Attachment 16

Revised Geotechnical Consultation

Proposed Kaiser Woods Park Development
Tumwater, Washington

for
City of Olympia
Olympia Parks, Arts, and Recreation

October 30, 2025

1101 Fawcett Avenue, Suite 200
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GeoEngineers

Revised Geotechnical Consultation

Proposed Kaiser Woods Park Development
Tumwater, Washington

File No. 0415-079-01
October 30, 2025

Prepared for:

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1.0 Introduction and Project Understanding

This report presents the results of GeoEngineers, Inc.'s (GeoEngineers') geotechnical engineering consultation for a portion of the overall Kaiser Woods Park improvement project in Olympia, Washington. The approximate location of this project is shown in Figure 1.

The subject of this report is proposed stormwater detention facilities in the southeastern portion of the park property. We completed a previous consultation regarding the proposed stormwater facilities in August 2024. The proposed facilities include a stormwater pond, which is shown in Figure 2. Other features include Filterra treatment features along an east-west oriented former logging road. The current gravel roadway will be surfaced with asphalt and will be about 21.5 feet wide. It appears the existing road surface area is equal to or wider than the proposed finished surfacing.

Sloping ground exists at the site. We understand that City of Olympia comments on project plans indicated these slopes, greater than 15 percent inclination, within 200 feet of the proposed stormwater features need to be evaluated with respect to landslide hazards. These areas include slopes within 200 feet of the proposed stormwater pond and within 200 feet of the proposed features along the access road and near a parking area to the east. The City defines landslide hazards within Chapter 18.32.610 of the City regulations.

Our work was generally performed in accordance with our revised proposal, dated January 9, 2025. We received written authorization on January 27, 2025.

2.0 Scope of Services

The scope of services completed for this project includes the following tasks.

1. Review selected geologic/hydrogeologic reports completed by Landau, Sage, and Krazan. These reports were completed for various park project elements.
2. Review published geologic maps for the site and nearby areas.
3. Review topographic maps for the site area.
4. Perform a geologic reconnaissance of slope areas within about 200 feet of the proposed stormwater facilities. This event occurred on February 7, 2025. Evaluate and map exposures of geologic materials that are visible in slope areas. Observe and note groundwater seepage on or near the slopes, if present.
5. Assess the visual stability of the slope areas.
6. Evaluate whether the slopes meet the technical criteria for landslide hazard areas by the City of Olympia Critical Areas Ordinance. Create a map of the slope areas and note those slopes that meet the technical criteria for Landslide Hazard Areas.
7. Develop opinions regarding the stability of the slope areas reviewed, whether these areas represent landside hazards for the project and whether the proposed stormwater infrastructure will negatively impact the slope areas.
8. Provide recommendations to mitigate landslide hazards from the proposed development, if it appears the proposed work could detrimentally affect slope stability.

3.0 Surface Conditions

The site is located west of Black Lake Boulevard SW as shown in Figures 1 and 2. Black Lake Boulevard SW traverses a north to south oriented valley that is bordered by the Black Hills to the west and Bush Mountain to the east. The park site is located on the east slope of the Black Hills. The site area has a general downward slope to the east.

A former logging road is located at the project site as shown in Figure 2. An unimproved parking area is located just south of the logging road, with an entrance from Black Lake Boulevard SW. We observed outcrops of basalt rock in the slope area west of this parking area. We also observed exposures of basalt on both sides of the site access road just west of Black Lake Boulevard SW. It appeared a cut into the basalt rock was completed in this area to build the logging road.

We also observed slope areas within about 200 feet from the proposed stormwater pond feature. Slopes northeast and northwest of the pond appear to be underlain at shallow depths by basalt bedrock. We observed scattered basalt outcrops and rectangular boulders throughout these areas. The slope directly south of the pond area appears to be fill used to support the unimproved roadway. Similarly, the south facing slope on the other side of the road also appears to be fill. Exposures of the fill slopes are basalt gravel and cobbles. This material was likely sourced locally within the site. We understand this material was identified by Krazan (2023) as rock spall fill.

We field measured slope inclinations throughout the site and reviewed a topographic map of the site area. The distribution of slope areas between 15 and 40 percent, and greater than 40 percent within about 200 feet of the proposed stormwater improvements are shown in Figure 2. All of these slope areas shown are equal to or greater than 10 feet in vertical height. The Cities ordinance specifies that slopes must be at least 10 feet in vertical height to meet the technical definition of a landslide hazard area.

3.1 GEOLOGIC CONDITIONS

Geologic conditions at the site and nearby area were evaluated by reviewing the Washington State Department of Natural Resources “Geologic Map of the Tumwater 7.5-minute Quadrangle, Thurston County, Washington, 2003.” Materials mapped in the site area comprise Vashon Recessional Outwash (map unit Qgo) and Crescent Formation Basalt (map unit Evc).

Recessional outwash material is mapped in a narrow, north to south oriented band through the site area, generally west of Black Lake Boulevard SW. This soil is described as sand and gravel with some silt. The remainder of the site is mapped as Cresent Formation Basalt. This material is described as dark gray, somewhat massive aphanitic basalt that was formed in an underwater environment. We observed some fracturing of the basalt in surface outcrops at the site during our site visits. Basalt bedrock is stable at very steep to near vertical slopes.

4.0 City of Olympia Critical Areas Ordinance Summary

The City of Olympia defines landslide hazard areas in Article IV, Chapter 18.32, Critical Areas within the Cities municipal code. Specifically, Section 18.32.610 Landslide Hazard Areas – Applicability and Definition.

The ordinance defines landslide hazard areas as slopes, equal to or greater than 10 vertical feet in height, meeting one or more of the following criteria:

1. Steep slopes of forty (40) percent or greater.
2. Slopes of fifteen (15) percent or greater, with:
    a. Impermeable subsurface material (typically silt and clay), frequently interbedded with granular soils (predominantly sand and gravel), and
    b. Springs or seeping groundwater during the wet season (November to February).
3. Any areas located on a landslide feature which has shown movement during the past 10,000 years or which is underlain by mass wastage debris from that period of time.

Areas which meet the criteria stated above, within the site subject area, are shown in Figure 2. A discussion of these areas, with respect to landslide hazards is contained in the following section.

5.0 Discussion

Based on our geologic reconnaissance and review of the geologic and topographic maps we conclude that slopes greater than 15 percent and less than 40 percent shown in Figure 2 do not meet the technical criteria for landslide hazard areas because neither condition (a) nor (b) appear to exist in these slope areas.

The areas of slope equal to or greater than 40 percent (and also 10 feet in vertical height) meet the technical criteria for landslide hazard areas based solely on slope inclination. All these areas shown in Figure 2, except for the fill slopes, are underlain by basalt bedrock. This material is stable at slopes much steeper than 40 percent. These slope areas should not be considered as landslide hazard areas in the areas shown in Figure 2.

The two fill slope areas located on the north and south sides of the existing site access road at the proposed storm pond area, which are inclined greater than 40 percent, appear stable in their current slope inclinations. We do not recommend buffers nor setbacks from the slope areas shown in Figure 2.

6.0 Conclusions

Based on our study we do not believe the slopes meeting the technical criteria for landslide hazard areas at the site (40 percent fill slopes) represent an issue with respect to the stability and performance of the proposed stormwater pond. We also do not believe constructing proposed asphalt surfacing over the gravel road on top of the existing fill will negatively affect adjacent slope areas. We recommend that the proposed pond excavation not extend into the toe of the fill slope area.

We understand construction of the pond will result in some excavation just north of the gravel road. The contractor should not excavate into the roadway embankment slope. Any excavation to deepen the pond area must result in a slope inclination that is either the same or flatter than the existing slope inclination. We recommend that this language be added to the project specifications and the contractor be made aware of the limitations regarding pond excavation.

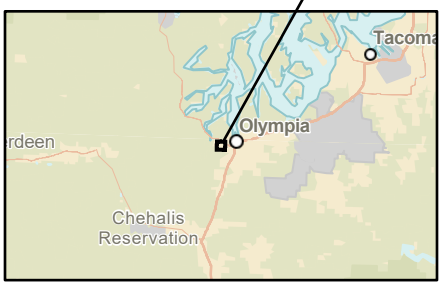
7.0 Limitations

We have prepared this report for use by the City of Olympia Parks, Arts, and Recreation Department. This report may be made available to regulatory agencies. Our analysis, interpretations and conclusions should not be construed as a warranty of subsurface conditions beneath the site. We have relied on information prepared and supplied by others in developing our recommendations. GeoEngineers makes no representations as to the accuracy or reliability of these data.

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. The conclusions, recommendations, and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix A titled “Report Limitations and Guidelines for Use” for additional information pertaining to use of this report.

Figures



N

0 1,000

Feet

Vicinity Map

City of Olympia - Kaiser Woods Geotechnical Evaluation
Olympia, Washington

GeoEngineers

Figure 1

Source(s):
- ESRI

Coordinate System: NAD 1983 UTM Zone 10N

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

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Legend

- 40% or Greater Slope 10' or More in Vertical Height
- 15% - 40% Slope 10' or More in Vertical Height

Sources:

- Aerial from Microsoft Bing, dated 2025.
- Contours and Design features from client sheet C1.2 Conceptual Stormwater Exhibit.

Coordinate System: NAD83 Washington State Planes, South Zone, US Foot.

N

0 80

Feet

Site Plan

City of Olympia - Kaiser Woods Geotechnical Evaluation
Olympia, Washington

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Figure 2

Appendices

Appendix A

Report Limitations and Guidelines for Use

Appendix A
Report Limitations and Guidelines For Use[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

READ THESE PROVISIONS CLOSELY

It is important to recognize that the geoscience practices (geotechnical engineering, geology, and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers, Inc. (GeoEngineers) includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS, AND PROJECTS

This report has been prepared for the City of Olympia and for the Project(s) specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with City of Olympia, dated January 9, 2025 and authorized on January 27, 2025 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

This report has been prepared for the Kaiser Woods Park improvement project in Olympia, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it 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.

[1] Developed based on material provided by GBA, GeoProfessional Business Association; www.geoprofessional.org.

For example, changes that can affect the applicability of this report include those that affect:

- The function of the proposed structure;
- Elevation, configuration, location, orientation, or weight of the proposed structure;
- Composition of the design team; or
- Project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

ENVIRONMENTAL CONCERNS ARE NOT COVERED

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

GEOTECHNICAL AND GEOLOGIC FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

GEOTECHNICAL ENGINEERING REPORT RECOMMENDATIONS ARE NOT FINAL

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers

cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT COULD BE SUBJECT TO MISINTERPRETATION

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- Advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- Encourages contractors to conduct additional study to obtain the specific types of information they need or prefer.

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 on-site personnel and adjacent properties.

BIOLOGICAL POLLUTANTS

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention, or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as

they may relate to this project. The term “Biological Pollutants” includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

INFORMATION PROVIDED BY OTHERS

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.