ICICLECREEK ENGINEERS

Revised Report
Geological Engineering Services
Proposed Property Development
Coal Mine Hazard Assessment and Ground Proofing Program
King County Parcel Nos. 332406-9029, 332406-9045
and 332406-9066
Issaquah, Washington

September 16, 2021
ICE File No. 1383-001

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Prepared For:
James Edwards

Prepared By:
Icicle Creek Engineers, Inc.

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September 16, 2021

James Edwards
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1.0 INTRODUCTION

This revised report presents the results of Icicle Creek Engineers' (ICE's) geological engineering services regarding a coal mine hazard assessment and ground proofing program for King County Parcel Nos. 332406-9029 (Donlin Parcel), 332406-9045 (Edwards South Parcel) and 332406-9066 (Edwards North Parcel) in Issaquah, Washington. The subject parcels are shown relative to nearby physical features on the Vicinity Map, Figure 1. The property area, including site topography, is shown on the Site Plan, Figure 2.

Our services were completed in general accordance with our Proposal dated July 16, 2021 and were authorized in writing by Chad Woods with Superior Steel & Ironworkers, Inc. representing James Edwards, on July 16, 2021.

We understand that a proposed property development within the Edwards South Parcel is in permit review by the City of Issaquah (City). The City requested that we provide an update to our July 15, 2016 Coal Mine Hazard Assessment and Ground Proofing Program report, completed for D4D Real Estate Development (ICE File No. 1199-001). This revised report is intended to replace our July 2016 report. ICE also previously completed a preliminary coal mine hazard assessment of the three parcels; the results are presented in our report dated March 23, 2016.

2.0 BACKGROUND INFORMATION

2.1 GENERAL

We understand that these parcels may be developed for residential use and that potential coal mine hazards need to be evaluated in detail to better understand the developable area for access and building lots.

The parcels are located in a "Coal Mine Hazard Area" according to the City of Issaquah (City) Critical Areas mapping. The property also has a history of ground subsidence with sinkhole features identified in the

northeast corner of the Edwards South Parcel. Because the parcels are in a Coal Mine Hazard Area, the City requires a coal mine hazard assessment to evaluate the potential for sinkhole potential or regional ground subsidence and to provide foundation design measures, if needed, to mitigate potential regional ground subsidence for new construction.

In our March 2016 preliminary coal mine hazard assessment report, we concluded that a relatively large portion of the three subject parcels is within a Severe or Moderate Coal Mine Hazard area. However, these conclusions were based primarily on historical map review and therefore incorporated conservative buffers to accommodate possible historical mine map inaccuracies.

Depending on the results of the ground proofing (subject to this report), it may be possible to reclassify all or part of the Severe and Moderate Coal Mine Hazard areas in the subject parcels area. The reclassification could result in unrestricted or mitigated residential property use or access.

2.2 EDWARDS SOUTH PARCEL

The current design plans for this project were obtained from MyBuildingPermit (https://mybuildingpermit. com), referenced as follows (permit set):

- LDC, Inc., March 4, 2020, Superior Steel and Ironworkers Inc., Edwards Property, sheets CS-01, TO-01, TR-01, ER-01, ER-02SP-01, RD-01, RD-02 and RD-03.

Based on our review of the design plans, the project within the Edwards South Parcel includes the development of ten residential lots, new access roads, a stormwater detention facility and open space.

The City has requested that we review the proposed design plans associated with our coal mine hazard assessment and ground proofing program.

3.0 SCOPE OF SERVICES

The purpose of this coal mine hazard assessment and ground proofing program was to 1) locate the abandoned underground coal mines to improve the confidence in historical mine map accuracy, 2) evaluate the presence of intact coal (no collapse potential) where the historical mine maps show that coal was not mined, 3) evaluate the status of abandoned underground coal mine collapse, and 4) re-evaluate the coal mine hazard designation (Severe, Moderate or Declassified). Specifically, our services included the following:

- Review ICE's March 2016 report and readily available historic coal mine records from the Washington State Department of Natural Resources.
- Complete a surface reconnaissance of the parcel areas.
- Drill 35 test borings (mostly in the Edwards South Parcel) where the abandoned underground coal mine/seam is less than 100-feet deep using track-mounted drilling equipment to depths ranging from 30 to 96 feet below the ground surface.
- Based on the results of the ground proofing, reclassify all or part of the Severe and Moderate Coal Mine Hazard areas, as appropriate.
- Develop mitigation associated with potential coal mine hazards for site use including road access and/or building design and construction, as appropriate.

4.0 GENERAL DESCRIPTION OF HAZARDS ASSOCIATED WITH COAL MINES

The City has established guidelines for evaluation of coal mine hazards generally based on King County Administrative Guidelines (AG), dated March 1999 and King County Ordinance 13319, dated November 9, 1998 (John Minato, City of Issaquah Building Department, personal communication, October 31, 2000; City of Issaquah Public Information Bulletin - PIB, June 1999).

The City defines "*Coal Mine Hazards*" as *"Those areas of the City directly underlain by or affected by abandoned coal mine workings such as adits, tunnels, drifts or air shafts"* (City Land Use Code, 18.10.360). Development in Coal Mine Hazard areas requires a *"Critical Area Study"* (City Land Use Code, 18.10.410) that evaluates development standards indicating that the *"Alteration of a site containing a coal mine hazard area may be permitted only when all significant risks associated with abandoned mine workings have been eliminated or mitigated. Appropriate mitigation shall be based upon a critical areas study that has been prepared by a qualified professional"* (City Land Use Code, 18.10.520).

The primary issues regarding public health and safety and/or property damage related to abandoned underground coal mines as defined by the City PIB (same as the King County AG) include:

- **Severe Coal Mine Hazard Areas –** Severe Coal Mine Hazard Areas are *those areas that pose a significant risk of catastrophic ground surface collapse. Severe coal mine hazard areas may typically include, but are not limited to, areas characterized by unmitigated openings such as entries, portals, adits, mine shafts, air shafts, timber shafts, sinkholes, improperly filled sinkholes, and other areas of past or significant probability for catastrophic ground surface collapse. Severe coal mine hazard areas typically include, but are not limited to, overland surfaces underlain or directly affected by abandoned coal mine workings from a depth of zero to one hundred fifty feet.*
- **Moderate Coal Mine Hazard Areas** - Moderate Coal Mine Hazard Areas are *those areas that pose significant risks of property damage which can be mitigated by special engineering or architectural recommendations. Moderate coal mine hazard areas may typically include, but are not limited to, areas underlain or directly affected by abandoned coal mine workings from a depth of zero to three hundred feet or with overburden-cover-to-seam thickness ratios of less than ten to one dependent on the inclination of the seam.*
- **Declassified Coal Mine Areas -** Declassified Coal Mine Areas are *those areas for which a risk of catastrophic collapse is not significant and which the hazard assessment report has determined require no special engineering or architectural recommendations to prevent significant risks of property damage. Declassified coal mine areas may typically include, but are not limited to, areas underlain or directly affected by coal mines at depths greater than three hundred feet as measured from the surface but may often include areas underlain or directly affected by coal mines at depths less than three hundred feet.*

5.0 ABANDONED UNDERGROUND COAL MINE DESCRIPTION

5.1 GENERAL

Past underground coal mining in the project area was evaluated by reviewing the following documents:

- Goodson & Associates, October 28, 1984, *Abandoned Coal Mine Survey of Issaquah, King County, Washington*, prepared for the Office of Surface Mining (OSM), Denver, Colorado.
- Schasse, H.W., Koler, L.M., Eberle, N.A. and Christie, R.A., May 1994, *The Washington State Coal Mine Collection Guide: A Catalog, Index and User's Guide - Pacific Coast Coal Company, Upper and Lower Bagley Seams*, (https://fortress.wa.gov/dnr/protectiongis/geology/?Theme=coalmine), Map K7, A through J, Newcastle-Issaquah Mines.

- US Geological Survey (USGS), Dunrud, C. Richard, 1990, unpublished compiled abandoned underground mine map of the Newcastle area showing the extent of mined out areas and location of surface openings. A copy of this map is in the ICE library.

5.2 ABANDONED UNDERGROUND COAL MINES

The abandoned coal mines that underlie the Edwards South Parcel, the Donlin Parcel and the Edwards North Parcel are referred to as the historic "Issaquah Mines." The Issaquah Mines were active from the late 1800s up until the 1940s. At least five underground mines were developed on coal seams dipping down to the north at a 28- to 40-degree angle extending from Issaquah to Newcastle. In the Issaquah area, the main entries to these mines were located along the base of Squak Mountain (lower Wildwood Boulevard/Mine Hill Road area).

Within the study area for this report, the abandoned No. 4 Mine (Water Level Tunnel and 400 Level Entry Tunnel and mine workings) underlie the Edwards South, Donlin and Edwards North Parcels, and the abandoned No. 1 Mine (800 Level) underlies the southeast corner of the Edwards South Parcel as shown on the Abandoned Underground Coal Mine Map, Figure 3. For the current study, the abandoned No. 1 Mine was not evaluated by ground proofing because this mine is deep enough so that it is considered a Declassified Mine Area as described in ICE's March 23, 2016 report.

The No. 1 Mine and the No. 4 Mine are the oldest mine workings in the Issaquah Mines area and were abandoned in the early 1900s. Both mines were worked from the surface by reinforced tunnels driven nearly level along the coal seam (for a water level mine) or perpendicular to the dip of the coal seam (for a slope mine). From the main entry, the coal was worked at various levels by extracting coal up the dip of the coal seam to utilize gravity to collect the coal for transport out of the mine.

For the Issaquah Mines, the coal seam was worked horizontally to the east and west to two levels underlying the three subject parcels; these two levels are referred to as the No. 4 Mine Water Level and the No. 4 Mine 400 Level. The No. 1 Mine 800 Level underlies the southeast part of the Edwards South Parcel, but at a depth (more than 300-feet deep) so that coal mine hazards are not a concern.

The historic locations of the main entries to the No. 4 Mine (Water Level Tunnel and 400 Level Entry Tunnel) are in the northeast corner of the Edwards South Parcel as shown on Figure 3. Currently, these main entry areas are covered, with little surface evidence of the presence of these historical features.

Goodson & Associates (Goodson, 1984), under contract with the US Department of the Interior Office of Surface Mining (OSM), completed a ground subsidence (sinkhole) inventory in the early 1980s. Based on our review of the 1984 Goodson study, the nearest reported surface subsidence feature is related to shallow workings and the three mine entries to the No. 1 and No. 4 Mines; this subsidence feature is located in the northeast corner of the Edwards South Parcel as shown on Figure 3 (referred to as "WAO 120" in the 1984 Goodson study). WA0120 is described as *"a main slope portal, two slope air chutes and an adit portal to the No. 4 seam workings."* At the time of the 1984 Goodson study, the subsidence area was described as "*covered*," though a "large depression" was observed in this general area. Based on our site observations, a subtle depression was observed in this area measuring about 200-feet long (east-west) by up to about 70-feet wide (north-south) as shown on Figure 3.

6.0 SITE DESCRIPTION

6.1 GEOLOGIC SETTING

The surficial geology in the project area has been mapped by the USGS (Booth, Walsh, Troost, and Shimel "*Geologic Map of the Issaquah 7.5' Quadrangle, King County, Washington*," 2006, in review, Miscellaneous Field Studies, scale 1:24,000) as Renton formation bedrock. Renton formation bedrock consists of non-marine sandstone and shale with coal seams. The Renton formation bedding dips at roughly 28 to 40 degrees downward to the north beneath the subject parcels. Based on our experience in this area, the ground surface is typically mantled with Glacial Drift consisting of silt, sand, gravel, cobbles and occasional boulders.

6.2 SURFACE CONDITIONS

Our surface reconnaissance of the Edwards South, Donlin and South Edwards Parcels was completed on March 4 and 29, 2016 by Jeff Schwartz of ICE. The total area of the three subject parcels occupies about 6 acres; these parcels are located on a northeast- to east-facing hillside near the base of Squak Mountain overlooking the City of Issaquah and the Issaquah Creek valley. The subject parcels are surrounded by rural residential development. Mine Hill Road SW borders the Edwards South and Donlin Parcels to the east and SW Francis Lane borders the southeast part of the Edwards South Parcel.

The Edwards South and Donlin Parcels are crossed from north to south by an unnamed stream which occupies a well-defined ravine through the parcels. Overall, the ground surface slopes moderately at about a 20 to 30 percent grade west of the stream, and gently down (less than 10 percent grade) to the west side of the stream. We observed the ravine slopes adjacent to the stream to be between about 10- to 20-feet high and sloping down to stream level at up to about a 40 to 100 percent grade. Topographic relief varies from about Elevation 260 feet in the southwest corner to about Elevation 170 feet along the east line of the subject parcels.

The east part of the Edwards South and Donlin Parcels is currently developed for rural residential use. According to the King County records, a house was constructed on each of these parcels in 1910. We observed numerous buildings, including a detached garage, a storage building, a barn and sheds within these parcels. We observed the buildings to be surrounded by lawn and pasture areas with scattered trees.

The west part of the Edwards South and Donlin Parcels and the entire Edwards North Parcel (west of the stream) are forested and undeveloped. The area is vegetated with deciduous trees (mostly maple trees) to 18 inches in diameter and scattered mature conifer (fir and cedar) trees with a moderately dense understory of ivy, alder saplings and brush.

We observed outcrops of Renton formation bedrock (sandstone) along the stream ravine slopes and in the scoured-out area of the stream channel.

Except for the stream, no surface water was observed on the subject parcels at the time of our reconnaissance.

We did not observe any topographic depressions on the subject parcels or other ground surface irregularities that may be associated with past mining activities other than the area of WAO 120 which

still exhibits a subtle depression, shown on Figure 3, consistent with the description in the 1984 Goodson study.

7.0 GROUND PROOFING PROGRAM SUMMARY

The ground proofing program was completed by drilling 35 test borings (Borings B-1 through B-35) to depths ranging from about 30 to 96 feet below the ground surface on March 4, 5 and 6, 2016. The borings were drilled with track-mounted, percussion (air) drilling equipment, using 3-inch diameter solid-stem drill rods. The drilling equipment is owned and operated by McCallum Rock Drilling, Inc. of Chehalis, Washington. The test borings were located in the field by measuring from known surface features and by using a hand-held Global Positioning System (GPS). The ground surface elevation of the borings was approximated using a topographic site plan processed by ICE using LiDAR-based data from the Puget Sound LiDAR Consortium. The approximate locations of the test borings are shown on Figure 2.

The test borings were continuously observed by an engineering geologist from our firm who classified the soils or bedrock encountered, obtained representative soil and bedrock samples (when practical), observed groundwater conditions (when possible) and prepared a log of each boring. Representative samples were obtained at approximate 5-foot depth intervals by screening drill cutting samples from the casing discharge. The drilling resistance was observed to evaluate for the presence of voids that would indicate open mine workings. Drilling fluid circulation was also observed as a loss of circulation may indicate voids in the bedrock.

Soils encountered were visually classified in general accordance with the classification system described in Figure 5. Bedrock was classified using standard geological methods. The boring logs (Borings B-1 through B-35) are presented in Figures 6 through 40.

The primary purpose of ground proofing at the subject parcels was to evaluate 1) the location of the abandoned underground No. 4 Mine (Water Level Tunnel and 400 Level Entry Tunnel and mine workings) to improve the confidence in historical mine map accuracy, 2) evaluate for the presence of intact coal (no collapse potential) where the historical mine maps show that coal was not mined, 3) evaluate the status of abandoned underground coal mine collapse.

The following is a summary of the soil, bedrock and groundwater conditions, and the condition and depth of the No. 4 Mine (Water Level Tunnel and 400 Level Entry Tunnel and mine workings):

Boring Number	Overburden Thickness (feet)	No. 4 Coal Seam Depth/Thickness (feet)	No. 4 Mine Depth (feet) and Collapse Status	Groundwater Depth (feet)	Total Depth (feet)
1	16	-	55-62 (void) 65-66 (caved rock)	None	66
2	24	66 / 11	-	None	80
3	17	65 / 2+	-	20	67
4	22	67 / 6	-	67	80
5	25	72 / 8	-	55	85
6	27	69 / 11	-	10	83
7	14	71/ 11	-	None	83
8	16	56 / 11	-	None	70
9	20	55 / 10	-	None	68
10	30	59 / 11	-	55	83
11	30	48 / 8	-	15	60
12	18	48 / 10	-	None	60
13	24	42 / 10.5	-	None	54
14	17	-	35-43 (void) 43-45 (caved rock)	None	45
15	24	-	24-27.5 (caved rock)	None	45
16	20	26 / 8	-	None	36
17	26	34 / 8	-	None	45
18	10	30 / 11	-	None	50
19	18	28 / 10	-	None	44
20	20	32 / 8	-	50	60
21	18	35 / 11	-	None	50
22	20	-	20-32 (void)	0-10	35
23	20	-	25-33 (void)	25	42
24	14	-	16-25 (void)	15	30
25	20	71 / 11	-	None	82.5
26	20	-	84-91 (void) 91-92 (caved rock) 92-95 (void)	None	78
27	13	77 / 10	-	None	90
28	13	-	-	None	96
29	17	39 / 10	-	None	50
30	20	36 / 11	-	None	50
31	16	-	73-74.5 (void) 74.5-76 (caved rock) 76-78 (void) 78-86 (caved rock)	None	94
32	15	-	79-86 (void) 86-91 (caved rock)	None	95
33	24	66 / 12	-	0-12	80
34	10	10 / 10	-	10	45
35	28	53 / 10	-	None	65

The overburden typically consisted of Glacial Drift and/or Weathered Bedrock. However, Fill was encountered in Borings B-12, B-15, B-16, B-17, B-18 and B-29 in the northeast corner of the Edwards South Parcel where it is known that non-engineered fill was placed to cover sinkholes and the main entry areas for the No. 4 Mine (Water Level Tunnel and the 400 Level Entry Tunnel.

Based on the results of the ground proofing and review of historical mine maps, the No. 4 Mine Water Level Tunnel is near horizontal though is sloped slightly down the east for water drainage and is 10 to 25 feet (deepening to the west) below the ground surface. The No. 4 Mine 400 Level Entry Tunnel is inclined downward to the north at about 30 degrees following the coal seam.

The following is a summary description of soil and bedrock types encountered in the test borings.
Fill – clayey, sandy silt, silty sand and sand with silt and glass fragments.
Glacial Drift – fine sand or fine to medium sand with variable amounts of silt and gravel or fine to coarse gravel with sand and a trace of silt (Boring B-8 only) or silty fine to coarse gravel with sand (Boring B-11 only).
Weathered Bedrock – silty fine sand.
Bedrock (Renton Formation) – fine-grained sandstone with occasional thin layers of carbonaceous shale and coal (No. 4 Coal Seam).

8.0 COAL MINE HAZARDS ANALYSIS

8.1 GENERAL

Our analysis of Coal Mine Hazards is based on definitions and methodologies described within the AG (March 1999), King County Ordinance 13319 (November 9, 1998) and the City of Issaquah PIB (June 1999). It should be noted that the No. 4 Mine (Water Level Tunnel and 400 Level Entry Tunnel and mine workings) were not particularly well documented, other than showing the general outline that enveloped a mined-out area and the main entry points; no specific details are shown such as dates of mining, pillars, haulageways and cross-cuts that are typically shown on the historic mine maps.

8.2 SEVERE COAL MINE HAZARDS

Based on our ground proofing, Severe Coal Mine Hazard Areas are present within the Edwards South and Donlin Parcels. However, we have further subdivided the Severe Coal Mine Hazard Area into a "Severe Coal Mine Hazard Area (Higher Risk)" and a "Severe Coal Mine Hazard Area (Lower Risk)," as shown on Coal Mine Hazards Map, Figure 4. These hazard areas are described as follows:
Severe Coal Mine Hazard Area (Higher Risk) – Open mine workings are less than 100 feet below the ground surface. A 15-foot zone has been added to the south edge of this area to provide additional buffer.
Severe Coal Mine Hazard Area (Lower Risk) – Open mine workings are 100 to 150 feet below the ground surface. A 25-foot zone has been added to the south edge of the Severe Coal Mine Hazard Area (Higher Risk) to provide additional buffer.

It is important to note that ICE has evaluated over 1,000 sinkholes across Washington State and there are only three cases where sinkholes formed where the abandoned underground mines were more than 100 feet below the ground surface. These sinkholes occurred in geologic conditions that included a thick overburden (over 100-feet thick) of clean sand and gravel that "flowed" into steeply inclined mine workings. These conditions do not exist at this site. The overburden at the site (in the test borings) is 10- to 30-feet thick with an average thickness of about 20 feet.

8.3 MODERATE COAL MINE HAZARD AREAS

Moderate Coal Mine Hazards include areas where there is the potential for regional ground subsidence (vertical ground displacement, ground tilt and ground strain). Regional ground subsidence can cause property damage but is not considered a risk to public health and safety.

Based on our analysis for the subject parcels, vertical ground displacement can be as much as several inches within the Moderate Coal Mine Hazard Area. However, the vertical ground displacement is spread over a large area so that these vertical displacements are not a concern. The thresholds for property damage are exceeded when ground tilt is more than 1:350 and ground strain is more than 0.003 inches per inch. Our analysis suggests that a portion of the Edwards South and Donlin Parcels may exceed these threshold values and should be considered a Moderate Coal Mine Hazard Area.

Moderate Coal Mine Hazard areas are shown on Figure 4.

8.4 DECLASSIFIED COAL MINE AREAS

Based on our review of subsurface explorations completed for the ground proofing study, portions of the three subject parcels are underlain by intact coal (not-mined) or mine workings that are more than 150 feet below the ground surface. These areas should be considered Declassified Coal Mine Areas as shown on Figure 4.

A special condition should be required for the north part of the Declassified Coal Mine Area within the Edwards South Parcel. This special condition requires that the No. 4 Mine Water Level Tunnel and 400 Level Entry Tunnel are excavated and replaced with structural fill (effectively reclaimed).

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 COAL MINE HAZARDS CONCLUSIONS

In our opinion, sufficient subsurface exploration (ground proofing) has been completed to better define the location, status of collapse and unmined areas for the No. 4 Mine Water Level Tunnel and 400 Level Entry Tunnel and mine workings. The primary conclusions based on our previous evaluation and the current ground proofing program are as follows.

- **Severe Coal Mine Hazard Area (Higher Risk)** – Severe Coal Mine Hazard Areas (Higher Risk) occur where open abandoned underground mine workings are less than 100-feet deep as shown on Figure 4. A 15-foot zone has been added to the south edge of this area to provide additional buffer.
- **Severe Coal Mine Hazard Area (Lower Risk) –** Severe Coal Mine Hazard Areas (Lower Risk) occur where open mine workings are 100 to 150 feet below the ground surface. A 25-foot zone has been added to the south edge of this area to provide additional buffer.
- **Moderate Coal Mine Hazard Area** – Moderate Coal Mine Hazard Areas occur where the abandoned underground coal mines are 150 to 300 feet below the ground surface with the potential magnitudes of ground tilt and strain due to regional subsidence could pose a significant risks of property damage which can be mitigated by special engineering or architectural recommendations.
- **Declassified Coal Mine Areas** – Declassified Coal Mine Areas exist where the abandoned underground coal mines are more than 150 feet below the ground surface with the potential magnitudes of ground tilt and strain due to regional subsidence do not pose a significant risks of property damage. We have included the No. 4 Mine Water Level Tunnel and 400 Level Entry Tunnel as Declassified Coal Mine Areas provided that our recommendations for reclamation of this area are successfully completed.

9.2 COAL MINE HAZARDS RECOMMENDATIONS

1) No development, including roads, should be constructed within the Severe Coal Mine Hazard Area (Higher Risk).
2) Roads and unoccupied structures should be allowed in the Severe Coal Mine Hazard Area (Lower Risk).
3) Moderate Coal Mine Hazard Areas exist within the property in the area shown on Figure 4. Development in the Moderate Coal Mine Hazard Area should be allowed provided the recommendations for mitigation are implemented.
4) Development in the Moderate Coal Mine Hazard Area should be planned using wood-frame, crawl-space type construction (slab-on-grade acceptable for garages and driveway aprons). Continuous spread footings (grade beams) should be used to connect interior column footings to provide more rigidity to the foundation.
5) A special condition should be required for the north part of the Declassified Coal Mine Area within the Edwards South Parcel (shown as the *"No. 4 Mine Water Level and 400 Level Entry Tunnels Reclamation Area"* on Figure 4). This special condition requires that the No. 4 Mine Water Level Tunnel and the No.4 Mine 400 Level Entry Tunnel entry areas (10- to 25-feet below the ground surface in the test borings) and any associated non-engineered fill be excavated and replaced with structural fill (see Section **9.3** of this report for details).
6) Development can occur in Declassified Coal Mine Areas with no specific recommendations for mitigation of coal mine hazards, except for the special condition as described for the *"No. 4 Mine Water Level and 400 Level Entry Tunnels Reclamation Area"* as shown on Figure 4 and in section **9.3** of this report.
7) ICE should be contacted immediately if suspected coal mine-related features are observed. Property owners should be provided a copy of this report and the March 23, 2016 preliminary coal mine hazard report by ICE for review and consideration of owning property in a coal mine hazard area to be fully aware of the risks to public health and safety.

9.3 NO. 4 MINE WATER LEVEL AND 400 LEVEL ENTRY TUNNELS RECLAMATION CONSIDERATIONS

9.3.1 Excavation

We recommend that the contractor submit a plan describing the reclamation process for the No.4 Mine Water Level and 400 Level Entry Tunnels (shown on Figure 4). We expect that a benched excavation may be required because the depth to the abandoned underground tunnels is about 10 to 25 feet below the ground surface (not including the tunnel height which may be about 2 to 8 feet). **Other methods of tunnel reclamation may be proposed by the contractor.**

ICE should be contacted to review all proposals submitted by the contractor for the tunnel reclamation. We strongly suggest that the tunnel reclamation be completed by a contractor familiar with this type of work. ICE can assist with locating a qualified contractor if requested.

During the reclamation, all non-engineered fill that has been placed to backfill these areas should also be removed. The extent of unsuitable soil removal should be evaluated by a representative from ICE during reclamation activities.

9.3.2 Groundwater

The No. 4 Mine Water Level tunnel is likely filled with groundwater. Excavation into this tunnel may result in large amounts of groundwater that cannot be effectively drained because of the network of mine workings connected to this tunnel. In addition, dewatering the upgradient mine workings could cause

hydrogeologic changes which could be detrimental. For these reasons, we recommend that a seepage barrier be installed at the west end of the reclamation area to establish a plug in the tunnel. The seepage barrier can be constructed by a perpendicular trench filled with controlled density fill, or by a method proposed by the contractor such as pressure grouting. We recommend that ICE be retained to observe and document the installation of the seepage barrier.

9.3.3 Structural Fill

Structural fill should be free of organic material or debris and have a maximum particle size of 4 inches. The material should contain less than five percent fines (soil passing the US Standard No. 200 sieve) by weight relative to the portion finer than the ¾-inch sieve. If earthwork is done during generally dry weather conditions, the fines content may be increased. As a guideline, structural fill should be placed in horizontal lifts which are 10 inches or less in loose thickness. The actual lift thickness depends on the quality of the fill material and the size of the compaction equipment.

We recommend that structural fill placed in the tunnel area (building, parking and access areas) be uniformly compacted to at least 95 percent of the maximum dry density (MDD) obtained in general accordance with ASTM Test Method D 1557. Nonstructural fill placed in landscape areas need only be compacted to the degree required for trafficability of construction equipment and effective surface drainage.

9.3.4 Construction Observation

ICE should have a representative on site to observe and document the mine tunnel reclamation process, including providing consultation and recommendations as needed.

9.4 PLANS REVIEW FOR PROPOSED DEVELOPMENT – EDWARDS SOUTH PARCEL

ICE reviewed the development plans (permit set) for the Edwards South Parcel referenced in section **2.0** of this report. Based on our review, the proposed layout for the lots, new roads, the stormwater detention facility and open space is in accordance with the recommendations in this report. All development is located within the Declassified Coal Mine Hazard Area or the No. 4 Mine Water Level Tunnel Reclamation Area.

10.0 USE OF THIS REPORT

We have prepared this revised report for use by James Edwards. The data and report should be provided to permitting agencies for their information, but our report conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

There are probable variations in subsurface conditions between the explorations and also that may occur with time. A contingency for unanticipated conditions should be included in the budget and schedule.

There are always risks to public health and safety and property damage related to development in areas of Coal Mine Hazards which includes most of the Wildwood/Mine Hill Road area in Issaquah. However, this risk can be reduced by following the recommendations presented in this report, but the risk cannot be eliminated. Potential owner(s) of this property should be informed of the hazards that do exist and be provided a copy of this report and the March 23, 2016 ICE report.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time the revised report was prepared. No warranty or other conditions, express or implied, should be understood.

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We trust this revised report meets your present needs. Please call if you have any questions concerning this report.

Yours very truly,
Icicle Creek Engineers, Inc.

Kathy S. Killman, LEG
Principal Engineering Geologist

Brian R. Beaman, PE, LEG, LHG
Principal Engineer/Geologist

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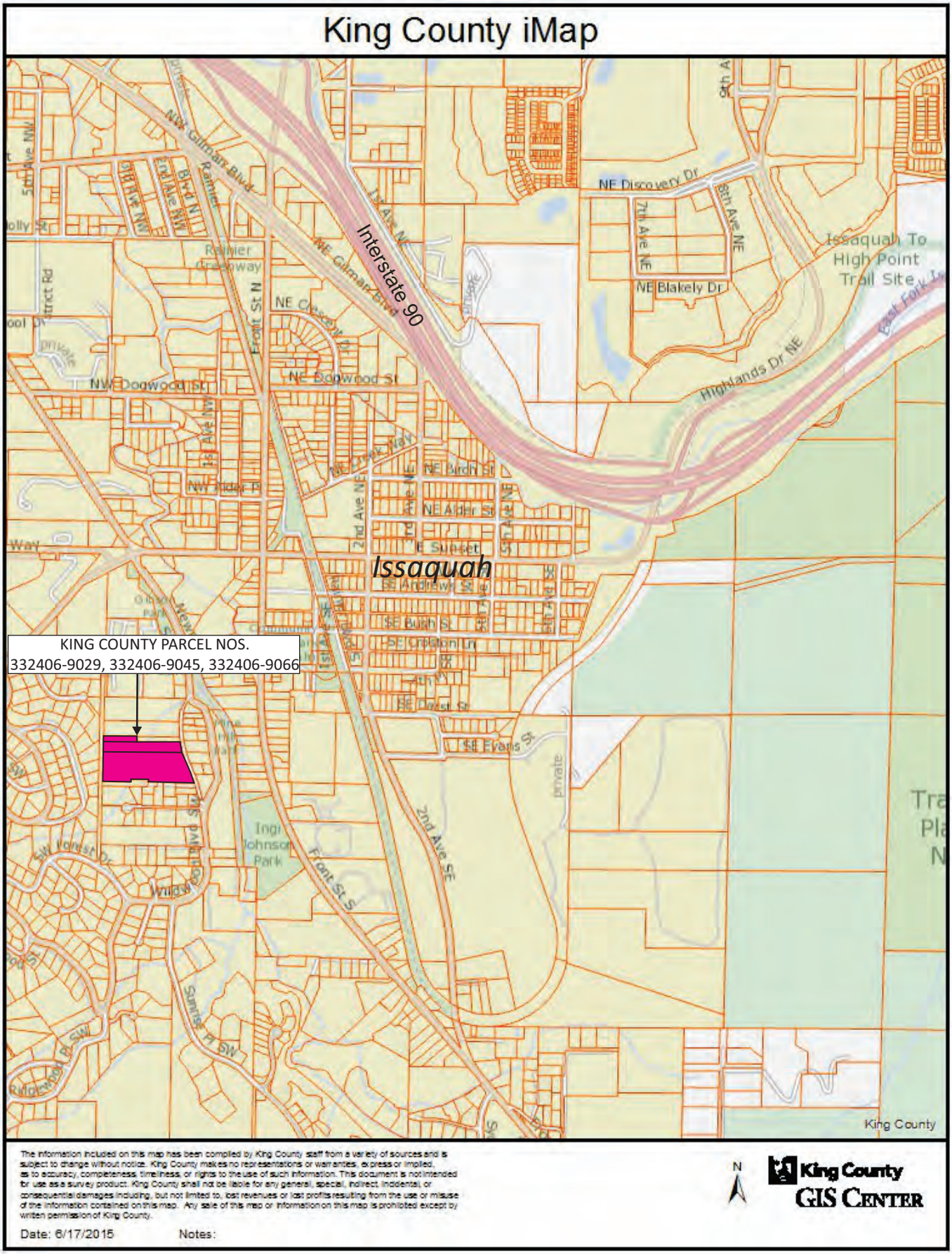
Attachments: Vicinity Map – Figure 1
Site Plan – Figure 2
Abandoned Underground Coal Mine Map – Figure 3
Coal Mine Hazard Map – Figure 4
Explanation for Boring Logs – Figure 5
Boring Logs – Figures 6 through 40

Submitted via email (PDF) and surface mail (one original copy)

FIGURES

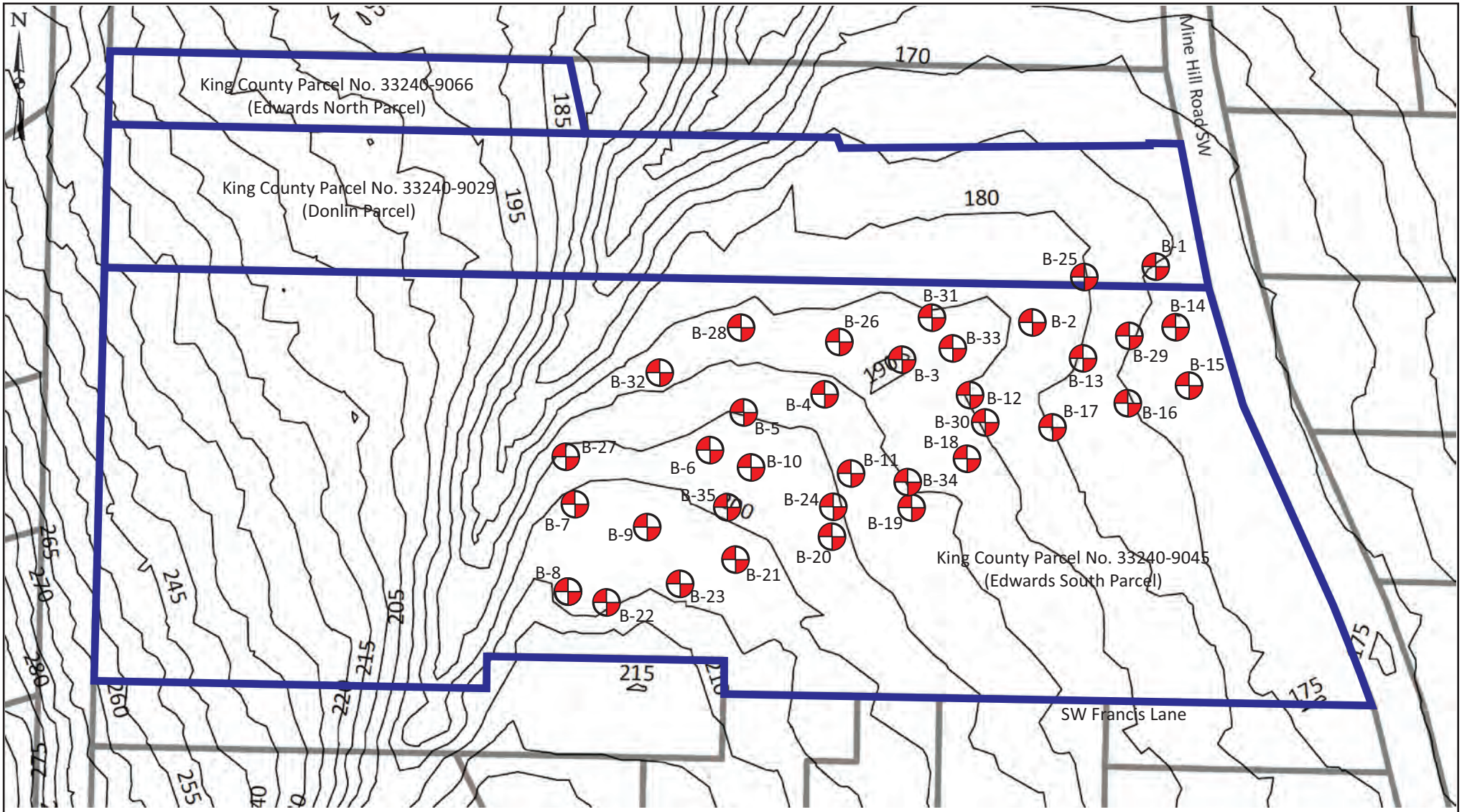


VICINITY MAP

COAL MINE HAZARD ASSESSMENT AND GROUND PROOFING PROGRAM
KING COUNTY PARCEL NOS. 332406-9029, 332406-9045 AND 332406-9066, ISSAQUAH, WA

ICICLE CREEK ENGINEERS
29335 NE 20th Street
Carnation, Washington 98014
(425) 333-0093

SCALE: None	ICE FILE NO.
DESIGNED: ---	1383-001
DRAWN: JMS	Figure
CHECKED: BRB	1
DATE: 09/16/21	



Base map obtained from LiDAR DTM data downloaded from the Puget Sound LiDAR Consortium (King County 2016 acquisition); processed by ICE for 5-foot elevation contours.

EXPLANATION

B-1 Test Boring Location

Property Boundary

0 80 160

Approximate Scale in Feet

SITE PLAN

COAL MINE HAZARD ASSESSMENT AND GROUND PROOFING PROGRAM
KING COUNTY PARCEL NOS. 332406-9029, 332406-9045 AND 332406-9066, ISSAQUAH, WA

ICICLE CREEK ENGINEERS
29335 NE 20th Street
Carnation, Washington 98014
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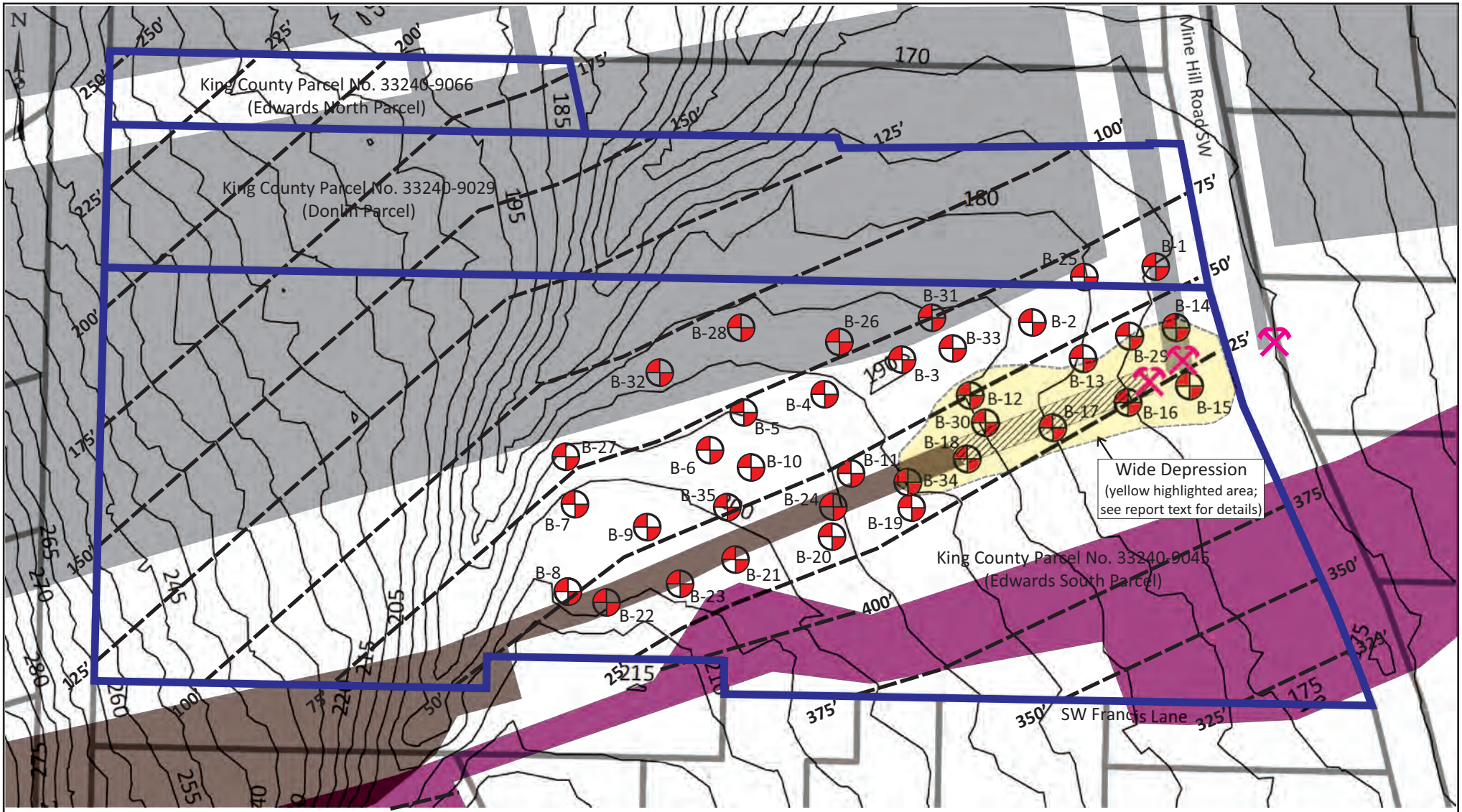
SCALE: As Shown	ICE FILE NO.
DESIGNED: BRB	1383-001
DRAWN: BRB/JMS	Figure
CHECKED: KSK	2
DATE: 09/16/21	



EXPLANATION

- B-1 Test Boring Location
- No. 4 Mine - 400 Level (entry tunnel and mine workings; covered)
- No. 4 Mine - Water Level (entry tunnel; collapsed where cross-hatched)
- No. 1 Mine - 800 Level (No. 1 Coal Seam)
- Depth to Mine Workings (approximate; in feet)
- Historic Mine Entry (filled, but not formally reclaimed)
- Property Boundary

Notes: 1) The locations for the No. 1 and No. 4 Mines are based on historical mine maps obtained from the Washington State Department of Natural Resources (https://fortress.wa.gov/dnr/protectiongis/geology/?Theme=coalmine), *Pacific Coast Coal Co., Map of Issaquah Mines*, Map K7 series.

Base map obtained from LiDAR DTM data downloaded from the Puget Sound LiDAR Consortium (King County 2016 acquisition); processed by ICE for 5-foot elevation contours.

0 80 160
Approximate Scale in Feet

ABANDONED UNDERGROUND COAL MINE MAP

COAL MINE HAZARD ASSESSMENT AND GROUND PROOFING PROGRAM
KING COUNTY PARCEL NOS. 332406-9029, 332406-9045 AND 332406-9066, ISSAQUAH, WA

ICICLE CREEK ENGINEERS
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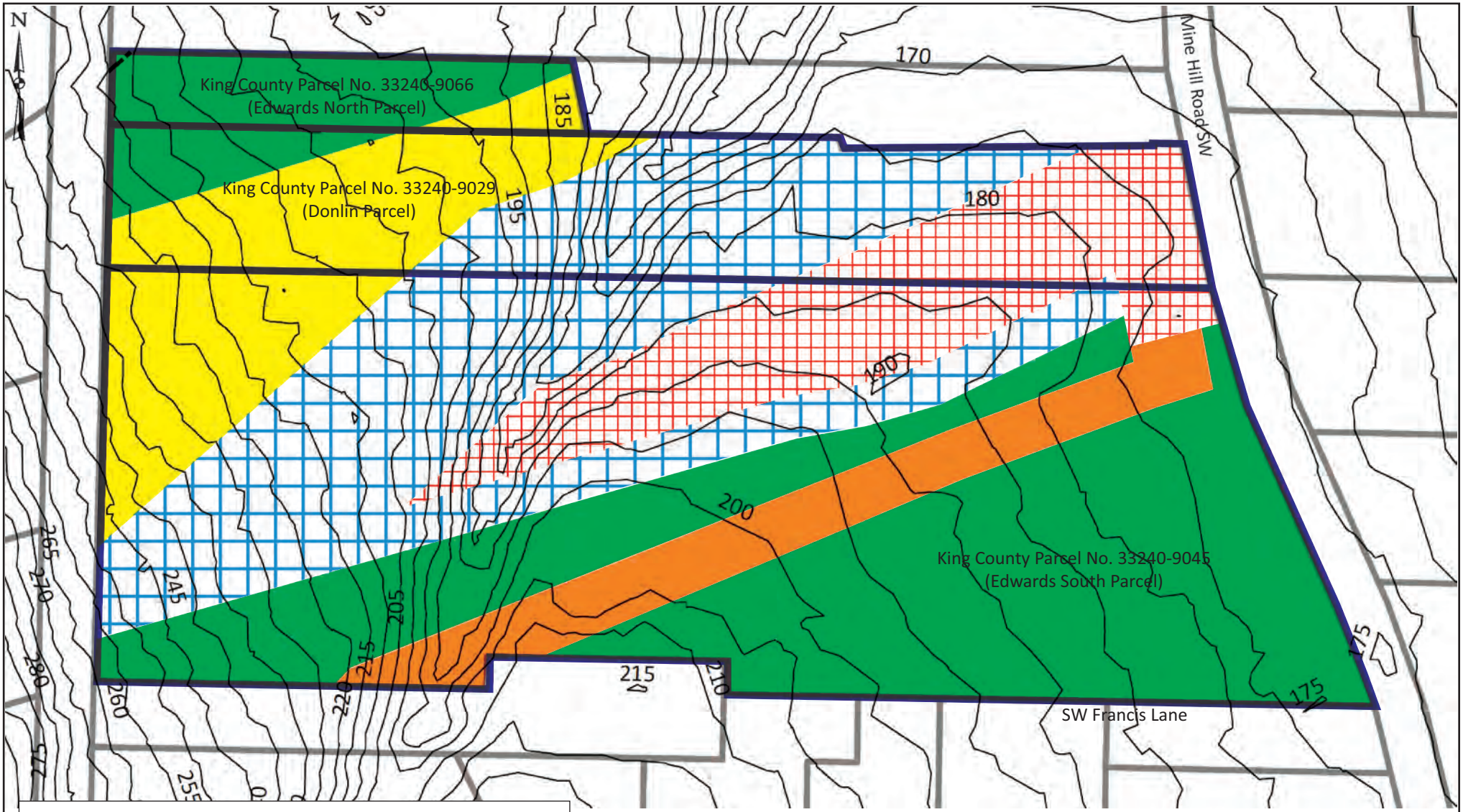
SCALE: As Shown	ICE FILE NO.
DESIGNED: BRB	1383-001
DRAWN: BRB/JMS	Figure
CHECKED: KSK	3
DATE: 09/16/21	



Severe Coal Mine Hazard Area (Higher Risk)*
(no development - cleared open space is OK)

Severe Coal Mine Hazard Area (Lower Risk)**
(roads and non-occupied structures are OK)

Moderate Coal Mine Hazard Area
(occupied structures OK with mitigation)

Declassified Coal Mine Area
(no development restrictions associated with coal mine hazards)

No. 4 Mine Water Level and 400 Level Entry Tunnels Reclamation Area ***
(may be Declassified provide that reclamation described in Section 9.2 of the report is successfully completed.

* The Severe Coal Mine Hazard Area (Higher Risk) includes a 15-foot wide buffer added to the south edge of this area.
** The Severe Coal Mine Hazard Area (Lower Risk) includes a 25-foot wide buffer added to the south edge of the Severe Coal Mine Hazard Area (Higher Risk).
*** Excavation of the No. 4 Mine Water Level 400 Level Entry Tunnels and replacement with Structural Fill is a required condition for the declassification of Severe Coal Mine Hazards in the north part of the Edwards South Parcel (see report text for additional details).

Base map obtained from LiDAR DTM data downloaded from the Puget Sound LiDAR Consortium (King County 2016 acquisition); processed by ICE for 5-foot elevation contours.

0 80 160
Approximate Scale in Feet

COAL MINE HAZARD MAP

COAL MINE HAZARD ASSESSMENT AND GROUND PROOFING PROGRAM
KING COUNTY PARCEL NOS. 332406-9029, 332406-9045 AND 332406-9066, ISSAQUAH, WA

ICICLE CREEK ENGINEERS
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Carnation, Washington 98014
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SCALE: As Shown	ICE FILE NO.
DESIGNED: BRB	1383-001
DRAWN: BRB/JMS	Figure
CHECKED: KSK	4
DATE: 09/16/21	

Unified Soil Classification System

MAJOR DIVISIONS			Soil Classification and Generalized Group Description	
Coarse-Grained Soils	GRAVEL More than 50% of coarse fraction retained on the No. 4 sieve	CLEAN GRAVEL	GW	Well-graded gravels
			GP	Poorly-graded gravels
		GRAVEL WITH FINES	GM	Gravel and silt mixtures
			GC	Gravel and clay mixtures
	SAND More than 50% of coarse fraction passes the No. 4 sieve	CLEAN SAND	SW	Well-graded sand
			SP	Poorly-graded sand
More than 50% retained on the No. 200 sieve		SAND WITH FINES	SM	Sand and silt mixtures
			SC	Sand and clay mixtures
Fine-Grained Soils	SILT AND CLAY Liquid Limit less than 50	INORGANIC	ML	Low-plasticity silts
			CL	Low-plasticity clays
		ORGANIC	OL	Low plasicity organic silts and organic clays
	SILT AND CLAY Liquid Limit greater than 50	INORGANIC	MH	High-plasticity silts
			CH	High-plasticity clays
More than 50% passing the No. 200 sieve		ORGANIC	OH	High-plasticity organic silts and organic clays
Highly Organic Soils	Primarily organic material with organic odor		PT	Peat

Notes: 1) Soil classification based on visual classification of soil is based on ASTM Test Method D 2488.
2) Soil classification using laboratory tests is based on ASTM Test Method D 2487.
3) Description of soil density or consistency is based on interpretation of blow count data and/or test data.

Soil Particle Size Definitions

Component	Size Range
Boulders	Coarser than 12 inch
Cobbles	3 inch to 12 inch
Gravel	3 inch to No. 4 (4.78 mm)
Coarse	3 inch to 3/4 inch
Fine	3/4 inch to No. 4 (4.78 mm)
Sand	No. 4 (4.78 mm) to No. 200 (0.074mm)
Coarse	No. 4 (4.78 mm) to No. 10 (2.0 mm)
Medium	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Finer than No. 200 (0.074 mm)

Soil Moisture Modifiers

Soil Moisture	Description
Dry	Absence of moisture
Moist	Damp, but no visible water
Wet	Visible water

Key to Boring Log Symbols

Sampling Method	Boring Log Symbol	Description
Blows required to drive a 2.4 inch I.D. split-barrel sampler 12-inches or other indicated distance using a 300-pound hammer falling 30 inches.	34	Location of relatively undisturbed sample
	12	Location of disturbed sample
	21	Location of sample attempt with no recovery
Blows required to drive a 1.5-inch I.D. split barrel sampler (SPT - Standard Penetration Test) 12-inches or other indicated distance using a 140-pound hammer falling 30 inches.	14	Location of sample obtained in general accordance with Standard Penetration Test (ASTM D-1586) test procedures.
	30	Location of SPT sampling attempt with no recovery.
Pushed Sampler	P	Sampler pushed with the weight of the hammer or against weight of the drilling rig.
Grab Sample	G	Sample obtained from drill cuttings.

Note: The lines separating soil types on the logs represents approximate boundaries only. The actual boundaries may vary or be gradual.

Laboratory Tests

Test	Symbol
Moisture Content	MC
Density	DN
Grain Size	GS
Percent Fines	PF
Atterberg Limits	AL
Hydrometer Analysis	HA
Consolidation	CN
Compaction	CP
Permeability	PM
Unconfined Compression	UC
Unconsolidated Undrained TX	UU
Consolidated Undrained TX	CU
Consolidated Drained TX	CD
Chemical Analysis	CA

SOIL CLASSIFICATION SYSTEM

COAL MINE HAZARD ASSESSMENT AND GROUND PROOFING PROGRAM
KING COUNTY PARCEL NOS. 332406-9029, 332406-9045 AND 332406-9066, ISSAQUAH, WA

ICICLECREEK ENGINEERS
29335 NE 20th Street
Carnation, Washington 98014
(425) 333-0093

SCALE: As Shown
DESIGNED: --
DRAWN: BRB
CHECKED: KSK
DATE: 09/16/21

ICE FILE NO.
1383-001
Figure
5

SAB: 04/12/16

Boring B-1

47.52555302, -122.0394188

Approximate Ground Surface Elevation: 175 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Reddish-yellow silty fine SAND (Weathered Bedrock)					No groundwater encountered at the time of drilling	0
5			SM	☒			5
10			SM	☒			10
15			SM	☒			15
20	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 6

SAB: 04/12/16

Boring B-1

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55	NO. 4 MINE (400 Level entry tunnel)	VOID			Lost air circulation at about 55.0 feet (no drill cuttings)		55
60							60
	NO. 4 MINE (400 Level entry tunnel - caved rock) (based on drill action)						
65	Boring completed at about 66.0 feet on 04/05/16						65
70							70
75							75
80							80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 6

SAB: 04/12/16

Boring B-2

47.52545969, -122.0397267

Approximate Ground Surface Elevation: 183 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND (Glacial Drift)					No groundwater encountered at the time of drilling	0
5			SM	☒			5
10			SM	☒			10
15			SM	☒			15
20			SM	☒			20
25	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 7

SAB: 04/12/16

Boring B-2

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)						
70			Rock	☒			70
75			Rock	☒			75
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
80	Boring completed at about 80.0 feet on 04/05/16						80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 7

SAB: 04/12/16

Boring B-3

47.52539546, -122.0400497

Approximate Ground Surface Elevation: 187 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine SAND (Glacial Drift)						0
5			SM	☒			5
10			SM	☒			10
15			SM	☒			15
17	Gray fine-grained SANDSTONE (Renton Formation)						
20			Rock	☒		Groundwater encountered at about 20 feet at the time of drilling	20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 8

SAB: 04/12/16

Boring B-3

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			65
	Boring completed at about 67.0 feet because of plugged drill bit on 04/05/16						
70							70
75							75
80							80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 8

SAB: 04/12/16

Boring B-4

47.52533659, -122.0402108

Approximate Ground Surface Elevation: 192 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine SAND (Glacial Drift)						0
5			SM	☒			5
10	Brown silty fine to medium SAND (Glacial Drift)		SM	☒			10
15			SM	☒			15
20			SM	☒			20
25	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 9

SAB: 04/12/16

Boring B-4

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)					Groundwater encountered at about 67 feet at the time of drilling	
70			Rock	☒			70
	Gray fine-grained SANDSTONE (Renton Formation)						
75			Rock	☒			75
80	Boring completed at about 80.0 feet on 04/04/16						80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 9

SAB: 04/12/16

Boring B-5

47.52530862, -122.0404417

Approximate Ground Surface Elevation: 195 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine SAND (Glacial Drift)						0
5			SM	☒			5
10			SM	☒			10
15			SM	☒			15
20	Gray silty fine SAND (Glacial Drift)		SM	☒			20
25	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 10

SAB: 04/12/16

Boring B-5

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒		Groundwater encountered at about 55 feet at the time of drilling	55
60			Rock	☒			60
65			Rock	☒			65
70			Rock	☒			70
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)						
75			Rock	☒			75
80	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			80
85	Boring completed at about 85.0 feet on 04/04/16						85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 10

SAB: 04/12/16

Boring B-6

47.52524324, -122.0405247

Approximate Ground Surface Elevation: 197 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine SAND with a trace of silt (Glacial Drift)						0
5			SP	☒			5
10			SP	☒		Groundwater encountered at about 10 feet at the time of drilling	10
15	Brown fine SAND with silt and a trace of gravel (Glacial Drift)		SP-SM	☒			15
20	Gray and brown silty fine SAND (Weathered Bedrock)		SM	☒			20
25			SM	☒			25
30	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous SHALE (Renton Formation)		Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 11

SAB: 04/12/16

Boring B-6

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
70	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			70
75			Rock	☒			75
80	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			80
85	Boring completed at about 83.0 feet on 04/04/16						85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 11

SAB: 04/12/16

Boring B-7

47.52515387, -122.0408594

Approximate Ground Surface Elevation: 201 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine to medium SAND with a trace of gravel (Glacial Drift)		SP	☒		No groundwater encountered at the time of drilling	0
5							5
10	Gray silty fine SAND (Weathered Bedrock)		SM	☒			10
15	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			15
20			Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 12

SAB: 04/12/16

Boring B-7

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
70			Rock	☒			70
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)						
75			Rock	☒			75
80			Rock	☒			80
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
	Boring completed at about 83.0 feet on 04/05/16						
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 12

SAB: 04/12/16

Boring B-8

47.52500814, -122.0408784

Approximate Ground Surface Elevation: 204 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine to coarse GRAVEL with sand and a trace of silt (Glacial Drift)					No groundwater encountered at the time of drilling	0
5			GP	☒			5
10			GP	☒			10
15			GP	☒			15
	Reddish-yellow silty fine SAND (Weathered Bedrock)		SM				
20	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 13

SAB: 04/12/16

Boring B-8

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)						
60			Rock	☒			60
65			Rock	☒			65
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
70	Boring completed at about 70.0 feet on 04/04/16						70
75							75
80							80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 13

SAB: 04/12/16

Boring B-9

47.52511433, -122.0406823

Approximate Ground Surface Elevation: 202 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine SAND with a trace of silt (Glacial Drift)		SP	☒		No groundwater encountered at the time of drilling	0
5							5
10			SP	☒			10
15	Gray silty fine to medium SAND with occasional gravel (Glacial Drift)		SM	☒			15
20	Gray silty fine SAND (Weathered Bedrock)		SM	☒			20
25	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 14

SAB: 04/12/16

Boring B-9

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			55
60			Rock	☒			60
65	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			65
	Boring completed at about 68.0 feet on 04/05/16						
70							70
75							75
80							80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 14

SAB: 04/12/16

Boring B-10

47.52521542, -122.0404231

Approximate Ground Surface Elevation: 197 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine SAND with a trace of silt (Glacial Drift)						0
5			SP	☒			5
10			SP	☒			10
15	Gray silty fine to medium SAND with occasional gravel (Glacial Drift)		SM	☒			15
20			SM	☒			20
25			SM	☒			25
30	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 15

SAB: 04/12/16

Boring B-10

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒		Groundwater encountered at about 55 feet at the time of drilling	55
60	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			60
65			Rock	☒			65
70	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			70
75			Rock	☒			75
80			Rock	☒			80
85	Boring completed at about 83.0 feet on 04/04/16						85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 15

SAB: 04/12/16

Boring B-11

47.52520521, -122.0401738

Approximate Ground Surface Elevation: 193 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND with occasional gravel (Glacial Drift)						0
5			SM	☒			5
10			SM	☒			10
15			SM	☒		Groundwater encountered at about 15 feet at the time of drilling	15
	Brown silty fine to coarse GRAVEL with sand (Glacial Drift)						
20			GM	☒			20
25			GM	☒			25
30	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
	Black coal (Renton Formation) (NO. 4 COAL SEAM)						
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 16

SAB: 04/12/16

Boring B-11

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			50
55			Rock	☒			55
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
60	Boring completed at about 60.0 feet on 04/04/16						60
65							65
70							70
75							75
80							80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 16

SAB: 04/12/16

Boring B-12

47.52529348, -122.0399041

Approximate Ground Surface Elevation: 185 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine to medium SAND with silt and glass fragments (Fill)					No groundwater encountered at the time of drilling	0
5			SP-SM	☒			5
10			SP-SM	☒			10
	Gray silty fine SAND (Weathered Bedrock)						
15			SM	☒			15
	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)						
20			Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)						
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 17

SAB: 04/12/16

Boring B-12

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			50
55			Rock	☒			55
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
60	Boring completed at about 60.0 feet on 04/06/16						60
65							65
70							70
75							75
80							80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 17

SAB: 04/12/16

Boring B-13

47.52535607, -122.0396544

Approximate Ground Surface Elevation: 180 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND with gravel (Glacial Drift)		SM	☒		No groundwater encountered at the time of drilling	0
5							5
10			SM	☒			10
15			SM	☒			15
	Gray silty fine SAND (Weathered Bedrock)						
20			SM	☒			20
25	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)						
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 18

SAB: 04/12/16

Boring B-13

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			50
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
55	Boring completed at about 54.0 feet on 04/06/16						55
60							60
65							65
70							70
75							75
80							80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 18

SAB: 04/12/16

Boring B-14

47.52543271, -122.0394042

Approximate Ground Surface Elevation: 173 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Reddish-yellow silty fine to medium SAND (Glacial Drift)		SM	☒		No groundwater encountered at the time of drilling	0
5							5
10			SM	☒			10
	Gray silty fine SAND (Weathered Bedrock)						
15			SM	☒			15
	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)						
20			Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35	NO. 4 MINE (400 Level entry tunnel)	VOID			Lost air circulation at about 35.0 feet (no drill cuttings)		35
40							40
	NO. 4 MINE (400 Level entry tunnel - caved rock)(based on drill action)		Rock				
45	Boring completed at about 45.0 feet on 04/06/16						45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 19

SAB: 04/12/16

Boring B-15

47.5253463, -122.0393609

Approximate Ground Surface Elevation: 173 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown clayey, sandy SILT (Fill)		SM	☒		No groundwater encountered at the time of drilling	0
5			SM	☒			5
10			SM	☒			10
15			Rock	☒			15
20							20
25	Wood timber (shoring for No. 4 Mine 400 Level entry tunnel)						25
	NO. 4 MINE (400 Level entry tunnel - caved rock)		Rock	☒			
30	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45	Boring completed at about 45.0 feet on 04/06/16						45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 20

SAB: 04/12/16

Boring B-16

47.52530111, -122.0395171

Approximate Ground Surface Elevation: 175 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine to medium SAND with silt and occasional gravel (Fill)		SP-SM	☒		No groundwater encountered at the time of drilling	0
5							5
10			SP-SM	☒			10
15	Gray and brown silty fine to medium SAND with occasional gravel (Fill)		SM	☒			15
20	Gray silty fine SAND (Weathered Bedrock)		SM				20
25	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			25
30	Black COAL (NO. 4 COAL SEAM) (Renton Formation) (based on drill action)		Rock				30
35	SANDSTONE (Renton Formation) (based on drill action)		Rock				35
40	Boring completed at about 36.0 feet on 04/06/16						40
45							45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 21

SAB: 04/12/16

Boring B-17

47.52523627, -122.0397153

Approximate Ground Surface Elevation: 180 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Dark brown to brown silty fine to medium SAND (Fill)		SM	☒		No groundwater encountered at the time of drilling	0
5							5
10			SM	☒			10
15	Gray and brown silty fine to medium SAND with occasional gravel (Fill?)		SM	☒			15
20			SM	☒			20
25			SM	☒			25
30	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			30
35	COAL (Renton Formation)(NO. 4 COAL SEAM)(based on drill action)		Rock				35
40			Rock				40
45	SANDSTONE (Renton Formation)(based on drill action)		Rock				45
50	Boring completed at about 45.0 feet on 04/06/16						50

Soil/Rock Profile

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 22

SAB: 04/12/16

Boring B-18

47.52519974, -122.0399132

Approximate Ground Surface Elevation: 187 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND with occasional gravel (Fill)		SM	☒		No groundwater encountered at the time of drilling	0
10	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			10
15			Rock	☒			15
20			Rock	☒			20
25			Rock	☒			25
30	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
40	Gray fine-grained SANDSTONE (Renton Formation)						
45			Rock	☒			45
50	Boring completed at about 50.0 feet on 04/04/16						50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 23

SAB: 04/12/16

Boring B-19

47.5251763, -122.040019

Approximate Ground Surface Elevation: 191 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine SAND with silt (Glacial Drift)		SP-SM	☒		No groundwater encountered at the time of drilling	0
5							5
10			SP-SM	☒			10
15			SP-SM	☒			15
20	Gray silty fine SAND (Weathered Bedrock)		SM	☒			20
25			SM	☒			25
30	COAL (NO. 4 COAL SEAM)(Renton Formation) (based on drill action)		Rock				30
35			Rock				35
40	SANDSTONE (Renton Formation) (based on drill action)		Rock				40
45	Boring completed at about 44.0 feet on 04/05/16						45
50							50

See Figure 5 for explanation of symbols

SAB: 04/12/16

Boring B-20

47.52509913, -122.0402229

Approximate Ground Surface Elevation: 196 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND with occasional gravel (Glacial Drift)						0
5			SM	☒			5
10			SM	☒			10
15	Gray silty fine SAND (Weathered Bedrock)		SM	☒			15
20	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			35
40	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			40
45			Rock	☒			45
50						Groundwater encountered at about 50 feet at the time of drilling	50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 25

SAB: 04/12/16

Boring B-20

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60	Boring completed at about 60.0 feet on 04/04/16						60
65							65
70							70
75							75
80							80
85							85
90							90
95							95
100							100

See Figure 7 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 25

SAB: 04/12/16

Boring B-21

47.52505873, -122.0404636

Approximate Ground Surface Elevation: 202 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Dark brown to brown silty fine to medium SAND with a trace of gravel (Glacial Drift)		SM	☒		No groundwater encountered at the time of drilling	0
5							5
10			SM	☒			10
15	Gray silty fine SAND (Weathered Bedrock)		SM	☒			15
20	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			50
	Boring completed at about 50.0 feet on 04/04/16						

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 26

SAB: 04/12/16

Boring B-22

47.52498851, -122.0407813

Approximate Ground Surface Elevation: 205 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND with occasional gravel (Glacial Drift)					Groundwater encountered from about 0 to 10 feet at the time of drilling	0
5			SM	☒			5
10			SM	☒			10
15			SM	☒			15
20	Wood timber			☒			20
	NO. 4 MINE (Water Level tunnel)	VOID			Lost air circulation at about 21 feet (no drill cuttings)		
25							25
30							30
	SANDSTONE (Renton Formation)(based on drill action)		Rock				
35	Boring completed at about 35.0 feet on 04/05/16						35
40							40
45							45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 27

SAB: 04/12/16

Boring B-23

47.52501949, -122.0405974

Approximate Ground Surface Elevation: 204 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine SAND (Glacial Drift)		SM	☒	Lost air circulation at about 25 feet (no drill cuttings)	Groundwater encountered at about 25 feet at the time of drilling	0
5							5
10			SM	☒			10
15	Reddish-yellow and gray silty fine SAND (Weathered Bedrock)		SM	☒			15
20	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			20
25	NO. 4 MINE (Water Level tunnel)	VOID					25
30							30
35	SANDSTONE (Renton Formation)(based on drill action)		Rock				35
40			Rock				40
45	Boring completed at about 42.0 feet on 04/05/16						45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 28

SAB: 04/12/16

Boring B-24

47.52514934, -122.040219

Approximate Ground Surface Elevation: 196 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND (Glacial Drift)		SM	☒			0
5							5
10			SM	☒			10
15	Wood timber (N0. 4 MINE Water Level tunnel shoring)			☒			15
	NO. 4 MINE (Water Level tunnel)	VOID			Lost air circulation at about 16 feet (no drill cuttings)	Groundwater encountered at about 16 feet at the time of drilling	
20							20
25	SANDSTONE (Renton Formation)(based on drill action)		Rock				25
30	Boring completed at about 30.0 feet on 04/05/16						30
35							35
40							40
45							45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 29

SAB: 04/12/16

Boring B-25

47.52554622, -122.039601

Approximate Ground Surface Elevation: 180 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine to medium SAND with silt (Glacial Drift)		SP-SM	☒		No groundwater encountered at the time of drilling	0
5			SP-SM	☒			5
10			SP-SM	☒			10
15	Gray silty fine SAND (Weathered Bedrock)		SM				15
20	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 30

SAB: 04/12/16

Boring B-25

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
70			Rock	☒			70
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)						
75			Rock	☒			75
80			Rock	☒			80
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
	Boring completed at about 82.5 feet on 04/05/16						
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 30

SAB: 04/12/16

Boring B-26

47.52542531, -122.0402006

Approximate Ground Surface Elevation: 187 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND (Glacial Drift)					No groundwater encountered at the time of drilling	0
5			SM	☒			5
10			SM	☒			10
15			SM	☒			15
20	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 31

SAB: 04/12/16

Boring B-26

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
70			Rock	☒			70
	NO. 4 MINE (400 Level - open mine workings)	VOID			Lost air circulation at about 72 feet (no drill cuttings)		
75	NO. 4 MINE (400 Level - caved rock) (based on drill action)						75
	NO. 4 MINE (400 Level - open mine workings)	VOID					
	Boring completed at about 78.0 feet on 04/05/16						
80							80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 31

SAB: 04/12/16

Boring B-27

47.52522958, -122.0408975

Approximate Ground Surface Elevation: 196 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND with gravel (Glacial Drift)		SM			No groundwater encountered at the time of drilling	0
5	Reddish-yellow and gray silty fine SAND (Weathered Bedrock)		SM	☒			5
10			SM	☒			10
15	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous SHALE (Renton Formation)		Rock	☒			15
20			Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 32

SAB: 04/12/16

Boring B-27

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous SHALE (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
70			Rock	☒			70
75			Rock	☒			75
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)						
80			Rock	☒			80
85			Rock	☒			85
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
90	Boring completed at about 90.0 feet on 04/05/16						90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 32

SAB: 04/12/16

Boring B-28

47.52545138, -122.040447

Approximate Ground Surface Elevation: 187 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine GRAVEL with sand (Glacial Drift)		GP	☒		No groundwater encountered at the time of drilling	0
5							5
10	Reddish-yellow silty fine SAND (Weathered Bedrock)		SM	☒			10
15	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			15
20			Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 33

SAB: 04/12/16

Boring B-28

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
70			Rock	☒			70
75			Rock	☒			75
80			Rock	☒			80
85	NO. 4 MINE (400 Level - open mine workings)	VOID			Lost air circulation at about 84 feet (no drill cuttings)		85
90	NO. 4 MINE (400 Level - caved rock) (based on drill action)						90
	NO. 4 MINE (400 Level - open mine workings)	VOID					
95	SANDSTONE (Renton Formation)(based on drill action)		Rock				95
	Boring completed at about 96.0 feet on 04/05/16						
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 33

SAB: 04/12/16

Boring B-29

47.52543948, -122.0394849

Approximate Ground Surface Elevation: 175 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND (Fill)		SM	☒		No groundwater encountered at the time of drilling	0
5			SM	☒			5
10			SM	☒			10
15			SM	☒			15
20	Gray silty fine SAND (Weathered Bedrock)		SM	☒			20
25	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			40
45			Rock	☒			45
50	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			50
	Boring completed at about 50.0 feet on 04/06/16						

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 34

SAB: 04/12/16

Boring B-30

47.52527097, -122.039825

Approximate Ground Surface Elevation: 185 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND (Glacial Drift)		SM	☒		No groundwater encountered at the time of drilling	0
5							5
10			SM	☒			10
15	Gray silty fine SAND (Weathered Bedrock)		SM	☒			15
20	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			40
45							45
50	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			50
	Boring completed at about 50.0 feet on 04/06/16						

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 35

SAB: 04/12/16

Boring B-31

47.5254698, -122.0399731

Approximate Ground Surface Elevation: 185 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND (Glacial Drift)					No groundwater encountered at the time of drilling	0
5			SM	☒			5
10			SM	☒			10
15			SM	☒			15
20	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 36

SAB: 04/12/16

Boring B-31

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
70			Rock	☒			70
	NO. 4 MINE (400 Level open mine workings)	VOID			Lost air circulation at about 73 feet (no drill cuttings)		
75	No. 4 MINE (400 Level caved rock) (based on drill action)		Rock				75
	NO. 4 MINE (400 Level open mine workings)	VOID					
	No. 4 Mine (400 Level caved rock) (based on drill action)		Rock				
80							80
85							85
	SANDSTONE (Renton Formation)(based on drill action)		Rock				
90							90
95	Boring completed at about 94.0 feet on 04/06/16						95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 36

SAB: 04/12/16

Boring B-32

47.52538057, -122.040615

Approximate Ground Surface Elevation: 189 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown to reddish-yellow silty fine SAND (Weathered Bedrock)					No groundwater encountered at the time of drilling	0
5			SM	☒			5
10			SM	☒			10
15	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			15
20			Rock	☒			20
25			Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 37

SAB: 04/12/16

Boring B-32

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
70			Rock	☒			70
75			Rock	☒			75
80	NO. 4 MINE (400 Level open mine workings)	VOID			Lost air circulation at about 79 feet (no drill cuttings)		80
85	NO. 4 MINE (400 Level caved rock) (based on drill action)		Rock				85
90	SANDSTONE (Renton Formation)(based on drill action)		Rock				90
95	Boring completed at about 95.0 feet on 04/06/16						95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 37

SAB: 04/12/16

Boring B-33

47.52541798, -122.0399215

Approximate Ground Surface Elevation: 186 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND (Glacial Drift)					Groundwater encountered from about 0 to 12 feet at the time of drilling	0
5			SM	☒			5
10			SM	☒			10
15			SM	☒			15
20			SM	☒			20
25	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			25
30			Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 38

SAB: 04/12/16

Boring B-33

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous shale (Renton Formation)		Rock	☒			50
55			Rock	☒			55
60			Rock	☒			60
65			Rock	☒			65
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)						
70			Rock	☒			70
75			Rock	☒			75
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
80	Boring completed at about 80.0 feet on 04/06/16						80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 38

Boring B-34

47.52519306, -122.0400339

Approximate Ground Surface Elevation: 190 feet

SAB: 04/12/16

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown silty fine to medium SAND with a trace of gravel (Glacial Drift)		SM	☒			0
10	MINE NO. 4 (Water Level tunnel)	VOID			Lost air circulation at about 10 feet (no drill cuttings)	Groundwater encountered at about 10 feet at the time of drilling	10
20	SANDSTONE (Renton Formation) (based on drill action)		Rock				20
25			Rock				25
30			Rock				30
35			Rock				35
40			Rock				40
45	Boring completed at about 45.0 feet on 04/06/16						45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 39

SAB: 04/12/16

Boring B-35

47.5251516, -122.0404795

Approximate Ground Surface Elevation: 199 feet

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
0	Brown fine SAND with a trace of silt (Glacial Drift)		SP	☒		No groundwater encountered at the time of drilling	0
5							5
10			SP	☒			10
15			SP	☒			15
20	Gray silty fine to medium SAND with occasional gravel (Glacial Drift)		SM	☒			20
25			SM	☒			25
	Brown silty fine SAND (Weathered Bedrock)		SM				
30	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous SHALE (Renton Formation)		Rock	☒			30
35			Rock	☒			35
40			Rock	☒			40
45			Rock	☒			45
50							50

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 40

SAB: 04/12/16

Boring B-35

Logged by: JMS

Project Name: D4D Real Estate Development CMH Assessment and Ground Proofing Program Issaquah

ICE Project No. 1199-001

Depth in Feet	Soil/Rock Profile: Description	Graphic Log	Soil Classification Symbol	Sample Location	Comments	Groundwater Observations	Depth in Feet
50	Gray fine-grained SANDSTONE with occasional thin layers of carbonaceous SHALE (Renton Formation)		Rock	☒			50
	Black COAL (Renton Formation) (NO. 4 COAL SEAM)		Rock	☒			
55							55
60			Rock	☒			60
	Gray fine-grained SANDSTONE (Renton Formation)		Rock	☒			
65	Boring completed at about 65.0 feet on 04/06/16						65
70							70
75							75
80							80
85							85
90							90
95							95
100							100

See Figure 5 for explanation of symbols

Icicle Creek Engineers

Boring Log - Figure 40