City of Kirkland

Request for Qualifications

Silver Spurs Storm System Upgrade – Project Number SDC1640000 Job #09-25-PW

ENGINEERING DESIGN SERVICES

Issue Date: **February 10, 2025**
Due Date: **March 7, 2025 – 4:00 p.m. (Pacific Time)**

REQUEST FOR QUALIFICATIONS

Notice is hereby given that qualifications will be received by the City of Kirkland, Washington, for:

Silver Spurs Storm System Upgrade
Project Number SDC1640000
Job #09-25-PW

File with Purchasing Agent, Finance Department, 123 Fifth Ave, Kirkland WA, 98033

Qualifications received later than **4:00 p.m. on March 7, 2025 will not** be considered.

A copy of this Request for Qualifications (RFQ) may be obtained from City's website at http://www.kirklandwa.gov/. Click on the Business tab at the top of the page and then click on "Doing Business with the City." All active projects can be found under the opportunities tab.

The City of Kirkland reserves the right to reject any and all qualifications, and to waive irregularities and informalities in the submittal and evaluation process. This RFQ does not obligate the City to pay any costs incurred by respondents in the preparation and submission of qualifications. Furthermore, the RFQ does not obligate the City to accept or contract for any expressed or implied services.

A Service Provider response that indicates that any of the requested information in this RFQ will only be provided if and when the Service Provider is selected as the apparently successful Service Provider is not acceptable, and, at the City's sole discretion, may disqualify the qualifications from consideration.

The City of Kirkland in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation Subtitle A, Office of the Secretary, Part 21, nondiscrimination in federally assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises as defined at 49 CFR Park 26 will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

In addition to nondiscrimination compliance requirements, the Service Provider(s) ultimately awarded a contract shall comply with federal, state and local laws, statutes and ordinances relative to the execution of the work. This requirement includes, but is not limited to, protection of public and employee safety and health; environmental protection; waste reduction and recycling; the protection of natural resources; permits; fees; taxes; and similar subjects.

Dated this February 10, 2025
Jay Gewin
Purchasing Agent
City of Kirkland

Advertised in Seattle Daily Journal of Commerce on February 10th & February 18th 2025

Background Information

The City of Kirkland is located on the eastern shore of Lake Washington. It is a suburban city, surrounded by other suburban cities and pockets of unincorporated King County. The City is near several major transportation routes including Interstate 405, State Route 520, and Interstate 5. These routes connect the City economically and socially to the greater Seattle area.

At the time of incorporation in 1905, the City of Kirkland's population was approximately 530. The current estimated population is 92,900. Kirkland is the twelfth largest city in the State of Washington and the sixth largest in King County.

Since its incorporation, Kirkland has grown in geographic size to eighteen square miles - approximately twenty times its original size. This growth occurred primarily through the consolidation of the cities of Houghton and Kirkland in 1968, the annexations of Rose Hill and Juanita in 1988 and the annexation of North Juanita, Finn Hill, and Kingsgate areas in 2011.

Kirkland operates under a Council-Manager form of government. The City Council is the policy-making branch of Kirkland's government and consists of seven members elected at large to staggered, four-year terms. The Mayor is elected from within the Council. The City Council is supported by several advisory boards and commissions and the City Manager. The City Manager is appointed by the City Council and serves as the professional administrator of the organization, coordinating its day-to-day activities.

Project Background:

This project will evaluate installing water quality treatment facilities and a series of UIC wells (infiltration wells) with infiltration to the maximum extent feasible within the ROW to reduce overflow of the existing system along 130th Avenue NE between NE 61st Place to NE 64th Street. Infiltration is the preferred method of flow control. The existing system ends in a closed depression/wetland on private property, and connection to nearby conveyance systems is infeasible. Other alternatives may be considered.

Residential homes near 6139 130th Ave NE have experienced crawl space and driveway flooding from surcharging of an existing drywell that is undersized and has no downstream overflow connection. Public and private stormwater flows to the existing storm system causing it to surcharge. It is estimated that the surcharging occurs during storms smaller than a 10-year event. The goal of the project is to reduce overflows to the degree feasible.

Key elements of this project include coordinating with existing utilities. Specifically there is a 24-inch water transmission line on NE 64th Street and an 8-inch water line along the east side of 130th Ave NE, both of which fall within the proposed project area. Additionally, ensuring private driveway access for properties near the planned drainage facilities and maintaining effective public coordination will be crucial for the project's success.

Subsurface exploration and stormwater infiltration feasibility study was conducted by Agency-contracted geotechnical consultant in 2024 included as Attachment 2. Monitoring well data is currently being collected and data will be available prior to beginning consultant design.

A project location map (Attachment 1) and the draft geotechnical subsurface investigation and infiltration feasibility assessment (Attachment 2) have been included to assist you in preparation of the SOQ. This project is funded by local general government funds.

Anticipated Scope of Work:

The anticipated scope of work for this project includes the design and development of Plans, Specifications, and Engineer's Estimates (PS&E) for the Project for the new storm water drainage system. Also included shall be the preparation of a 10% Design Concept layout discussing the proposed improvements concept-level analysis, alignment, and feasibility. The letter must only include two alternatives with concept-level cost estimates within the existing construction budget. This scope includes all surveying, geotechnical, and related engineering and environmental studies to support both the design and permitting efforts.

This scope may consist of the following elements:

Task 1 – Project Management and Coordination
Task 2 – Survey and Basemapping
Task 3 – Environmental Documentation and Permitting
Task 4 – Storm Drainage Review and Memorandum (TIR)
Task 5 – 10% Design Concept Exhibit and Estimates (P&E)
Task 6 – 30% Design, Plans and Estimate (P&E)
Task 7 – 60% Design, Plans and Estimate (P&E)
Task 8 – 90% Design, Plans, Specifications, and Estimate (PS&E)
Task 9 – 100% Ad-Ready Plans, Specifications, and Estimate (PS&E)
Task 10 – Bid Support
Task 11 – Optional Services

Optional Services May Include:

Optional services may include right-of-way support including but not limited to legal descriptions, appraisals, property owner negotiation, temporary construction easements; and construction support including but not limited to submittal review, preconstruction conference attendance, record drawings, and time sensitive design changes.

SOQ Format:

The format of your SOQ will be at your discretion. However, at a minimum, it shall address the following and not exceed 10 single-sided pages (8-1/2" x 11") in length:

1. A statement of your understanding of the various aspects of the project.
2. Your identification of critical project elements and how your project team would handle those elements to achieve a successful result.
3. A preliminary schedule of key milestones and deliverables dates.
4. Key personnel that will be assigned to this project, their roles, unique skills, experiences, and qualifications for the work.
5. Examples of similar projects successfully completed through PS&E by your design team, with an emphasis on recent, related projects. Please also include the names and phone numbers of client references that would be most knowledgeable of your firm's performance on these similar projects.

Contract Requirements and Fees

If your qualifications are accepted, the following fees and requirements will be due upon award, prior to issuance of a contract:

1. **Compliance with Law/City of Kirkland Business License**
    - Consultant must obtain and provide a copy of a City of Kirkland Business License and otherwise comply with Kirkland Municipal Code Chapter 7.02.
    - The Consultant shall comply with all applicable State, Federal and City laws, ordinances, regulations, and codes.

2. **Insurance**

    Consultant's insurance should be consistent with the requirements found in the sample agreement shown as Attachment 3.

Consultant Evaluation:

Consultant selection will be based on the SOQ and criteria weighting noted in the following section. In addition, references of the top scoring firm will be contacted before final selection is made.

Criteria	Points
Previous Experience in Similar Projects	0-25
Expertise of Key Personnel	0-25
Project Understanding and Approach	0-30
Availability to Meet Time Schedule	0-20
Maximum Points Possible	*100*

The Firm scoring highest on the above scale will be invited to submit a scope and fee proposal to the City. If a tie should occur, resolution will be based upon additional information requested by the City. The City reserves the option to also require virtual interviews with all firms submitting.

Interviews may be conducted with each firm after all qualifications are reviewed by the City. Each interview may consist of:

1. Consultant presentation, (approx. 10 mins)
2. Questions and answers (approx. 45 mins)

Tentative Project Schedule:

The project schedule is as follows:

- February 10, 2025 – RFQ is issued.
- February 21, 2025 at 12:00 PM – Deadline for Questions
- February 25, 2025 – Responses to Questions Posted
- March 7, 2025 – Consultant Statement of Qualifications Due
- March 21 2025 – Consultant Selection Decision
- April 4, 2025 – Finalize Scope and Fee

- April 21, 2025 – Notice to Proceed with Design Services
- January 14, 2026 – Complete PS&E and Bid Advertisement

Questions

Written questions regarding this request for qualifications should be submitted by 12:00 p.m. on February 21, 2025, directed to Kimberly Coraza to kcoraza@kirklandwa.gov

Questions regarding the RFQ process should be directed to Jay Gewin at purchasing@kirklandwa.gov

Answers will be posted to the City's website by February 25, 2025.

Statement of Qualifications Submittal Instructions

Please note: The following general requirements are mandatory for all statements of qualifications. Statements of Qualifications submitted after the deadline date and time or lacking one or more of the following requirements will not be accepted:

1. **Statements of qualifications must be received no later than 4:00 PM on March 7, 2025 (Pacific Time).**
2. Emailed statements of qualifications should include, "RFQ 09-25-PW – Silver Spurs Storm System Upgrade" in the subject line and be addressed to purchasing@kirklandwa.gov.
3. All statements of qualifications sent electronically must be in the form of a PDF document and cannot exceed 20MB. Qualifications should not exceed 10 pages.
4. All statements of qualifications must include the legal name of the organization, firm, individual or partnership submitting the RFQ. Include the address of the principal place of business, mailing address, phone numbers, emails, fax number (if one exists) and primary contact person.
5. To be evaluated, a statement of qualifications must address all requirements and instructions contained within.

Terms and Conditions

A. The City reserves the right to reject any and all statements of qualifications, and to waive minor irregularities in any statement of qualifications.

B. Proposers responding to this RFQ must follow the procedures and requirements stated in the RFQ document. Adherence to the procedures and requirements of this RFQ will ensure a fair and objective analysis of your statement of qualifications. Failure to comply with or complete any part of this RFQ may result in rejection of your statement of qualifications.

C. The City reserves the right to request clarification of information submitted, and to request additional information on any statement of qualifications.

D. The City reserves the right to award any contract to the next most qualified Consultant, if the successful agency does not execute a contract within 30 days of being notified of selection.

E. Any statement of qualifications may be withdrawn up until the date and time set above for opening of the statements of qualifications. Any statement of qualifications not so timely withdrawn shall constitute an irrevocable offer, for a period of one hundred and twenty (120) days to sell to the City the services described in the attached specifications, or until one or more of the statements of qualifications have been approved by the City administration, whichever occurs first.

F. The contract resulting from acceptance of a statement of qualifications by the City shall be in a form supplied or approved by the City and shall reflect the specifications in this RFQ. A copy of the City's standard Professional Services Agreement is available for review (see Attachment 3). The City reserves the right to reject any proposed agreement or contract that does not conform to the specifications contained in this RFQ and which is not approved by the City Attorney's office.

G. The City shall not be responsible for any costs incurred by the agency in preparing, submitting or presenting its response to the RFQ.

H. Any material submitted by a proposer shall become the property of the City. Materials submitted after a contract is signed will be subject to the ownership provision of the executed contract.

I. The City reserves the right not to award any portion or all of the project if it finds that none of the statements of qualifications submitted meets the specific needs of the project. The City reserves the right to modify the scope of work and award portions of this RFQ to the selected vendor. The City reserves the right to award this work to multiple vendors if the scope of work would be best completed by multiple vendors and their associated experience.

Cooperative Purchasing

Chapter 39.34 RCW allows cooperative purchasing between public agencies in the State of Washington. Public agencies which have filed an Intergovernmental Cooperative Purchasing Agreement with the City may purchase from City contracts, provided that the consultant agrees to participate. The City does not accept any responsibility for contracts issued by other public agencies, however.

Public Disclosure

Once submitted to the City, statements of qualifications shall become the property of the City, and all statements of qualifications shall be deemed a public record as defined in "The Public Records Act," chapter 42 section 56 of the RCW. Any statement of qualifications containing language which copyrights the statement of qualifications, declares the entire statement of qualifications to be confidential, declares that the document is the exclusive property of the proposer, or is any way contrary to state public disclosure laws or this RFQ, could be removed from consideration. The City will not accept the liability of determining what the proposer considers proprietary or not. Therefore, any information in the statement of qualifications that the proposer claims as proprietary and exempt from disclosure under the provisions of RCW 42.56.270 must be clearly designated as described in the "Proprietary Material Submitted" section above. It must also include the exemption(s) from disclosure upon which the proposer is making the claim, and the page it is found on must be identified. With the exception of lists of prospective proposers, the City will not disclose RFQ statements of qualifications until a bid selection is made. At that time, all information about the competitive procurement will be available with the exception of: proprietary/confidential portion(s) of the statement of qualifications(s), until the proposer has an adequate opportunity to seek a court order preventing disclosure. The City will consider a proposer's request for exemption from disclosure; however, the City will make a decision predicated upon RCW 42.56.

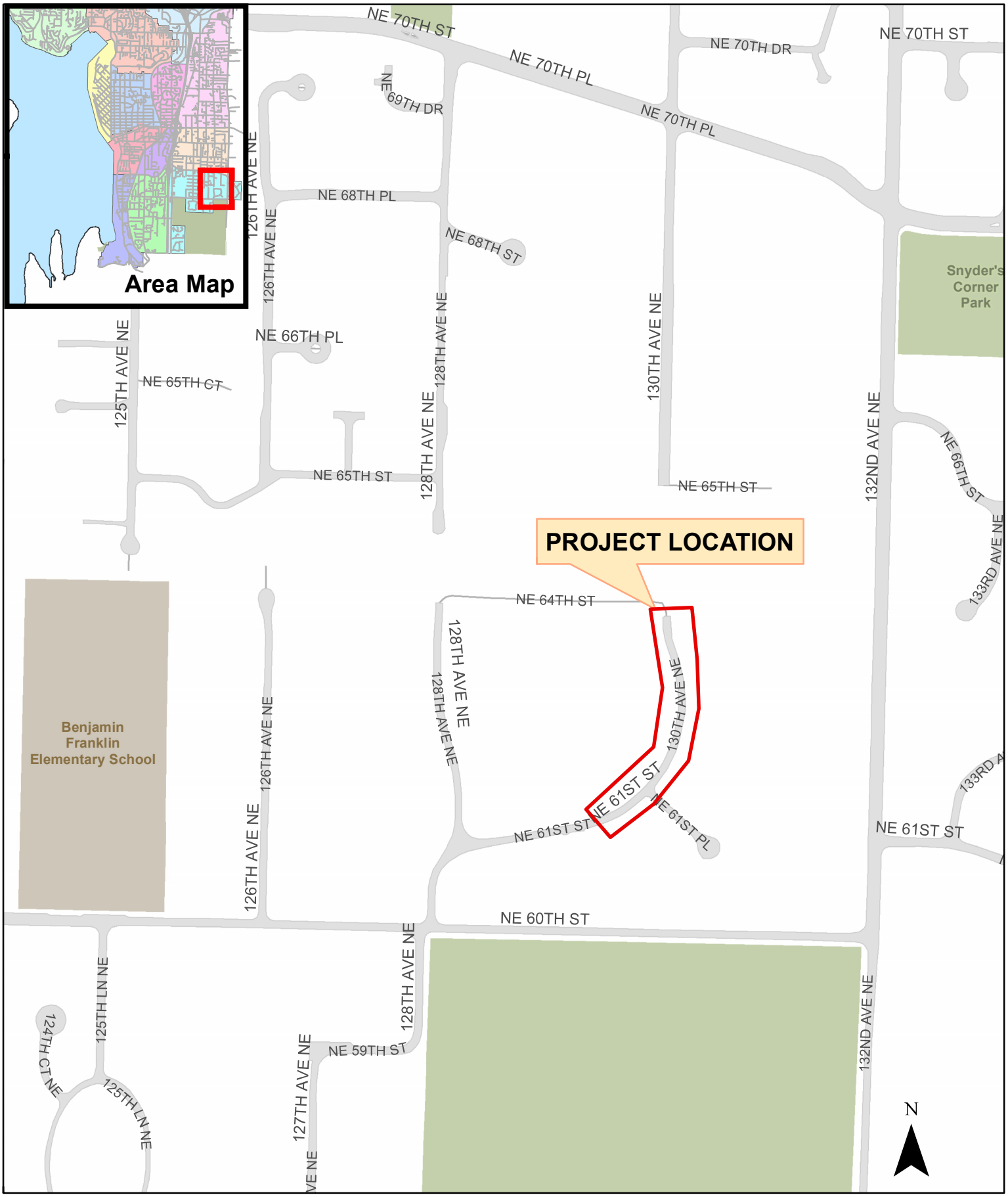
DBE Participation

The City encourages DBE firms to submit qualifications and encourages all firms to team with DBE firms in their pursuit of this project.

Federal Debarment

The firm shall not currently be debarred or suspended by the Federal government. The firm shall not be listed as having an "active exclusion" on the U.S. government's "System for Award Management" database (www.sam.gov).

ATTACHMENT 1



Vicinity and Area Map
Silver Spurs Storm System Upgrade

associated earth sciences incorporated

Technical Memorandum

Date:	September 3, 2024	**From:**	Collin E. Marshall, G.I.T.
To:	City of Kirkland Public Works Department	**Project Manager:**	Jennifer H. Saltonstall, L.G., L.Hg.
	123 Fifth Avenue	**Principal in Charge:**	Jennifer H. Saltonstall, L.G., L.Hg.
	Kirkland, Washington 98033	**Project Name:**	Silver Spurs Storm System Upgrade
Attn:	Kimberly Coraza, P.E.	**Project No:**	20240089H001
Subject:	Silver Spurs - Infiltration Feasibility Assessment, Task 1		

INTRODUCTION

This technical memorandum, prepared by Associated Earth Sciences, Inc. (AESI), presents the results of our subsurface exploration and stormwater infiltration feasibility study for the subject project. Our understanding of the project is based on conversations previously held between AESI and the City of Kirkland Public Works Department, and on our experience working on similar projects in the local area. The site location is shown on the "Vicinity Map," Figure 1. The approximate locations of the explorations completed for this study are shown on an aerial photo background, in relation to existing site features on Figure 2. The site and exploration locations, as well as AESI's nearby completed projects and their explorations are displayed on a Light Detection and Ranging (LiDAR)-based topography background, at regional-scale on Figure 3. The explorations completed for this study are also shown in relation to regional geologic mapping on Figure 4. Our interpretation of the subsurface and groundwater conditions present at the site is shown on the illustrated geologic cross-section, Figure 5. Copies of the exploration logs, including monitoring well as-built logs are attached.

PURPOSE AND SCOPE

The purpose of this study was to provide subsurface and groundwater data to be used in support of stormwater facility design in the vicinity of the project site. Our study included reviewing available geologic literature, reviewing nearby projects previously completed by AESI, completing two exploration borings (with one completed as a groundwater monitoring well), and performing geologic studies to assess the type, thickness, distribution, and physical properties of the subsurface sediments and shallow groundwater conditions. Geotechnical engineering and hydrogeologic studies were then completed to assess the infiltration feasibility in the project site vicinity. This technical memorandum summarizes our fieldwork and offers preliminary

recommendations based on our present understanding of the project. We recommend that we be allowed to review the recommendations presented in this technical memorandum and revise them, if needed, when the project design progresses.

AUTHORIZATION

Our study was accomplished in general accordance with our scope of work and cost proposal, dated May 21, 2024. Authorization to proceed was granted via a "Professional Services Agreement" (contract number 32400194*)*, dated June 14, 2024. This technical memorandum has been prepared for the exclusive use of the City of Kirkland Public Works Department and their agents for specific application to this project. Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering and hydrogeology practices in effect in this area at the time our technical memorandum was prepared. No other warranty, express or implied, is made.

PROJECT AND SITE DESCRIPTION

We understand that the City of Kirkland has identified an area within the Silver Spurs neighborhood, north of Bridle Trails State Park, that is experiencing poor drainage, flooding, and other stormwater-related issues including a poorly functioning existing shallow dry well. We understand that stormwater infiltration is being considered as an option to improve drainage. The location of the Silver Spurs neighborhood in relation to the surrounding area is shown on Figure 1, "Vicinity Map." The locations of our explorations and the existing dry well are shown in relation to the Silver Spurs neighborhood on an aerial photo on Figure 2, "Existing Site and Exploration Plan." The project site is shown in relation to regional features and previously completed AESI projects and explorations on LiDAR-based topography on Figure 3, "Nearby Projects and Explorations." The explorations completed for this study are also shown in relation to regional geologic mapping on Figure 4, "Geology." Our interpretation of the subsurface and groundwater conditions present at the site is shown on the illustrated geologic cross-section, Figure 5, "Geologic Cross-Section A-A'."

A detailed discussion of the project location, geologic mapping, subsurface conditions, and infiltration feasibility for the project site is included in the "Infiltration Feasibility Considerations" section of this technical memorandum. The following "Subsurface Exploration" and "Subsurface Conditions" sections detail the general means and methods we utilized during our study, as well as providing general geologic descriptions for the sediments encountered within our exploration borings.

SUBSURFACE EXPLORATION

Our field study included completing two exploration borings to gain subsurface information about the site. One of the borings, EB-1W, was completed as a groundwater monitoring well. The various types of materials, as well as the depths where characteristics of the materials changed, are indicated on the attached exploration logs. The depths indicated on the logs where conditions changed may represent gradational variations between material types in the field. The approximate locations of the exploration borings completed for this study are shown on Figure 2 through Figure 5.

The conclusions and recommendations presented in this technical memorandum are based, in part, on the exploration borings completed for this study. The number, locations, and depths of the explorations were completed within site and budgetary constraints. Because of the nature of exploratory work below ground, interpolation of subsurface conditions between field explorations is necessary. It should be noted that subsurface conditions differing from those depicted on the logs may be present at the sites due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of variations between the field explorations may not become fully evident until construction. If variations are observed at that time, it may be necessary to re-evaluate specific recommendations in this technical memorandum and make appropriate changes.

Exploration Borings

For this study, two hollow-stem auger exploration borings were performed by Advance Drill Technologies Inc., an independent driller working under subcontract to AESI. Interpretive logs of our exploration borings, labeled EB-1W and EB-2, are included with this technical memorandum. The borings were completed by advancing a 6- or 8-inch outside-diameter, hollow-stem auger with a track-mounted drill rig. Prior to drilling, the exploration locations were excavated to approximately 6 feet below existing ground surface using an air-knife type vactor truck. Samples were obtained at approximately 2-foot-depth intervals, where possible, using hand-auger tools. During the drilling process, samples were generally obtained at 2½- to 5-foot-depth intervals. Upon completion of drilling for EB-1W, the borehole was constructed as a groundwater monitoring well with a traffic-rated steel flush-grade well monument. The EB-2 borehole was backfilled with bentonite chips, and the surface was patched using crushed rock upon completion of drilling.

Disturbed, but representative samples were obtained by using the Standard Penetration Test (SPT) procedure in accordance with *ASTM International* (ASTM) D-1586. This test and sampling method consists of driving a standard 2-inch, outside-diameter, split-barrel sampler a distance of 18 inches into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded, and the number of blows required to drive the sampler the final 12 inches is known as the Standard Penetration Resistance (“N”) or blow count. If a total of 50 is recorded within one 6-inch interval, the blow count is recorded as the number of blows for the corresponding number of inches of penetration. The resistance, or N-value,

provides a measure of the relative density of granular soils or the relative consistency of cohesive soils; these values are plotted on the attached exploration boring logs.

The borings were continuously observed and logged by a geologist from our firm. The samples obtained from the split-barrel sampler were classified in the field and representative portions placed in watertight containers. The samples were then transported to our laboratory for further visual classification and laboratory testing. The attached exploration logs are based on the N-values, field observations, and drilling action.

Monitoring Well Installation and Development

One of our exploration borings (EB-1W) was completed as a groundwater observation well. The well was constructed with a 2-inch-diameter polyvinyl chloride (PVC) Schedule-40 well casing with threaded connections. The lower 10 feet of the well consists of finely slotted (0.010-inch-width machine slot) well screen to permit water inflow. The annular space around the well screen and lower portion of the well casing was backfilled with clean silica sand, and the upper portion of the annular space was sealed with bentonite chips. The wellhead is protected by a flush-mount monument. Well construction details are illustrated on the exploration logs attached to this technical memorandum.

SUBSURFACE CONDITIONS

Regional Geology and Soils

Review of the regional geologic maps of the project area, titled *Surficial Geology of Kirkland*, by GeoMapNW, Department of Earth and Space Sciences, University of Washington (2017) and *Geologic Map of the Kirkland Quadrangle, Washington* (Miscellaneous Field Studies Map MF-1543) by James P. Minard (1983) indicates that surficial sediments mapped at the site consist of Vashon lodgement till with Vashon advance outwash mapped a short distance to the southeast and west of the site. A portion of the regional geologic map is presented as Figure 4, “Geology.” Our interpretation of the sediments encountered in our explorations is consistent with the regional geologic maps.

Review of the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) *Web Soil Survey* indicates that the soil in the vicinity of the site consists of Arents-Alderwood and Alderwood soil series. Arents-Alderwood soils are Alderwood soils that have been disturbed by urbanization. Alderwood soils generally form from the weathering of glacial till. Our interpretation of the sediments encountered at the subject site is in general agreement with the regional soils map.

Site Stratigraphy

Subsurface conditions at the project site were inferred from the field explorations accomplished for this study, our visual reconnaissance of the site, review of subsurface information from nearby AESI projects, and a review of selected geologic literature. Detailed descriptions of the materials encountered in the explorations are provided on the attached exploration logs. The explorations generally encountered thin fill sediments overlying low-permeability Vashon lodgement till, with Vashon advance outwash present at depth. "Geologic Cross-Section A-A'" (Figure 5) shows an interpreted geologic profile of the subsurface in the vicinity of the proposed infiltration facility. The following section presents more detailed subsurface information organized from the shallowest (youngest) to the deepest (oldest) sediment types.

Fill

Existing fill sediments (those not naturally deposited) were encountered in both of the exploration borings completed for this study. Observed fill depths ranged from approximately 1 to 3.5 feet below existing grades. The fill generally consisted of loose to medium dense, brown, silty fine to medium sand with some gravel and significant fine organics content.

Fill soils are also likely present in unexplored areas of the right-of-way, such as in existing utility trench areas, near the edge of landscaped or yard areas, and in previously graded/backfilled areas. Existing fill is not suitable for infiltration of stormwater.

Vashon Lodgement Till

Underlying the existing fill encountered in both of our exploration borings, we encountered sediments interpreted as Vashon lodgement till generally consisting of dense to very dense, generally unsorted, light brownish orange with gray, grading to grayish brown, silty fine sand with typically minor gravel content.

We interpret these sediments to be representative of Vashon lodgement till. The Vashon lodgement till was deposited directly from basal, debris-laden glacial ice during the Vashon Stade of the Fraser Glaciation, approximately 12,500 to 15,000 years ago. The high relative density characteristic of lodgement till is due to its consolidation by the massive weight of the glacial ice from which it was deposited. The Vashon lodgement till sediments had observed thicknesses between 12.5 feet and 12 feet, in EB-1W and EB-2, respectively. Vashon lodgement till typically contains a significant fine-grained fraction and is not considered a suitable receptor for stormwater infiltration due to its low permeability.

As part of this study, we reviewed exploration logs from previously completed AESI projects in the vicinity of the project area. In general, the project area appears to contain lodgement till sediments overlying the advance outwash to depths between 15 and 30 feet, with the depth to the advance outwash decreasing in a southward direction. In the current project area, the Vashon lodgement till had an observed thickness of approximately 12 feet. In the explorations completed

nearest to the project site, our borings encountered Vashon ice-contact (melt-out till) deposits with an observed thickness between approximately 17.5 feet and greater than 20 feet. Nearby exploration pits completed by AESI encountered Vashon lodgement till extending beyond the bottom of the explorations, at depths between 6 and 14 feet below the surface. One exploration boring, completed approximately 1,000 feet northwest of the site, encountered Vashon lodgement till to a depth of approximately 27.5 feet below the surface. To the south of the project area, the depth to the Vashon advance outwash is more variable. In the vicinity of NE 60th Street, approximately 1,500 feet southwest of the current project area, our previously completed explorations encountered some areas with no Vashon lodgement till or ice-contact deposits present at the surface. Other explorations encountered between 2 and 7 feet of Vashon lodgement till, with one boring encountering recessional lacustrine deposits overlying the lodgement till, extending to a depth of approximately 13.5 feet below the surface.

Vashon Advance Outwash

Sediments encountered below the Vashon lodgement till in exploration borings EB-1W and EB-2 generally consisted of dense to very dense, massive to well-stratified, light brownish gray to grayish brown, fine to medium sand with trace to some silt and minor gravel content.

We interpret these sediments to be representative of Vashon advance outwash. The Vashon advance outwash was deposited by meltwater streams that flowed off the advancing glacial ice during the early stages of the Vashon Stade of the Fraser Glaciation, approximately 12,500 to 15,000 years ago. Because these sediments were overridden by the glacial ice subsequent to their deposition, they exhibit a high relative density where they are present in an undisturbed, unweathered state. Where encountered, the advance outwash sediments extended beyond the maximum depths explored of approximately 101 feet in EB-1W and 81.5 feet in EB-2. The Vashon advance outwash deposits are generally suitable for infiltration of stormwater, provided they are permeable and unsaturated.

Vashon Advance Outwash – Silty Layer

Within the Vashon advance outwash, we encountered a distinct layer of sediments generally consisting of dense to very dense, massive to well-stratified, light gray to light brown, silty sand with 1/2-inch to 1-inch-thick beds of fine to medium sand with some silt. Some of these sediments were observed to have a somewhat plastic, cemented texture. We interpret these sediments to be representative of an inter-formational layer deposited within the Vashon advance outwash (see Figure 5), when the depositional environment was characterized by a lower-energy system. The silty layer was first encountered at a depth of approximately 23 feet below ground surface in EB-1W, and at 27.5 feet in EB-2. The silty layer had observed thicknesses between 14.5 and 16 feet, in EB-1W and EB-2, respectively. The Vashon advance outwash silty layer is not suitable for infiltration of stormwater due to its high proportion of fine-grained sediments, and resulting low permeability. More detailed discussions of the hydraulic and hydrogeologic implications of the silty layer are provided in the "Infiltration Feasibility Considerations" section of this technical memorandum.

GROUNDWATER CONDITIONS

Groundwater is expected to be present in two general intervals in the vicinity of the project area: shallow perched groundwater and deeper regional groundwater within the Vashon advance outwash. Exploration for this phase of work was completed on July 22 and 23, 2024, when shallow and regional groundwater levels are typically lower than the seasonal average. It should be noted that the presence and depth of groundwater underlying the subject site may vary in response to such factors as changes in season, precipitation, and land use.

Hydrogeologic Framework

Water that exists in the pore spaces of sediments is part of the hydrologic cycle. In the natural state, the hydrologic cycle begins with infiltration of precipitation (recharge) and ends with discharge to springs, streams, wetlands, and/or wells. Under natural conditions, groundwater recharge and discharge may shift with climatic cycles but remain in overall balance. Groundwater will flow under saturated conditions, preferentially through materials with greater porosity and permeability, such as clean gravels and sands. Where geologic conditions limit discharge, groundwater accumulates in such permeable zones, where if sufficient groundwater quantities are present to supply water to wells, are termed aquifers.

Regional Hydrogeology

Descriptions of regional hydrogeology are contained in reports prepared by the Washington State Division of Water Resources, titled *Geology and Ground-Water Resources of Northwestern King County, Washington*, Water Supply Bulletin 20, by Bruce A. Liesch, Charles E. Price, and Kenneth L. Walters (Liesch et al., 1963) and by the U.S. Geological Survey (USGS), titled *Hydrogeologic Framework of the Puget Sound Aquifer System, Washington and British Columbia*, Professional Paper 1424-D, by J.J. Vaccaro, Arnold J. Hansen Jr., and M.A. Jones (Vaccaro et al., 1998).

Vashon-age lodgement till is exposed at ground surface across much of the city. Where the lodgement till underlies more-permeable deposits, it forms an aquitard to groundwater flow. The lodgement till is typically comprised of a very dense, glacially compacted low-permeability, unsorted matrix of silty fine to medium sand with variable percentages of clay, gravel, cobbles, and boulders. The high silt content and high density impedes the movement of groundwater in the lodgement till. The lodgement till has been eroded by streams and rivers in some areas, exposing the underlying Vashon-age advance outwash.

Groundwater contained at depth in the Vashon advance outwash and coarse-grained older sediments typically form deeper semi-confined and confined aquifers.

The advance outwash aquifer, where present, is interpreted to be developed above low-permeability pre-Fraser fine-grained deposits, which limit further downward flow of groundwater. Recharge to the aquifer occurs from precipitation and leakage from surface water

features. Discharge occurs as springs, slow leakage to lower aquifers, and to water wells that pump from the Vashon advance outwash aquifer.

Site Groundwater

Vashon Advance Aquifer

Groundwater interpreted to be part of a regional aquifer is anticipated to be present in the Vashon advance outwash sediments at depth. EB-1W encountered the Vashon advance aquifer at a depth of approximately 80 feet at the time of drilling. The Vashon advance aquifer was not fully penetrated in EB-2, however sediments began to show increased moisture contents at a depth of approximately 80 feet. An electronic data logger was installed in monitoring well EB-1W to monitor for fluctuations in the groundwater level.

As part of this study, we reviewed exploration logs from previously completed AESI projects in the vicinity of the project area. A 71-foot-deep groundwater level monitoring well was installed on the Benjamin Franklin Elementary School campus about 1,500 feet from the site, and remained dry for the period of monitoring.

Shallow Perched Groundwater

For this site, perched groundwater occurs when surface water infiltrates down through relatively permeable soils such as weathered portions of Vashon lodgement till deposits, and then becomes trapped or "perched" atop a comparatively impermeable barrier, such as unweathered lodgement till.

Perched groundwater also occurs within sandy pockets in the till or ice-contact deposits, or within the Vashon advance outwash above silty layers. Perched groundwater was encountered in EB-1W within the silty layer between 27.5 and 37.5 feet below ground surface. Perched groundwater was encountered in EB-2 within the silty layer between 32.5 and 43 feet below ground surface. Discontinuous lenses of silty fine sand and silt were encountered on the nearby Benjamin Franklin Elementary School site that acted as a hydraulically restrictive layer, creating intermittent seepage zones. A 31-foot-deep groundwater level monitoring well was installed at the Benjamin Franklin Elementary School site and remained dry for the period of monitoring.

LABORATORY TESTING AND RESULTS

AESI performed six grain-size analyses (sieves) on representative samples of Vashon advance outwash sediments. These grain-size analysis test results are included in the attachments and are summarized below in Table 1 with soil descriptions based on the ASTM D-2487 Unified Soil Classification System (USCS).

Table 1
Summary of Grain-Size Analysis

Exploration Number	Depth (feet)	Geologic Unit	USCS Soil Description	Fines Content (%)
EB-1W	15	Vashon Advance Outwash	gravelly, silty SAND	15.3
EB-1W	40	Vashon Advance Outwash	SAND some gravel, some silt	7.5
EB-1W	50	Vashon Advance Outwash	SAND some gravel, some silt	6.9
EB-1W	60	Vashon Advance Outwash	SAND some gravel, some silt	7.3
EB-2	45	Vashon Advance Outwash	SAND some silt, trace gravel	5.9
EB-2	65	Vashon Advance Outwash	SAND some gravel, some silt	5.5

USCS = Unified Soil Classification System
% = percent of total weight passing the U.S. No. 200 Sieve

INFILTRATION FEASIBILITY CONSIDERATIONS

The following is a discussion of site conditions including regional geologic and soils mapping, soil and groundwater conditions, geologic hazards, and our opinion regarding feasibility of stormwater infiltration.

Specific Site Area

This project area consists of the section of right-of-way that extends from the intersection of NE 61st Street and NE 61st Place, northward to the intersection of NE 64th Street and 130th Avenue NE in the Silver Spurs neighborhood of Kirkland, Washington. The project area also includes a 10-foot-wide drainage easement, extending from the southern end of the driveway at 6115 130th Avenue NE and connecting through the front yard of the parcel to the existing dry well installed at the northeast corner of the property. No mapped landslide hazards were identified on the City of Kirkland GIS mapping, and due to the relatively low topographic relief present in the project area, we do not anticipate that steep slopes will impact infiltration feasibility.

Background

AESI was informed during conversations previously held with representatives from the City of Kirkland that the Silver Spurs neighborhood has historically experienced drainage issues leading to flooding and ponding. While conducting our exploration program, we were approached by several homeowners and community members who informed us that they were aware of flooding issues, or that their yards or basements had experienced seasonal flooding issues in the

past. Representatives from the City of Kirkland Public Works Department informed us that the dry well was installed to a depth of approximately 8 feet below ground surface.

Existing Dry Well

The 8-foot-deep dry well is situated within the silty, low-permeability Vashon lodgement till sediments based on our explorations. It is our opinion that the dry well is improperly functioning likely due to the low permeability of the receptor soils, which causes stormwater to fill the dry well, and then overtop, creating localized surface water runoff and ponding to occur. The location of the borings completed for this study, in relation to the right-of-way and the existing dry well are displayed on Figures 2 and 3. The location of the dry well is also displayed in relation to our exploration borings, subsurface interpretations, and other site features on Figure 5, "Geologic Cross-Section A-A'."

Infiltration Strategies

Infiltration facilities may be either shallow or deep or a combination of both techniques. This technical memorandum discusses the feasibility of both types of infiltration systems in the study area. Shallow and deep infiltration facilities for this document are generally described below.

- Shallow infiltration facilities may include conventional infiltration ponds, vaults, shallow dry wells or other infiltrating basins, or permeable pavement or bioretention/ raingardens. Shallow infiltration facilities are best suited in settings where moderate- to high-permeability sediments are present near the ground surface in sufficient unsaturated thickness and lateral extent to allow the stormwater to spread-out, disperse, and avoid re-emergence. Moderate- to high-permeability sediments include Vashon recessional outwash and Vashon advance outwash.

- Deep infiltration facilities may include infiltration trenches and dry wells, both of which can also be referred to as Class V underground injection control (UIC) wells, or conventional infiltration facilities with specialized grading that includes deep infiltration strategies. Some types of deeper dry wells are referred to as "drilled drains" or "pit drains." Deep infiltration facilities are designed to penetrate low-permeability sediments and allow infiltration into the more-permeable underlying sediments. Deep infiltration facilities could be considered in settings where surficial low-permeability geologic units (such as glacial till or silty ice-contact sediments) are present at the surface and more-permeable sediments (such as Vashon advance outwash) are present below in sufficient unsaturated thickness. Deep infiltration facilities can be more challenging to maintain than shallow infiltration facilities or more costly to install compared to shallow infiltration facilities, but may be the only infiltration opportunity for some settings.

Our review of the available site information indicates the following regarding the general infiltration potential of the study area:

- The study area is primarily located on till-mantled uplands. The presence of till limits shallow infiltration opportunities because unweathered till is a very low-permeability material (less than 0.1 inches per hour). Varying amounts of groundwater seepage should be expected within the weathered till deposits, and would also inhibit infiltration in the wetter winter months.

- Shallow infiltration opportunities:
    - Not present where explored at EB-1W and EB-2.
    - Present where Vashon advance outwash was mapped at the ground surface as part of regional maps. Distribution of Vashon advance outwash is shown on Figure 4. If present, the advance outwash could serve as an infiltration receptor horizon if permeable and not saturated. Groundwater is typically deep in the study area.

- Moderate depth and deep infiltration opportunities: Vashon advance outwash where present at depth beneath thicker surficial till or other low-permeability deposits could serve as an infiltration receptor horizon using deeper infiltration techniques such as deep dry wells (UIC wells) or deep infiltration trenches. Deep infiltration systems must be vertically separated from the water table to maintain an unsaturated zone beneath the infiltration facility. In that sense, deep infiltration facilities are limited by groundwater. A hydraulicly restrictive layer was present at about elevation 465 to 470 feet. Regional groundwater is on the order of elevation 420 feet in the study area. Groundwater elevation information is illustrated on Figure 5.

EB-1W

Exploration boring EB-1W was completed to a depth of 101 feet below existing grade and encountered approximately 1 foot of existing fill, underlain by Vashon lodgement till and Vashon advance outwash. The lodgement till extended to a depth of approximately 13.5 feet and was directly underlain by advance outwash, which extended beyond the maximum depth explored of 101 feet. In EB-1W, the Vashon advance outwash was observed to contain a silty layer between approximately 23 and 37.5 feet below ground surface. Regional groundwater was encountered within the Vashon advance outwash at a depth of 80 feet.

At the time of our study, the Vashon advance outwash sediments in the vicinity of EB-1W appeared permeable and unsaturated between approximately 50 and 75 feet below ground surface, and are a potentially suitable infiltration receptor. Shallow to moderate infiltration opportunities appear limited at this time, as the low-permeability silty layer within the Vashon advance outwash would act as hydraulically restrictive, significantly impacting infiltration rates and causing infiltration to be restricted by lateral flow perched atop or within the silty layer.

Concentrated infiltration design in the vicinity of EB-1W should focus on receptor horizons located **below** the silty layer.

EB-2

Exploration boring EB-2 was completed to a depth of 81.5 feet below existing grade and encountered approximately 3.5 feet of existing fill, underlain by Vashon lodgement till and Vashon advance outwash. The lodgement till extended to a depth of approximately 15.5 feet and was directly underlain by advance outwash, which extended beyond the maximum depth explored of 81.5 feet. In EB-2, the Vashon advance outwash was also observed to contain a silty layer between approximately 27.5 and 43 feet below ground surface. Regional groundwater was not encountered to the depth explored within the Vashon advance outwash; however, the sediments began to grade from slightly moist to moist at approximately 80.5 feet. We interpret that the regional aquifer is present in the vicinity of EB-2, at a slightly lower elevation than the maximum depth explored in our boring completed for this study.

At the time of our study, the Vashon advance outwash sediments in the vicinity of EB-2 appeared permeable and unsaturated between approximately 45 and 80 feet below ground surface and are a potentially suitable infiltration receptor. Shallow to moderate infiltration opportunities appear limited at this time, as the low-permeability silty layer within the Vashon advance outwash would act as hydraulically restrictive, significantly impacting infiltration rates and causing infiltration to be restricted by lateral flow perched atop or within the silty layer. Concentrated infiltration design in the vicinity of EB-2 should focus on receptor horizons located **below** the silty layer.

Conceptual Infiltration Strategies

Infiltration feasibility is dependent on the permeability of the infiltration receptor horizon, the vertical and lateral extent of the unsaturated material, the depth to groundwater for perched water, the transmissivity of the underlying aquifer, proximity to geologic hazards, and considerations for other nearby water users such as water wells, springs, and streams. Conceptual geologic conditions are illustrated on Figure 5. A key design factor is to maintain vertical separation from perching layers or groundwater. The unsaturated portion of the Vashon advance outwash layer would be the receptor for either shallow or deep infiltration, depending on the facility location.

Infiltration facilities may be either shallow or deep. Shallow infiltration facilities could be considered in settings where moderate-permeability sediments (Vashon advance outwash) are present in sufficient unsaturated thickness and lateral extent to allow the stormwater to spread out, disperse, and avoid either groundwater mounding or re-emergence. Deep infiltration facilities could be considered in settings where low-permeability geologic units (such as glacial till) are present at the surface and more-permeable sediments are present below. Deep infiltration facility strategies would be dependent on the thickness of the low-permeability unit at the surface and the depth to groundwater in the infiltration receptor horizon.

Moderate depth infiltration strategies for Silver Spurs retrofit include:

- Limited capacity: Moderate depth long or linear infiltration systems that spread out recharge such as a series of moderate depth dry wells and/or infiltration trenches. The infiltration facilities could be combined with bioretention swales for pretreatment. The excavation must extend through the lodgement till to the thin unsaturated advance outwash between the till and silty perching layer.

- Study area Vashon advance outwash (Qva): Long-term design infiltration rates for shallow infiltration facilities situated in Vashon advance outwash are on the order of 0.5 to 5 inches per hour. More rare are long-term design rates of 10 to 20 inches per hour or sites where the Vashon advance outwash is too fine-grained for reliable infiltration. We suggest a planning level long-term design infiltration rate on the order of 2 inches per hour for moderate depth infiltration.

Deep infiltration strategies including combination facilities and deep (UIC) facilities such as:

- UIC Well Systems: Deep UIC wells may be considered, such as a single deep dry well, that is cased through the till and through the silty perching layer to access the deeper Vashon advance outwash. In practice, based on over 200 UIC well tests, our projects have had UIC design flow rates that ranged from 50 gallons per minute (gpm) to over 300 gpm per UIC well. Flow rates depend on the permeability of the geologic unit, and the thickness of the unsaturated zone. Lower flow rates are associated with shorter screen intervals in sandy deposits; higher flow rates are obtained using longer screens in material containing gravelly sand. We suggest a planning level long-term infiltration rate on the order of 100 gpm per UIC well for wells receiving treated stormwater that does not pass through bioretention soil, with a reduction to 25 gpm for wells that receive water that is treated by flow through bioretention soil. For comparison, the more gravelly Qva sediments have had flow rates exceeding 300 gpm. For multiple UIC wells, we recommend an initial spacing of 25 to 50 feet on-center. Ultimately well spacing is dependent on the amount of stormwater runoff to be managed (hydraulic loading), length of well screen, permeability, and groundwater mounding.

RECOMMENDATIONS FOR ADDITIONAL STUDY

Based on our study, it is our opinion that deep infiltration methods appear feasible in the vicinity of the project site. In both exploration boring locations, unsaturated granular outwash sediments were encountered which appear suitable for stormwater infiltration at depth. Moderate depth opportunities immediately beneath the till and above the silty Vashon advance layer will be more limited. Below we have included our recommendations for additional study. AESI is available to provide additional geotechnical/hydrogeologic consultation as the project design develops.

If deep infiltration is pursued, we recommend the following:

- Complete additional exploration borings and groundwater separation documentation;
- Complete laboratory testing at specific facility locations for grain-size-based infiltration rate determination;
- Conduct a groundwater mounding analysis;
- Consider site suitability in accordance with City of Kirkland's *Addendum to the 2021 King County Surface Water Design Manual*.
- Conduct either pit drain or borehole infiltration tests at the proposed facility location. Infiltration testing for UIC systems is conducted as pseudo steady-state flow rate tests and should be conducted after exploration boring and groundwater observation well installation activities.
- Possible infiltration facility locations should be planned to avoid any nearby utilities which would transmit infiltrated stormwater along pipe bedding or trench backfill.
- Impacts downslope of infiltration facilities should be considered to avoid pooling around foundations or within crawl spaces and basements.
- Proper erosion control best management practices should be planned to avoid sediment transport into infiltration facilities, which can severely impact the efficiency of the facility.

We are available to provide additional geotechnical/hydrogeologic consultation as the project design develops and possibly changes from that upon which this technical memorandum is based.

CLOSURE

We appreciate the opportunity to be of service to you on this project. Should you have any questions regarding this technical memorandum or other hydrogeologic/geotechnical aspects of the project, please call us at your earliest convenience.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

DRAFT

DRAFT

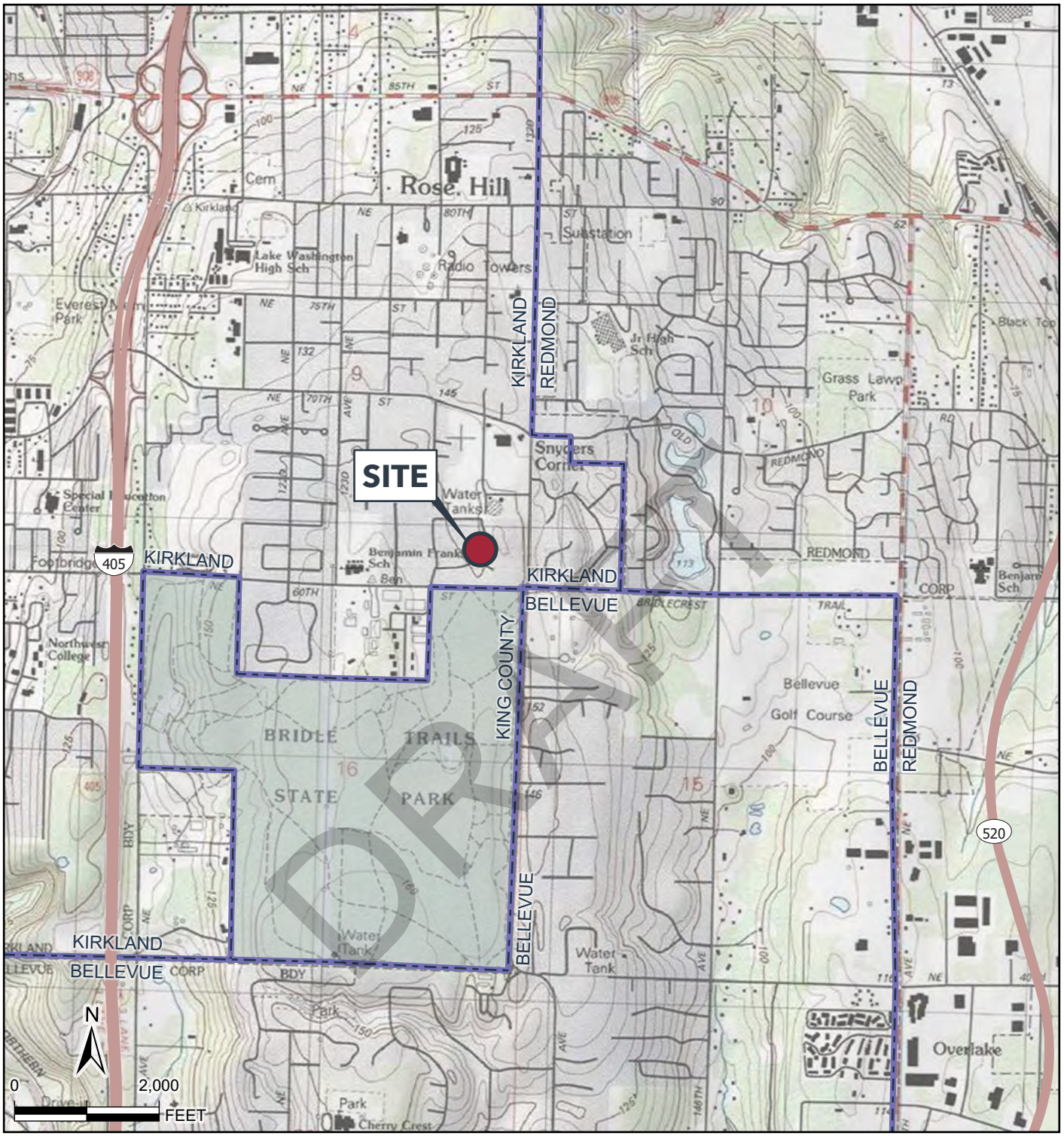
Collin E. Marshall, G.I.T.
Staff Geologist

DRAFT

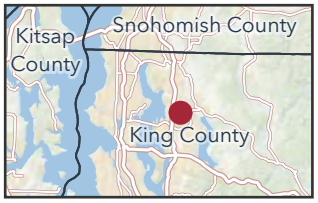
Jennifer H. Saltonstall, L.G., L.Hg.
Principal Geologist/Hydrogeologist

Attachments:
Figure 1: Vicinity Map
Figure 2: Existing Site and Exploration Plan
Figure 3: Nearby Projects and Explorations
Figure 4: Geology
Figure 5: Geologic Cross-Section A-A'
Exploration Logs
Laboratory Testing Results

CEM/ld – 20240089H001-001



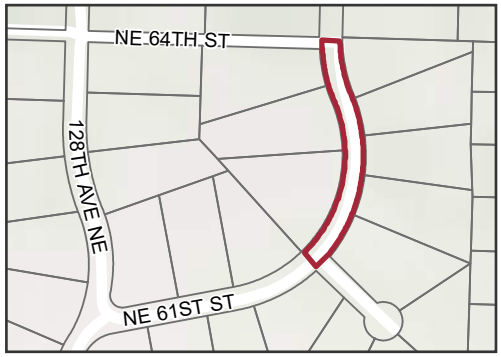
COUNTY LOCALE



ESRI, USGS, NATIONAL GEOGRAPHIC, DELORME, NATURALVUE, I-CUBED, GEBCO: ARCGIS ONLINE BASEMAP. WADOT STATE ROUTES 24K (12/20). KING CO: PARCELS (4/23), ROADS (5/23).

NOTE: LOCATION AND DISTANCES SHOWN ARE APPROXIMATE. BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

LOCATION



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VICINITY MAP

SILVER SPURS STORMWATER SYSTEM UPGRADE
KIRKLAND, WASHINGTON

PROJECT NO.	DATE	FIGURE
20240089H001	8/24	1

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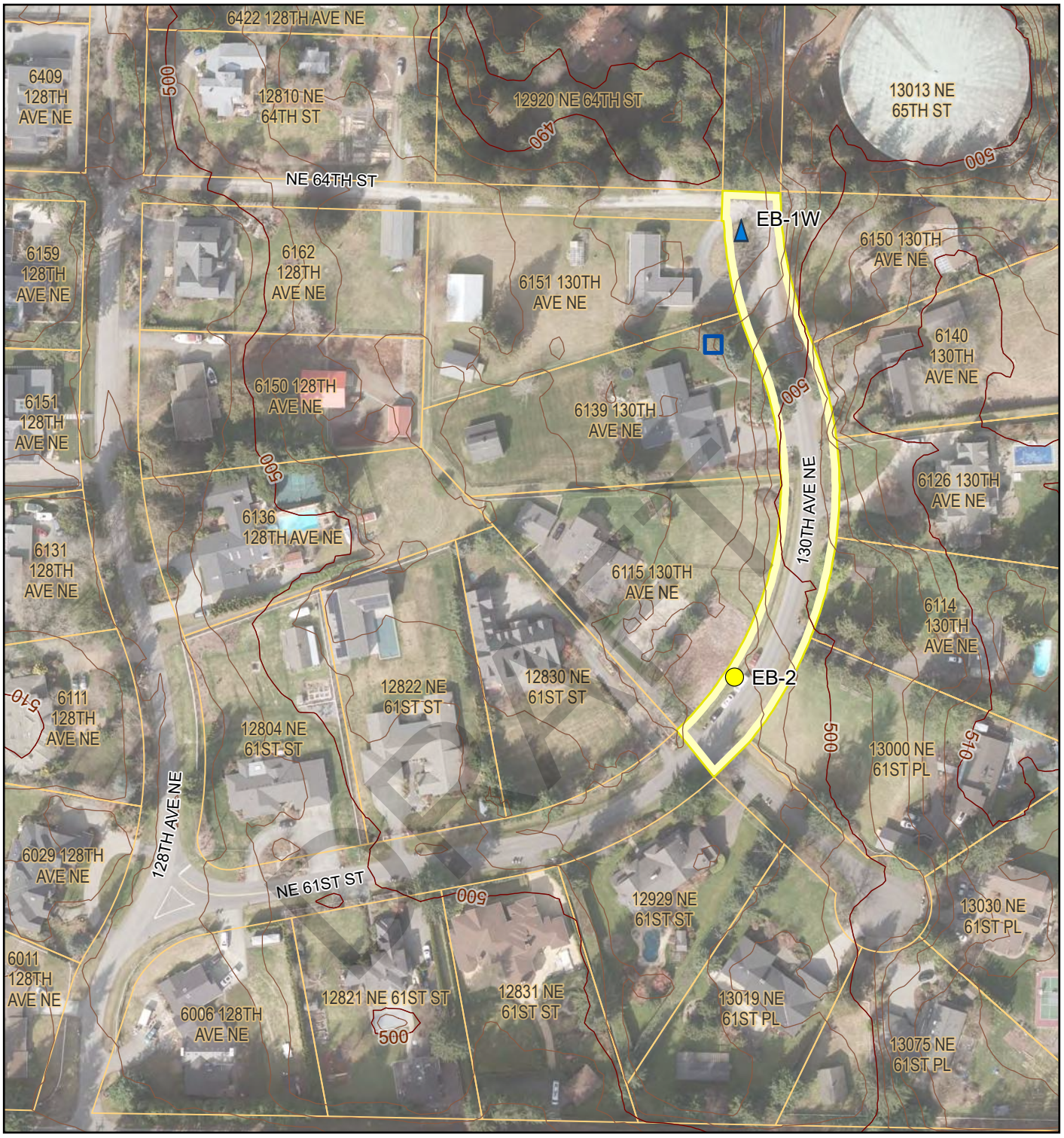

LEGEND

- SITE
- EXPLORATION BORING
- MONITORING WELL
- DRY WELL
- CONTOUR 10 FT
- CONTOUR 2 FT
- PARCEL

DATA SOURCES/REFERENCES:
KING COUNTY: PARCELS, ROADS (8/24), CITY OF KIRKLAND: AERIAL IMAGERY (2023). WA DNR LIDAR: KING_COUNTY_WEST_2021, ACQUIRED 4/21, 1.5' CELL SIZE. CONTOURS DERIVED FROM LIDAR.

N

0 150

FEET

LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

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EXISTING SITE AND EXPLORATION PLAN

SILVER SPURS STORMWATER SYSTEM UPGRADE
KIRKLAND, WASHINGTON

PROJECT NO.	DATE	FIGURE
20240089H001	8/24	2

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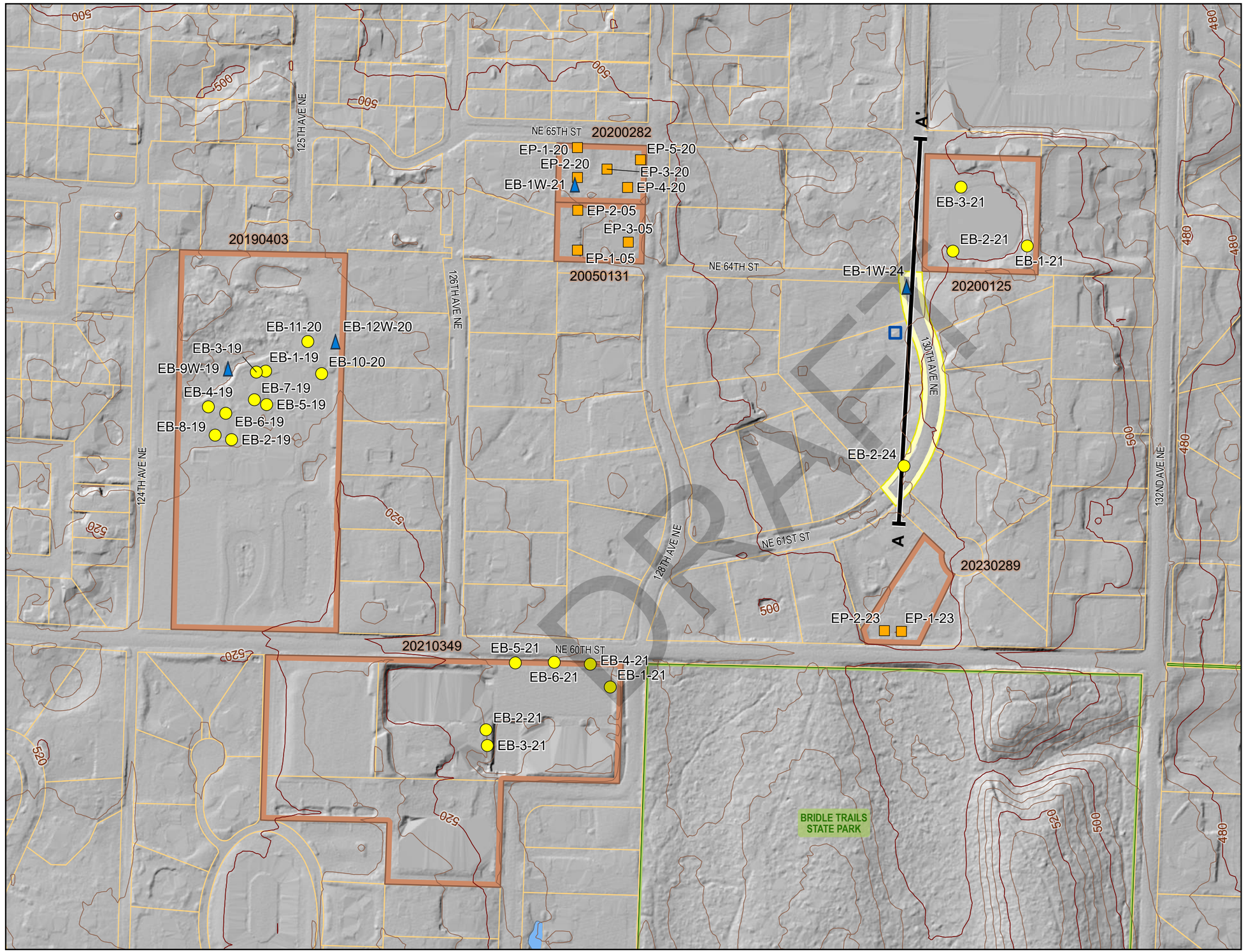

LEGEND

- SILVER SPURS STORM SYSTEM UPGRADE SITE
- OTHER AESI PROJECT SITE

EXPLORATION TYPE - YEAR

- EXPLORATION BORING
- MONITORING WELL
- EXPLORATION PIT
- CROSS-SECTION
- DRY WELL
- CONTOUR 20 FT
- CONTOUR 5 FT
- PARCEL
- PARK

N

0 250

FEET

DATA SOURCES/REFERENCES:
KING COUNTY: PARCELS, PARKS, CITY BOUNDARY, ROADS, TRAILS (8/24), WATERBODIES (9/22), STREAMS (9/21). EAGLEVIEW TECHNOLOGIES, INC.: AERIAL IMAGERY (2023). WADOT STATE ROUTES 24K (12/20). WA DNR LIDAR: KING_COUNTY_WEST_2021, ACQUIRED 4/21, 1.5' CELL SIZE. CONTOURS DERIVED FROM LIDAR.

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION. LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

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NEARBY PROJECTS AND EXPLORATIONS

SILVER SPURS STORMWATER SYSTEM UPGRADE
KIRKLAND, WASHINGTON

PROJECT NO.	DATE	FIGURE
20240089H001	8/24	3

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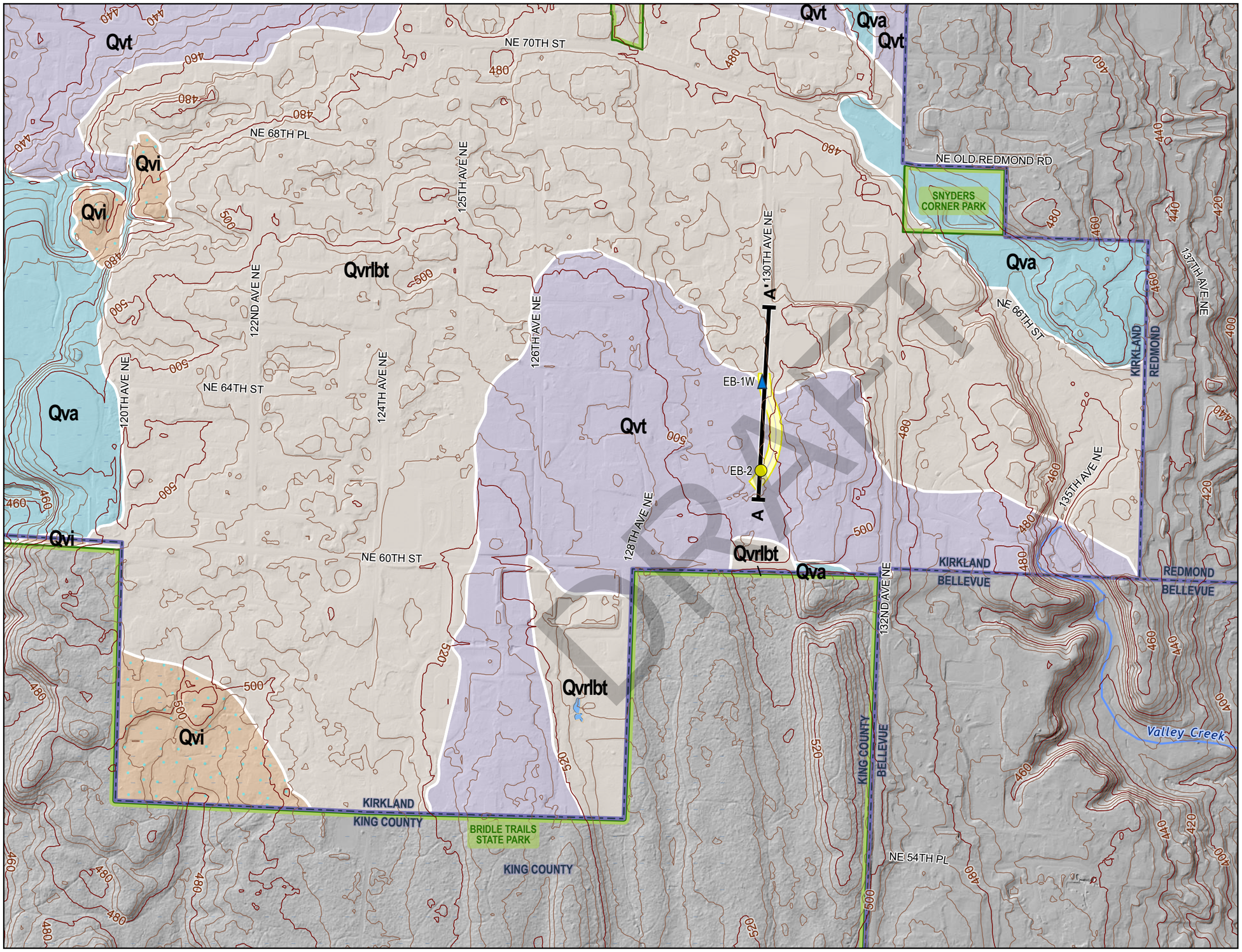

LEGEND

- SILVER SPURS STORM SYSTEM UPGRADE SITE
- EXPLORATION BORING
- MONITORING WELL
- CROSS-SECTION
- **Qvrlbt** - VASHON RECESSIONAL LAKE BRIDAL TRAILS DEPOSITS (490'-520')
- **Qvi** - VASHON ICE-CONTACT DEPOSITS
- **Qvt** - VASHON SUBGLACIAL TILL
- **Qva** - VASHON ADVANCE OUTWASH DEPOSITS
- CONTOUR 20 FT
- CONTOUR 5 FT
- CITY BOUNDARY
- PARK

N

0 500

FEET

DATA SOURCES/REFERENCES:
KING COUNTY: PARKS, CITY BOUNDARY, ROADS (8/24), WATERBODIES (9/22), STREAMS (9/21). WA DNR LIDAR: KING_COUNTY_WEST_2021, ACQUIRED 4/21, 1.5' CELL SIZE. CONTOURS DERIVED FROM LIDAR. GEOLOGY: KIRKLAND SURFICIAL GEOLOGY MAP, GEOMAPNW, 2017.

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION. LOCATION AND DISTANCES SHOWN ARE APPROXIMATE.

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GEOLOGY

SILVER SPURS STORMWATER SYSTEM UPGRADE
KIRKLAND, WASHINGTON

PROJECT NO.	DATE	FIGURE
20240089H001	8/24	4

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LEGEND:

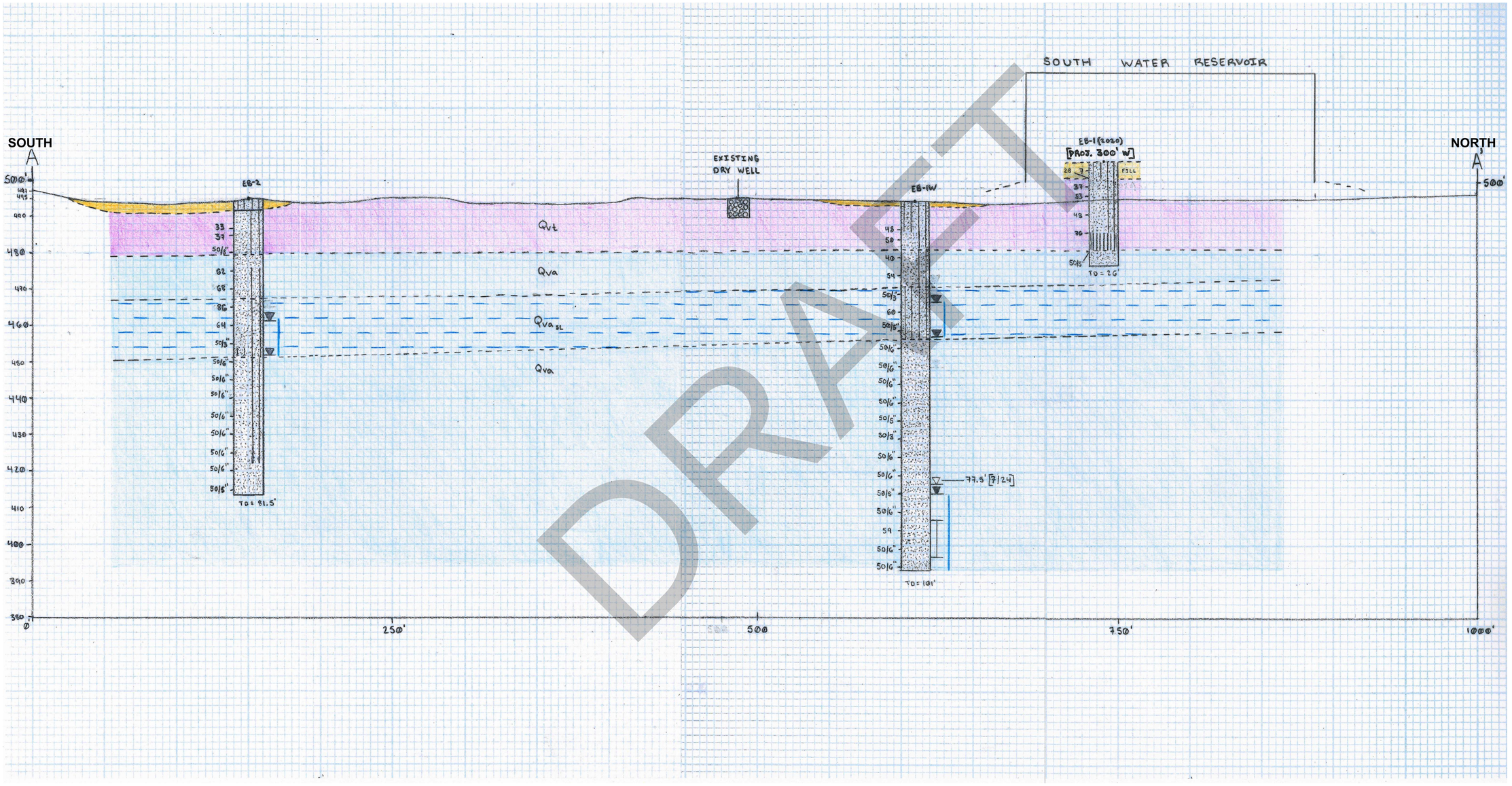
Fill	
Qvt	VASHON LODGEMENT TILL
Qva	VASHON ADVANCE OUTWASH
Qva_{sl}	VASHON ADVANCE OUTWASH - SILTY LAYER

MONITORING WELL SCREEN ZONE

STATIC WATER LEVEL

WATER LEVEL AT TIME OF DRILLING

VERTICAL EXAGGERATION = 2.5X



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GEOLOGIC CROSS-SECTION A - A'

SILVER SPURS STORM SYSTEM UPGRADE
KIRKLAND, WA

DRAWN BY:	AK/CM
CHECKED BY:	JHS
DATE	08/24
PROJECT NO.	20240089H001
FIGURE	5

Coarse-Grained Soils - More than 50%[1] Retained on No. 200 Sieve	Gravels - More than 50%[1] of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines[2]	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≥12% Fines[2]	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50%[1] or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines[2]	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≥12% Fines[2]	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50%[1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

Coarse-Grained Soils	Density	SPT[3] blows/foot
	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50

Fine-Grained Soils	Consistency	SPT[3] blows/foot
	Very Soft	0 to 2
	Soft	2 to 4
	Medium Stiff	4 to 8
	Stiff	8 to 15
	Very Stiff	15 to 30
	Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

[4] Estimated Percentage

Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols

Sampler Type and Description

- Blows/6" or portion of 6"
- Split-Spoon Sampler (SPT)
- California Sampler
- Ring Sampler
- Continuous Sampling
- Grab Sample
- Portion not recovered

Groundwater depth

- ATD At time of drilling
- Static water level (date)

- Cement grout surface seal
- Bentonite seal
- Filter pack with blank casing section
- Screened casing or Hydrotip with filter pack
- End cap

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

(1) Percentage by dry weight
(2) Combined USCS symbols used for fines between 5% and 12%
(3) (SPT) Standard Penetration Test (ASTM D-1586)
(4) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)

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EXPLORATION LOG KEY FIGURE: A1

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Monitoring Well — EB-1W

Silver Spurs Storm System Upgrade — Sheet: 1 of 6

Kirkland, WA	Start Date: 7/22/24	Logged By: CEM
20240089H001	Ending Date: 7/22/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Ground Surface Elevation (ft): 491
Water Level Elevation (ft):
▼ Groundwater Depth ATD (ft): 27.5, 80

Total Depth (ft): 101
Well Completion Depth (ft): 97
Well Tag No.: BPQ299
Top of Well Casing Elevation (ft):
Datum: NAVD 88 (King Co. LiDAR)
▽ Groundwater Depth Post Drilling (ft) (Date): 77.5 (7/24/24)

Depth (ft)	Sample Type	Sample No.	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Well Construction
0				Grass/Sod - 6 inches				Stickup 0.5 feet Quickcrete 0 to 2 feet
				Fill				
				Vashon Lodgement Till				
2.5		1		Dense, slightly moist, orangish brown (oxidized), fine to medium SAND, some silt, trace gravel; 4 to 6 inch cobbles in situ with diamict texture (SM).				Bentonite 2 to 15 feet
		2		Dense, moist, gray with orange mottling, very fine SAND, some silt, trace gravel; operator states suddenly very dense at 5 feet, sandy layer at 5.5 feet (SM).				
5		3		As above; large intact clasts of diamict.				
7.5		4		Slightly moist, brownish gray, silty, fine SAND, trace gravel; occasional thin medium sand laminae; 1 piece of broken gravel; blow counts may be overstated; diamict texture (SM).		12 23 25	48	2-inch I.D. Sch 40 PVC casing threaded connections -0.5 to 87 feet
				Driller states sandy at 10 feet, cobbly after.				
10		5		Slightly moist, brownish gray, silty, fine SAND, trace gravel; diamict; bed (4 inches thick) of slightly moist, gray, fine to medium sand, trace silt, trace gravel at middle; upper 6 inches sluff (SM/SP).		11 24 26	50	
12.5				Vashon Advance Outwash				
15		6		Moist, grayish brown, silty, fine to medium SAND, trace gravel; bed (2 inches thick) of gray, fine to medium sand, some silt; beds (0.5 inches thick) of slightly moist, gray, very silty, fine sand; somewhat stratified (SM/SP).		9 15 25	40	Grout 15 to 80 feet
17.5								

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Monitoring Well EB-1W

Silver Spurs Storm System Upgrade — Sheet: 2 of 6

Kirkland, WA	Start Date: 7/22/24	Logged By: CEM
20240089H001	Ending Date: 7/22/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Ground Surface Elevation (ft): 491
Water Level Elevation (ft):
▼ Groundwater Depth ATD (ft): 27.5, 80

Total Depth (ft): 101
Well Completion Depth (ft): 97
Well Tag No.: BPQ299
Top of Well Casing Elevation (ft):
Datum: NAVD 88 (King Co. LiDAR)
▽ Groundwater Depth Post Drilling (ft) (Date): 77.5 (7/24/24)

Depth (ft)	Sample Type	Sample No.	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Well Construction
20		7		Moist to very moist, brownish gray, fine to medium SAND, some silt; bed (3 inches thick) of very moist, light gray, very silty, fine to medium SAND; oxidation laminations; bed (1 inch thick) with more coarse sand; well stratified (SP/SM).		11 24 30	54	Grout 15 to 80 feet
22.5				Vashon Advance Outwash (Silty Layer) Cuttings moist; driller states water at 23 feet.				
25		8		Very moist, light gray, very silty, fine to medium SAND; massive; somewhat cemented; plastic texture; cuttings wet (SM).		20 25 50/2"	75/8"	
27.5					▼			
30		9		Very moist to wet, light brown to gray brown, very silty, fine SAND, some medium sand; beds (1 to 2 inches thick) of wet, gray brown, silty, fine to medium SAND.		13 25 35	60	
32.5				Driller states gravel at 32 feet; cuttings wet.				
35		10		Groundwater measured at 34 feet with sample in at 35 feet. Wet, light brown to gray, silty, fine to coarse SAND, trace gravel; somewhat stratified; weak oxidation banding; free water on sampler; broken gravel lodged		23 50/5"	50/5"	

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Monitoring Well — EB-1W

Silver Spurs Storm System Upgrade — Sheet: 3 of 6

Kirkland, WA	Start Date: 7/22/24	Logged By: CEM
20240089H001	Ending Date: 7/22/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Ground Surface Elevation (ft): 491
Water Level Elevation (ft):
▼ Groundwater Depth ATD (ft): 27.5, 80

Total Depth (ft): 101
Well Completion Depth (ft): 97
Well Tag No.: BPQ299
Top of Well Casing Elevation (ft):
Datum: NAVD 88 (King Co. LiDAR)
▽ Groundwater Depth Post Drilling (ft) (Date): 77.5 (7/24/24)

Depth (ft)	Sample Type	Sample No.	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Well Construction
				in tip (SM).				
37.5				Vashon Advance Outwash				Grout 15 to 80 feet
40		11		Very moist, grayish brown, fine to medium SAND, some silt, trace gravel; upper 6 inches likely heave (SP).		28 50/6"	50/6"	
42.5								
45		12		Very moist, grayish brown, fine to medium SAND, some silt; bed (2 inches thick) of wet, gray, silty, fine to coarse sand, some gravel; occasional silty, and medium sand laminae; cuttings wet (SP/SM).		28 50/6"	50/6"	
47.5				Driller states feels sandy; occasional gravel.				
50		13		Upper 8 inches: Moist, grayish brown, fine to coarse SAND, trace silt; rare gravel (SP). Lower 4 inches: Slightly moist, light grayish brown, fine to medium SAND, trace silt (SP).		32 50/6"	50/6"	
52.5								

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Monitoring Well — EB-1W

Silver Spurs Storm System Upgrade — Sheet: 4 of 6

Kirkland, WA	Start Date: 7/22/24	Logged By: CEM
20240089H001	Ending Date: 7/22/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Ground Surface Elevation (ft): 491
Water Level Elevation (ft):
▼ Groundwater Depth ATD (ft): 27.5, 80

Total Depth (ft): 101
Well Completion Depth (ft): 97
Well Tag No.: BPQ299
Top of Well Casing Elevation (ft):
Datum: NAVD 88 (King Co. LiDAR)
▽ Groundwater Depth Post Drilling (ft) (Date): 77.5 (7/24/24)

Depth (ft)	Sample Type	Sample No.	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Well Construction
55		14		Moist, grayish brown, fine to medium SAND, trace silt; rare gravel; massive (SP).		31 50/6"	50/6"	Grout 15 to 80 feet
57.5								
60		15		Slightly moist, light brownish gray, fine to medium SAND, some silt; rare gravel; faint cross bedding; weakly stratified (SP).		26 50/5"	50/5"	
				Driller states smooth, sandy drilling.				
62.5								
65		16		Upper 4 inches: Slightly moist, gray brown, fine to coarse SAND, trace silt; some gravel (SP). Lower 6 inches: Slightly moist, light brownish gray, fine SAND, some silt; over recovery (SP).		50/3"	50/3"	
67.5								
70		17		Slightly moist, light grayish brown, fine to medium SAND, trace silt; rare gravel; faint laminations of dark (mafic) lithics/minerals; massive overall (SP).		36 50/6"	50/6"	
72.5								

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Monitoring Well EB-1W

Silver Spurs Storm System Upgrade — Sheet: 5 of 6

Kirkland, WA	Start Date: 7/22/24	Logged By: CEM
20240089H001	Ending Date: 7/22/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Ground Surface Elevation (ft): 491
Water Level Elevation (ft):
▼ Groundwater Depth ATD (ft): 27.5, 80

Total Depth (ft): 101
Well Completion Depth (ft): 97
Well Tag No.: BPQ299
Top of Well Casing Elevation (ft):
Datum: NAVD 88 (King Co. LiDAR)
▽ Groundwater Depth Post Drilling (ft) (Date): 77.5 (7/24/24)

Depth (ft)	Sample Type	Sample No.	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Well Construction
75		18		Slightly moist, light grayish brown, fine to medium SAND, trace silt; 1 gravel; massive (SP).		30 50/6"	50/6"	Grout 15 to 80 feet
77.5				Hole sat open at 78 feet for 20 minutes; water level measured at 78 feet.	▽			
				Driller states water shot up at 80 feet; hit aquifer.				
80		19		Very moist, grayish brown, fine to medium SAND, some silt; massive (SP).	▼	27 34 50/5"	84/11"	Bentonite 80 to 82 feet
82.5								Sand 82 to 97 feet.
85		20		Wet, dark grayish brown, fine to medium SAND, trace silt; rare gravel; broken gravel at tip; massive; blow counts may be overstated (SP).		16 50/6"	50/6"	
87.5								2-inch I.D. Sch 40 PVC slotted well screen 0.010-inch slot width 87 to 97 feet
				Driller added ≈8 gallons of water at 90 feet.				
90		21		Wet, brownish gray, fine to medium SAND, some silt; massive; over recovery due to heave; top 12 inches of		5 15 44	59	

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Monitoring Well EB-1W

Silver Spurs Storm System Upgrade — Sheet: 6 of 6

Kirkland, WA	Start Date: 7/22/24	Logged By: CEM
20240089H001	Ending Date: 7/22/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Ground Surface Elevation (ft): 491
Water Level Elevation (ft):
▼ Groundwater Depth ATD (ft): 27.5, 80

Total Depth (ft): 101
Well Completion Depth (ft): 97
Well Tag No.: BPQ299
Top of Well Casing Elevation (ft):
Datum: NAVD 88 (King Co. LiDAR)
▽ Groundwater Depth Post Drilling (ft) (Date): 77.5 (7/24/24)

Depth (ft)	Sample Type	Sample No.	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Well Construction
				sample not collected (SP).				
92.5								
				Driller states ≈1 foot of heave, adding more water at 95 feet.				
95		22		As above; faintly stratified; bed (2 inches thick) of wet, slightly siltier, more fine sand (SP).		5 17 50/6"	67/12"	
97.5								Conical endcap
100		23		Wet, brownish gray, fine to coarse SAND, trace silt; rare gravel (SP).		11 50/6"	50/6"	
102.5				Perched groundwater encountered from 27.5 to 37.5 feet ATD. Groundwater encountered at 80 feet ATD. Groundwater measured at 78.5 feet 10 minutes AB. Groundwater measured at 77.5 feet on 7/24/24. Hole was cleared to 6.5 feet below original grade, using an air-knife type vactor truck on 7/15/24.				
105								
107.5								

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Exploration Boring EB-2

Silver Spurs Storm System Upgrade — Sheet: 1 of 5

Kirkland, WA	Start Date: 7/23/24	Logged By: CEM
20240089H001	Ending Date: 7/23/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Groundwater Depth ATD (ft): 32.5

Total Depth (ft): 81.5
Ground Surface Elevation (ft): 495
Datum: NAVD 88 (King Co. LiDAR)
Groundwater Depth Post Drilling (ft) (Date): ()

Depth (ft)	Sample Type	Sample	% Recovery	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Other Tests
0					Grass/Sod - 6 inches				
					Fill				
2.5		1			Medium dense, brown, moist, silty, fine to medium SAND, some gravel; rootlets; abundant fine organics (SM).				
					Vashon Lodgement Till				
		2			Medium dense, slightly moist, light brown/mottled gray, very silty, fine SAND, trace gravel; vac truck operator states suddenly very dense at 4.5 feet; difficult excavation (SM).				
5					Compact cobbles at 6 feet; unable to retrieve sample with hand auger.				
7.5		3			Slightly moist, light gray to brown, fine SAND, some silt, trace gravel; massive (SP-SM).		7 15 18	33	
10		4			Slightly moist, gray to brown, silty, fine SAND; diamict texture; bed (3 inches thick) at middle of gray brown, slightly moist, fine to coarse sand, trace silt (SM/SP)		11 16 21	37	
12.5									
					Sampler bouncing.				
15		5			Upper 6 inches: Slightly moist, gray to brown, silty, fine SAND, trace gravel (SM).		17 40 50/3"	90/9"	
					Vashon Advance Outwash				
					Lower 6 inches: Slightly moist, gray, fine to medium SAND, trace silt, trace gravel (SP).				
17.5									

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Exploration Boring EB-2

Silver Spurs Storm System Upgrade — Sheet: 2 of 5

Kirkland, WA	Start Date: 7/23/24	Logged By: CEM
20240089H001	Ending Date: 7/23/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Groundwater Depth ATD (ft): 32.5

Total Depth (ft): 81.5
Ground Surface Elevation (ft): 495
Datum: NAVD 88 (King Co. LiDAR)
Groundwater Depth Post Drilling (ft) (Date): ()

Depth (ft)	Sample Type	Sample	% Recovery	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Other Tests
					Sampler bouncing; used rod to push rock and re-sample.				
20		6			Slightly moist, brown to gray, silty, fine to coarse SAND; beds (0.5 to 1 inch thick) of slightly moist, gray brown, fine to medium sand, trace silt; stratified (SM/SP).		20 26 36	62	
22.5									
25		7			Moist, gray to brown, fine to coarse SAND, some silt; laminae of fine to medium sand, trace silt; pulverized rock at top of bottom 6 inches; well stratified (SM/SP).		19 26 42	68	
27.5					Vashon Advance Outwash (Silty Layer)				
30		8			Moist, light gray, very silty, fine to medium SAND, some clay; plastic texture; two beds (0.5 inches thick) of very moist, fine to medium sand, some silt (SM/SP).		20 39 47	86	
32.5						▼			
35		9			As above; very moist; beds (1 inch thick) of wet, fine to medium sand, some silt (SM/SP).		18 30 34	64	
37.5									

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Exploration Boring EB-2

Silver Spurs Storm System Upgrade — Sheet: 3 of 5

Kirkland, WA	Start Date: 7/23/24	Logged By: CEM
20240089H001	Ending Date: 7/23/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Groundwater Depth ATD (ft): 32.5

Total Depth (ft): 81.5
Ground Surface Elevation (ft): 495
Datum: NAVD 88 (King Co. LiDAR)
Groundwater Depth Post Drilling (ft) (Date): ()

Depth (ft)	Sample Type	Sample	% Recovery	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Other Tests
40		10			Upper 12 inches: Wet, gray to brown, silty, fine to coarse SAND, some gravel (SM). Lower 6 inches: Wet, gray to brown, silty, fine to medium SAND (SM).		20 30 50/3"	80/9"	
42.5					Vashon Advance Outwash				
45		11			Moist, light brownish gray, fine to medium SAND, some silt; faint bed (0.25 inches thick) with some gravel (SP-SM).		26 50/6"	50/6"	
47.5									
50		12			Upper 6 inches: As above; slightly moist. Lower 6 inches: Slightly moist, grayish brown, silty, fine to medium SAND; gravel lodged in sampler; blow counts may be overstated; over recovery (SM).		50/6"	50/6"	
52.5									
55		13			Upper 2 inches: Pulverized rock. Lower 4 inches: Moist, grayish brown, fine to coarse SAND, some silt (SP-SM).		50/6"	50/6"	

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associated earth sciences incorporated

Exploration Boring EB-2

Silver Spurs Storm System Upgrade — Sheet: 4 of 5

Kirkland, WA	Start Date: 7/23/24	Logged By: CEM
20240089H001	Ending Date: 7/23/24	Approved By: JHS

Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Groundwater Depth ATD (ft): 32.5

Total Depth (ft): 81.5
Ground Surface Elevation (ft): 495
Datum: NAVD 88 (King Co. LiDAR)
Groundwater Depth Post Drilling (ft) (Date): ()

Depth (ft)	Sample Type	Sample	% Recovery	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Other Tests
57.5									
60		14			Upper 6 inches: Moist, gray to brown, fine to medium SAND, trace silt; bed at middle (6 inches thick) of very moist, light gray, very silty, fine to medium SAND; plastic texture; contains laminae of gray, fine to medium sand, some silt; slight over recovery (SP).		39 50/6"	50/6"	
62.5									
65		15			Moist, light gray to brown, fine to medium SAND, trace silt, trace gravel; beds (1/4 to 1/8 inches thick) of very moist, light gray, very silty, fine sand (SP/SM).		27 50/6"	50/6"	
67.5									
70		16			Slightly moist, gray, fine to medium SAND, trace silt; laminae of dark mafic minerals/lithics and light gray, moist, silty, fine sand (SP/SM).		37 50/6"	50/6"	
72.5									
75		17			Slightly moist, light grayish brown, fine to medium SAND, trace silt, trace		30 50/6"	50/6"	

associated earth sciences incorporated

Exploration Boring EB-2

Silver Spurs Storm System Upgrade — Sheet: 5 of 5

Kirkland, WA	Start Date: 7/23/24	Logged By: CEM
20240089H001	Ending Date: 7/23/24	Approved By: JHS

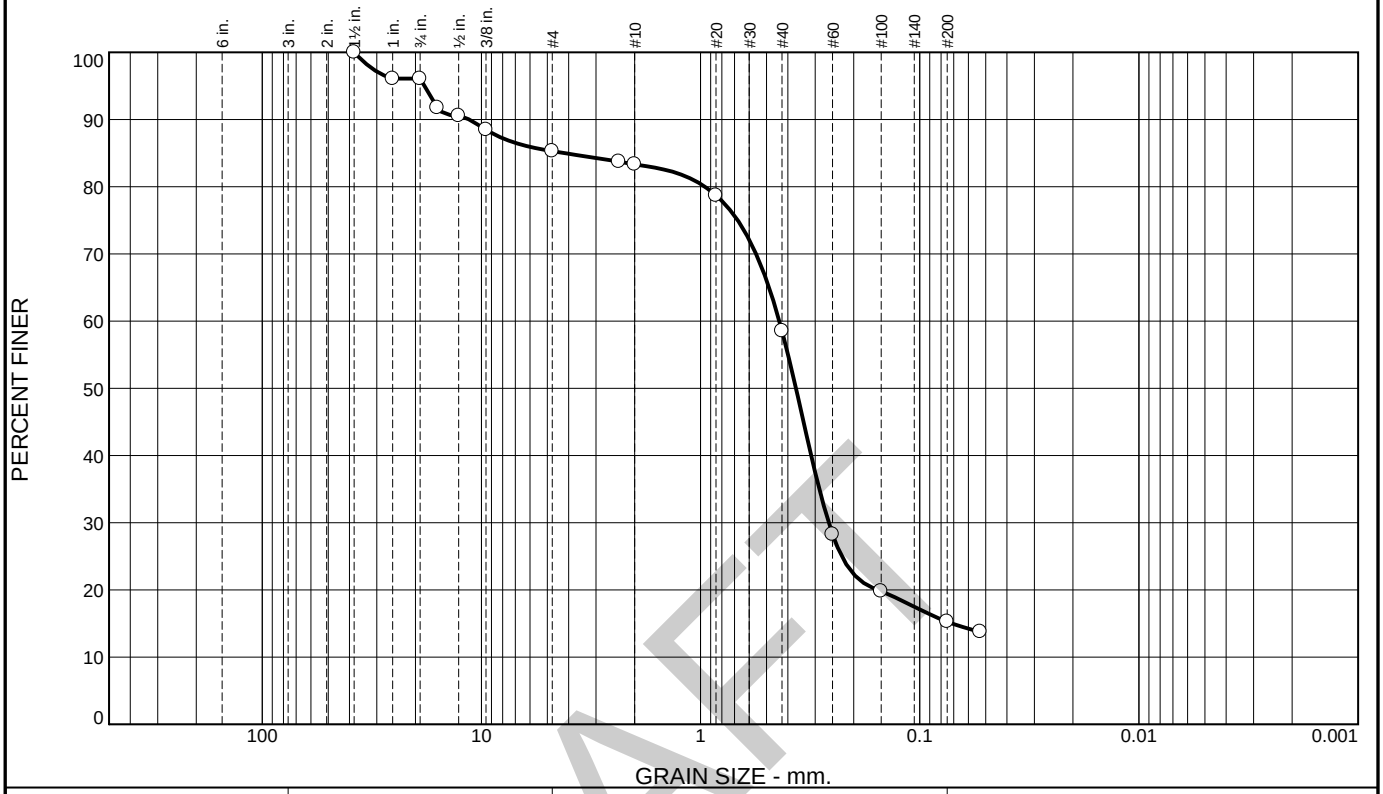
Driller/Equipment: Advance Drill Technologies/D-50
Hammer Weight/Drop: 140#/30"
Hole Diameter (in): 8
Groundwater Depth ATD (ft): 32.5
Total Depth (ft): 81.5
Ground Surface Elevation (ft): 495
Datum: NAVD 88 (King Co. LiDAR)
Groundwater Depth Post Drilling (ft) (Date): ()

Depth (ft)	Sample Type	Sample	% Recovery	Graphic Symbol	Description	Water Level	Blows/6"	Blows/Foot (10 20 30 40 50+)	Other Tests
					gravel; faintly stratified; bed (0.5 inches thick) at middle contains some gravel (SP).				
77.5									
80		18			Slightly moist grading to moist, gray, fine to medium SAND, trace SILT; massive; 1 piece of broken gravel; blow counts may be overstated (SP).		24 40 50/5"	90/11"	
					Perched groundwater encountered from 32.5 to 43 feet ATD. No groundwater encountered 15 minutes AB. Hole was cleared to 6 feet below original grade, using an air-knife type vactor truck on 7/15/24.				
82.5									
85									
87.5									
90									
92.5									

8/14/2024

20240089H001

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.9	10.8	2.0	24.8	43.2	15.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	96.1		
3/4"	96.1		
5/8"	91.7		
1/2"	90.6		
3/8"	88.5		
#4	85.3		
#8	83.7		
#10	83.3		
#20	78.7		
#40	58.5		
#60	28.3		
#100	19.8		
#200	15.3		
#270	13.8		

* (no specification provided)

Material Description

gravelly silty SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 11.3766 D_{85}= 4.1899 D_{60}= 0.4371
D_{50}= 0.3672 D_{30}= 0.2603 D_{15}= 0.0711
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Location: Onsite
Sample Number: EB-1W **Depth:** 15' **Date:** 8-5-2024

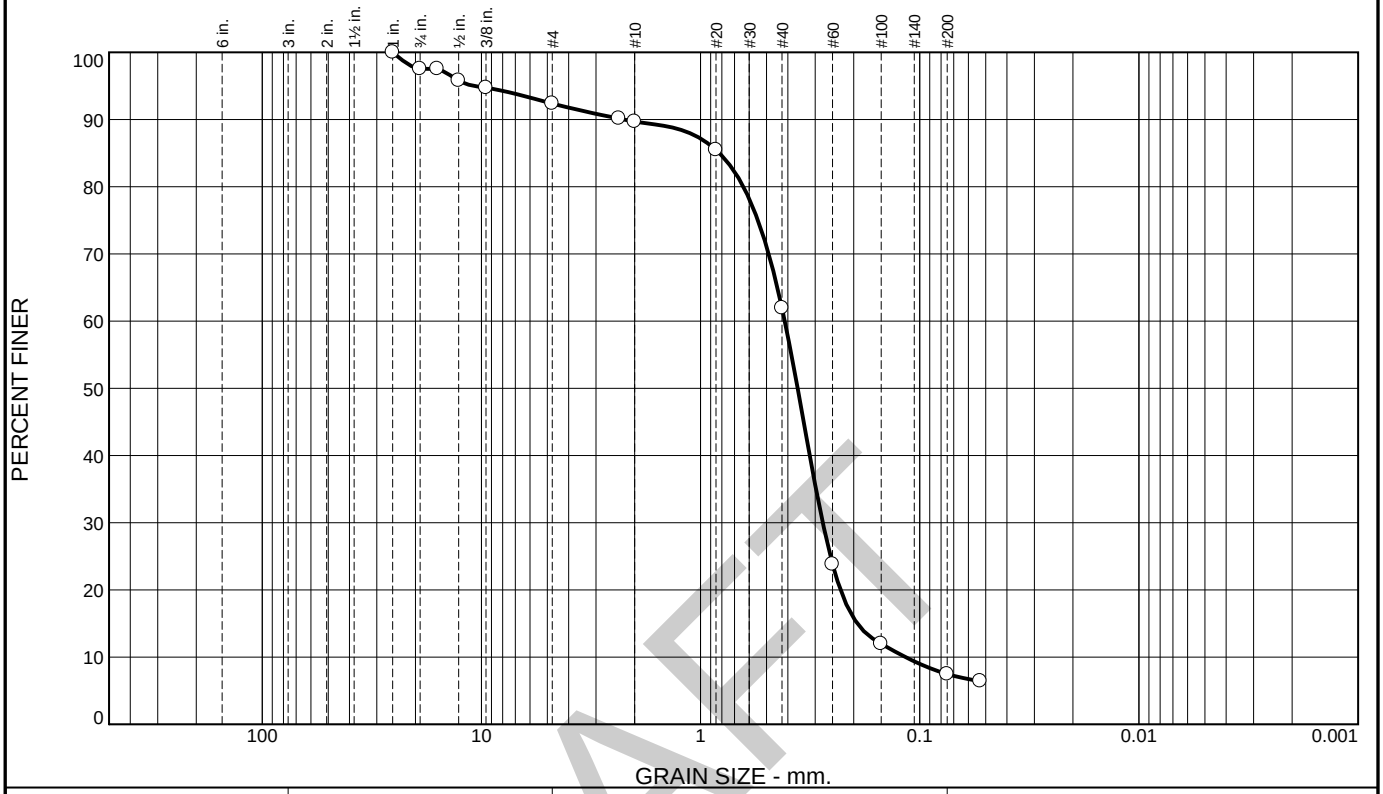
associated earth sciences incorporated

Client: City of Kirkland, Public Works Department
Project: Silver Spurs Storm System Upgrade

Project No: 20240089 H001 **Figure**

Tested By: FEW **Checked By:** CM/JHS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.5	5.1	2.7	27.7	54.5	7.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	97.5		
5/8"	97.5		
1/2"	95.8		
3/8"	94.7		
#4	92.4		
#8	90.1		
#10	89.7		
#20	85.5		
#40	62.0		
#60	23.8		
#100	12.0		
#200	7.5		
#270	6.4		

* (no specification provided)

Material Description

SAND some gravel some silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 2.2511 D_{85}= 0.8212 D_{60}= 0.4128
D_{50}= 0.3608 D_{30}= 0.2770 D_{15}= 0.1929
D_{10}= 0.1161 C_u= 3.56 C_c= 1.60

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Location: Onsite
Sample Number: EB-1W **Depth:** 40' **Date:** 8-5-2024

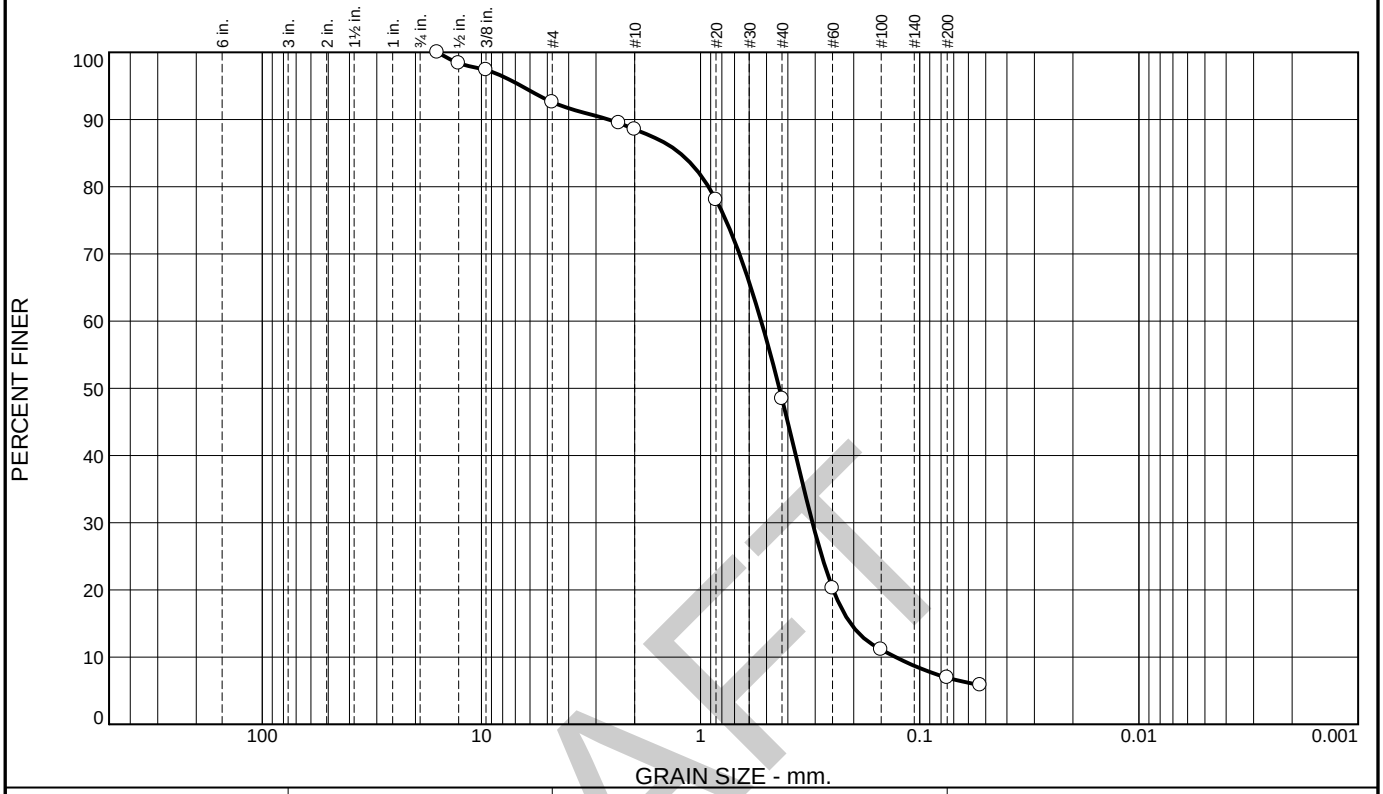
associated earth sciences incorporated

Client: City of Kirkland, Public Works Department
Project: Silver Spurs Storm System Upgrade

Project No: 20240089 H001 **Figure**

Tested By: FEW **Checked By:** CM/JHS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.4	4.1	40.1	41.5	6.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5/8"	100.0		
1/2"	98.4		
3/8"	97.4		
#4	92.6		
#8	89.5		
#10	88.5		
#20	78.0		
#40	48.4		
#60	20.3		
#100	11.1		
#200	6.9		
#270	5.8		

* (no specification provided)

Material Description

SAND some gravel some silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 2.6343 D_{85}= 1.2425 D_{60}= 0.5292
D_{50}= 0.4370 D_{30}= 0.3085 D_{15}= 0.2068
D_{10}= 0.1289 C_u= 4.10 C_c= 1.39

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Location: Onsite
Sample Number: EB-1W **Depth:** 50' Upper 8" **Date:** 8-5-2024

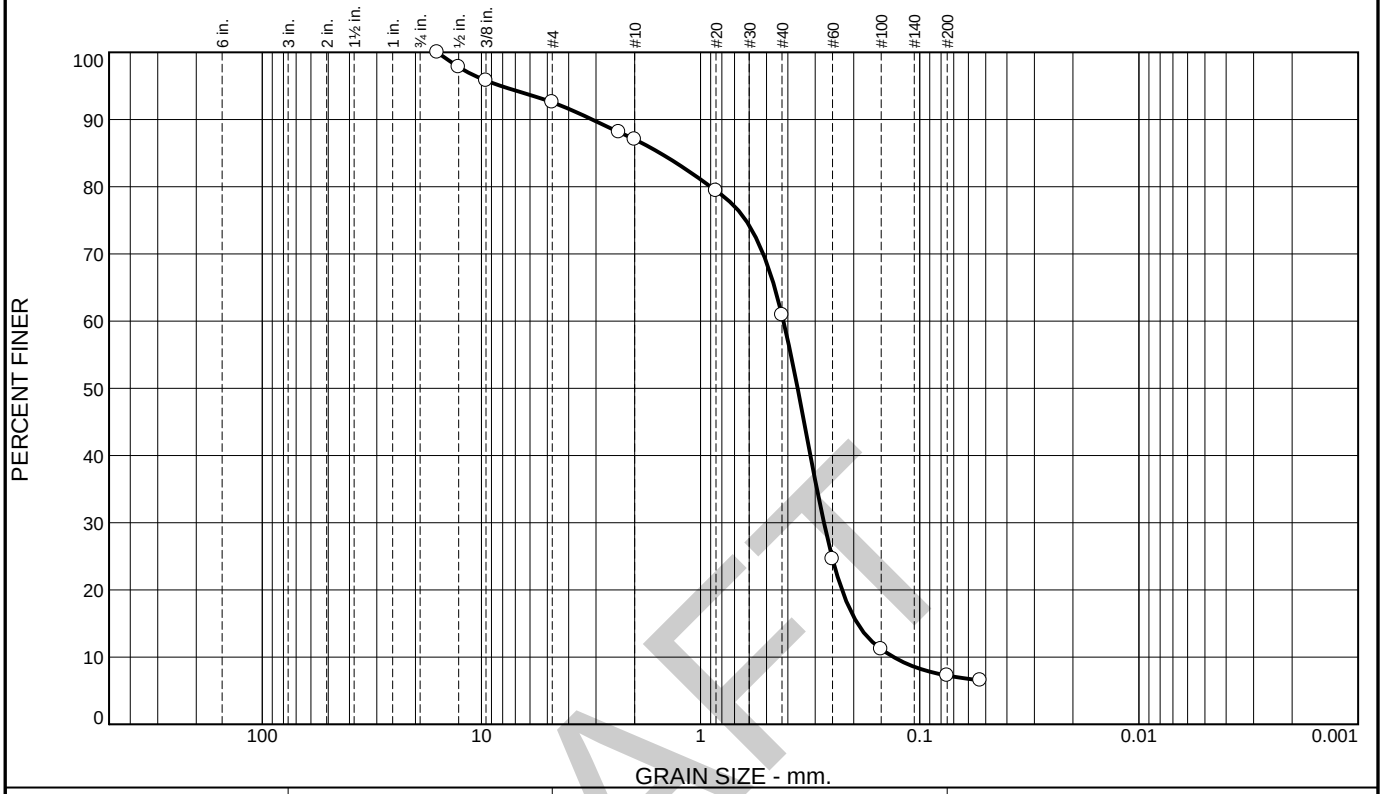
associated earth sciences incorporated

Client: City of Kirkland, Public Works Department
Project: Silver Spurs Storm System Upgrade

Project No: 20240089 H001 **Figure**

Tested By: FEW **Checked By:** CM/JHS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.4	5.6	26.1	53.6	7.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5/8"	100.0		
1/2"	97.8		
3/8"	95.8		
#4	92.6		
#8	88.1		
#10	87.0		
#20	79.4		
#40	60.9		
#60	24.6		
#100	11.2		
#200	7.3		
#270	6.5		

* (no specification provided)

Material Description

SAND some gravel some silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 3.1260 D_{85}= 1.5293 D_{60}= 0.4185
D_{50}= 0.3608 D_{30}= 0.2737 D_{15}= 0.1925
D_{10}= 0.1316 C_u= 3.18 C_c= 1.36

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Location: Onsite
Sample Number: EB-1W **Depth:** 60' **Date:** 8-5-2024

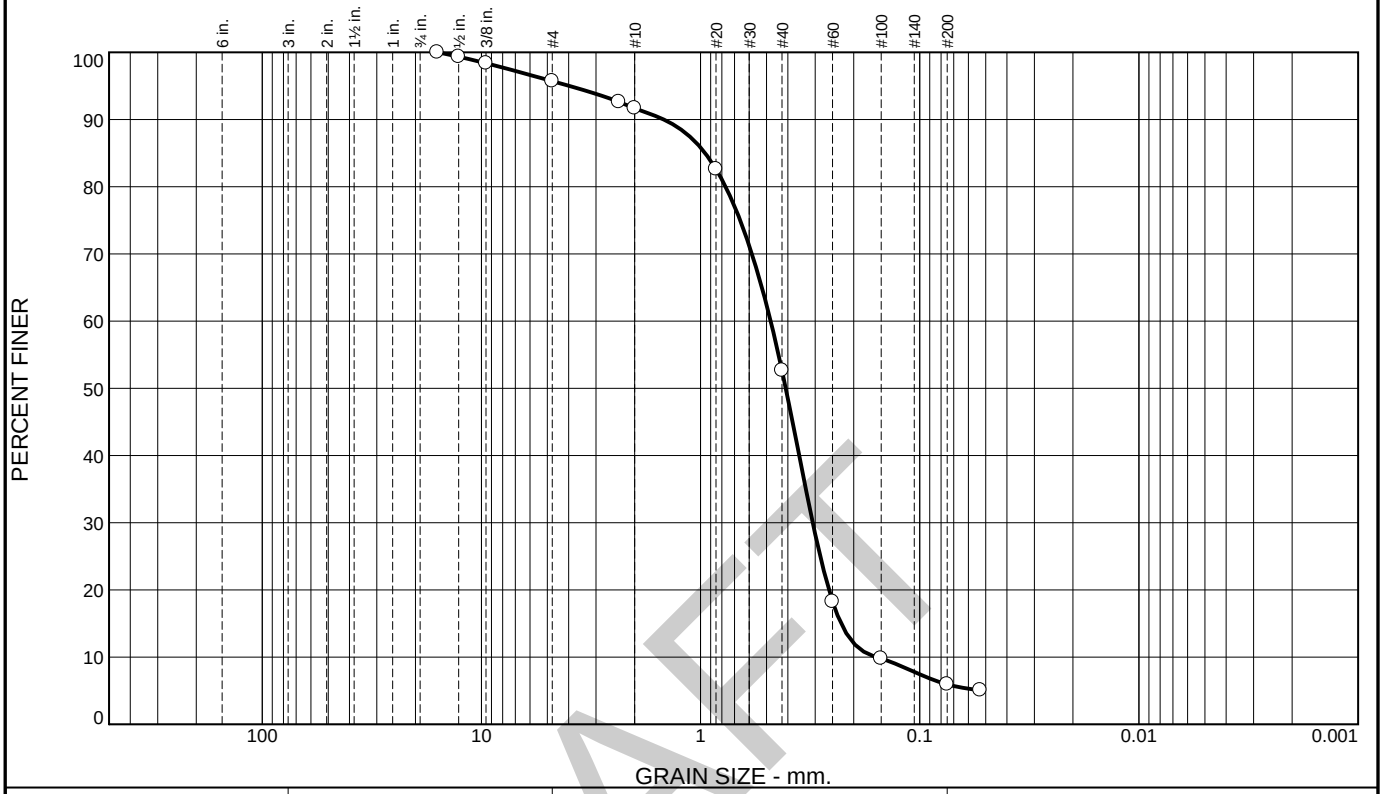
associated earth sciences incorporated

Client: City of Kirkland, Public Works Department
Project: Silver Spurs Storm System Upgrade

Project No: 20240089 H001 **Figure**

Tested By: FEW **Checked By:** CM/JHS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.3	4.0	39.0	46.8	5.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5/8"	100.0		
1/2"	99.3		
3/8"	98.4		
#4	95.7		
#8	92.6		
#10	91.7		
#20	82.6		
#40	52.7		
#60	18.3		
#100	9.8		
#200	5.9		
#270	5.1		

* (no specification provided)

Material Description

SAND some silt trace gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.4747 D_{85}= 0.9535 D_{60}= 0.4789
D_{50}= 0.4086 D_{30}= 0.3077 D_{15}= 0.2285
D_{10}= 0.1570 C_u= 3.05 C_c= 1.26

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Location: Onsite
Sample Number: EB-2 **Depth:** 45' **Date:** 8-5-2024

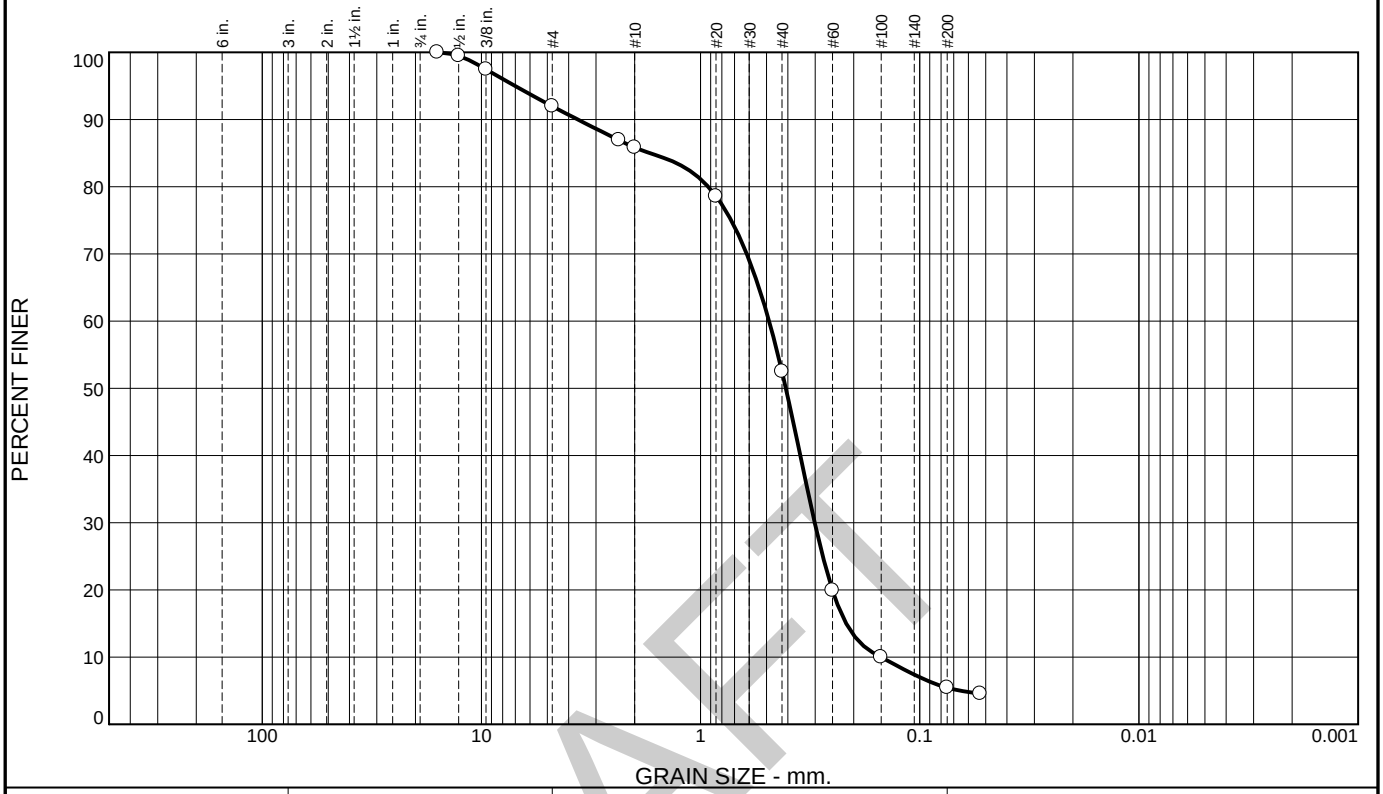
associated earth sciences incorporated

Client: City of Kirkland, Public Works Department
Project: Silver Spurs Storm System Upgrade

Project No: 20240089 H001 **Figure**

Tested By: FEW **Checked By:** CM/JHS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.0	6.2	33.3	47.0	5.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5/8"	100.0		
1/2"	99.5		
3/8"	97.5		
#4	92.0		
#8	86.9		
#10	85.8		
#20	78.6		
#40	52.5		
#60	19.9		
#100	10.0		
#200	5.5		
#270	4.6		

* (no specification provided)

Material Description

SAND some gravel some silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 3.6358 D_{85}= 1.7050 D_{60}= 0.4869
D_{50}= 0.4082 D_{30}= 0.3013 D_{15}= 0.2165
D_{10}= 0.1502 C_u= 3.24 C_c= 1.24

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Location: Onsite
Sample Number: EB-2 **Depth:** 65' **Date:** 8-5-2024

associated earth sciences incorporated

Client: City of Kirkland, Public Works Department
Project: Silver Spurs Storm System Upgrade

Project No: 20240089 H001 **Figure**

Tested By: FEW **Checked By:** CM/JHS

PROFESSIONAL SERVICES AGREEMENT
PSA 6/30/2020

The City of Kirkland, Washington, a municipal corporation ("City") and _____, whose address is _____ ("Consultant"), agree and contract as follows.

In consideration of the mutual benefits and conditions set forth below, the parties agree as follows:

I. SERVICES BY CONSULTANT

A. The Consultant agrees to perform the services described in Attachment _to this Agreement, which attachment is incorporated herein by reference.

B. All services and duties shall be conducted and performed diligently, completely and in accordance with professional standards of conduct and performance.

II. COMPENSATION

A. The total compensation to be paid to Consultant for these services shall not exceed $_____, as detailed in Attachment _____.

B. Payment to Consultant by the City in accordance with the payment ceiling specified above shall be the total compensation for all services performed under this Agreement and supporting documents hereto as well as all subcontractors' fees and expenses, supervision, labor, supplies, materials, equipment or the use thereof, reimbursable expenses, and other necessary incidentals.

C. The Consultant shall be paid on the basis of invoices submitted. Invoicing will be on the basis of percentage complete or on the basis of time, whichever is applicable in accordance with the terms of this Agreement.

D. The City shall have the right to withhold payment to Consultant for any services not completed in a satisfactory manner until such time as Consultant modifies such services to the satisfaction of the City.

E. Unless otherwise specified in this Agreement, any payment shall be considered timely if a warrant is mailed or is available within 45 days of the date of actual receipt by the City of an invoice conforming in all respects to the terms of this Agreement.

III. TERMINATION OF AGREEMENT

The City or the Consultant may terminate or suspend this Agreement at any time, with or without cause, by giving ten (10) days' notice to the other in writing. In the event of termination, all finished or unfinished reports, or other material prepared by the Consultant pursuant to this Agreement, shall be provided to the City. In the event the City terminates prior to completion without cause, consultant may complete such analyses and records as may be necessary to place its files in order. Consultant shall be entitled to receive just and equitable compensation for any satisfactory services completed on the project prior to the date of termination, not to exceed the payment ceiling set forth above.

IV. OWNERSHIP OF WORK PRODUCT

A. Ownership of the originals of any reports, data, studies, surveys, charts, maps, drawings, specifications, figures, photographs, memoranda, and any other documents which are developed, compiled or produced as a result of this Agreement, whether or not completed, shall be vested in the City. Any reuse of these materials by the City for projects or purposes other than those which fall within the scope of this Agreement or the project to which it relates, without written concurrence by the Consultant will be at the sole risk of the City.

B. The City acknowledges the Consultant's plans and specifications as instruments of professional service. Nevertheless, the plans and specifications prepared under this Agreement shall become the property of the City upon completion of the services. The City agrees to hold harmless and indemnify consultant against all claims made against Consultant for damage or injury, including defense costs, arising out of any reuse of such plans and specifications by any third party without the written authorization of the Consultant.

C. Methodology, materials, software, logic, and systems developed under this Agreement are the property of the Consultant and the City, and may be used as either the consultant or the City sees fit, including the right to revise or publish the same without limitation.

D. The Consultant at such times and in such forms as the City may require, shall furnish to the City such statements, records, reports, data, and information as the City may request pertaining to matters covered by this Agreement. All of the reports, information, data, and other related materials, prepared or assembled by the Consultant under this Agreement and any information relating to personal, medical, and financial data will be treated as confidential only as allowed by Washington State laws regarding disclosure of public information, Chapter 42.56 RCW

The Consultant shall at any time during normal business hours and as often as the City may deem necessary, make available for examination all of its records and data with respect to all matters covered, directly or indirectly, by this Agreement and shall permit the City or its designated authorized representative to audit and inspect other data relating to all matters covered by this Agreement. The City shall receive a copy of all audit reports made by the agency or firm as to the Consultant's activities. The City may, at its discretion, conduct an audit, at its expense, using its own or outside auditors, of the Consultant's activities which relate, directly or indirectly, to the Agreement.

Consultant will provide all original operation and maintenance manuals, along with all warranties, from the manufacturer for any equipment or items installed or supplied to the City has part of this contracted project.

The Consultant shall maintain accounts and records, including personnel, property, financial, and programmatic records, which sufficiently and properly reflect all direct and indirect costs of any nature expended and services performed pursuant to this Agreement. The Consultant shall also maintain such other records as may be deemed necessary by the City to ensure proper accounting of all funds contributed by the City to the performance of this Agreement.

The foregoing records shall be maintained for a period of seven years after termination of this Agreement unless permission to destroy them is granted by

the Office of the Archivist in accordance with RCW Chapter 40.14 and by the City.

V. GENERAL ADMINISTRATION AND MANAGEMENT

The _____ for the City of Kirkland shall review and approve the Consultant's invoices to the City under this Agreement, shall have primary responsibility for overseeing and approving services to be performed by the Consultant, and shall coordinate all communications with the Consultant from the City.

VI. COMPLETION DATE

The estimated completion date for the Consultant's performance of the services specified in Section I is _____.

Consultant will diligently proceed with the services contracted for, but consultant shall not be held responsible for delays occasioned by factors beyond its control which could not reasonably have been foreseen at the time of the execution of this Agreement. If such a delay arises, Consultant shall forthwith notify the City.

VII. SUCCESSORS AND ASSIGNS

The Consultant shall not assign, transfer, convey, pledge, or otherwise dispose of this Agreement or any part of this Agreement without prior written consent of the City.

VIII. NONDISCRIMINATION

Consultant shall, in employment made possible or resulting from this Agreement, ensure that there shall be no unlawful discrimination against any employee or applicant for employment in violation of RCW 49.60.180, as currently written or hereafter amended, or other applicable law prohibiting discrimination, unless based upon a bona fide occupational qualification as provided in RCW 49.60.180 or as otherwise permitted by other applicable law. Further, no person shall be denied or subjected to discrimination in receipt of the benefit of any services or activities made possible by or resulting from this Agreement in violation of RCW 49.60.215 or other applicable law prohibiting discrimination.

IX. HOLD HARMLESS/INDEMNIFICATION

To the greatest extent allowed by law the Contractor shall defend, indemnify and hold the City, its officers, officials, employees and volunteers harmless from any and all claims, injuries, damages, losses or suits including attorney fees, arising out of or in connection with performance of this Agreement, except for injuries and damages caused by the sole negligence of the City.

Should a court of competent jurisdiction determine that this Agreement is subject to RCW 4.24.115, then, in the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of the Contractor and the City, its officers, officials, employees, and volunteers, the Contractor's liability hereunder shall be only to the extent of the Contractor's negligence. It is further specifically and expressly understood that the indemnification provided herein constitutes the Contractor's waiver of immunity under Industrial Insurance, Title 51 RCW, solely for the purpose of this indemnification. This waiver has been mutually negotiated by the parties. The provisions of this section shall survive the expiration or termination of this Agreement.

X. LIABILITY INSURANCE COVERAGE

The Consultant shall procure and maintain for the duration of the Agreement, insurance against claims for injuries to persons or damage to property which may arise from or in connection with the performance of the work hereunder by the Consultant, its agents, representatives, or employees. A failure to obtain and maintain such insurance or to file required certificates and endorsements shall be a material breach of this Agreement.

Consultant's maintenance of insurance as required by the agreement shall not be construed to limit the liability of the Consultant to the coverage provided by such insurance, or otherwise limit the City's recourse to any remedy available at law or in equity.

A. Minimum Scope of Insurance

Consultant shall obtain insurance of the types described below:

1. Automobile Liability insurance covering all owned, non-owned, hired and leased vehicles. Coverage shall be as least as broad as Insurance Services Office (ISO) form CA 00 01 or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage.

2. Commercial General Liability insurance shall be as least as broad as ISO occurrence form CG 00 01 and shall cover liability arising from premises, operations, stop-gap independent contractors and personal injury and advertising injury. The City shall be named as an additional insured under the Consultant's Commercial General Liability insurance policy with respect to the work performed for the City using an additional insured endorsement at least as broad as ISO CG 20 26.

3. Workers' Compensation coverage as required by the Industrial Insurance laws of the State of Washington.

4. Professional Liability insurance appropriate to the Consultant's profession.

B. Minimum Amounts of Insurance

Consultant shall maintain the following insurance limits:

1. Automobile Liability insurance with a minimum combined single limit for bodily injury and property damage of $1,000,000 per accident.

2. Commercial General Liability insurance shall be written with limits no less than $1,000,000 each occurrence, $2,000,000 general aggregate.

3. Professional Liability insurance shall be written with limits no less than $1,000,000 per claim and $1,000,000 policy aggregate limit.

C. Other Insurance Provisions

The insurance policies are to contain, or be endorsed to contain, the following provisions for Automobile Liability and Commercial General Liability insurance:

1. The Consultant's insurance coverage shall be primary insurance as respects the City. Any insurance, self-insurance, or self-insured pool coverage maintained by the City shall be excess of the Consultant's insurance and shall not contribute with it.

2. The Consultant shall provide the City and all Additional Insureds for this services with written notice of any policy cancellation, within two business days of their receipt of such notice.

D. **Acceptability of Insurers**

Insurance is to be placed with insurers with a current A.M. Best rating of not less than A:VII.

E. **Verification of Coverage**

Consultant shall furnish the City with original certificates and a copy of the amendatory endorsements, including but not necessarily limited to the additional insured endorsement, evidencing the insurance requirements of the Consultant before commencement of the services.

F. **Failure to Maintain Insurance**

Failure on the part of the Consultant to maintain the insurance as required shall constitute a material breach of agreement, upon which the City may, after giving five business days' notice to the Consultant to correct the breach, immediately terminate the agreement or, at its discretion, procure or renew such insurance and pay any and all premiums in connection therewith, with any sums so expended to be repaid to the City on demand, or at the sole discretion of the City, offset against funds due the Consultant from the City.

G. **City Full Availability of Consultant Limits**

If the Consultant maintains higher insurance limits than the minimums shown above, the City shall be insured for the full available limits of Commercial General and Excess or Umbrella liability maintained by the Consultant, irrespective of whether such limits maintained by the Consultant are greater than those required by this agreement or whether any certificate of insurance furnished to the City evidences limits of liability lower than those maintained by the Consultant.

XI. COMPLIANCE WITH LAWS/BUSINESS LICENSE

The Consultant shall comply with all applicable State, Federal, and City laws, ordinances, regulations, and codes. Consultant must obtain a City of Kirkland business license or otherwise comply with Kirkland Municipal Code Chapter 7.02.

XII. FUTURE SUPPORT

The City makes no commitment and assumes no obligations for the support of Consultant activities except as set forth in this Agreement.

XIII. INDEPENDENT CONTRACTOR

Consultant is and shall be at all times during the term of this Agreement an independent contractor and not an employee of the City. Consultant agrees that he

or she is solely responsible for the payment of taxes applicable to the services performed under this Agreement and agrees to comply with all federal, state, and local laws regarding the reporting of taxes, maintenance of insurance and records, and all other requirements and obligations imposed on him or her as a result of his or her status as an independent contractor. Consultant is responsible for providing the office space and clerical support necessary for the performance of services under this Agreement. The City shall not be responsible for withholding or otherwise deducting federal income tax or social security or for contributing to the state industrial insurance of unemployment compensation programs or otherwise assuming the duties of an employer with respect to the Consultant or any employee of Consultant.

XIV. EXTENT OF AGREEMENT/MODIFICATION

This Agreement, together with all attachments and addenda, represents the final and completely integrated Agreement between the parties regarding its subject matter and supersedes all prior negotiations, representations, or agreements, either written or oral. This Agreement may be amended only by written instrument properly signed by both parties.

XV. ADDITIONAL WORK

The City may desire to have the Consultant perform work or render services in connection with the project other than provided for by the express intent of this Agreement. Any such work or services shall be considered as additional work, supplemental to this Agreement. This Agreement may be amended only by written instrument properly signed by both parties.

XVI. NON-ENDORSEMENT

As a result of the selection of a consultant to supply services to the City, the consultant agrees to make no reference to the City in any literature, promotional material, brochures, sales presentation or the like without the express written consent of the City.

XVII. NON-COLLUSION

By signature below, the Consultant acknowledges that the person, firm, association, co-partnership or corporation herein named, has not either directly or indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in the preparation or submission of a proposal to the City for consideration in the award of a contract on the specifications contained in this Agreement.

XVIII. WAIVER

Waiver by the City of any breach of any term or condition of this Agreement shall not be construed as a waiver of any other breach.

XIX. ASSIGNMENT AND SUBCONTRACT

The Consultant shall not assign or subcontract any portion of the services contemplated by this Agreement without the prior written consent of the City.

XX. DEBARMENT

Recipient certifies that it is not suspended, debarred, proposed for debarment, declared ineligible or otherwise excluded from contracting with the federal government, or from receiving contracts paid for with federal funds.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the dates written below:

CONSULTANT:	CITY OF KIRKLAND:
Signature: _____	Signature: _____
Printed Name: _____	Printed Name: _____
	(Type City Staff Name)
Title: _____	Title: _____
Date: _____	Date: _____