APPENDIX G: CREDIT ACCOUNTING

The MRP seeks to achieve a net gain in ecological functions across the landscape; **at minimum the program must achieve no net loss of ecological function.**

From a credit accounting standpoint, the MRP will seek to maintain a surplus of credits available to sell, neither amassing a significant surplus of credits, nor selling all available advance credits for a particular service area. In cases where demand for MRP mitigation credits is higher than anticipated, the MRP may request additional advance credits from the IRT, which would require an amendment to the instrument. The intent is to "earn back" credits through mitigation prior to drawing down the total amount of advance credit in a given service area.

1.0 Balancing Credits by Functional Type

Until the program accrues impact fees and implements mitigation projects, it is hard to predict exactly how mitigation credit types will balance with impact debits in each functional type (see Appendix D). For example, finding mitigation sites and designing projects to earn habitat credits may prove easy, and implementing mitigation projects that will earn hydrology and water quality credits may be more difficult. In some service areas, watershed needs assessments may indicate that an imbalance across functional types is desirable; in other cases balancing functional debit and credit types may be the goal. As the program accrues mitigation fees and implements mitigation through time, the type and amounts of debits and credits, and the balance among them, will be tracked and reported to the IRT (via the Credit Ledger, see Section 2.0, below). MRP staff will consult with the IRT to discuss if balancing across functional credit subtypes should be attempted, or if "trading" among functional subtypes will be preferable. It is likely to vary by watershed based on specific watershed needs. Tracking each of the three functional subtypes of debits and credits separately will allow these decisions to be made in an explicit and transparent way.

One objective of the MRP is to fully offset functional losses resulting from impacts with equivalent or greater functional gains in ways that address watershed needs. The sections below describe how the sponsor will track credits according to functional categories (i.e., habitat, hydrology and water quality) and ensure that losses through time are offset by equivalent or greater functional gains in each respective functional category. For instance, if hydrologic functions, e.g., infiltration, provided by a wetland are reduced due to an unavoidable permitted impact, then equal or greater hydrologic functions should be replaced through mitigation projects over time since maintaining (and when possible, increasing) hydrologic functions is a known watershed need throughout King County. Section 1.1 outlines the process for tracking functional credit types and Section 1.2 outlines the timing considerations. Section 1.3 outlines the compliance measures with respect to offsetting functional losses with equivalent or greater functional gains. All of the conditions below apply for each of the program service areas.

1.1 Tracking Functional Gains and Losses

The sponsor shall be responsible for taking the following steps to ensure functional losses are mitigated through implementation of projects that achieve equivalent or greater functional gains within each service area:

A. When a mitigation credit is sold to offset an unavoidable impact in a given service area, the sponsor shall identify, quantify and record the debits of each functional type lost as a result of the impact (see Section 6.0 of this Appendix G).
B. The sponsor shall consider these functional losses during the process of selecting mitigation sites in the service area (see Appendix J) and strive to design and implement projects that fully compensate for functional losses in a manner that is consistent with addressing watershed needs.
C. The sponsor shall quantify the functional credit types "earned" through implementation of a mitigation project (see Section 6.0 of this Appendix G).
   For each service area the sponsor shall maintain a ledger of all debits and credits, including the functional type of each credit and debit (see Section 4.0 of this Appendix G).

1.2 Timing Considerations for Achieving Functional Balance

The following conditions apply with respect to fully offsetting functional losses with equivalent or greater functional gains within a particular service area.

A. Following the sale of any credits in a service area, to the extent practicable, the next mitigation project the sponsor implements within that service area should attempt to fully compensate for the functions lost to the impact(s) for which credits were sold if the best available science dictates that this strategy is consistent with watershed needs.
B. When fully offsetting functional losses in a given functional category is consistent with meeting science-based watershed needs, and an implemented mitigation project in a service area does not achieve equal or greater credits of the three functional types as the functional debits lost to impacts, the sponsor shall prioritize meeting any outstanding functional credit type deficit in the next mitigation project implemented in the service area (see Appendix J, Section 3.2).
C. If there is still a deficit in one or more functional credit types after two mitigation projects are implemented following a credit sale, and addressing the deficit is consistent with meeting science-based watershed needs, then the next mitigation project implemented must address the functional deficit.
D. If functional losses are not offset by the third implemented mitigation project subsequent to a given credit sale or if more than ten (10) years have passed since the initial credit sale for which there is still a functional deficit, and addressing the deficit is consistent with meeting science-based watershed needs, then the conditions outlined in Section 1.3 below shall apply.

1.3 Functional Balance Compliance Measures

The goal of fully offsetting functional losses with equivalent or greater functional gains is consistent with the intent of the Federal Rule (See Preamble to Rule, 33 CFR Parts 325 and 332 pp. 19596 and 19601), but the text of the rule allows the district engineer discretion to approve out of kind mitigation when such mitigation occurs in a watershed context [33 CFR 332.3(e)]. King County recognizes the importance of fully offsetting functional losses in cases where doing so addresses science-based watershed needs. For example, maintaining and increasing hydrologic functions within the landscape is an important watershed function region-wide to address; as such, watershed needs would require that any losses of hydrologic function would need to be replaced in-kind.

If the sponsor fails to meet the requirements specified in Sections 1.1 and 1.2 above, King County shall restrict operations of the MRP in the affected watershed in the following ways:

A. If the third project implemented within a service area following a given credit sale in the same service area does not address outstanding functional deficits, or if more than ten (10) years have passed since an initial credit sale for which there is still a functional deficit, then no more credit sales of that functional type shall be allowed in that service area.
B. Money from future sales of credit types not restricted by measure 1.3.A above shall be used to address the functional deficit(s) in the affected functional category(ies).
C. The restriction on sales of credits in functional categories restricted per 1.3.A above shall continue until the sponsor implements a mitigation project that addresses the deficit (i.e., that the credit ledger reflects the deficit in a functional credit category has been eliminated).

2.0 Wetland Credit/Debit Ledger

King County will maintain a Wetland Credit/Debit Ledger to account for all wetland and wetland buffer credit transactions. This ledger will be used to track credits that are sold as well as credits that are released as mitigation projects meet performance success standards (see Appendix K, Section 6.0, Credit Release Schedule).

The Credit Ledger template is shown in Exhibit 12.

Upon program certification, the Credit Ledger will reflect the amount of "Advance Credits" advanced by the IRT (see Appendix E).

King County will compile an annual ledger report for the District Engineer of the Seattle District, U.S. Army Corps of Engineers and the Department of Ecology that will include the beginning and ending balance of available credits, permitted impacts for each resource type, all additions and subtractions of credits and any other changes in credit availability (e.g., additional credits released or if credit sales are suspended).

The credit ledger will contain basic information about each impact site and mitigation project. The MRP Database (Section 6.0, below) will contain much more detail about each of the projects.

The Credit Ledger and the MRP database will be linked by a "unique identifier" for each record. For impact projects, the unique identifier will be the DDES permit number for the project; for mitigation projects the unique identifier will be a unique project name for each mitigation project.

3.0 Aquatic Areas Ledger

King County will also maintain a ledger to track aquatic area and aquatic area buffer impacts and lift. The "Aquatic Areas Ledger" is necessary because the tool used to calculate wetland credits and debits (Appendix D, Section 3.0) is only designed to assess wetlands, not wetland buffers and other aquatic resources such as rivers and streams.

The template for the Aquatic Ledger is included as Exhibit 12, Part 2. More detailed information about impacts and resulting mitigation will be recorded and tracked in the MRP Database (Section 6.0, below).

4.0 Credit Ledger Reporting

The MRP Manager will submit annual Credit Ledger reports (for both wetlands and aquatic areas) to the IRT according to the requirements specified in the federal rule, 33CFR 332.8(q)(1):

> (1) *Ledger account.* The sponsor must compile an annual ledger report showing the beginning and ending balance of available credits and permitted impacts for each resource type, all additions and subtractions of credits, and any other changes in credit availability (e.g., additional credits released, credit sales suspended). The ledger report must be submitted to the district engineer, who will distribute copies to the IRT members. The ledger report is part of the administrative record for the mitigation bank or in-lieu fee program. The district engineer will make the ledger report available to the public upon request.

In addition to annual credit ledger reports, the MRP Manager will also submit reports from the MRP Database (see Section 6.0, below) with details about the ecological attributes of impacts and mitigation projects.

5.0 IRT Concerns with Use of Credits

If an IRT member has a concern with how MRP credits are being used or whether use is consistent with the terms of the instrument, the concerned IRT member may notify the Corps and/or Ecology in writing of the concern per 33 CFR 332.8(s). This section of the rule states, "Resolution of the concern is at the discretion of the district engineer consistent with applicable statutes, regulations, and policies regarding compensatory mitigation requirements for DA permits. Nothing in this section limits the authorities designated to IRT agencies under existing statutes or regulations."

Further, IRT members with permitting authority retain the right to enforce permit conditions on any permits issued according to state or local regulations.

6.0 MRP Database

The MRP database will support accounting functions, map production, compliance reporting and efficient program implementation across King County departments. The database will include information about Roster sites and any related credit fulfillment projects that have been undertaken on them. Information about impact sites that has been recorded during application of the mitigation assessment tool will also be tracked in the database. While the MRP requires "decoupling" of impact sites from receiving sites, the database will nonetheless allow King County to analyze how the nature and type of impacts within a service area relate to the nature and type of mitigation performed.

Tracking impacts (and impact site attributes) and mitigation receiving sites (including mitigation project information) in the same database will facilitate analysis of impacts and mitigation within service areas to ensure adequate and appropriate mitigation is implemented for impacts in each service area. For both impact sites and receiving sites, the database includes fields for site location, Watershed Resource Inventory Area (WRIA), service area, habitat types, HGM class, Cowardin class, environmental functions and opportunities for lift. The database will be regularly updated as additional sites are identified and are determined to be suitable according to program criteria.

The database will also include fields that identify establishment, restoration, enhancement, and preservation projects that have occurred on Roster sites in the past, or which are anticipated to occur outside of the MRP in the future. The purpose for including this information in the database is to identify potential scale efficiencies and partnerships that may be achieved by aligning funding, planning and construction resources. It is also to avoid conflicts between MRP activities and activities being undertaken by other programs that may have different objectives, and to clearly delineate project actions that are providing mitigation credit, and those being undertaken for purposes other than mitigation. The projects occurring on the Roster sites outside of the MRP will generally fall into three categories:

A. Known/prioritized habitat enhancement need, as identified within a WLRD study or the Parks Site Management Guidelines for King County Public Lands. This category captures public lands sites that have a known generalized restoration/enhancement need, though a specific restoration or enhancement project has yet to be developed.

B. Proposed or ongoing multi-phased, large scale restoration project, as identified within Water and Land Resources Division (WLRD) capital improvement projects budget.

C. Proposed, or ongoing multi-phased, small scale restoration or enhancement projects, as included within WLRD's Small Habitat Restoration Program annual project list or River and Floodplain Management Section annual project list, as long as additional mitigation would not inhibit these projects from achieving their primary goal of reducing flood hazards.

6.1 Impact Site Data

For Impact sites the MRP Database will store detailed information about each impact site, including:

IMPACT SITE REPORT
Project Name:
Permit Number:
Name of Reviewer:

General Location Details:

Parcel ID Number(s):
Street Address:
Zoning:
WRIA, Watershed, Basin, CAO Basin Location
Elevation
Township, Range, Section, QS, Latitude/Longitude
Latitude and Longitude

Type(s) of Critical Area Disturbed:

Wetland: Wetland Buffer:
Aquatic Area: Aquatic Area Buffer:
Wildlife Habitat Network: Wildlife Habitat Conservation Area

Description of Wetlands and Buffers:

Wetland Categor(ies)
Area disturbed: (sq. ft)
Number, species and sizes of trees, the extent of a shrub layer, and the extent of groundcover to be impacted at aquatic sites.
Hydrogeomorphic Classification:
Habitat Type:
Summary of Rating Scores
Water Quality Functions:
Description:
Hydrologic Functions:
Description:
Habitat Functions:
Description:
Wetland (Category) Buffer - Area disturbed: (sq. ft)
Hydrogeomorphic Classification:
Habitat Type:

Description of Aquatic Areas and Buffers:

Type of Area disturbed: (sq. ft) or (lineal feet)
Hydrogeomorphic Classification:
Aquatic Area Name:
WRIA Stream Number:

6.2 Mitigation Site Data

The MRP Database will store the following types of information about mitigation receiving site projects:

RECEIVING SITE REPORT:
Natural Area Name:
Managing Agency:
Staff Contact:
Site Management Guidelines:
IAC/RCO Funding:
Special Consideration:

General Location Details:
Parcel ID Number(s):
Street Address:
Elevation CAO Basin Location: WRIA: Watershed:
Basin: Subbasin:
Township: Range: Section: QS: Latitude/Longitude
Critical Area Information:
WETLANDS
Wetland #1 Present (GIS):
Wetland NWI Code (GIS):
Wetland Habitat Type (GIS):
KC SAO Rating (GIS):
Wetland Acreage (GIS):
SAO ID# (GIS):
Wetland Buffer Habitat Type:
Wetland #1 HGM (Non-GIS):
Wetland Habitat Type:
KC SAO Rating:
Wetland Size:
Approximate Area to be Established, Restored, Enhanced, or Preserved:
Functional Lift Opportunities:
Additional Information:

Summary of Wetland Rating Scores
KC CAO Category:
Water Quality Functions:
Description:
Hydrologic Functions:
Description:
Habitat Functions:
Description:
Additional information about functions and values:

WETLAND BUFFERS
Wetland HGM Buffer:
Wetland Habitat Type:
Wetland Buffer Size:
Approximate Area to be restored:

RECEIVING SITE REPORT (continued):
Restoration Opportunities:
Additional Information:

AQUATIC AREAS
Aquatic Area #1 (GIS):
HGM (GIS):
KC SAO Rating (GIS):
Aquatic Area #2 (GIS): HGM (GIS):
KC SAO Rating (GIS):

Aquatic Area (non-GIS):
Hydrogeomorphic Classification:
Habitat Type:
Aquatic Area Name:
Stream Type:
WRIA Stream Number:
Restoration Opportunities:
Additional Information:

AQUATIC BUFFERS
Aquatic Area Buffer:
Hydrogeomorphic Classification:
Habitat Type:
Description:

WILDLIFE NETWORK
Wildlife Habitat Network:
Documentation:
This section includes reports about the Receiving Site (click on the link to access report):

IDENTIFIED PROJECTS
Identified Site Projects (includes CIP and SHRP):
This section includes identified restoration projects for this Receiving Site (click on the link to project information):

In addition to tracking debits at impact projects and credits at mitigation projects by aquatic resource type, debits and credits will also be categorized by jurisdictional authority, i.e., whether an impact site or mitigation project was permitted under local, state and/or federal jurisdiction.

COMPENSATION PLANNING FRAMEWORK

Appendices H through Q establish the Compensation Planning Framework, which provides information about each of the service areas covered by the program and outlines the process by which mitigation projects will be implemented. The Compensation Planning Framework includes descriptions of all steps involved in the mitigation process, including receiving site selection, project planning and implementation and long-term maintenance, monitoring, and stewardship provisions. This Compensation Planning Framework describes program elements designed to meet requirements of 33 CFR 332.8(c). The table below shows the required elements of the federal rule and the sections of this instrument that address the requirements:

Table 5. Where Sections of the Federal Rule are Addressed in This Instrument

33 CFR Federal Rule Section	Summary description of federal rule requirement	Relevant Section(s) of this Instrument
§332.8(c)(1)	Compensation Planning Framework purpose; need for watershed approach	Appendix H: Mitigation in a Watershed Approach
§332.8(c)(2)(i)	Service area descriptions	Appendix I, Sections 1.0 – 7.0 and maps included as Exhibits 1-8
§332.8(c)(2)(ii)	Threats to aquatic resources	"Threats" subsections in sections Appendix H, Sections 1.0 – 7.0
§332.8(c)(2)(iii)	Analysis of historic losses to aquatic resources	"Historic Losses" subsections in Appendix H, Sections 1.0 – 7.0
§332.8(c)(2)(iv)	Current aquatic resource conditions	"Physical Description and Current Aquatic Resource Conditions" subsections in Appendix H, Sections 1.0 – 7.0
§332.8(c)(2)(v)	Aquatic resources goals and objectives for each service area	"Goals for Mitigation in a Watershed Context" subsections in Appendix H, Sections 1.0 – 7.0
§332.8(c)(2)(vi)	Prioritization strategy for implementing mitigation	Appendix I, Part 2 and Appendix J
§332.8(c)(2)(vii)	Preservation Objectives	Appendix I, Part 2; Appendix J; and Appendix K, Section 5.0
§332.8(c)(2)(viii)	Description of public and private stakeholder involvement	Appendix J, Section 3.1 and Appendix K, Section 3.0
§332.8(c)(2)(ix)	Long term protection and management strategies	Appendix P
§332.8(c)(2)(x)	Program evaluation and reporting	Appendix N and Appendix U
§332.8(c)(2)(xi)	Other compensation planning information as required by the Corps and/or Ecology	Will address in amendments to this instrument as necessary.

Zipper Geo Associates, LLC
Geotechnical and Environmental Consulting

Project No. 1575.01
August 29, 2017

CJOK, Inc.
PO Box 2879
Kirkland, Washington 98083

Attention: Mr. Greg Rairdon

Subject: Geotechnical Report Addendum
Proposed Kirkland Rairdon Improvements
13110 NE 126th Place
Kirkland, Washington

Dear Mr. Rairdon:

The purpose of this letter is to provide an addendum to our previously-issued preliminary geotechnical report (Phase 1 Geotechnical Report, Proposed Kirkland Rairdon Improvements, 13110 NE 126th Place, Kirkland, Washington) dated December 2, 2016 (Previous Report). Our previous report described an apparently unstable bare soil escarpment located at the toe of a ridge feature to the north of the proposed improvement area. Our Previous Report presented a conceptual alternative to stabilize the escarpment utilizing a quarry spall buttress.

We understand the City of Kirkland has voiced concern regarding successfully establishing permanent vegetation on the quarry spall buttress. As an alternative to the quarry spall buttress, it is our opinion that a reinforced soil slope could be constructed to stabilize the escarpment. With a reinforced soil slope, the entire slope would be constructed of "soil", thereby increasing the probability of establishing healthy, permanent vegetation on the slope. A conceptual cross-section of the reinforced soil slope is provided in the attached Figure 1. If approved, design details for the reinforced soil slope will be provided as part of our final geotechnical report for the project.

We trust this addendum meets your current needs. If we can be of further assistance, please contact us.

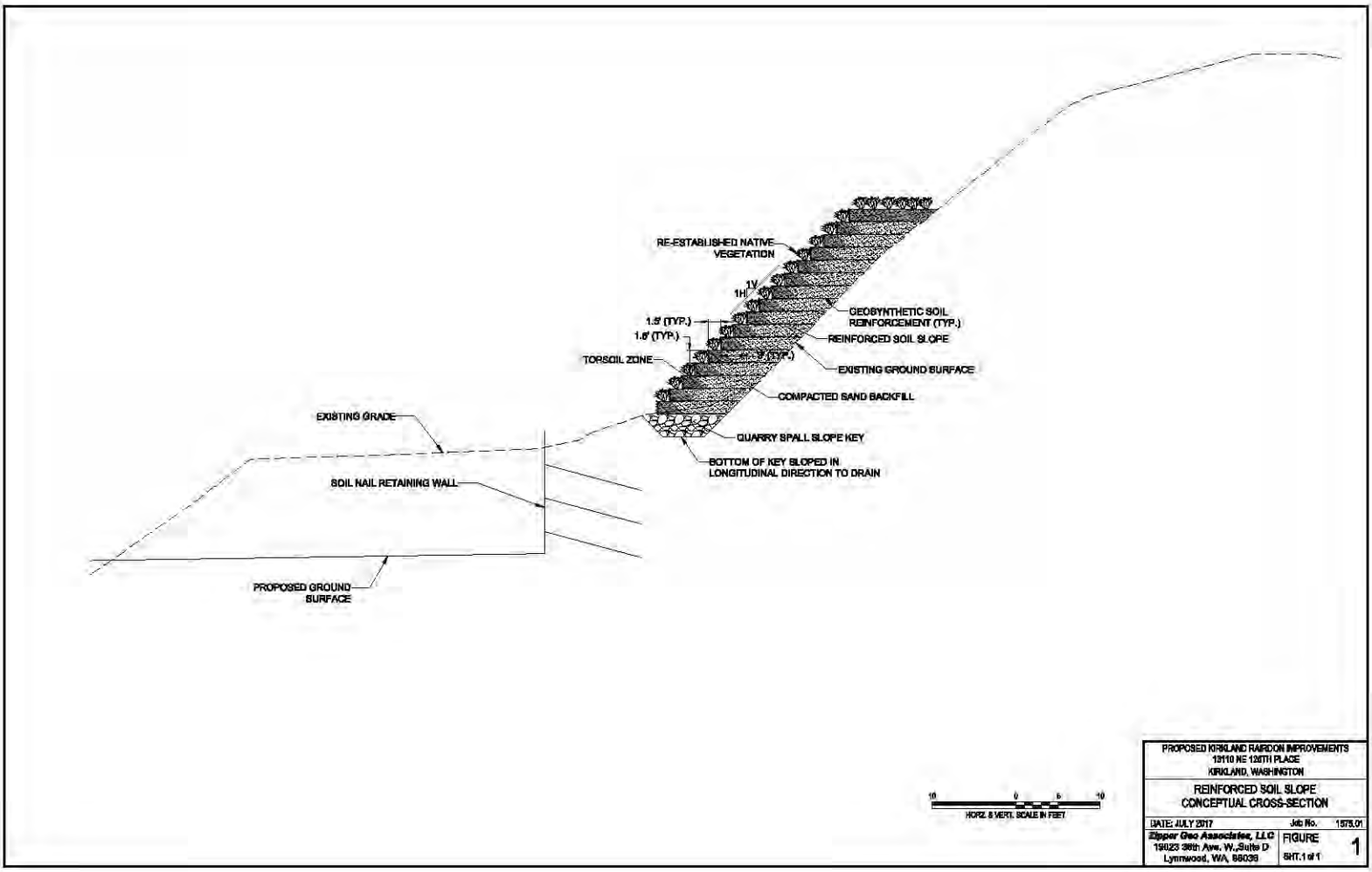
Respectfully submitted,
Zipper Geo Associates, LLC

8/29/17

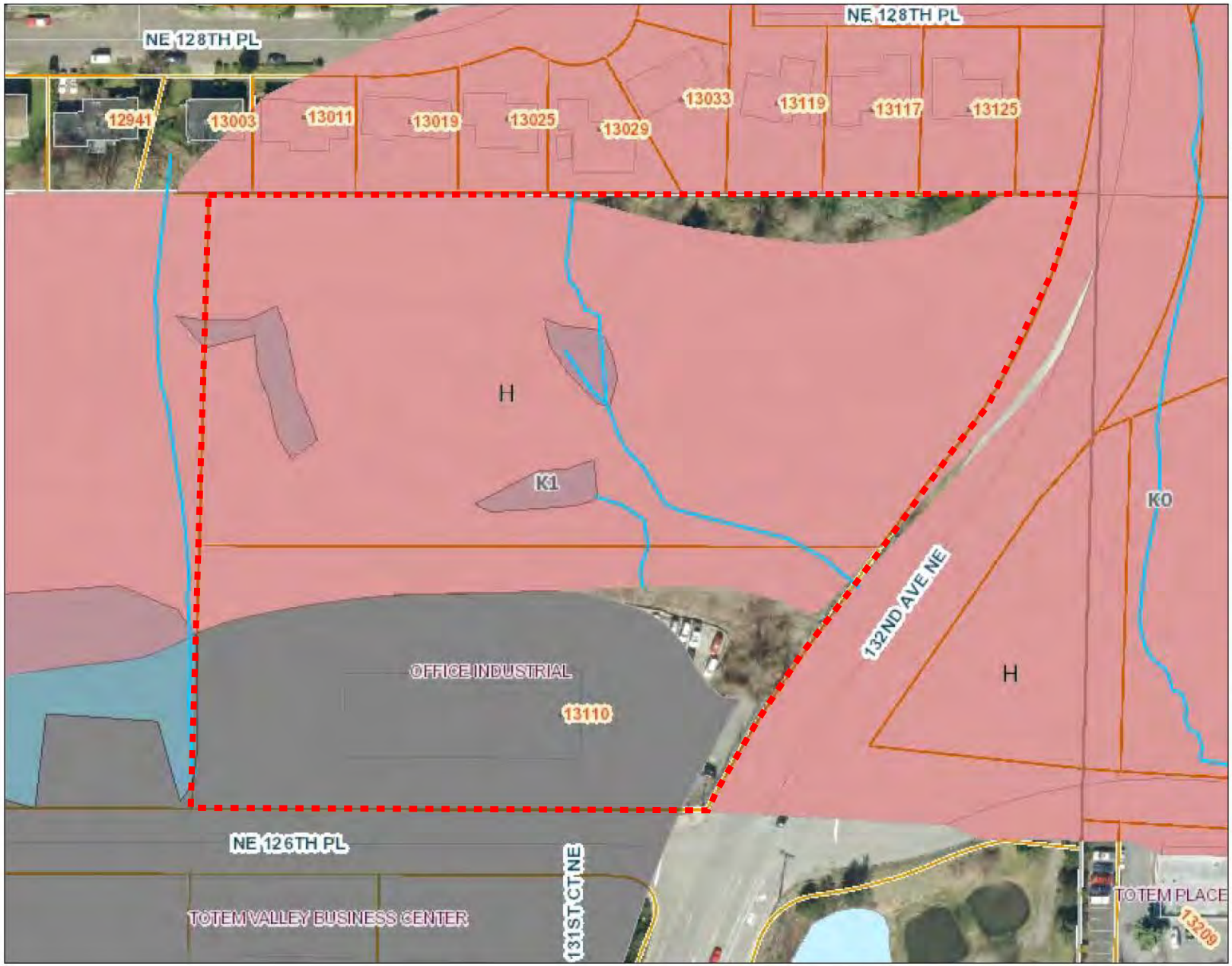
ROBERT A. ROSS
STATE OF WASHINGTON
38384
REGISTERED
PROFESSIONAL ENGINEER

Robert A. Ross, P.E.
Principal

19023 36th Avenue West, Suite D Lynnwood, Washington 98036 (425) 582-9928


RE-ESTABLISHED NATIVE VEGETATION
1V
1H
1.5' (TYP.)
1.5' (TYP.)
1' (TYP.)
TOPSOIL ZONE
GEOSYNTHETIC SOIL REINFORCEMENT (TYP.)
REINFORCED SOIL SLOPE
EXISTING GROUND SURFACE
COMPACTED SAND BACKFILL
QUARRY SPALL SLOPE KEY
BOTTOM OF KEY SLOPED IN LONGITUDINAL DIRECTION TO DRAIN
EXISTING GRADE
SOIL NAIL RETAINING WALL
PROPOSED GROUND SURFACE
10 0 5 10
HORZ. & VERT. SCALE IN FEET
PROPOSED KIRKLAND RARDON IMPROVEMENTS
13110 NE 126TH PLACE
KIRKLAND, WASHINGTON
REINFORCED SOIL SLOPE
CONCEPTUAL CROSS-SECTION
DATE: JULY 2017
Job No. 1575.01
Zipper Geo Associates, LLC
19023 36th Ave. W., Suite D
Lynnwood, WA, 98036
FIGURE
SHT. 1 of 1
1

Geological Hazards - Rairdon PUD



Legend

- Streams
  - Open
  - Pipe
- Landslide
  - High
  - Moderate
- Wetlands
- Seismic
- Address
  - Other Address
  - Current Address
  - Current ADU
  - Pending Address
- City Limits
- Grid
- QQ Grid
- Cross Kirkland Corridor
- Regional Rail Corridor
- Streets
- Parcels
- Place Names
- Buildings
- Lakes
- Parks
- Schools

1: 1,366

0.0 0 0.02 0.0 Miles

NAD_1983_StatePlane_Washington_North_FIPS_4601_Feet

Produced by the City of Kirkland. © 2017 City of Kirkland, all rights reserved.
No warranties of any sort, including but not limited to accuracy, fitness, or merchantability, accompany this product.

Notes

PHASE 1 GEOTECHNICAL ENGINEERING REPORT

PROPOSED KIRKLAND RAIRDON IMPROVEMENTS
13110 NE 126TH PLACE
KIRKLAND, WASHINGTON

Project No. 1575.01
December 2, 2016

Prepared for:
CJOK, Inc.

Prepared by:

ZGA

Zipper Geo Associates, LLC
Geotechnical and Environmental Consultants
19023 36th Avenue W., Suite D
Lynnwood, WA 9803

Project No. 1575.01
December 2, 2016

CJOK, Inc.
PO Box 2879
Kirkland, Washington 98083

Attention: Mr. Greg Rairdon

Subject: **Phase 1 Geotechnical Engineering Report**
Proposed Kirkland Rairdon Improvements
13110 NE 126th Place
Kirkland, Washington

Dear Mr. Rairdon,

In accordance with your request and written authorization, Zipper Geo Associates, LLC (ZGA) has completed the subsurface explorations and Phase 1 Geotechnical evaluation for the proposed Kirkland Rairdon Improvements project. This report presents the findings of our subsurface explorations and conclusions regarding the geotechnical feasibility of the project and conceptual-level geotechnical recommendations. This report will be supplemented by a final geotechnical report which will provide detailed geotechnical conclusions and recommendations for the project. The final report will be completed once the project site plan has been finalized. Our work was completed in general accordance with our *Proposal for Geotechnical Services* (Proposal No. P16105) dated September 28, 2016. Written authorization to proceed was provided you on September 30, 2016. We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Zipper Geo Associates, LLC

12/2/16

ROBERT A. ROSS
STATE OF WASHINGTON
38384
REGISTERED
PROFESSIONAL ENGINEER

Robert A. Ross, P.E.
Principal Geotechnical Engineer

Copies: Addressee (1), PACLAND (1), VanNess Feldman, LLP (1)

TABLE OF CONTENTS

Page

INTRODUCTION **1**
PROJECT UNDERSTANDING **1**
SURFACE CONDITIONS **2**
SUBSURFACE CONDITIONS **3**
Regional Geology 3
Soil Conditions 4
Groundwater Conditions 5
Summary of Laboratory Testing 5
REGULATED GEOLOGICALLY HAZARDOUS AREAS **5**
DEVELOPMENT IMPACTS TO GEOLGIC HAZARD AREAS and MITIGATION **6**
OFF-SITE GEOLOGIC HAZARDS and MITIGATION **7**
PRELIMINARY GEOTECHNICAL RECOMMENDATIONS **8**
Site Retaining Walls 8
Wet Weather Construction 9
Construction Dewatering 9
CLOSURE **10**

FIGURES

Figure 1 – Site and Exploration Plan
Figure 2 – Section A – A' Generalized Subsurface Profile
Figure 3 – Quarry Spall Buttress Conceptual Cross Section

APPENDICES

Appendix A – Subsurface Exploration Procedures and Logs
Appendix B – Laboratory Testing Procedures and Results

PHASE 1 GEOTECHNICAL ENGINEERING REPORT
PROPOSED KIRKLAND RAIRDON IMPROVEMENTS
13110 NE 126th Place
KIRKLAND, WASHINGTON

Project No. 1575.01

December 2, 2016

INTRODUCTION

This report presents the findings of our Phase 1 geotechnical investigation for the proposed Kirkland Rairdon Improvements project. This report provides feasibility-level conclusions and conceptual-level recommendations for the proposed project. Once the project site plan is finalized, additional geotechnical investigation and a final design report is planned. The final design report will supersede this report. The project description, site conditions, and our conclusions are presented in the text of this report. Supporting data including detailed exploration logs and field exploration procedures, and results of laboratory testing are presented as appendices.

PROJECT UNDERSTANDING

The project site consists of two neighboring parcels of land located off the northwest corner of the intersection of NE 126th Place and 132nd Avenue NE. The north parcel consists of a 3.74-acre undeveloped site. The south parcel, located at 13110 NE 126th Place, consists of a largely developed, 2.2-acre site. The south, developed parcel is currently utilized as a vehicle service center and for vehicle inventory storage.

Based on our review of conceptual civil engineering plans dated July 25, 2016 prepared by PACLAND, the project proposes to create additional vehicle inventory storage (VIS) to the north of the existing vehicle service center and vehicle inventory storage areas. Creating the new VIS area will require substantial grading at the site. In the south half of the proposed VIS area, fills with a maximum anticipated thickness of about 24 feet are planned. In the north half of the proposed VIS area, cuts with a maximum anticipated depth of about 17 feet are planned. Except for a small area in the eastern limits of the proposed VIS area, the cuts and fills will be supported by new retaining walls.

Stormwater runoff from the new VIS area will be routed to two new underground detention vaults. One vault is proposed in the southwest portion of the new VIS area. A second vault is proposed west of the existing vehicle service building. Details regarding vault geometry were unknown at the time this report was prepared.

The project is expected to include related improvements including stormwater infrastructure, paving, and other underground utilities. Details regarding related improvements were not known at the time this report was prepared.

SURFACE CONDITIONS

The project site consists of two neighboring parcels of land located off the northwest corner of the intersection of NE 126th Place and 132nd Avenue NE. The north parcel consists of a 3.74-acre undeveloped site. The south parcel, located at 13110 NE 126th Place, consists of a largely developed, 2.2-acre site. The south, developed parcel is currently utilized as a vehicle service center and for vehicle inventory storage. The project site is bordered to the north by developed residential property; to the south by NE 126th Place and commercial development beyond; to the east by 132nd Avenue NE; and to the west by an undeveloped, forested property.

The developed area of the south parcel includes an approximate 8,000 square foot, two-story, wood framed building. The north and south sides of the building are bordered by concrete aprons varying in width. Beyond the concrete aprons, the ground surface is generally covered by asphalt concrete pavement. West of the building and asphalt-covered surface exists a gravel-surfaced area currently utilized as a vehicle storage area. The vehicle service building is serviced by buried underground utilities including gas, water, and sanitary sewer and overhead power, telephone, and cable.

Topographically, the developed areas of the project site are generally level to gently sloping in varied directions. To the north of the developed areas, the project site generally occurs as a south-facing hillside with a total vertical relief approaching 120 feet. For purposes of describing topography, the undeveloped areas of the project site can be separated into two areas; the area of proposed improvements and the area north of the proposed improvements. Topography in the area of proposed improvements generally consists of two generally flat benches bisected by a steep slope and also bordered to the south by a steep slope. During our site reconnaissance, we identified features indicative of current and/or historic slope instability on the slopes in the proposed improvements area. Specifically, we observed an old tension crack located at the bottom of the slope that separates the lower bench from the upper bench. Directly above this tension crack, we observed a fresh, 4-foot tall head scrap. Features identified as indicative of slope instability within the proposed improvements area were localized to the areas noted above and are shown on the attached Figure 1, Site and Exploration Plan.

Topography north of the proposed improvement areas can generally be characterized as ground that slopes moderately to steeply downward in varied directions ranging from nearly due east to southwest. The west portion of this area generally occurs as a south to south-west facing hillside with slopes ranging from about 16 to 36 degrees. During our site reconnaissance, we did not observe obvious indications of slope instability in this area.

The central portion of the hillside above the improvements area generally occurs as a ridge-like feature that terminates at the south end with a steep (45 to 50+ degrees), bare soil escarpment. Based on our review of historical aerial photographs, the steep escarpment appears to be the result of previous grading on the property. At the top west edge of the escarpment, we observed a 10 foot long tension crack indicative of

slope instability. Additionally, the escarpment appears to be experiencing erosion due to lack of vegetative cover and exposure to direct rainfall and runoff from the slopes above. The location of this escarpment feature is shown on the attached Figure 1.

To the east of the ridge feature, the area transitions to a southeast oriented bowl feature with a gently sloping base slope below. The head and side slopes of the bowl feature are inclined at about 18 to 26 degrees. The base slope below the bowl is inclined at about 10 degrees. Along the west side slope, we observed irregular downsets indicative of shallow instability. Additionally, in the lower portion of the head slope, we observed what appears to be landslide deposits possibly from a past shallow landslide that initiated in the upper portion of the head slope. These features are shown on the attached Figure 1.

To the east of the bowl, the area generally occurs as a convex-shaped (in the across-slope direction) hillside. Slopes on the hillside are inclined downward to the southwest to southeast at about 20 to 32 degrees. During out site reconnaissance, we did not observe obvious signs of instability in this area.

Vegetation in the undeveloped areas of the project site generally consists of dense deciduous brush and moderately dense deciduous trees. During our site reconnaissance, we observed several areas of ponded surface water generally occurring on the nearly level benches in the improvement area and within the base slope below the bowl feature to the north of the improvement area. Additionally, we observed local areas of groundwater seepage emanating from the slopes north of the improvement area.

SUBSURFACE CONDITIONS

Regional Geology

We assessed the geologic setting of site and the surrounding vicinity by reviewing information available on the Washington Department of Natural Resource's Washington Interactive Geologic Map website (https://fortress.wa.gov/dnr/protectiongis/geology/?Theme=wigm) as well as USGS Miscellaneous Field Studies Map MF1543, Geologic Map of the Kirkland quadrangle, Washington. The above references indicate the regional geology of the hillside on which the project occur consists of the following stratigraphic sequence:

- **Glacial Till**: The above-referenced mapping indicates that the upper reaches of the hillside north of the improvements area consist of glacial till. Glacial till consists of a compact mixture of sand, silt, gravel, cobbles, and occasional boulders. During our geologic reconnaissance, we did not observe exposures of glacial till on the hillside.
- **Advance Outwash**: Below the glacial till, the mapping indicates advance outwash. Advance outwash is typically described as clean, dense sand. During our geologic reconnaissance, we generally observed what appears to be advance outwash on the hillside to the north of the proposed improvements area.

- **Transitional Beds**: Below the advance outwash, the mapping indicates transitional beds. Transitional beds are typically described as massive to bedded, medium gray to dark gray, clay, silt, and fine to very fine sand. Subsurface soils encountered in borings completed for this study appear to generally consist of transitional beds lacking bedding and appear massive. Based on our geologic reconnaissance, the contact between the transitional beds and the upper advance outwash unit appears to be at or near the toe of the hillside to the north of the proposed improvements area.

Soil Conditions

Soil conditions at the site were evaluated through the completion of 3 geotechnical test borings (B-1 to B-3). The borings were advanced to depths ranging from 16.5 to 31 feet below existing site grade. The approximate exploration locations are shown on the *Site and Exploration Plan, Figure 1*. Soils were visually classified using the Unified Soil Classification System as a guide. Descriptive logs of the subsurface explorations and the procedures utilized in the subsurface exploration program are presented in *Appendix A*. A generalized description of soil conditions encountered in the borings is presented below. Detailed descriptions of soils encountered are provided on the descriptive logs in *Appendix A*.

Boring B-1 was completed through asphalt pavement in the existing vehicle storage area to the north of the existing vehicle service building. Boring B-1 encountered 6 inches of asphalt concrete pavement underlain by wet to saturated silty sand (interpreted based on soil cuttings) extending to about 5 feet below existing site grade. Dense to very dense, saturated sand with trace silt and gravel was encountered below the silt sand and extended to about 12.5 feet below existing site grade. Below the dense to very dense sand, boring B-1 encountered hard, wet silt with some sand extending to the completion depth of about 16.5 feet below existing grade. The dense sand and hard silt appear to be representative of the transitional beds geologic unit.

Borings B-2 and B-3 were completed in the undeveloped areas of the site, north of boring B-1. Surficial soils encountered in borings B-2 and B-3 generally consisted of about 12 inches of forest duff and topsoil. Below the forest duff and topsoil, borings B-2 and B-3 generally encountered very stiff to hard, moist to saturated, silty clay to sandy silt extending to about 7 feet in boring B-2 and about 31 feet in boring B-3, below existing site grade, respectively. Boring B-3 was completed in hard, wet, sandy silt at a depth of 31 feet below existing site grade. Below the silty clay and sandy silt, boring B-2 encountered very dense, moist to saturated, sand with variable silt content to the completion depth of about 26.5 feet below existing grade. The dense to very dense sand and hard silts encountered in borings B-2 and B-3 appear to be representative of the transitional beds geologic unit. The transitional bed soils encountered in borings B-2 and B-3 appeared massive and lacked bedding and jointing. A generalized subsurface profile through the borings is shown on Figure 2.

Groundwater Conditions

Groundwater seepage was observed in all the borings completed on site. A summary of groundwater depths observed in the borings is provided below.

Boring Number	Ground Surface Elev. (ft)	Groundwater Depth (ft)	Groundwater Elev. (ft)
B-1	163	1	162
B-2	180	17.5	162.5
B-3	198	15	183

Groundwater observed in the borings is interpreted to be a shallow local aquifer within the transitional beds soil unit. The saturated thickness of the aquifer is unknown. In addition to the aquifer in the transitional beds, there appears to also be groundwater within the advance outwash unit as seepage emanating from the hillside above the proposed improvements area was observed in some locations. Fluctuations in groundwater levels will likely occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the explorations were performed. Therefore, groundwater levels during construction or at other times in the life of the project may be higher than indicated on the logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Summary of Laboratory Testing

Laboratory testing was completed on select soil samples obtained from the explorations. Moisture content testing of fine-grained (silts, sandy silts, and clayey silts) soil samples obtained above the groundwater table at the time of exploration ranged from 24 to 30 percent. Moisture content testing of granular (sands) soil samples obtained from above the groundwater table at the time of exploration ranged from about 11 to 13 percent. Atterberg limits testing of fine-grained soil samples indicated the soils are low plasticity silts and clays. Moisture content and Atterberg limits data are shown on the boring logs. Plots of Atterberg limits are also provided in Appendix B.

REGULATED GEOLOGICALLY HAZARDOUS AREAS

The City of Kirkland regulates development within Geologically Hazardous Areas (GHAs). Development regulations related to GHAs are contained in Chapter 85 of the Kirkland Zoning Code (The Code). The Code labels GHAs as Landslide Hazard Areas, Erosion Hazard Areas, and Seismic Hazard Areas. Definitions of the GHAs and comments regarding the presence or absence of these GHAs at the site are presented below.

Erosion Hazard Areas: The Code defines Erosion Hazard Areas as “Those areas containing soils which, according to the USDA Soil Conservation Service King County Soil Survey dated 1973, may

experience severe to very severe erosion hazard. This group of soils includes, but is not limited to, the following when they occur on slopes of 15 percent or greater: Alderwood gravelly sand loam (AgD), Kitsap silt loam (KpD), Ragnar Indianola Association (RdE) and portions of the Everett gravelly sand loams (EvD) and Indianola Loamy fine sands (InD)." The project site is mapped as containing Alderwood gravelly sandy loam soils and has slopes in excess of 15 percent or greater. Therefore the site contains Erosion Hazard Areas as defined by The Code.

High Landslide Hazard Areas: The Code defines High Landslide Hazard Areas as "Areas sloping 40 percent or greater, areas subject to previous landslide activities and areas sloping between 15 percent and 40 percent with zones of emergent groundwater or underlain by or embedded with impermeable silts or clays." The project site as well as areas north of the project site contain areas sloping 40 percent or greater, areas that appear to be subject to previous landslide activities, and areas sloping between 15 percent and 40 percent with zones of emergent groundwater and underlain by impermeable silts or clays. Therefore, the site contains High Landslide Hazard Areas as defined by The Code.

Seismic Hazard Areas: The Code defines Seismic Hazard Areas as "Those areas subject to severe risk of earthquake damage as a result of seismically induced settlement or soil liquefaction, which conditions occur in areas underlain by cohesionless soils of low density usually in association with a shallow groundwater table." The borings completed for this study generally encountered high density soils not susceptible to liquefaction. Therefore, it is our opinion the site does not contain Seismic Hazard Areas as defined by The Code.

DEVELOPMENT IMPACTS TO GEOLGIC HAZARD AREAS and MITIGATION

During construction, soils will be exposed and therefore susceptible to erosion. Regulations to control erosion are contained in Kirkland Municipal Code (KMC) Title 15. Provided that an appropriate temporary erosion and sediment control (TESC) plan that meets the requirements of KMC Title 15 is prepared by the project civil engineer, and is constructed and maintained in accordance with the TESC plan, it is our opinion that the erosion hazard during construction will be adequately mitigated. We recommend we review the TESC plan prior to construction.

It is our opinion that the potential for post-construction erosion within the proposed improvement areas can be mitigated through the following:

- Cut and fill slopes prepared in accordance with the recommendations presented in our final geotechnical report.
- Permanent cover of exposed soil surfaces with landscaping, seeding, and erosion control products as recommended in our final geotechnical report.
- Proper control of surface water runoff in the undeveloped, upland portions of the project site.

Within the proposed improvement area, the project site contains several, over-steepened slopes that are currently eroding and experiencing shallow surficial slope failures. The proposed project will cover these slopes with new fill and retaining walls. Based on soil conditions observed in our explorations, it is our opinion that properly designed and constructed, the new fill and retaining walls will enhance slope stability and significantly reduce the risk of erosion. Our final report will provide recommendations for retaining walls and global stability analyses demonstrating adequate global stability factors of safety.

The proposed improvements will alter the natural flow path of surface water runoff on the slopes north of the existing developed areas of the site. The current flow paths direct water over the steep slopes and is resulting in erosion and shallow surficial slope failures. Proposed grading for the project will fill over these slopes therefore eliminating the flow paths and related erosion. Surface water runoff from the slopes north of the proposed improvement area will be intercepted at the top of the north cut wall and collect and direct the runoff to storm drainage facilities. Overall, the proposed work will improve surface water drainage in a manner that will reduce current erosion and shallow slope failures, in our opinion.

The proposed improvements will alter the natural flow path of subsurface water. The construction of both the lower fill and upper cut retaining walls will intercept groundwater flow. Both retaining walls will be designed and constructed with subsurface drainage systems to collect subsurface water.

OFF-SITE GEOLOGIC HAZARDS and MITIGATION

Improvements to much of the north parcel are not planned. However, as described above, there is a steep, bare soil escarpment at the toe of the ridge feature to the north of the proposed improvements area. This escarpment is located in close proximity to the top of the proposed cut retaining wall. The approximate limits of this feature are shown on the attached Figure 1. The escarpment shows signs of instability including a tension crack at the top and erosion. In our opinion, this apparently unstable escarpment presents a long-term geologic hazard to the project and should be mitigated. It is our opinion this slope can be permanently stabilized and our final geotechnical report will provide recommendations for such. We envision stabilizing the slope can be accomplished by placing a quarry spall buttress in front of the slope. The upper zone of spalls can be mixed with topsoil and planted. We have utilized this concept on previous projects with success. A conceptual cross-section of the quarry spall buttress is shown on Figure 3.

Other slopes on the north parcel may contain a long-term risk of shallow slope failures. However, additional work is necessary to evaluate and quantify this risk. This work will be completed as part of our final geotechnical report. If such a risk is present, it is our opinion that the proposed improvements area could be protected against this risk through increasing the height of the upper cut wall above existing site grades to create a barrier to prevent landslide debris from overtopping the wall and impacting the site.

For development to be permitted within Landslide Hazard GHAs, The Code requires submittal of specific geotechnical information. This information will be submitted with our final geotechnical report. However, preliminary geotechnical recommendations regarding critical elements of the project are presented below.

PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

This section of our report presents preliminary comments and recommendations regarding critical elements of the project. As noted above, additional geotechnical explorations will be completed at the site. Our final report, which will included detailed geotechnical conclusions and recommendations, will be submitted once our additional field work is complete.

Site Retaining Walls

The project proposes to construct two retaining walls. The south wall will retain new fills to raise site grades and will have a maximum anticipated exposed height of about 24 feet. The north wall will retain cuts to lower site grades and will have a maximum anticipated height of about 17 feet.

Generally, the most economical alternative for fill walls consists of geosynthetic-reinforced fill faced with precast concrete blocks, commonly referred to as structural earth walls (SEWs). SEWs consist of layers of geosynthetic fabric that extends back into the fill behind the face of the wall. The combination of fabric and fill is termed “reinforced fill”. The geosynthetic fabric is connected at the face of the wall to precast concrete blocks typically measuring about 8 inches tall by 1.5 feet long at the face. It is our opinion this type of wall is feasible for this project. Some design elements that will need to be considered with respect to SEWs for this project are as follows:

- **Reinforced Fill Material:** Soils encountered in our explorations within the expected cut depths generally consist of fine-grained silts. Design guidelines do not recommend the use of fine-grained soils as reinforced fill as there are documented case histories of poor performance related to the use of fine-grained soils as reinforced fill. As a result, we recommend fill used within the reinforced fill mass for this project consist of imported coarse-grained soils meeting the requirements of Gravel Borrow for Geosynthetic Walls as specified in the WSDOT Standard Specifications. The limits of reinforced fill can typically be assumed to range from 0.7 to 1.0 times the total wall height. For this project, the total wall height can be assumed to be the exposed wall height plus about 1 foot.

- **Obstructions Within the Reinforced Fill Zone:** The project plans currently show a stormwater detention vault located about 10 feet behind the face of the lower fill wall. At this location, the vault would obstruct the geosynthetic reinforcement. We recommend the vault be moved a minimum of 1.0 times the wall height away from the face of wall. In addition, we recommend

underground utilities be located outside of the reinforced fill zone if possible. It is feasible to account for underground utilities in the design of SEWs. However, it is preferable for utilites to be located outside the reinforced fill zone.

Several options could be considered for the upper cut wall. The types of walls can be generally separated into two categories: Gravity and non-gravity. Gravity walls typically consist of cast-in-place concrete, crib type, and large pre-cast concrete block walls. Gravity walls are constructed from the bottom up and require a temporary excavation behind the wall to construct. Because the ground surface behind the wall slopes up, temporary excavations required to construct the east one third of the wall could extend 50 feet behind the wall significantly disturbing the steep slopes north of the wall. Additionally, a temporary cut behind the central portion of the wall would be completed directly below the escarpment associated with the ridge feature north of the wall. Such a cut could destabilize the escarpment.

Non-gravity walls typically consist of soil nail, cantilever soldier pile, and soldier pile tie back walls. These walls are constructed from the top down and do not require temporary excavations behind the wall. To limit disturbance to the steep slopes north of the wall and reduce the risk of further destabilizing the escarpment feature, we recommend a non-gravity type wall be utilized. Soil nail walls are typically the most economical non-gravity type retaining walls. Based on soil and groundwater conditions observed in our explorations completed for this study, soil nailing appears feasible. However, additional work is needed to confirm soil nail feasibility, and this work will be completed as part of our final geotechnical report.

Wet Weather Construction

Subsurface soils encountered in our explorations within the expected cut depths generally consisted of fine-grained silts and silty sands. During wet weather, site soils will quickly become disturbed, soft, and unsuitable for support of construction traffic and reuse as structural fill. Additionally, wet weather will increase the risk of temporary excavation instability. We recommend the project be completed during the driest summer months.

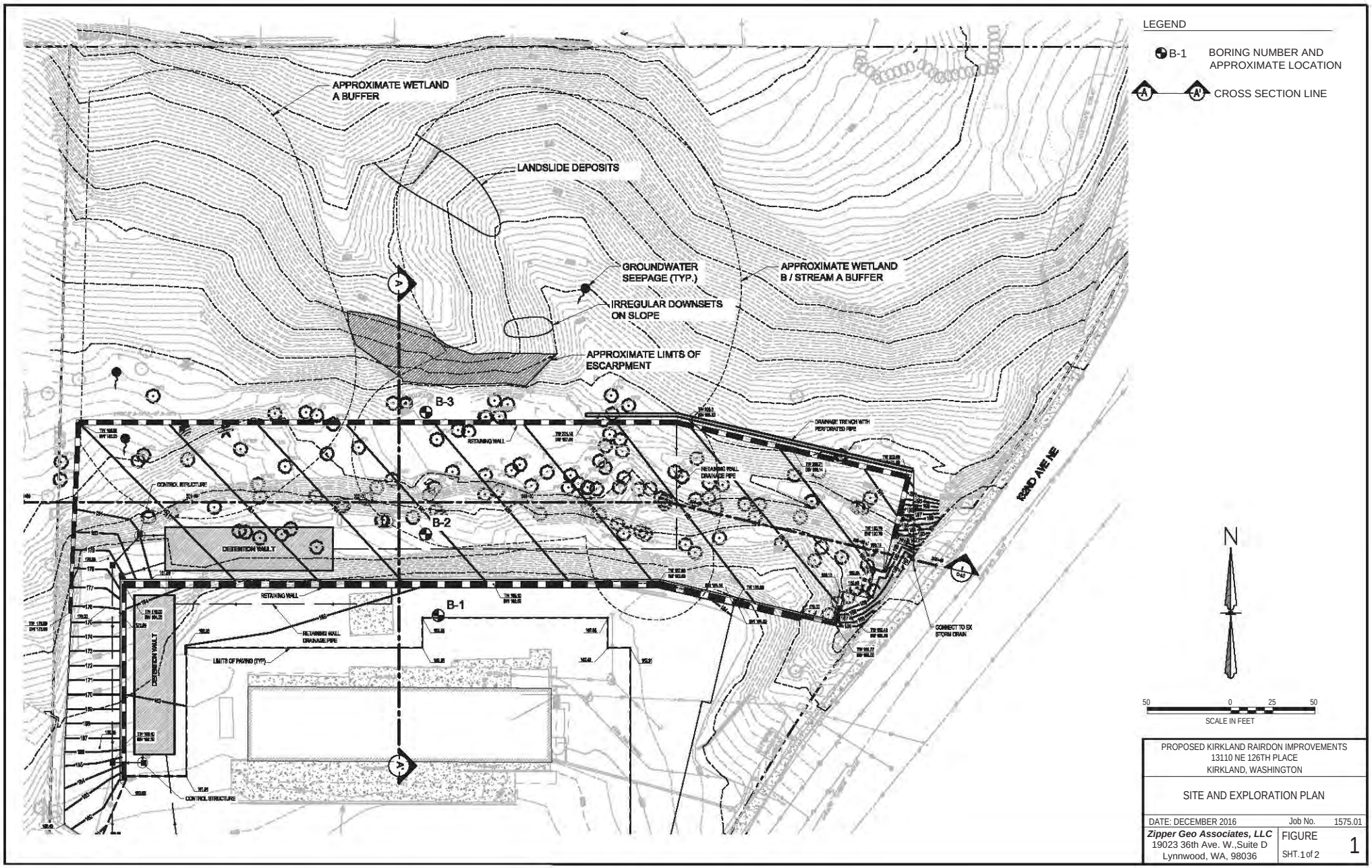
Construction Dewatering

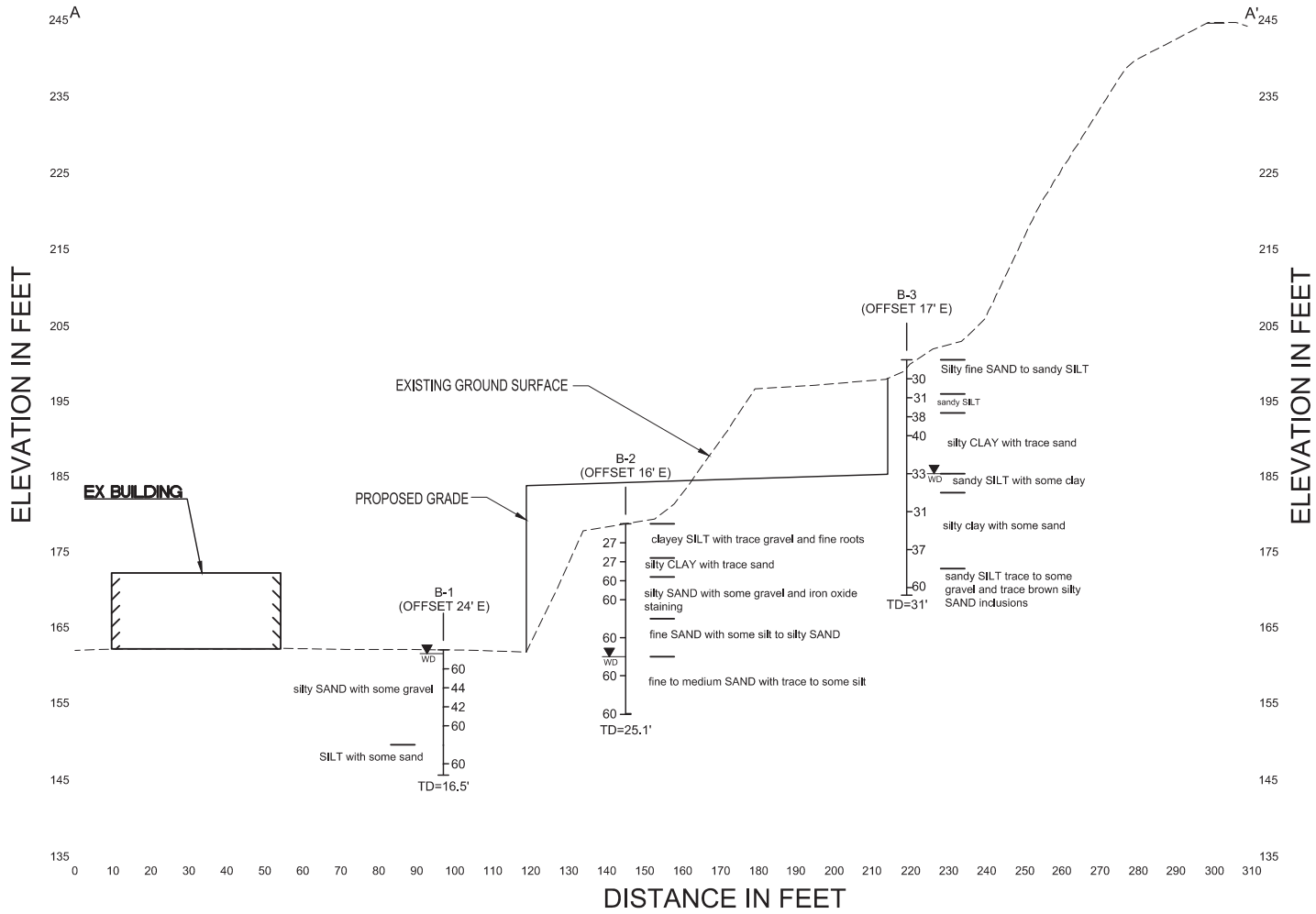
Current plans call for an underground stormwater detention vault located in the lower, developed area of the site. Boring B-1 completed in the lower, developed area of the site encountered relatively clean sands and groundwater at a shallow depth below existing site grade. Construction of the stormwater vault may require temporary dewatering consisting of well points or sumps and pumps.

CLOSURE

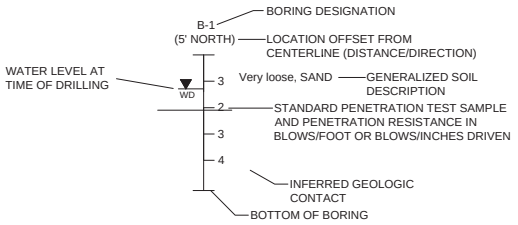
The information contained in this report should be utilized for preliminary planning purposes. Additional field work, analysis, and design are required in order to develop final geotechnical design and construction recommendations for the project. Additional work is planned and this report will be supplement with a final geotechnical report.

This report has been prepared for the exclusive use of CJOK, Inc. and their agents, for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Zipper Geo Associates, LLC reviews the changes and either verifies or modifies the conclusions of this report in writing.


LEGEND
B-1 BORING NUMBER AND APPROXIMATE LOCATION
A A' CROSS SECTION LINE
APPROXIMATE WETLAND A BUFFER
LANDSLIDE DEPOSITS
GROUNDWATER SEEPAGE (TYP.)
IRREGULAR DOWNSETS ON SLOPE
APPROXIMATE WETLAND B / STREAM A BUFFER
APPROXIMATE LIMITS OF ESCARPMENT
B-3
B-2
B-1
RETAINING WALL
DRAINAGE TRENCH WITH PERFORATED PIPE
RETAINING WALL DRAINAGE PIPE
CONTROL STRUCTURE
DETENTION VAULT
RETAINING WALL DRAINAGE PIPE
LIMITS OF PAVING (TYP.)
CONNECT TO EX STORM DRAIN
132ND AVE NE
N
50 0 25 50
SCALE IN FEET
PROPOSED KIRKLAND RAIRDON IMPROVEMENTS
13110 NE 126TH PLACE
KIRKLAND, WASHINGTON
SITE AND EXPLORATION PLAN
DATE: DECEMBER 2016
Job No. 1575.01
Zipper Geo Associates, LLC
19023 36th Ave. W.,Suite D
Lynnwood, WA, 98036
FIGURE 1
SHT. 1 of 2

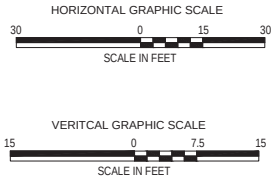


BORING LOG LEGEND:



NOTES:

1. THIS SUBSURFACE PROFILE IS GENERALIZED FROM MATERIALS OBSERVED IN SOIL BORINGS. ELEVATIONS OF GEOLOGIC CONTACTS SHOULD BE CONSIDERED APPROXIMATE. VARIATIONS BETWEEN THE PROFILE AND ACTUAL CONDITIONS ARE LIKELY TO EXIST.
2. SEE BORING LOGS FOR DETAILED EXPLORATION INFORMATION.



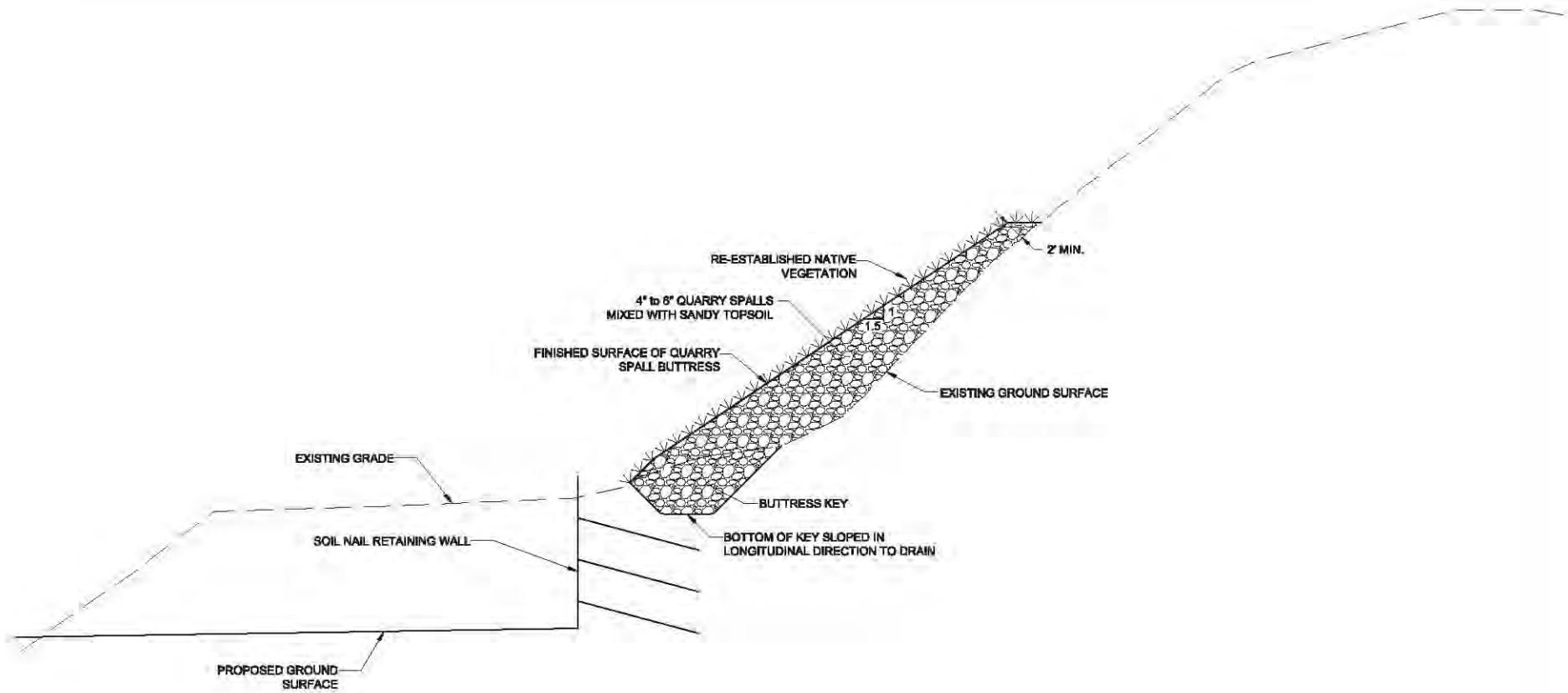
PROPOSED KIRKLAND RAIRDON IMPROVEMENTS
13110 NE 126TH PLACE
KIRKLAND, WASHINGTON

SECTION A-A'
GENERALIZED SUBSURFACE PROFILE

DATE: DECEMBER 2016 | Job No. 1575.01

Zipper Geo Associates, LLC
19023 36th Ave. W.,Suite D
Lynnwood, WA, 98036

FIGURE 2
SHT. 1 of 1



10 0 5 10

HORZ. & VERT. SCALE IN FEET

PROPOSED KIRKLAND RAIRDON IMPROVEMENTS
13110 NE 126TH PLACE
KIRKLAND, WASHINGTON

QUARRY SPALL BUTTRESS
CONCEPTUAL CROSS-SECTION

DATE: DECEMBER 2016 | Job No. 1575.01

Zipper Geo Associates, LLC
19023 36th Ave. W.,Suite D
Lynnwood, WA, 98036

FIGURE 3
SHT. 1 of 1

APPENDIX A

SUBSURFACE EXPLORATION PROCEDURES & LOGS

APPENDIX A
SUBSURFACE EXPLORATION PROCEDURES AND LOGS

Field Exploration Description

Our field exploration for this project included 3 test borings completed on October 20, 2016. The approximate exploration locations are shown on the Site and Exploration Plan, Figure 1. Exploration locations were determined by measuring off of existing site features shown on a site survey provided by PACLAND. The approximate ground surface elevation at the exploration locations was determined by interpolating from topographic information shown on the above-referenced survey. As such, the exploration locations and elevations should be considered accurate only to the degree implied by the means and methods used to define them.

Boring Procedures

Our exploratory borings were advanced with a hollow stem auger, using a track-mounted drill rig operated by an independent drilling firm working under subcontract to our firm. A geotechnical engineer from our firm continuously observed the borings, logged the subsurface conditions encountered, and obtained representative soil samples. All samples were stored in moisture-tight containers and transported to our laboratory for further visual classification and testing. After each boring was completed, the borehole was backfilled with bentonite clay.

Throughout the drilling operation, soil samples were obtained at 2.5- to 5-foot depth intervals by means of the Standard Penetration Test (ASTM: D-1586). This testing and sampling procedure consists of driving a standard 2-inch outside diameter steel split spoon sampler 18 inches into the soil with a 140-pound hammer free falling 30 inches. The number of blows required to drive the sampler through each 6-inch interval is recorded, and the total number of blows struck during the final 12 inches is recorded as the Standard Penetration Resistance, or “blow count” (N value). If a total of 50 blows is struck within any 6-inch interval, the driving is stopped and the blow count is recorded as 50 blows for the actual penetration distance. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils.

The enclosed boring logs describe the vertical sequence of soils and materials encountered in each boring, based primarily upon our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our logs indicate the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our logs also graphically indicate the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the boring, as well as any laboratory tests performed on these soil samples. If any groundwater was encountered in a borehole, the approximate groundwater depth, and date of observation, is depicted on the log. Groundwater depth estimates are typically based on the moisture content of soil samples, the wetted portion of the drilling rods, the water level measured in the borehole after the auger has been extracted, or through the use of an observation well.

APPENDIX B

LABORATORY TESTING PROCEDURES & RESULTS

Boring Location:	Refer to Figure 1	Drilling Company:	Bortec	Bore Hole Dia.:	4.25
Top Elevation:	163 FT	Drilling Method:	HAS	Hammer Type:	Cathead
Date Drilled:	10/20/2016	Drill Rig:	Track	Logged by:	S. Miller

B-1

Depth (ft)	SOIL DESCRIPTION	Sample Number	SAMPLES Recovery	Ground Water	PENETRATION RESISTANCE (blows/foot)	Blow Counts	Testing
	The stratification lines represent the approximate boundaries between soil types. The transition may be gradual. Refer to report text and appendices for additional information.				▲ Standard Penetration Test; △ Hammer Weight and Drop: ____ (0, 20, 40, 60)		
0	6" Asphalt concrete pavement			ATD			
	Moist, brown, silty SAND with some gravel observed in drill cuttings						
	No Recovery. Saturated, silty SAND observed in cuttings	S-1	0"			71/12"	
5	Dense, saturated, gray, fine to medium SAND with trace silt and gravel	S-2	18"			44	
		S-3	18"			42	
10	grades to very dense	S-4	18"			77/12"	
	Hard, wet, SILT with some sand (pocket pen value = 4.5 tsf)						
15		S-5	18"			62/12"	ATT
	Boring B-1 completed at 16.5 feet. Groundwater observed at approximately 1 foot at time of drilling.						
20							
25							

SAMPLE LEGEND

- 2-inch O.D. split spoon sample
- 3-inch I.D. Shelby tube sample

GROUNDWATER LEGEND

- Clean Sand
- Bentonite
- Grout/Concrete
- Screened Casing
- Blank Casing
- ▼ Groundwater level at time of drilling (ATD) or on date of measurement. (11/2/12)

◇ % Fines (<0.075 mm)

○ % Water (Moisture) Content

Plastic Limit ├──○──┤ Liquid Limit

Natural Water Content

TESTING KEY

GSA = Grain Size Analysis

200W = 200 Wash Analysis

Consol. = Consolidation Test

Att. = Atterberg Limits

Rairdons Auto Expansion
13009 NE 126th Place
Kirkland, Washington

Date: Nov. 2016 Project No.: 1575.01

Zipper Geo Associates
19023 36th Ave. W, Suite D
Lynnwood, WA

BORING LOG: B-1

Page 1 of 1

Boring Location:	Refer to Figure 1	Drilling Company:	Bortec	Bore Hole Dia.:	4.25
Top Elevation:	180 FT	Drilling Method:	HAS	Hammer Type:	Cathead
Date Drilled:	10/20/2016	Drill Rig:	Track	Logged by:	S. Miller

B-2

Depth (ft)	SOIL DESCRIPTION	Sample Number	SAMPLES Recovery	Ground Water	PENETRATION RESISTANCE (blows/foot)	Blow Counts	Testing
0	12" forest duff and topsoil						
	Very stiff, moist, gray, clayey SILT with trace gravel and fine roots (pocket pen value = 4.75 tsf)	S-1	18"			27	
5	Very stiff, moist, gray, silty CLAY with trace sand (pocket pen value = 4.25 tsf)	S-2	18"			27	ATT
	Very dense, moist, gray-brown, silty SAND with some gravel and iron oxide staining	S-3	12"			80/12"	
10	grades to with trace gravel	S-4	12"			80/12"	
	Very dense, moist, brown, fine SAND with some silt to silty SAND						
15		S-5	12"	ATD		90/12"	
	Very dense, saturated, brown, fine to medium SAND with trace to some silt						
20		S-6	18"			60	
25							

The stratification lines represent the approximate boundaries between soil types. The transition may be gradual. Refer to report text and appendices for additional information.

PENETRATION RESISTANCE (blows/foot): ▲ Standard Penetration Test; △ Hammer Weight and Drop: ____; 0, 20, 40, 60

SAMPLE LEGEND
- 2-inch O.D. split spoon sample
- 3-inch I.D. Shelby tube sample

GROUNDWATER LEGEND
- Clean Sand
- Bentonite
- Grout/Concrete
- Screened Casing
- Blank Casing
- ▼ Groundwater level at time of drilling (ATD) or on date of measurement. 11/2/12

◇ % Fines (<0.075 mm)

○ % Water (Moisture) Content

Plastic Limit ├──○──┤ Liquid Limit

Natural Water Content

TESTING KEY
- GSA = Grain Size Analysis
- 200W = 200 Wash Analysis
- Consol. = Consolidation Test
- Att. = Atterberg Limits

Rairdons Auto Expansion
13009 NE 126th Place
Kirkland, Washington

Date: Nov. 2016 Project No.: 1575.01

Zipper Geo Associates
19023 36th Ave. W, Suite D
Lynnwood, WA

BORING LOG: B-2

Page 1 of 2

Boring Location:	Refer to Figure 1	Drilling Company:	Bortec	Bore Hole Dia.:	4.25
Top Elevation:	180 FT	Drilling Method:	HAS	Hammer Type:	Cathead
Date Drilled:	10/20/2016	Drill Rig:	Track	Logged by:	S. Miller

B-2

Depth (ft)	SOIL DESCRIPTION	Sample Number / SAMPLES / Recovery	Ground Water	PENETRATION RESISTANCE (blows/foot)	Blow Counts	Testing
	The stratification lines represent the approximate boundaries between soil types. The transition may be gradual. Refer to report text and appendices for additional information.			▲ Standard Penetration Test △ Hammer Weight and Drop: _____		
25		S-7 18"		87/12"		
	B-2 completed at 26.5 feet. Groundwater observed at approximately 20 feet at time of drilling.					
30						
35						
40						
45						
50						

0 20 40 60

SAMPLE LEGEND

- 2-inch O.D. split spoon sample
- 3-inch I.D. Shelby tube sample

GROUNDWATER LEGEND

- Clean Sand
- Bentonite
- Grout/Concrete
- Screened Casing
- Blank Casing
- ▼ Groundwater level at time of drilling (ATD) or on date of measurement. 11/2/12

◇ % Fines (<0.075 mm)

○ % Water (Moisture) Content

Plastic Limit ├──○──┤ Liquid Limit

Natural Water Content

TESTING KEY

GSA = Grain Size Analysis

200W = 200 Wash Analysis

Consol. = Consolidation Test

Att. = Atterberg Limits

Rairdons Auto Expansion
13009 NE 126th Place
Kirkland, Washington

Date: Nov. 2016 Project No.: 1575.01

Zipper Geo Associates
19023 36th Ave. W, Suite D
Lynnwood, WA

BORING LOG: B-2

Page 2 of 2

Boring Location:	Refer to Figure 1	Drilling Company:	Bortec	Bore Hole Dia.:	4.25
Top Elevation:	198 FT	Drilling Method:	HAS	Hammer Type:	Cathead
Date Drilled:	10/20/2016	Drill Rig:	Track	Logged by:	S. Miller

B-3

Depth (ft)	SOIL DESCRIPTION	Sample Number	SAMPLES	Recovery	Ground Water	PENETRATION RESISTANCE (blows/foot)	Blow Counts	Testing
0	12" forest duff and topsoil							
	Dense, moist, gray, silty fine SAND to sandy SILT (pocket pen value = 1.5 tsf)	S-1		12"			30	
5	Hard, moist to wet, gray, sandy SILT (pocket pen value = 4.5 tsf)	S-2		18"			31	
	Hard, moist, gray, silty CLAY with trace sand (pocket pen value = 4.5 tsf)	S-3		18"			38	ATT
10		S-4		18"			40	
15	Hard, saturated, gray, sandy SILT with some clay (pocket pen value = 4.5 tsf)	S-5		18"	ATD		33	ATT
	Hard, saturated, gray, silty CLAY with some sand (pocket pen value = 4.5 tsf)							
20		S-6		18"			31	ATT
25								

The stratification lines represent the approximate boundaries between soil types. The transition may be gradual. Refer to report text and appendices for additional information.

▲ Standard Penetration Test
△ Hammer Weight and Drop: _____

0 20 40 60

SAMPLE LEGEND
- 2-inch O.D. split spoon sample
- 3-inch I.D. Shelby tube sample

GROUNDWATER LEGEND
- Clean Sand
- Bentonite
- Grout/Concrete
- Screened Casing
- Blank Casing
- ▼ Groundwater level at time of drilling (ATD) or on date of measurement. 11/2/12

◇ % Fines (<0.075 mm)
○ % Water (Moisture) Content
Plastic Limit ├─○─┤ Liquid Limit
Natural Water Content

TESTING KEY
- GSA = Grain Size Analysis
- 200W = 200 Wash Analysis
- Consol. = Consolidation Test
- Att. = Atterberg Limits

Rairdons Auto Expansion
13009 NE 126th Place
Kirkland, Washington

Date: Nov. 2016 Project No.: 1575.01

Zipper Geo Associates
19023 36th Ave. W, Suite D
Lynnwood, WA

BORING LOG: B-3

Boring Location:	Refer to Figure 1	Drilling Company:	Bortec	Bore Hole Dia.:	4.25
Top Elevation:	198 FT	Drilling Method:	HAS	Hammer Type:	Cathead
Date Drilled:	10/20/2016	Drill Rig:	Track	Logged by:	S. Miller

B-3

Depth (ft)	SOIL DESCRIPTION	Sample Number / SAMPLES / Recovery	Ground Water	PENETRATION RESISTANCE (blows/foot)	Blow Counts	Testing
	The stratification lines represent the approximate boundaries between soil types. The transition may be gradual. Refer to report text and appendices for additional information.			▲ Standard Penetration Test △ Hammer Weight and Drop: _____		
25		S-7 18"			37	
	Hard, wet, gray, sandy SILT with trace to some gravel and trace brown silty SAND inclusions (pocket pen value = 4 tsf)					
30		S-8 12"			63/12"	
	Boring B-3 completed at 31 feet. Groundwater observed at approximately 13.5 feet at time of drilling					
35						
40						
45						
50						

0 20 40 60

SAMPLE LEGEND

- 2-inch O.D. split spoon sample
- 3-inch I.D. Shelby tube sample

GROUNDWATER LEGEND

- Clean Sand
- Bentonite
- Grout/Concrete
- Screened Casing
- Blank Casing
- ▼ Groundwater level at time of drilling (ATD) or on date of measurement. 11/2/12

◇ % Fines (<0.075 mm)

○ % Water (Moisture) Content

Plastic Limit ├──○──┤ Liquid Limit

Natural Water Content

TESTING KEY

GSA = Grain Size Analysis

200W = 200 Wash Analysis

Consol. = Consolidation Test

Att. = Atterberg Limits

Rairdons Auto Expansion
13009 NE 126th Place
Kirkland, Washington

Date: Nov. 2016 Project No.: 1575.01

Zipper Geo Associates
19023 36th Ave. W, Suite D
Lynnwood, WA

BORING LOG: B-3

Page 2 of 2

APPENDIX B
LABORATORY TESTING PROCEDURES AND RESULTS

A series of laboratory tests were performed by ZGA and a subcontract testing laboratory during the course of this study to evaluate the index and geotechnical engineering properties of the subsurface soils. Descriptions of the types of tests performed are given below.

Visual Classification

Samples recovered from the exploration locations were visually classified in the field during the exploration program. Representative portions of the samples were carefully packaged in moisture tight containers and transported to our laboratory where the field classifications were verified or modified as required. Visual classification was generally done in accordance with ASTM D2488. Visual soil classification includes evaluation of color, relative moisture content, soil type based upon grain size, and accessory soil types included in the sample. Soil classifications are presented on the exploration logs in Appendix A.

Moisture Content Determinations

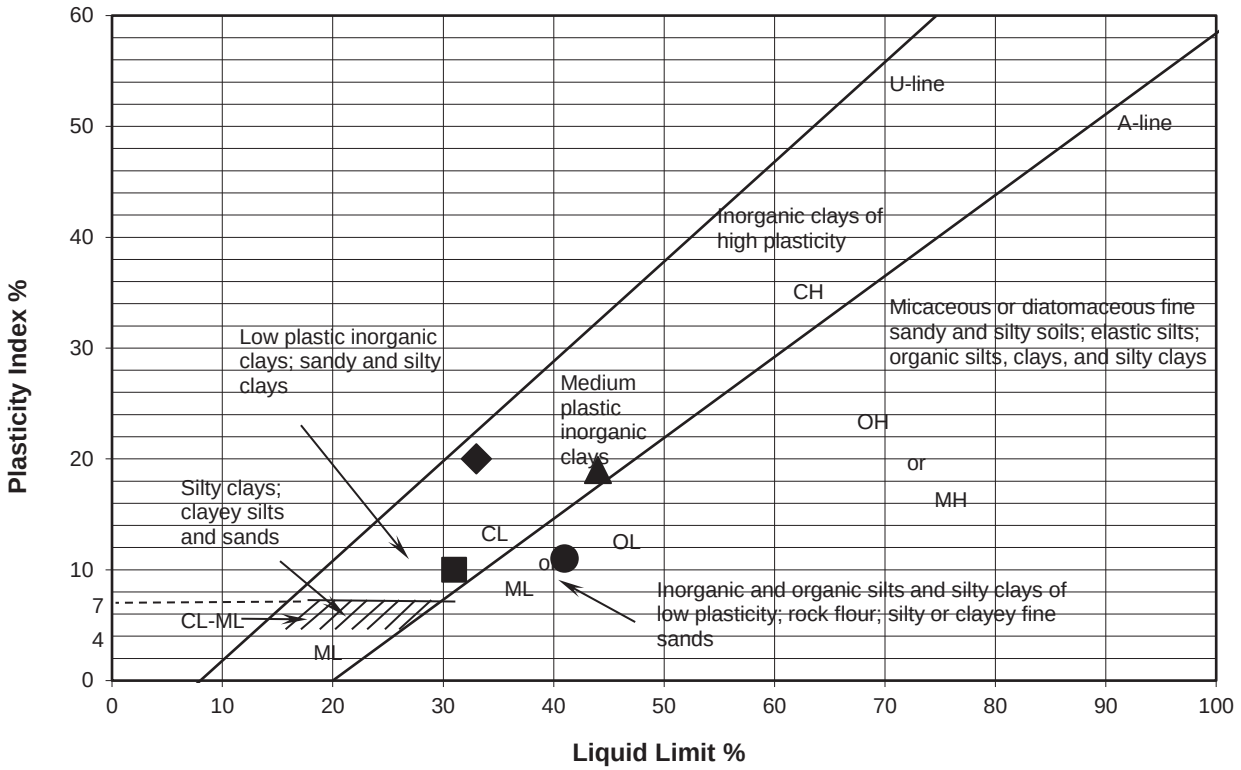
Moisture content determinations were performed on representative samples obtained from the explorations in order to aid in identification and correlation of soil types. The determinations were made in general accordance with the test procedures described in ASTM D 2216. Moisture contents are presented on the exploration logs in Appendix A.

Atterberg Limits

Atterberg limits are used primarily for classification and indexing of cohesive soils. The liquid and plastic limits are two of the five Atterberg limits and are defined as the moisture content of a cohesive soil at arbitrarily established limits for liquid and plastic behavior, respectively. Liquid and plastic limits were established for selected samples in general accordance with ASTM: D-423 and ASTM: D-424, respectively. The results of the Atterberg limits are presented on a plasticity chart in this appendix where the plasticity index (liquid limit minus plastic limit) is related to the liquid limit. The plastic limits and liquid limits are also presented adjacent to appropriate samples on the exploration logs in Appendix A..

PLASTICITY CHART

ASTM D 4318



Symbol	Boring	Sample	USCS Description	Received M.C. (%)	Liquid Limit	Plastic Limit	Plasticity Index	Comments
●	B-1	S-5	ML	31	41	30	11	
▲	B-2	S-2	CL	28	44	25	19	
■	B-3	S-3	CL	25	31	21	10	
	B-3	S-5	SM	25	NON-PLASTIC			
◆	B-3	S-6	CL	25	33	20	13	

Remarks:

Zipper GEo Associates, LLC Geotechnical and Environmental Consultants	PROJECT NO: 1575.01 DATE OF TESTING: 10/25/2016	PROJECT NAME: Rairdons Auto Expansion

Rairdon PUD - Off-site wetland Exhibit

Legend

- Streams
  - Open
  - Pipe
- Wetlands
- Address
  - Other Address
  - Current Address
  - Current ADU
  - Pending Address
- City Limits
- Grid
- QQ Grid
- Cross Kirkland Corridor
- Regional Rail Corridor
- Streets
- Parcels
- Buildings
- Lakes
- Parks
- Schools
- Olympic Pipeline Corridor

1: 2,179

Notes

0.1 0 0.03 0.1 Miles

NAD_1983_StatePlane_Washington_North_FIPS_4601_Feet

Produced by the City of Kirkland. © 2017 City of Kirkland, all rights reserved.
No warranties of any sort, including but not limited to accuracy, fitness, or merchantability, accompany this product.

Wetland Resources, Inc.

Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance

9505 19th Avenue S.E.
Suite 106
Everett, Washington 98208
(425) 337-3174
Fax (425) 337-3045

September 26, 2014

Greg Rairdon
PO Box 2879
Kirkland WA 98093

RE: Reconnaissance Report for King County Parcel No. 8663350120

Wetland Resources, Inc. (WRI) performed a site reconnaissance on September 18, 2014 to locate jurisdictional wetlands and streams on and in the vicinity of King County parcel number 8663350120. The subject property is located at 12509 130th Lane NE in the city of Kirkland, Washington. The Public Land Survey System (PLSS) locator for the subject property is Section 28, Township 26N, Range 05E, W.M. The subject property is located within the Cedar/Sammamish Watershed, Water Resources Inventory Area (WRIA) 8.

The 7.25-acre subject property is located northeast of the intersection of 128th Lane NE and NE 126th Place in the Juanita Creek Basin, which is considered a primary basin in the City of Kirkland. The site is undeveloped and is primarily forested, with some areas dominated by Himalayan blackberry shrubs. Commercial buildings and office complexes are present to the south of the subject property. Land use to the north of the property is primarily single-family residential. Topography of the subject property generally slopes to the south, with the strongest aspect near the center of the site.

METHODOLOGY AND RESULTS

Prior to conducting the site reconnaissance, public resource information was reviewed to gather background information on the subject property and the surrounding area in regards to wetlands, streams, and other critical areas. These sources included the USFWS National Wetlands Inventory (NWI), USDA/NRCS Web Soil Survey, WDFW SalmonScape Interactive Map, WDFW Priority Habitat and Species (PHS) Interactive Map, the King County iMap Interactive Mapping Tool, the Kirkland Sensitive Areas Map, and the WDNR Forest Practices Application Review System (FPARS) water type map.

The Kirkland Sensitive Areas Map shows two wetlands and one stream on the subject property, all located on the east side of the site. Soils mapped on the subject property include Indianola loamy fine sand 4 to 15 percent slopes, Alderwood gravelly sandy loam 6-15 percent slopes, and Alderwood gravelly sandy loam 15 to 30 percent slopes.

Wetland areas were determined using the routine determination approach described in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountians, Valleys, and Coast Region (Version 2.0) (U.S. Army Corps of Engineers 2010). Under the routine methodology, the process for making a wetland determination is based on three steps:

1.) Examination of the site for hydrophytic vegetation (species present and percent cover);

2.) Examination of the site for hydric soils;

3.) Determining the presence of wetland hydrology

Based on the results of the site reconnaissance, two wetlands and one stream were identified on the subject property. The wetlands identified on the subject property were rated using the city of Kirkland Wetland Field Data From pursuant to Chapter 90 of the Kirkland Zoning Code. However, it must be noted that a formal wetland delineation was not performed on Wetland A and the rating is based primarily on observations made during the site reconnaissance. Therefore, the rating may be subject to change if formal delineation is carried out.

Wetland A scored a total of 23 on the City of Kirkland Wetland field Data Form. This wetland is therefore a Type 2 wetland within a primary basin. In the City of Kirkland, wetlands with these characteristics require a 75-foot buffer per Kirkland Zoning Code (KZC) 90.45. Wetland A is a palustrine, forested wetland located on a slope in the southeast area of the subject property. Observed plant species within Wetland A include: red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera*), scouler willow (*Salix scouleriana*), salmonberry (*Rubus spectabilis*), lady fern (*Athyrium filix-femina*), and giant horsetail (*Equisetum telmateia*). The majority of the wetland contained dry soils at the time of the reconnaissance, but seeps were observed in a few locations. Soils in Wetland A consist of an upper layer that is very dark grey (5YR 3/1) sandy clay loam with dark yellowish (10YR 3/6) redoximorphic features. The sublayer is a dark gray (10YR 4/1) clay loam with dark yellowish (10YR 3/6) redoximorphic features.

The rating and delineated boundary of Wetland B was included in the Critical Area Study for Rairdon-132nd Place dated November 8, 2013. This report was previously submitted to the City of Kirkland. A review letter from The Watershed Company dated December 3, 2013, stated that this wetland (Wetland B) meets the criterion for a Type 2 wetland in the City of Kirkland. Type 2 wetlands in primary basins require a 75-foot buffer.Wetland B is a palustrine, forested/emergent wetland located on a slope near the east boundary of the subject site. Dominant vegetation includes: red alder, black cottonwood, salmonberry (*Rubus spectabilis*), western red cedar (*Thuja plicata*), lady fern (*Athyrium filix-femina*), and skunk cabbage (*Lysichiton americanus*). Wetland B was previously rated and delineated by WRI. Soils within the wetland are a very dark brown (10YR 2/2) sandy clay loam in the upper layer. The second layer is a very dark greenish gray (10GY 4/1) clay loam and the third layer is a black (10YR 2/1) clay loam.

The areas mapped as non-wetland are dominated by forested and scrub-shrub vegetation. Dominant trees include red alder, western red cedar, and black cottonwood. A dense layer of Himalayan blackberry is also present throughout the non-wetland/upland areas. Soil texture and color varied across the non-wetland areas. Upland soils were sandy clay loam and silty clay in texture and exhibited colors of dark grayish brown (10YR 4/2), brown (10YR 4/3), very dark brown (10YR 2/2), and very dark grayish brown (10YR 3/2). The upland soils were dry during the September 2014 site visit.

The on-site stream enters the site from the north near the eastern property line, flows south through the site, and appears to go subsurface near the southern property line. No water was observed within the channel during the September 2014 site investigation. This stream meets the definition of a Class C stream as described in KZC 90.30.6. Class C streams in primary basins require a 35-foot buffer.

In addition to the aforementioned critical area features, the entire site is mapped a High Hazard area on the Kirkland Landslide Hazard Areas map. Areas designated as Landslide Hazard Areas are subject to review under the provisions outline in KZC Chapter 85—Geologically Hazardous Areas. Additional information typically required for Geologically Hazardous Areas include surveyed topography and a geotechnical report for the subject property.

USE OF THIS REPORT

This reconnaissance report is supplied to Greg Rairdon as a means of determining the presence of on-site and adjacent critical areas as required by the city of Kirkland. This report is based largely on readily observable conditions and, to a lesser extent, on readily ascertainable conditions. No attempt has been made to determine hidden or concealed conditions.

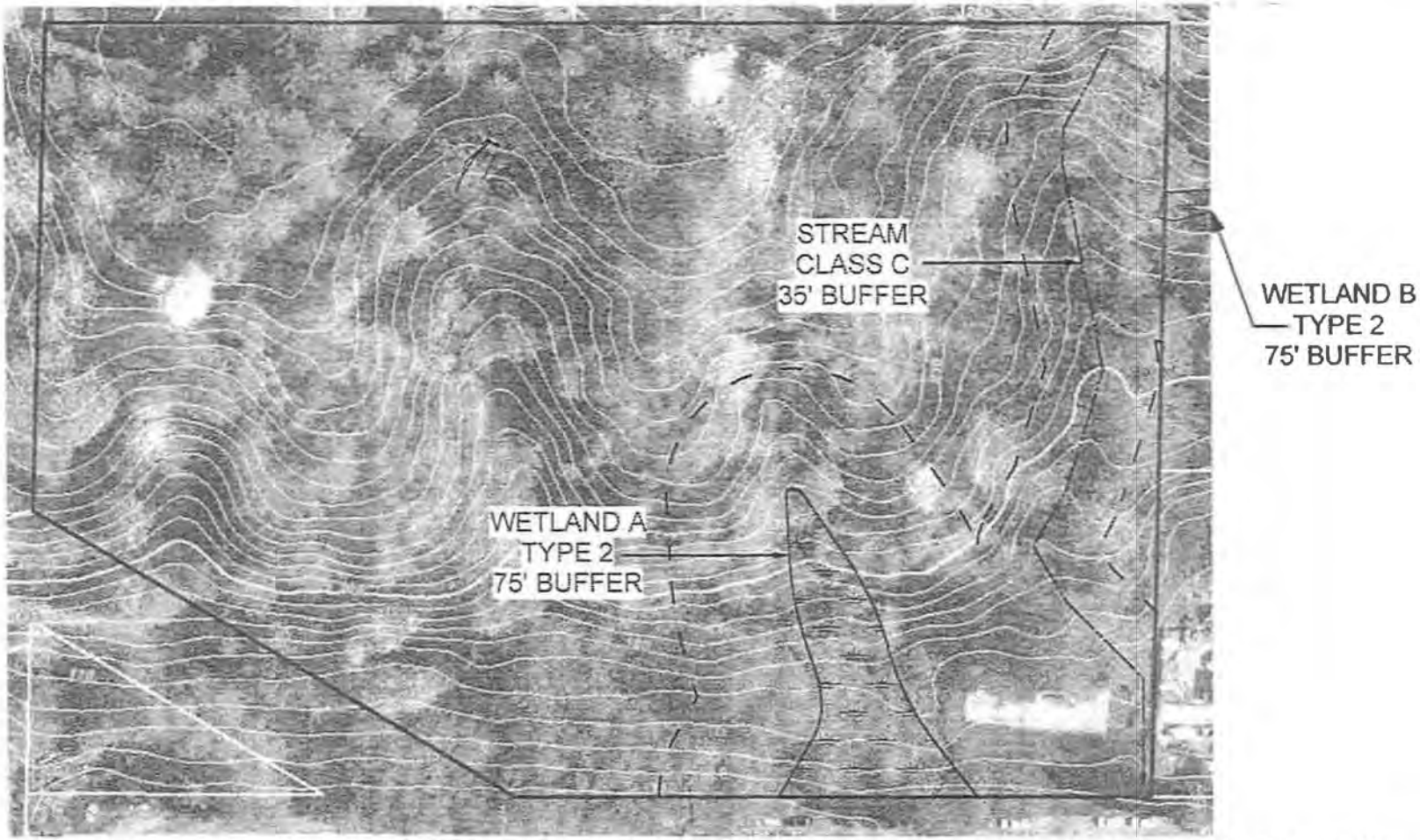
The laws applicable to critical areas are subject to varying interpretations and may be changed at any time by the courts or legislative bodies. This report is intended to provide information deemed relevant in the applicant's attempt to comply with the laws now in effect.

This report conforms to the standard of care employed by wetland ecologists. No other representation or warranty is made concerning the work or this report and any implied representation or warranty is disclaimed.

Wetland Resources, Inc.

Meryl Kamowski
Associate Ecologist

WETLAND AND STREAM RECONNAISSANCE MAP
RAIRDON - 130TH LANE NE
PORTION OF SECTION 28, TOWNSHIP 26, RANGE 05E, W.M.



PLEASE NOTE: THIS MAP IS FOR PLANNING AND DISCUSSION PURPOSES ONLY. IT DOES NOT REPRESENT A FORMAL WETLAND OR STREAM DELINEATION OR PROFESSIONAL SURVEY. DEPICTED PROPERTY LINES, WETLANDS, STREAM, AND BUFFER BOUNDARIES ARE APPROXIMATE. AERIAL IMAGE AND TOPOGRAPHY LINES ARE FROM KING COUNTY IMAP (http://www.kingcounty.gov/operations/GIS/Maps/iMAP.aspx).

LEGEND

- WETLAND
- STREAM
- BUFFER

SCALE: 1" = 200'

0 50 100 150 200

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Design / Permit Assistance
9805 19th Avenue S.E. Suite 106 Everett, Washington 98208
Phone: (425) 337-3174
Fax: (425) 337-3045
Email: mailbox@wetlandresources.com

WETLAND AND STREAM RECONNAISSANCE MAP
RAIRDON - 130TH LANE NE

Greg Rairdon
PO Box 2879
Kirkland, WA 98083

Sheet 1/1
WRI Job #14221
Drawn by: MK
Date: 09.26.14