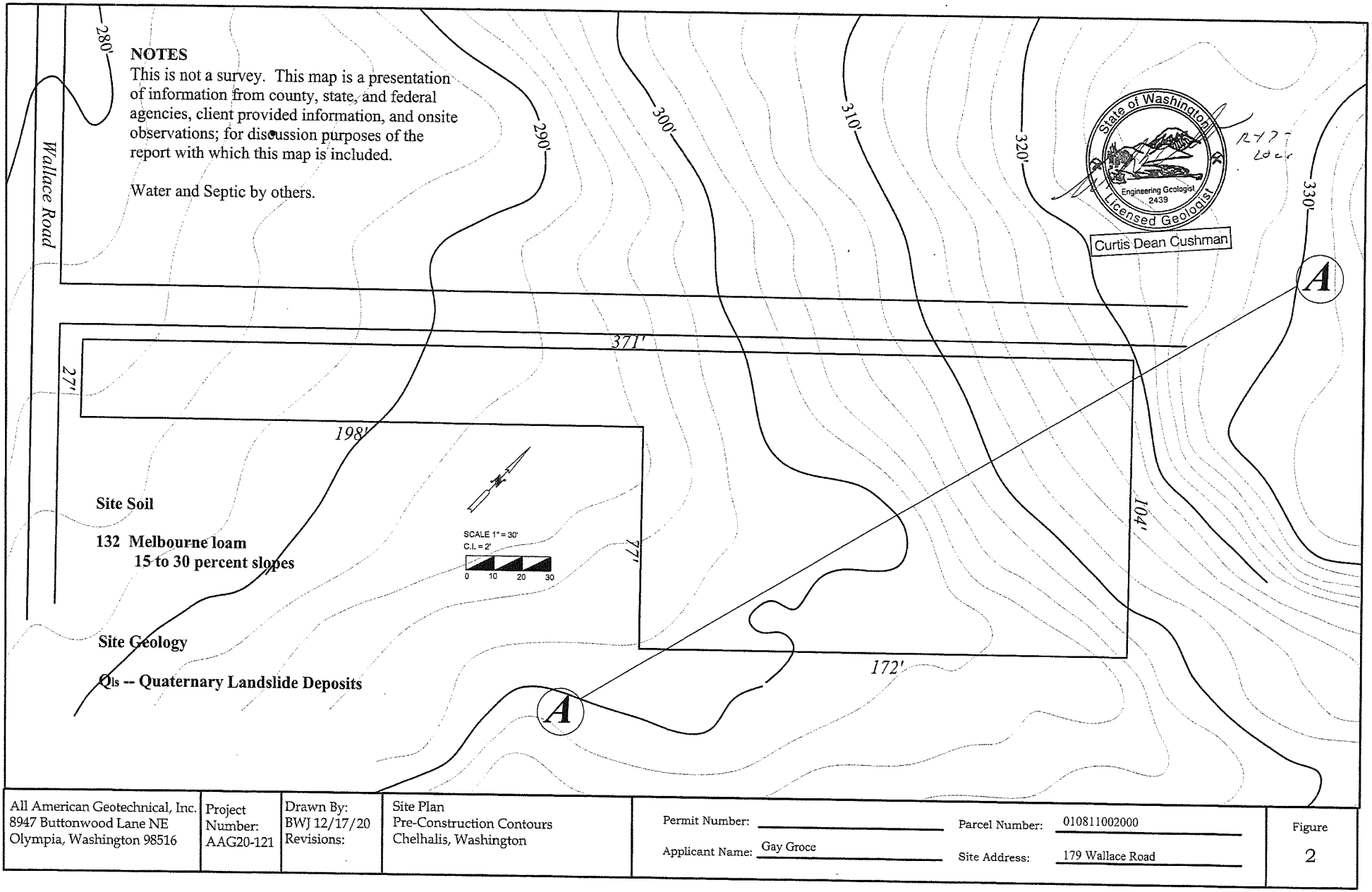
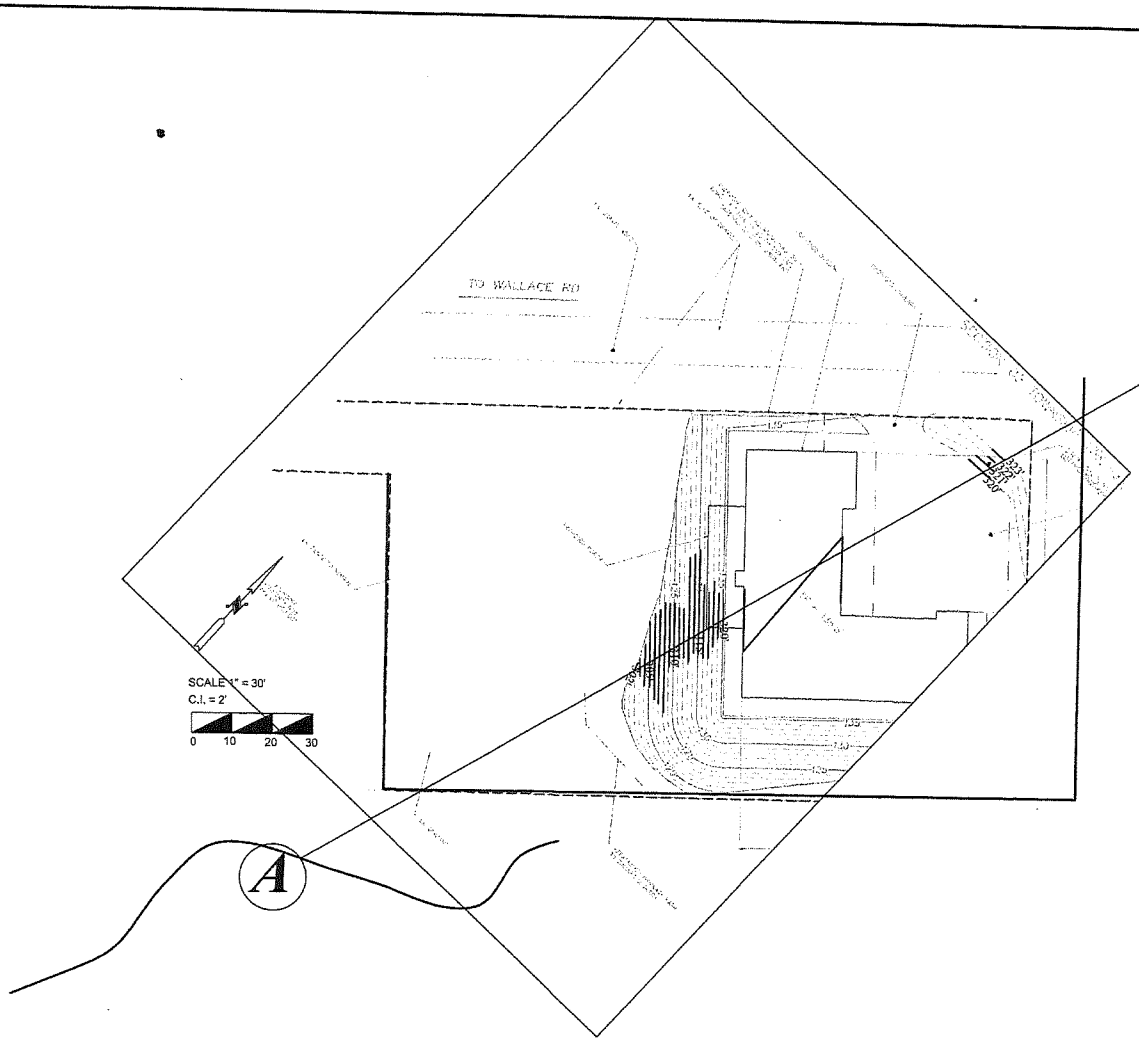


FIGURE 2. SITE PLAN



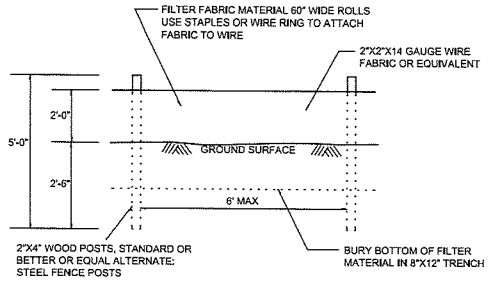
All American Geotechnical, Inc. 8947 Buttonwood Lane NE Olympia, Washington 98516	Project Number: AAG20-121	Drawn By: BWJ 12/17/20 Revisions:	Site Plan Pre-Construction Contours Chelhalis, Washington	Permit Number:	Parcel Number: 010811002000	Figure 2
				Applicant Name: Gay Groce	Site Address: 179 Wallace Road	

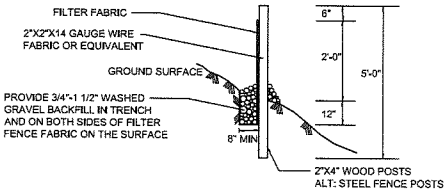


State of Washington
Engineering Geologist
2439
Licensed Geologist
12-17-2020
Curtis Dean Cushman

All American Geotechnical, Inc. 8947 Buttonwood Lane NE Olympia, Washington 98516	Project Number: AAG20-121	Drawn By: BWJ 12/17/20 Revisions:	Site Plan Post-Construction Contours Chelhalis, Washington	Permit Number:	Parcel Number: 010811002000	Figure 2A
				Applicant Name: Gay Groce	Site Address: 179 Wallace Road	

FIGURE 3. EROSION CONTROL NOTES



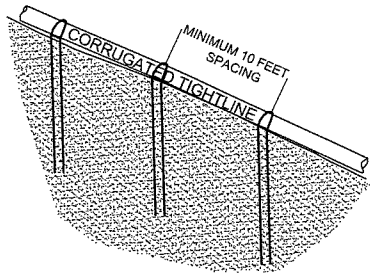


FILTER FABRIC FENCE NOTES:

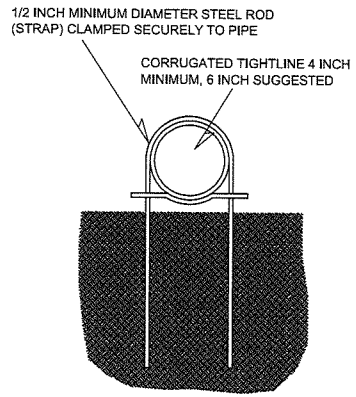
1. FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST WITH A MINIMUM 6-INCH OVERLAP AND SECURELY FASTENED AT BOTH ENDS TO THE POST.
2. POSTS SHALL BE SPACED A MAXIMUM OF 6 FEET APART AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 30 INCHES).
3. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 8 INCHES WIDE AND 12 INCHES DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
4. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 1 INCH LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 4 INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
5. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE AND 20 INCHES OF FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO THE EXISTING TREES.
6. WHEN EXTRA-STRENGTH FILTER FABRIC AND CLOSER POST SPACING IS USED, THE WIRE MESH SUPPORT FENCE MAP BE ELIMINATED, IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OR ABOVE NOTES APPLYING.
7. FILTER FABRIC FENCES SHALL NOT BE REMOVED BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
8. FILTER FABRIC FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.

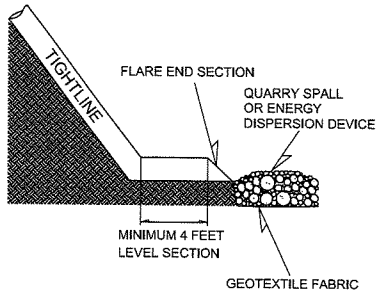
GENERAL EROSION CONTROL NOTES:

1. EROSION CONTROL MEASURES SHALL BE IN PLACE PRIOR TO THE BEGINNING OF CONSTRUCTION. THE PROJECT ENGINEER AND THE COUNTY SHALL INSPECT AND APPROVE THE INSTALLATION OF EROSION CONTROL MEASURES PRIOR TO BEGINNING CONSTRUCTION.
2. EROSION CONTROL MEASURES ARE NOT LIMITED TO THE ITEMS ON THIS PLAN. THE CONTRACTOR IS RESPONSIBLE FOR THE INSTALLATION AND MAINTAINANCE OF ALL EROSION CONTROL MEASURES. NO SILTATION OF EXISTING OR PROPOSED DRAINAGE FACILITIES SHALL BE ALLOWED. CARE SHALL BE TAKEN TO PREVENT MIGRATION OF SILTS TO OFF SITE PROPERTIES.
3. THE CONTRACTOR SHALL MAKE DAILY SURVEILLANCE OF ALL EROSION CONTROL MEASURES AND MAKE ANY NECESSARY REPAIRS OR ADDITIONS TO THE EROSION CONTROL MEASURES. THE CONTRACTOR SHALL PROVIDE ADDITIONAL EROSION CONTROL MEASURES AS DETERMINED NECESSARY BY THE COUNTY INSPECTOR AND/OR THE PROJECT ENGINEER. FAILURE TO COMPLY WITH ALL LOCAL AND STATE EROSION CONTROL REQUIREMENTS MAY RESULT IN CIVIL PENALTIES BEING LEVIED AGAINST THE CONTRACTOR AND/OR PROJECT OWNER.
4. DURING THE WET SEASON (NOVEMBER TO MARCH) ALL DISTURBED SOILS SHALL BE STABILIZED WITHIN 48 HOURS AFTER STOP OF WORK. EROSION CONTROL MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, COVERING THE EFFECTED AREA INCLUDING SPOIL PILES WITH PLASTIC SHEETING, STRAW MATTING, JUTE MATTING, STRAW MULCH, OR WOOD CHIPS. SEEDING OF THE DISTURBED AREAS SHALL TAKE PLACE AS WEATHER PERMITS.
5. ALL SEEDED OR SODDED AREAS SHALL BE CHECKED REGULARLY TO MAKE SURE VEGETATIVE COVERAGE IS COMLETE. AREAS SHALL BE REPAIRED, RESEEDED, AND FERTILIZED AS REQUIRED.
6. TRACKING OF SOIL OFFSITE WILL NOT BE ALLOWED. IF ANY SOIL IS TRACKED ONTO A COUNTY STREET, IT SHALL BE REMOVED BY THE END OF THAT WORKING DAY. ANY FURTHER TRACKING OF MUD WILL THEN BE PREVENTED BY SWEEPING OR WASHING OF THE VEHICLES TIRES BEFORE DRIVING ON A COUNTY STREET.
7. NO MORE THAN 500 LF OF TRENCH ON A DOWNSLOPE OF MORE THAN 5 PERCENT SHALL BE OPENED AT ONE TIME.
8. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES.
9. TRENCH DEWATERING DEVICES SHALL BE DISCHARGED IN A MANNER THAT WILL NOT ADVERSELY AFFECT FLOWING STREAMS. DRAINAGE SYSTEMS OR OFFSITE PROPERTIES.
10. ALL STORM SEWER INLETS RECEIVING RUNOFF FROM THE PROJECT DURING CONSTRUCTION SHALL BE PROTECTED SO THAT SEDIMENT-LADEN WATER WILL BE FILTERED BEFORE ENTERING THE CONVEYANCE SYSTEM.
11. ALL OFF-SITE CATCH BASINS IMMEDIATELY ADJACENT TO THE SITE SHALL BE PROTECTED FROM SILTATION.
12. ALL DISTURBED AREAS SHALL BE SEEDED OR SODDED UPON COMPLETION OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THAT COMPLETE COVERAGE OF THE DISTURBED AREAS IS PROVIDED & THAT GROWTH OF THE VEGETATION IS ESTABLISHED.
13. CATCH BASINS SHALL TRAP SEDIMENT OR FILTER FABRIC MUST BE PLACED UNDER GRATE UNTIL VEGETATION IS ESTABLISHED.



TIGHTLINE ANCHORED WITH TWO,
3 FOOT REBAR LENGTHS OR BOLTS.





GRASS-LINED SWALE SHOULD BE A
MINIMUM ONE FOOT WIDE AT THE
BOTTOM AND ONE FOOT DEEP WITH
A MAXIMUM SLOPE OF 5 PERCENT.

All American Geotechnical, Inc. 8947 Buttonwood Lane NE Olympia, Washington 98516	Drawn By: BWJ 12/17/20 Revisions:	Erosion Control Notes Proposed Home Lewis County Chehalis, Washington	Permit Number:		Parcel Number:	010811002000	Figure 3
			Applicant Name:	Gay Groce	Site Address:	179 Wallace Road	