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Robert Tomlinson, Member
Legacy Ridge, LLC.
1836 Northwest Boulevard
Coeur d' Alene, ID 83814

December 23, 2024

Project: G241121

Project: Legacy Phase F, Liberty Lake, WA
Subject: Results of Geohazard Evaluation

Mr. Tomlinson:

At your request, we conducted geologic research and reconnaissance of the subject property and prepared this geohazard evaluation preliminary report.

INTRODUCTION

Project Considerations

We previously completed a geotechnical engineering report (GER)¹ related to proposed residential development of the eastern half of Spokane County parcel 55211.9189. Plans provided by Whipple Consulting Engineers (WCE) show an approximately 35-acre expansion of the housing development is proposed on the western half of the parcel. Cuts and fills greater than 30 feet are planned. City of Liberty Lake (COLL) has requested a geohazard evaluation of the expansion area.

Other geotechnical evaluations conducted in the vicinity of the site include the following:

- *Geotechnical Engineering Report, Legacy Ridge CID Reservoir, August 2, 2022; and,*
- *Geotechnical Engineering Report, Legacy Ridge Phase F, November 6, 2024.*

Location

The site is in the SW $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 21, Township 25 North, Range 45 East, Willamette Meridian. A physical address is not currently assigned. The project area is directly north of the Saltese Uplands Conservation Area. The location is shown in the attached *Figures*.

Scope

The scope of services included:

- Review of readily available geologic and soil information;
- Field reconnaissance of the subject property;
- Evaluation of pertinent geologic and hydrologic conditions at the site based on visual observations;
- Development of professional opinions and recommendations relating to potential geologic hazards as defined by the COLL Development Code, *Title 10, Chapter 6B-5: Geologically Hazardous Areas*; and,
- Preparation of a letter report documenting our conclusions.

Laboratory analysis was not included in this scope of services. Additional geotechnical evaluation to support the construction of structures or the safety factors associated with existing fill, cut, or native

¹ *Geotechnical Engineering Report, Legacy Ridge Phase F*, dated April 9, 2022.

slopes was not performed. Such an evaluation would require subsurface exploration and geotechnical engineering analysis of information associated with the design of infrastructure and houses such as loads, levels, and geometry that is not included in the scope of these services.

This geohazard evaluation preliminary report addresses our conclusions as to the potential geohazards as defined by the COLL Development Code. The conclusions are based on visual observations of the ground surface conditions and our review of the published data. Soil parameters associated with foundation design, wall design, structural fill, bearing capacity, or seismic criteria are not addressed in this report.

ENCOUNTERED CONDITIONS

Physical Setting and USDA Soil Mapping

The site is in the southern portion of the Priest River metamorphic core complex. Core complexes are typically “domal” and comprised of a core of high-grade metamorphic rocks such as gneiss. These metamorphic rocks formed deep within the crust as a result of significant elevated pressure and temperature causing metamorphism of the preexisting rock. Geologic mapping of the area shows the site is underlain by Hauser Lake Gneiss (*pChl*) consisting of gray, tan, and brown coarse-grained gneiss (WSDNR, 2004).

The Natural Resource Conservation Service (NRCS) maps the site soils as listed in *Table 1* below.

Table 1. NRCS Soil Units

Soil Unit Number	Soil Unit Name
3025	Battleplain ashy sandy loam, 15 to 30 percent slopes
5037	Spokane-Rock outcrop complex, 30 to 55 percent slopes
5040	Spokane-Swakane complex, 3 to 15 percent slopes
5071	Lenz-Spokane complex, 15 to 30 percent slopes
5313	Kramerhill-Spokane complex, 8 to 25 percent slopes

Site Reconnaissance

We visited the subject property on December 11, 2024, to observe the surface conditions.

The site is on the north side of Carson Hill and spans a series of short, broad ridges that generally slope down to the northwest (see *Figure 3-1*). The ground surface was covered with low-growing grass and weeds and sparsely populated by mature conifers and shrubs. Slopes ranged from approximately 15 to 60 percent and were steepest at the southern end near the summit of the hill. Slopes in areas where building pads and roadways are proposed ranged from 15 to 40 percent.

Indications of *existing fill* soil were limited to a narrow, 3- to 6-foot-tall, berm that trended southeast to northwest through the center of the site. An overgrown primitive road was observed at the proposed alignment of “Road A” extending from the north end of the site south to proposed “Lot 47” and appeared to have been constructed by cut and fill methods. A fill wedge (estimated less than 10-foot thick) appeared to have been placed at the top of the slope in the southeast corner, possibly related to past grading activities on the hilltop.

Outcrops of *gneiss* were observed in several areas throughout the site (see *Figure 3-2*). Orientations of observed foliation and joint planes are listed in *Table 2*.

Table 2. Gneiss Foliation and Joint Plane Orientations

Foliation Planes:		Joint Planes:	
Dip (degrees)	Dip Direction (degrees azimuth)	Dip (degrees)	Dip Direction (degrees azimuth)
17	145	53	055
22	130	55	065
20	170	69	321
30	136	71	326
Spacing ranged from ¼ to 5 inches		Spacing ranged from ¾ to 6 inches	

A shallow excavation at the north end of proposed “Lot 54” on the east side of the site revealed 1 to 2 feet of silty sand over *gneiss* (see *Figure 3-3*). The excavation reached a maximum depth of approximately 5 feet. Rock strength appeared to increase with depth.

GEOLOGIC HAZARDS

The COLL Development Code requires evaluation of geologically hazardous areas, principally erosion and landslide areas (*Title 10, Chapter 6B-5, Section A*). The purpose of the code is to discourage development in geologically hazardous areas unless proponents demonstrate that such areas can be developed consistent with acceptable standards for public health and safety.

Based on this code, geohazard areas in Liberty Lake exhibit at least one of the following characteristics:

- a. *A slope of 30 percent or greater;*
- b. *Soils identified by Natural Resource Conservation Service (NRCS) as posing a severe potential for erosion (see Section 11.20.090M Appendix M);*
- c. *Hydraulic factors such as existing on-site surface and groundwater or changes in hydraulic factors, caused by proposals that create a severe potential for erosion or landslide hazard;*
- d. *Areas that historically have been prone to land sliding or with one of the following geologic formations: alluvium, landslide deposits, Latah Formation;*
- e. *Areas of uncompacted fill; and,*
- f. *Areas that are unstable as a result of rapid stream or stream bank erosion.*

In addition to the geohazard characteristics listed above, the Spokane County Critical Areas Ordinance (SCCAO), *Section 11.20.070*, includes the following characteristics:

- *Seismic hazards include the following areas identified on the Liquefaction Susceptibility Map of Spokane County, Washington (source: Washington State Department of Natural Resources, Sept. 2004):*
 - *For public buildings and public assembly buildings and uses those areas classified as having a liquefaction susceptibility of moderate; and*
 - *For all buildings and public assembly uses those areas classified as having liquefaction susceptibilities of “moderate to high”, “high”, or “peat deposit.”*
- *Seismic hazards include the following areas identified on the Site Class Map of Spokane County, Washington (source: Washington State Department of Natural Resources, Sept. 2004):*
 - *For public buildings and public assembly buildings and uses those areas classified as having a site class of “D”;* and
 - *For all buildings and public assembly uses those areas classified as having a site class of “D to E”, “E”, or “F.”*

DISCUSSION

Geologically hazardous areas were identified during the review of published data and field reconnaissance of the site including components *a*, *b*, and *e* of the COLL Development Code, as listed above. Seismic hazards, as described in the SCCAO, were not identified.

- Slopes of 30 percent or greater are present as shown in *Figure 2-2*. Structures and pavements are not currently proposed in areas where slopes exceed approximately 40 percent with the exception of a few isolated areas of rock outcrop and shallow pre-existing road cut.
- Severe erosion potential was calculated based on soil erodibility factors defined by the NRCS and existing slope observed at the site. Results are summarized in *Table 3* below and illustrated in *Figure 2-3*.

Table 3. NRCS Soil Data

Soil Unit Number	Erosion Factor Kf (rock free)	Severe Erosion Potential*
3025	0.32	Slopes greater than 12 percent
5037	0.32	
5040	0.32	
5071	0.10	Slopes greater than 40 percent
5313	0.43	Slopes greater than 9 percent

*Based on calculations in the modified version of the Universal Soil Loss Equation (USLE) described in the COLL Development Code.

Exposed soil on slopes greater than those listed in *Table 3* above pose a severe potential for erosion and should be revegetated as soon as possible to mitigate risk of erosion. Typical construction Best Management Practices and preservation of natural drainages are anticipated to be adequate to address soil erosion issues. Dust abatement will likely be necessary during grading activities and dry periods.

- Records of compaction required to verify placement of fill materials were not provided or readily available. Thus, the observed *existing fill* is assumed to be “uncompacted.” We anticipated uncompacted, *existing fill*” will be removed from areas where structures and pavements are proposed during initial site grading activities.
- While geologically hazardous areas are present within the proposed development, we conclude the project is feasible because these conditions can be managed through proper design, construction, and verification. Special considerations will need to be addressed by civil and structural engineers with respect to designing utilities, roads, and buildings on and directly adjacent to steep slopes and areas posing severe potential for erosion.

Subsurface conditions within the site are anticipated to be very similar to those described in the previous GER, and the earthwork recommendations presented in the GER will likely be applicable to the proposed expansion of the development. We recommend completing additional exploration to verify the subsurface conditions before constructing pavements and embankment fills.

LIMITATIONS

The conclusions presented herein represent our professional opinions based on the limited scope of work performed to date. This report is intended for the sole use of our client for the purposes stated herein and should not be used by other parties for other purposes without contacting us to provide specific evaluation and recommendations. Specific geotechnical evaluation and design for construction is beyond the scope of this report.

The client should expect these services to have been completed in a manner consistent with the level of skill and care ordinarily exercised by members of the profession currently practicing in this area with similar budget and time constraints on projects of similar size and scope. No express or implied warranties are offered or made.

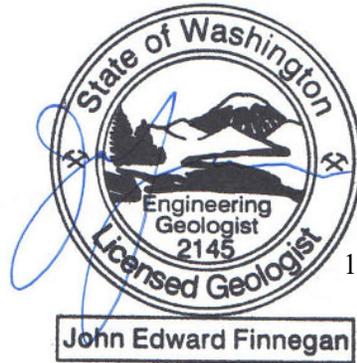
Be aware that geohazard evaluation reports do not substitute for geotechnical engineering evaluations to design slopes, walls, roads, utilities, stormwater facilities, structures, and earthwork.

Please contact us if you have questions or concerns regarding the information presented herein.

Prepared by:
BUDINGER & ASSOCIATES, INC.

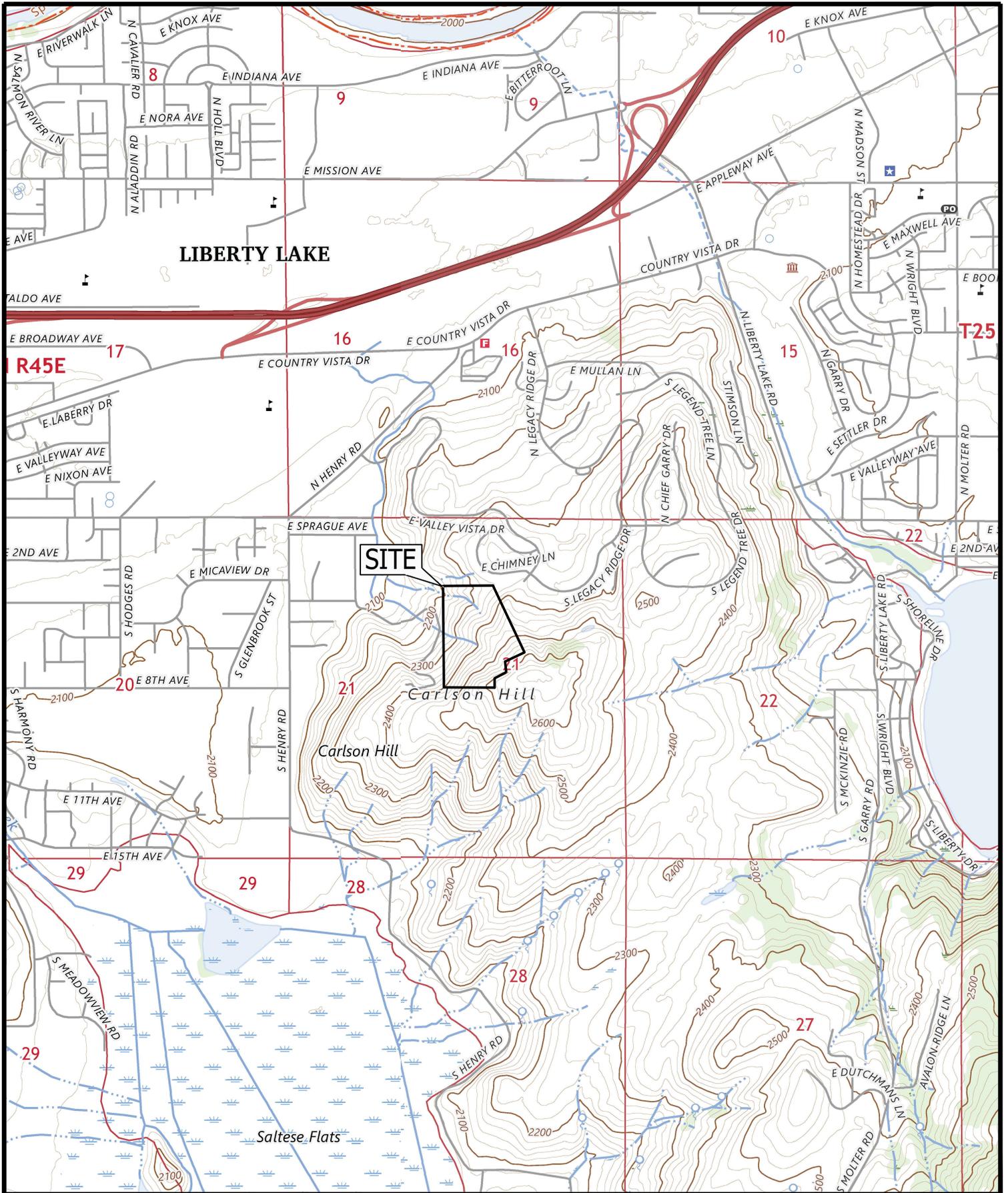
Jason Pritzl, LG
Lead Professional Geologist

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Geotechnical Engineer



Attachments:

- Vicinity Map, Figure 1
- Site Plan, Figure 2-1
- Slopes 30 Percent or Greater, Figure 2-2
- Sever Erosion Potential, Figure 2-3
- Photograph Log, Figures 3-1 to 3-3
- *Important Information about This Geotechnical-Engineering Report*

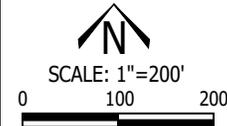
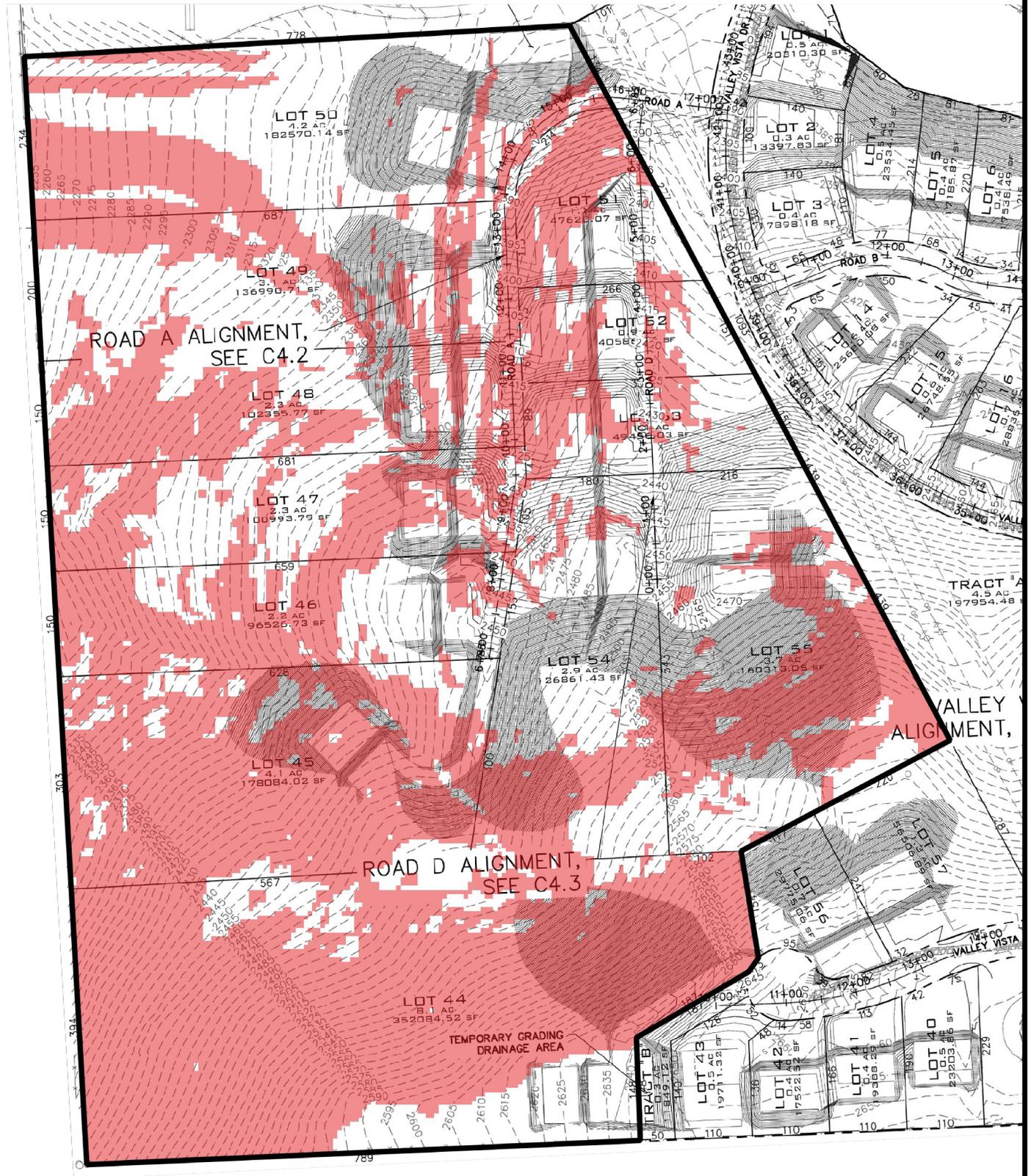



 SCALE: 1"=2000'
 0 1000 2000
 SECTION 21
 T 25 N R 45 E
 USGS 2023


 Budinger
 & Associates

VICINITY MAP
 LEGACY PHASE F
 LIBERTY LAKE, WASHINGTON

FIGURE 1
 PROJECT NUMBER G241121
 DATE: 12/2024



SECTION 21
T 25 N R 45 E
USGS 2023



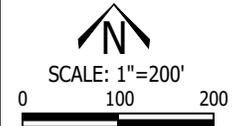
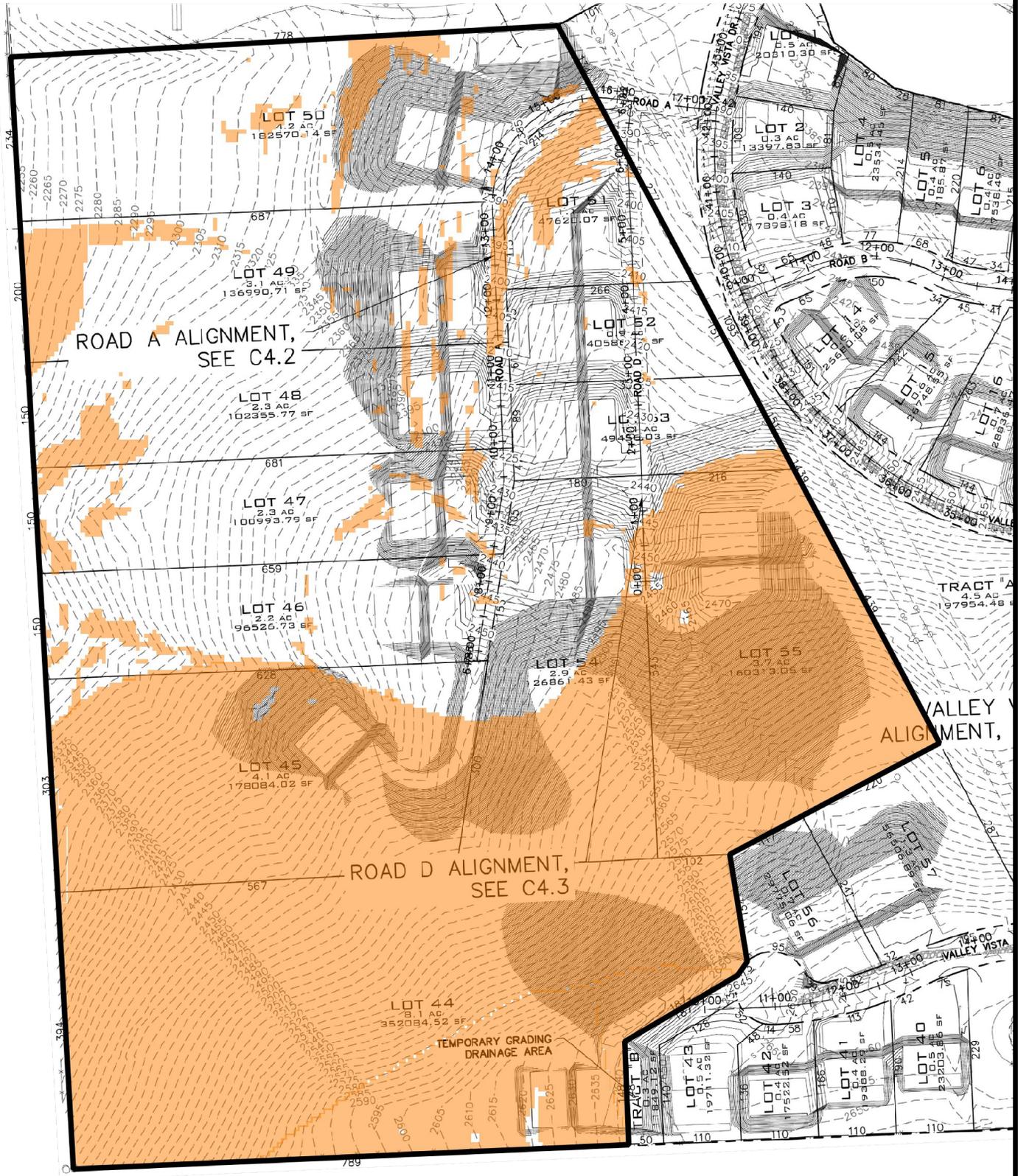
SLOPES 30% OR GREATER

LEGACY PHASE F
LIBERTY LAKE, WASHINGTON

FIGURE 2-2

PROJECT NUMBER G241121

DATE: 12/2024



SECTION 21
T 25 N R 45 E
USGS 2023



SEVERE EROSION POTENTIAL

LEGACY PHASE F
LIBERTY LAKE, WASHINGTON

FIGURE 2-3

PROJECT NUMBER G241121
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Southwest corner of proposed development; looking north.



East-central side of proposed development; looking west.



Rock outcrop at southwest corner of proposed development; looking east. Notebook dimensions are 4.5 by 7 inches.



Rock outcrop at east side of proposed development; looking east.



Excavation at north end of proposed Lot 54. Approximately 1.5 feet of silty sand over gneiss; maximum depth of 5.5 feet.



View inline with strike of rock joint planes.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply this report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold-prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical-engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your GBC-Member geotechnical engineer for more information.



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