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January 15, 2024

Dean Biddle
6539 – 44th Avenue Southwest
Seattle, Washington
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Soils Report: Standard Subsurface Investigation
Proposed Townhomes
6539 – 44th Avenue Southwest
Seattle, Washington
PN: 7625704390
Doc ID: Biddle.44thAveSW.SR

INTRODUCTION & DESCRIPTION

This standard subsurface investigation summarizes our site observations, subsurface explorations, and assessment of the site soil to support infiltration for four proposed townhomes (rowhouses) at 6539 – 44th Avenue Southwest in Seattle, Washington. The general location of the site is shown on the attached Site Location Map, Figure 1.

Our understanding of the project is based on our conversations with you, our review of the *4th Ave TH progress* plans by MMuM Studio LLC dated August 21, 2023 and the Topographic & Boundary Survey for 6539 - 44th Avenue Southwest by Terrane dated October 26, 2023, our review of the City of Seattle Environmentally Critical Area (ECA) and infiltration feasibility mapping on the Seattle Department of Construction and Inspections (SDCI) GIS web application, our understanding of the City of Seattle Municipal and Zoning Codes, and our previous experience with similar residential projects in the City of Seattle. The parcel is developed as a single-family residence with a detached shed and garage, paved driveway, and associated residential utilities. The single-family residence is proposed to be demolished and replaced with four townhouses (Named Unit A, B, C, and D) with parking spaces, pedestrian sidewalk, and associated residential utilities. The proposed development is shown on the Site & Exploration Plan, Figure 2.

PURPOSE AND SCOPE

The purpose of our services was to evaluate the site conditions as a basis for assessing the feasibility of the subsurface soils to support infiltration of collected stormwater runoff from the proposed impervious surfaces. Specifically, our scope of services for this project included the following:

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;
2. Exploring the surface and subsurface conditions by reconnoitering the site and logging the soils in two test pits at the site;
3. Completing two small-scale Pilot Infiltration Tests (Small PITs) in the test pits in accordance with the July 2021 *City of Seattle Stormwater Design Manual* (COS SWDM);
4. Describing surface and subsurface conditions, including soil type and depth to groundwater;

5. Providing our opinion about the feasibility of onsite infiltration of stormwater in accordance with the *July 2021 Seattle Stormwater Manual*, including a design infiltration rate based on the measured infiltration rate recorded in our Small PITs; and,
6. Preparing this written *Soils Report* summarizing our site observations and conclusions, and our geotechnical recommendations and design criteria, along with the supporting data.

The above scope of work was summarized in our *Proposal for Geotechnical Engineering Services* dated December 12, 2023. We received authorization from you to proceed on December 14. 2023.

SITE CONDITIONS

Surface Conditions

The site consists of a single tax parcel at 6539 – 44th Avenue Southwest in the West Seattle neighborhood of Seattle, Washington. According to the *Topographic & Boundary Survey* and the SDCI GIS parcel layer, the site is rectangular in shape, measuring about 125 feet wide (east to west) by 50 feet long (north to south) and encompasses about 0.14 acres. The site is bounded by a single-family residence to the north, by townhomes and a single-family residence to the south, by 44th Avenue Southwest to the east, and by an alleyway to the west.

Our description of the topography is from the *Topographic & Boundary Survey* for the site. The site grade is slightly sloping down northeast to southwest at about 5 percent with a vertical relief of less than 10 feet. The topographic survey for the site is included on the attached Site Topography Map, Figure 3.

The site vegetation was observed as residential shrubs and landscaping. No areas of bare soil, erosion, ponding, or standing water were observed at the time of our site visit. The existing site configuration and topography are shown on the Site Vicinity Map, Figure 4.

Site Soils

The USDA Natural Resource Conservation Survey (NRCS) Web Soil Survey for the City of Seattle (WA775) maps the site soil as Urban land – Alderwood complex (3056). An excerpt from the NRCS mapping that covers the area of interest is attached as Figure 5.

- *Urban land – Alderwood Complex (3056)*: Mapped across the site, this soil is derived from the modification of glacial drift and/or glacial outwash over dense glaciomarine deposits and is included in hydrologic soils group A. Type 3056 forms on slopes of 5 to 12 percent and is not for an erosion hazard when exposed.

Site Geology

The *Geologic Map of Seattle – A Progress Report* by K.G. Troost, et al. (2005) maps the site geology as advance outwash deposits (Qva). Mass wastage deposits are mapped near the site, approximately 500 feet to the southeast and 800 feet to the west. No landslides, mass wasting deposit, or alluvial fans are shown within 300 feet of the site by the above referenced geologic map. An excerpt of the above referenced map is attached as Figure 6.

- *Mass wastage deposits (Qmw)*: Mass wastage deposits are generally composed of non-uniform deposits of loose silts, sands, and gravel with few to no discernible sedimentary

structures, and can contain buried organic material. Stormwater infiltration is not permitted in mass wastage deposits.

- *Advance outwash (Qva)*: The advance outwash typically consists of a well graded, lightly stratified mixture of sand and gravel that may locally contain silt and clay. The advance outwash was deposited by meltwaters emanating from the advancing Puget lobe of the Cordilleran Ice Sheet during the Vashon Stade of the Fraser Glaciation (about 12,000 to 15,000 years ago). The advance outwash was subsequently overridden by the ice mass; therefore, it is considered over-consolidated and exhibits high strength and low compressibility characteristics when undisturbed. Stormwater infiltration in advance outwash is generally favorable.

Subsurface Explorations

On December 20, 2023, we visited the site and logged the soil in two test pits to about 6 feet below the existing grade. The test pits were used for small-scale Pilot Infiltration Tests (Small PITs) and excavated to their final depths following the completion of the Small PITs. The test pits were excavated by representatives working for you and over excavated to their final depth by our field representative using a hand auger. Our field representative logged the subsurface conditions encountered in the test pit and obtained representative soil samples. Table 1, below, summarizes the approximate location, elevations, and termination depth of our explorations.

TABLE 1:
APPROXIMATE LOCATIONS, ELEVATIONS, AND DEPTHS OF EXPLORATIONS

Exploration Number	Functional Location	Surface Elevation[1] (feet)	Termination Depth (feet)	Termination Elevation (feet)
TP-1/PIT-1	SW portion of site (back yard)	204.5	6.0	198.5
TP-2/PIT-2	SE portion of site (front yard)	206.0	6.0	200.0

Notes: [1]Surface elevations from the *Topographic & Boundary Survey* for 6539 44th Avenue Southwest by Terrane dated October 26, 2023

The specific number, locations, and depths of our test pits were selected based on the configuration of the proposed location of the development and were adjusted in the field based on consideration for underground utilities, existing site conditions, site access limitations and encountered stratigraphy. Representative soil samples obtained from the test pits and hand auger over excavation were placed in sealed plastic containers and then taken to our laboratory for further examination and testing as deemed necessary. Soil densities presented on the logs are based on the difficulty of excavation and our experience. The test pits and hand augers were backfilled with the excavated soils and tamped, but not otherwise compacted.

The approximate locations of our subsurface explorations are shown on the attached Site & Exploration Plan, Figure 2. The indicated locations were determined by pacing and measuring from existing features shown on the site plan; as such, the locations should only be considered as accurate as implied by the measurement method. The subsurface explorations excavated as part of this evaluation indicate the conditions at a specific location only, as actual subsurface conditions can vary across the site. Furthermore, the nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun.

The soils encountered in each exploration were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our test pit and hand auger explorations are included as Figures A-2.

Subsurface Conditions

At both locations explored, we encountered subsurface conditions that were consistent with uncontrolled fill mantling undisturbed advance outwash soils. Table 2 summarizes the approximate thicknesses, depths, and elevations of selected soil layers observed from our explorations.

- *Topsoil*: We observed 0.5 feet of topsoil at both test pit explorations as the upper most soil layer.

- *Uncontrolled Fill:* Beneath the topsoil layer in both test pits, we encountered about 3 feet of loose to medium dense, brown to reddish brown gravelly silty sand in a moist condition. We interpret this soil layer to be uncontrolled fill.

- *Advance outwash*: Underlying the uncontrolled fill at test pit TP-1/PIT-1, we observed a medium dense, reddish brown to brown silty sand with variable amounts of gravel in a moist condition to the full depth explored. Underlying the weathered advance outwash at exploration TP-2/PIT-2, we encountered a medium dense, reddish brown sandy silt with some gravel in moist condition to the full depth explored. We interpret these soil layers to be weathered to undisturbed advance outwash deposits.

TABLE 2:
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF ENCOUNTERED SOIL TYPES

Exploration Number	Thickness of Topsoil (feet)	Thickness of Uncontrolled Fill (feet)	Depth to Advance Outwash (feet)	Top Elevation of Advance Outwash (feet)[1]
TP-1/PIT-1	0.5	3.0	3.5	201.0
TP-2/PIT-2	0.5	3.0	3.5	202.5

Notes: [1]Surface elevations from the *Topographic & Boundary Survey* for 6539 - 44th Avenue Southwest by Terrane dated October 26, 2023

Groundwater Conditions

We did not observe any groundwater seepage in test pits TP-1/PIT-1 and TP-2/PIT-2. We observed spot orange iron oxide staining/discoloration consistent with spot mottling from 1.5 to 3.5 feet at test pit TP-1/PIT-1 and TP-2/PIT-2. Typically, mottling indicative of a seasonal fluctuating groundwater table is a continuous band on all sides of a soil layer(s).

The sandy silt soil layer observed underlying the fill at test pit TP-2/PIT-2 is typically associated with a low saturated hydraulic conductivity and could impede the infiltration of stormwater runoff. Perched groundwater develops when the vertical and/or horizontal infiltration of stormwater runoff is slowed or impeded by a soil with low saturated hydraulic conductivity (K_{sat}). Relatively rapid fluctuations of groundwater levels at the site should be anticipated with seasonality and precipitation events.

Laboratory Testing

Geotechnical laboratory tests were performed on three samples to estimate index and engineering properties of the soils encountered in our test pits/PITs. Laboratory testing included visual soil classification per ASTM D2487 and ASTM D2488, moisture content determinations per ASTM D2216, and grain size analyses per ASTM D6913 standard procedures. We also submitted a sample of the silty sand advance outwash for water quality treatment testing. We will provide an addendum to this report with the results of the testing. The results of the laboratory tests are included in Appendix B and are summarized below in Table 3.

TABLE 3:
LABORATORY TEST RESULTS FOR ON-SITE SOILS

Soil Type	Sample	Gravel Content (percent)	Sand Content (percent)	Silt/Clay Content (percent)	Moisture (percent)[1]
SM	TP-1/PIT-1, S-3, D: 4ft	26.7	44.9	28.4	23.5
SM	TP-1/PIT-1, S-4, D: 6ft	6.6	62.0	31.4	18.3
ML	TP-2/PIT-2, S-3, D: 4ft	7.3	41.2	51.5	20.8

Note: [1]Samples collected following completion of the PIT

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our data review, site reconnaissance, and subsurface explorations, it is our opinion that infiltration of stormwater is feasible at the location of test pit TP/-1PIT-1. The sandy silt soil layer observed at test pit TP-2/PIT-2 is not suitable to support infiltration of stormwater. The uncontrolled fill observed at both test pit TP-1/PIT-1 and TP-2/PIT-2 is not suitable to support infiltration of stormwater. Pertinent conclusions and recommendations for the geotechnical and stormwater management design of the townhomes are provided in the following sections.

Infiltration Feasibility

During the falling head period of TP-1/PIT-1 and TP-2/PIT-2, we measured infiltration rates of 7.0 and 1.5 inches per hour, respectively. Per the 2021 COS SWDM, Vol. 3, Section 3.2 – Table 3.3, the minimum measured infiltration rate for infiltration trenches or drywells is 5 inches per hour for on-site list approach and for meeting flow control, water quality treatment, and on-site performance standards.

Infiltration Trench and Drywell

Infiltration trenches and drywells are feasible at the location of TP-1/PIT-1 in the silty sand advance outwash encountered at about 3.5 feet below grade. We recommend any infiltration trench or drywell bottom be at the test depth of 4 feet to maintain vertical separation from any impervious layer or groundwater at depths greater than the explored depth of 6 feet. We encountered approximately 3.5 feet of fill at the location of TP-1/PIT-1, and this soil is not suitable to support infiltration of stormwater. We recommend a representative from GeoResources confirm the soil in any proposed infiltration facility is consistent with the soils tested at TP-1/PIT-1.

Permeable Pavement and Bioretention

The advance outwash silty sand at a depth of 4.0 feet at TP-1/PIT-1 are suitable to support permeable pavement and bioretention. The observed uncontrolled fill mantling the advance outwash silty sand at TP-1/PIT-1 and TP-2/PIT-2 is not suitable for support of permeable pavement or bioretention.

Small-Scale Pilot Infiltration Test

We performed two in-situ small-scale pilot infiltration tests in accordance with Appendix D-3.3 of the *City of Seattle Stormwater Manual (2021)*. See the attached Figure 2 for the location of the tests. The geometry of the test pits for TP-1/PIT-1 and TP-2/PIT-2 were measured as 4 feet (length) x 3 feet (width) x 4 feet (depth) with an area encompassing about 12 square feet. A pre-soak period of 6 hours was performed prior to a water level depth of at least 12 inches being maintained for the steady state period. During the steady state period, we recorded the cumulative volume and instantaneous flow rate necessary to maintain the water level at the same point for 1 hour. The City of Seattle Pilot Infiltration Test (PIT) Checklist is attached as Appendix C.

Measured Infiltration Rate

The measured infiltration rate calculated during the **steady state period** for TP-1/PIT-1 and TP-2/PIT-2 was **5.0 and 1.8 inches per hour**, respectively. After the steady state period, we turned off the water and recorded the rate of infiltration every 15 minutes in inches per hour using a measuring rod. Table 4 summarizes the measurements collected during the falling head period of the Small PITs.

TABLE 4:
FALLING HEAD PERIOD – MEASURED INFILTRATION RATE

Time of Measurement	PIT-1 Depth of Water (inches)	PIT-2 Depth of Water (inches)	PIT-1 Infiltration Rate (in/hr)	PIT-2 Infiltration Rate (in/hr)
16:00	12.0	12.0	---	---
16:10	11.0	11.7	6	1.8
16:20	10.2	11.5	4.8	1.2
16:30	9.4	11.3	4.8	1.2
16:40	8.6	11.1	4.8	1.2
16:50	7.8	10.9	4.8	1.2
17:00	7.0	10.7	4.8	1.2

During the **falling head period** of TP-1/PIT-1 and TP-2/PIT-2, we measured saturated hydraulic conductivities ($K_{sat,\ Measured}$) of **5.0 and 1.3 inches per hour**, respectively. See the attached Appendix A for the soil log for the Small PITs and attached Appendix C for the City of Seattle Pilot Infiltration Test (PIT) Checklists.

Design Infiltration Rate

For determining the design infiltration rate at test pit TP-1/PIT-1, we used the more conservative measured rate calculated from the steady state flow rate. We applied appropriate correction factors to the measured K_{sat} for site variability (CF_v of 0.6), testing method (CF_t of 0.5 for small-scale PIT), and maintenance (CF_m of 0.9 for siltation biofouling). The correction factor of 0.2,

the minimum correction factor allowed by the City of Seattle, was applied to the measured infiltration rates. The resulting design infiltration rate is **1.0 inches per hour** for TP-1/PIT-1. As mentioned above, infiltration is not recommended at test pit TP-2/PIT-2, because of the high fines in the sandy silt soil. We recommend that any infiltration facility be established in the silty sand advance outwash observed at the location of TP-1/PIT-1.

Construction Considerations

Appropriate design, construction and maintenance measures will be required to ensure the infiltration rate can be effectively maintained over time. Suspended solids could clog the underlying soil and reduce the infiltration rate. Appropriate temporary erosion and sediment control methods should be included in the project plans and specifications to minimize the potential for fines contamination during construction of the permanent infiltration facility utilized at the site.

To further reduce the potential for fines migration, any infiltration facility should not be connected to the stormwater runoff system until after construction is complete and the site area is landscaped, paved, or otherwise protected. Additional measures may also be taken during construction to minimize the potential of fines contamination of the proposed infiltration system, such as utilizing an alternative storm water management location during construction or leaving the bottom of the permanent systems 1 to 2 feet high, and subsequently excavating to the finished grade once the site soils have been stabilized. All contractors working on the site (builders and subcontractors) should divert sediment laden stormwater away from proposed infiltration facilities during construction and landscaping activities. No concrete trucks should be washed or cleaned, and washout areas should not be within the vicinity of the proposed infiltration facilities. After construction activities have been completed, periodic sweeping of the paved areas will help extend the life of the infiltration facility.

LIMITATIONS

We have prepared this report for use by Dean Biddle and other members of the design team for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully

applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We appreciate the opportunity to be of service to you on this project. Please do not hesitate to call at your convenience with any additional comments or questions.

Respectfully submitted,
GeoResources, LLC

Cooper Crowder, GIT
Staff Geologist

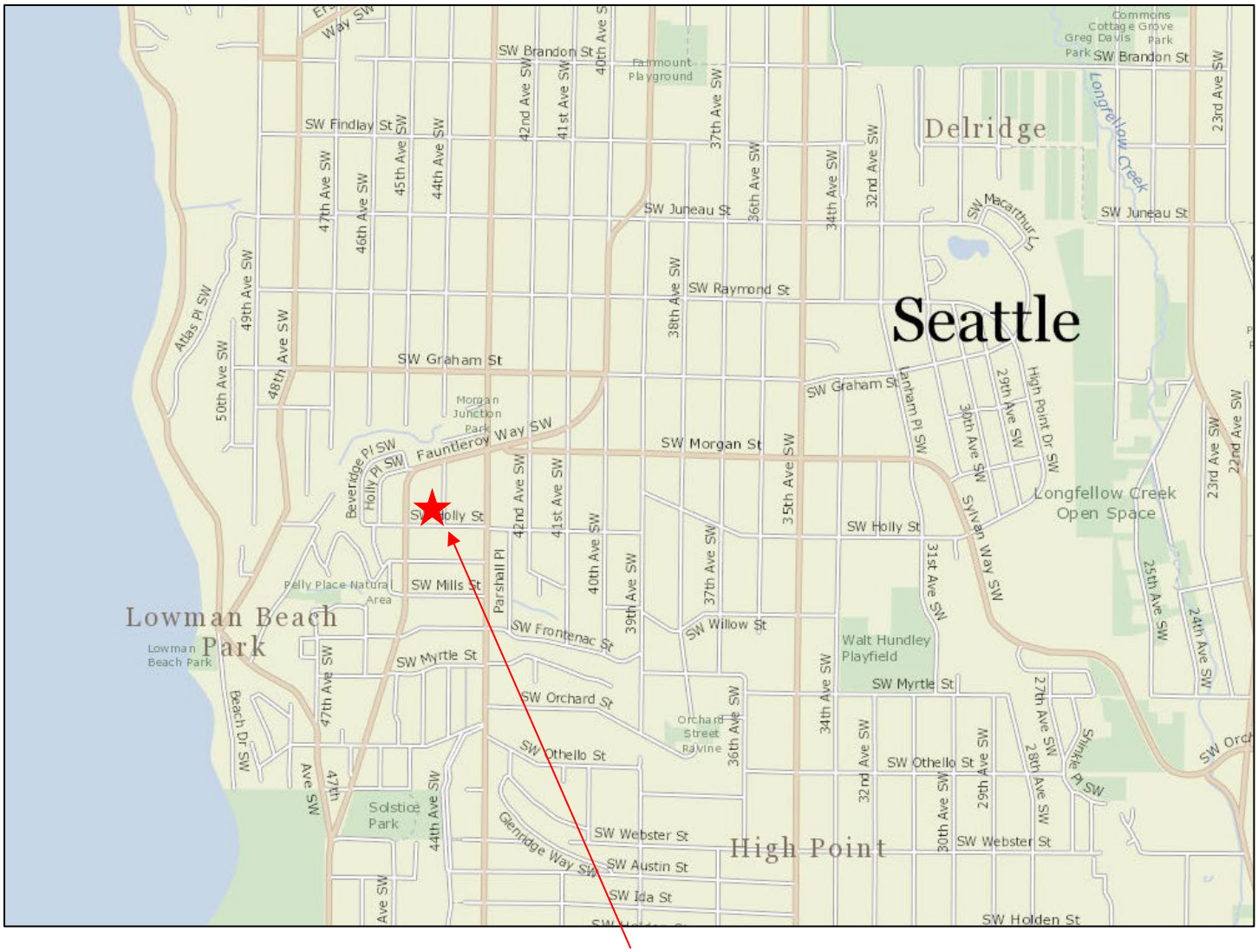
State of Washington 23013787 Licensed Geologist
ERIK FINA
1/15/24

Erik J. Fina, LG
Project Geologist

ANDREW EDWARD B SCHNITGER STATE OF WASHINGTON 23020710 REGISTERED PROFESSIONAL ENGINEER
1/15/24

Andrew E. Schnitger, PE
Project Engineer

CJC:EJF:AES/dem/ejf
Doc ID: Biddle.44thAveSW.SR
Attachments: Figure 1: Site Vicinity Map
Figure 2: Site & Exploration Plan
Figure 3: Site Topography Map
Figure 4: Site Vicinity Map
Figure 5: NRCS Soils Map
Figure 6: Geologic Map
Appendix A: Subsurface Explorations
Appendix B: Laboratory Test Results
Appendix C: City of Seattle Pilot Infiltration Test (PIT) Checklists



Approximate Site Location

Figure created from the King County public GIS website (https://gismaps.kingcounty.gov/iMap/)

N W E S

Not to Scale

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Site Location Map

Proposed Townhomes
6539 44th Avenue Southwest
Seattle, Washington
PN: 7625704390

DocID: Biddle.44thAveSW.F	Jan 2024	Figure 1

Legend

GeoResources Small PITs 12/20/23

0 5 10 20 30 40 Feet

N

Excerpt from sheet A101 of the 44th Ave TH architectural plans by MNMum Studio, LLC dated August 21, 2023

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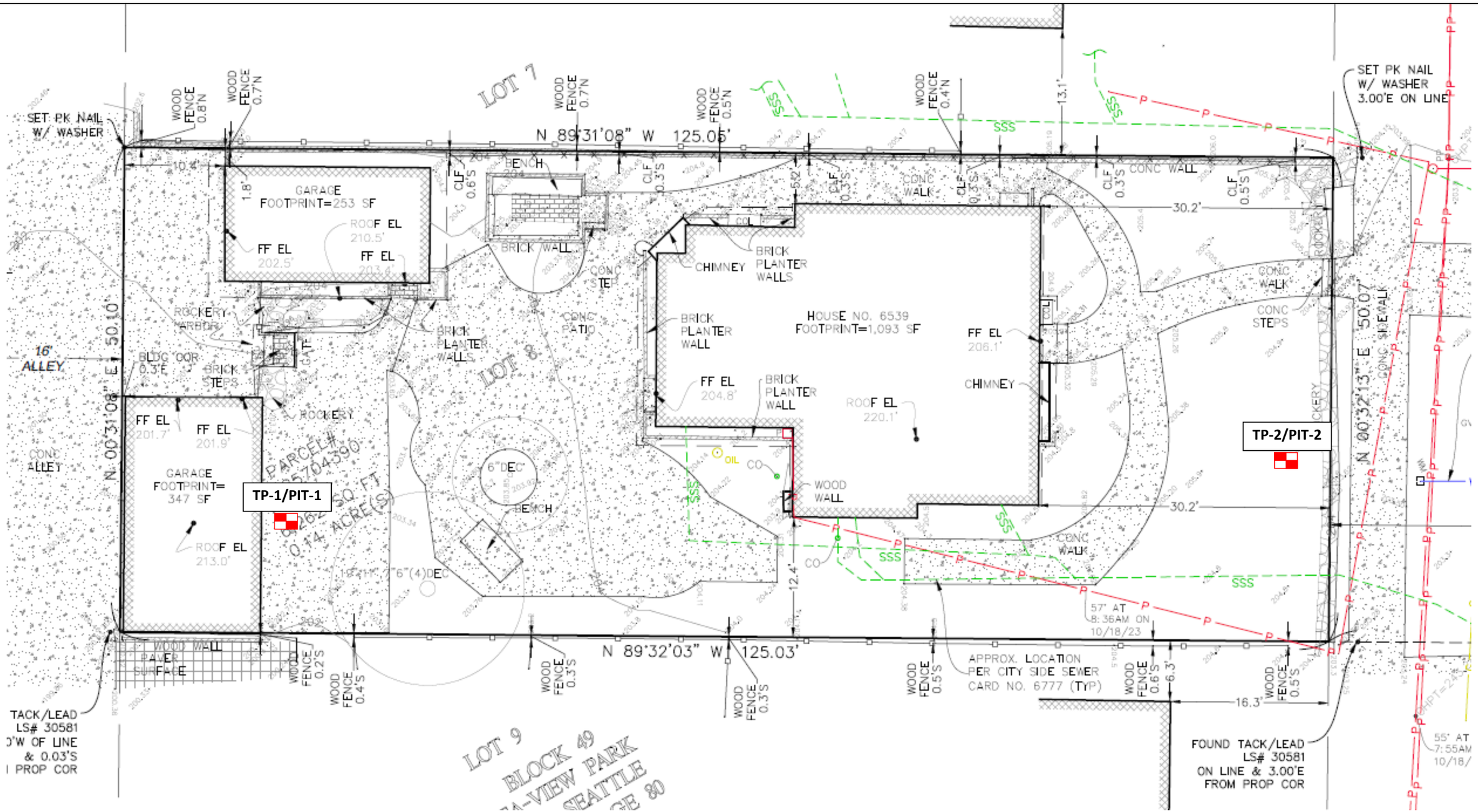
Site & Exploration Plan

Proposed Townhomes
6539 – 44th Avenue Southwest
Seattle, Washington
PN: 7625704390

Biddle.44thAveSW.P	January 2024	Figure 2



Notes:
Excerpt from the *Survey Document* provided by client
Scale 1"=500'

TP-1 Test pit number and approximate location (GeoResources 2023)

N

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Site Topography Map

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Seattle, Washington
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Doc ID: Biddle.44thAveSW.F2	January 2024	Figure 3

Approximate Site Location

Figure created from the King County public GIS website
(https://gismaps.kingcountyu.gov/iMap/)

Not to Scale

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Site Vicinity Map

Proposed Townhomes
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Seattle, Washington
PN: 7625704390

DocID: Biddle.44thAveSW.F	Jan 2024	Figure 4

Approximate Site Location

Figure created from the Web Soil Survey
(http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes	Erosion Hazard (road, trail)	Hydrologic Soil Group
3056	Urban land-Alderwood complex	Glacial drift and/or glacial outwash over dense glaciomarine deposits	5 to 12	Not rated	A

Not to Scale

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NRCS Soils Map

Proposed Townhomes
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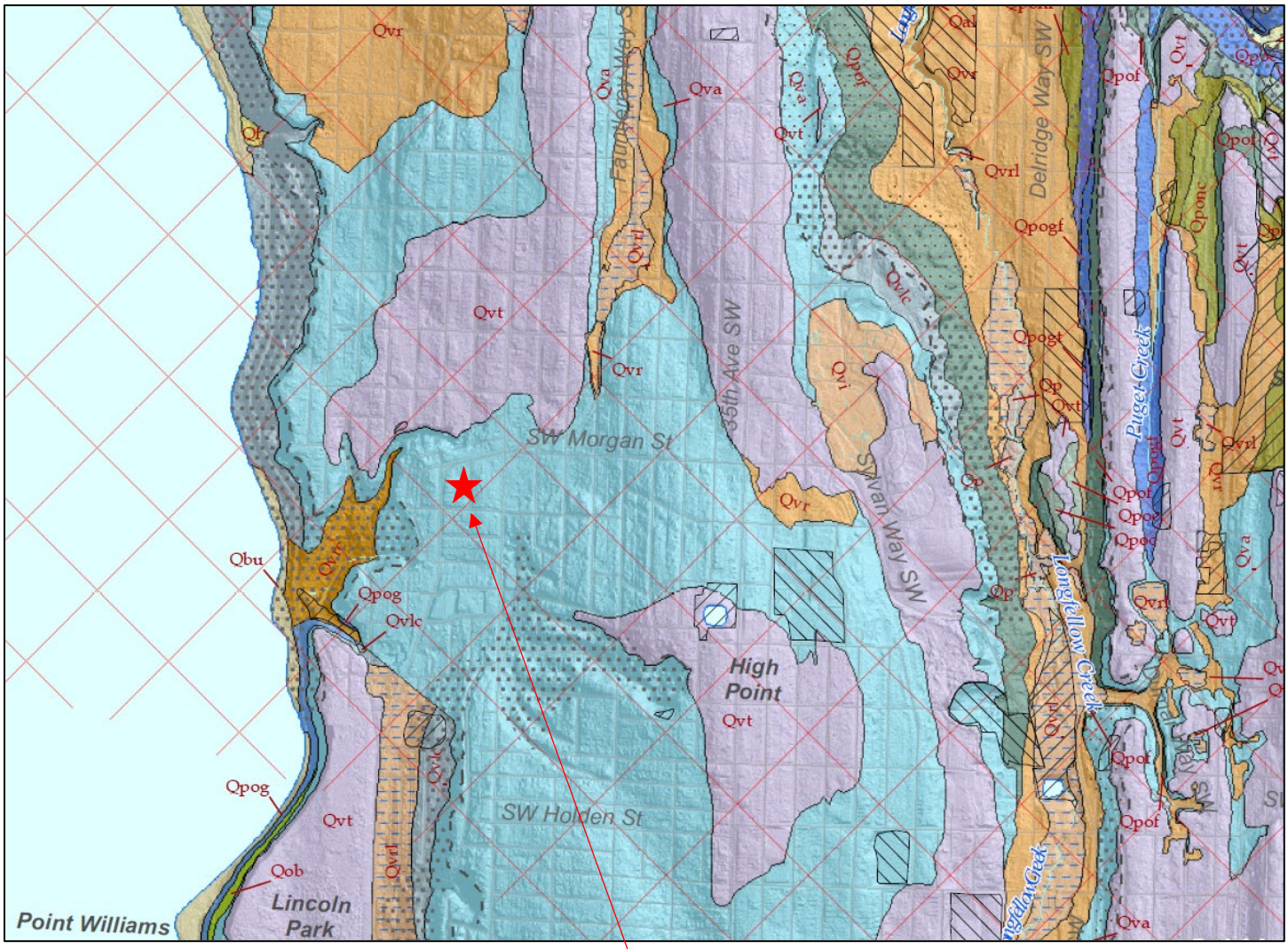

Approximate Site Location

An excerpt from *The Geologic Map of Seattle – A Progress Report*, Troost, K. G. et al., 2005

Symbol	Geologic Unit
Qvr	Recessional outwash deposits
Qvt	Vashon till
Qva	Advance outwash deposits

Not to Scale

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Geologic Map

Proposed Townhomes
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Seattle, Washington
PN: 7625704390

Appendix A

Subsurface Explorations

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D6913.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System

Proposed Townhomes
6539 44th Avenue Southwest
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Test Pit TP-1/PIT-1

Location: Southwest portion of the parcel (back yard)
Approximate Elevation: 204.5 feet (*Topographic & Boundary Survey* by Terrane)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.5	-	Topsoil
0.5	-	3.5	SM	Reddish brown gravelly silty SAND with scattered organics (loose to medium dense, moist) (Uncontrolled Fill)
3.5	-	4.5	SM	Reddish brown gravelly silty SAND (medium dense, moist) (Weathered Advance outwash)
4.5	-	6.0	SM	Brown silty SAND with some to trace gravel (medium dense, moist) (Advance Outwash)

PIT performed at 4.0 feet below ground surface (BGS).
PIT over-excavated with hand auger to final depth at 6.0 feet.
Spot mottling observed from 1.5 to 3.5 feet BGS at time of excavation.
No caving observed during excavation.
No groundwater seepage observed at the time of excavation.

Test Pit TP-2/PIT-2

Location: Southeast portion of the parcel (front yard)
Approximate Elevation: 206 feet (*Topographic & Boundary Survey* by Terrane)

Depth (ft)			Soil Type	Soil Description
0.0	-	0.5	-	Topsoil
0.5	-	3.5	SM	Brown to reddish brown gravelly silty SAND with gravel (loose to medium dense, moist) (Uncontrolled Fill)
3.5	-	6.0	ML	Reddish brown sandy SILT with some gravel (stiff, moist) (Advance outwash)

PIT performed at 4.0 feet below ground surface (BGS).
PIT over-excavated with hand auger to final depth at 6.0 feet.
Spot mottling observed from 1.5 to 3.5 feet BGS at time of excavation.
No caving observed during excavation.
No groundwater seepage observed at the time of excavation.

Logged by: CJC **Excavated on: December 20, 2023**

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Test Pit Logs

Proposed Townhomes
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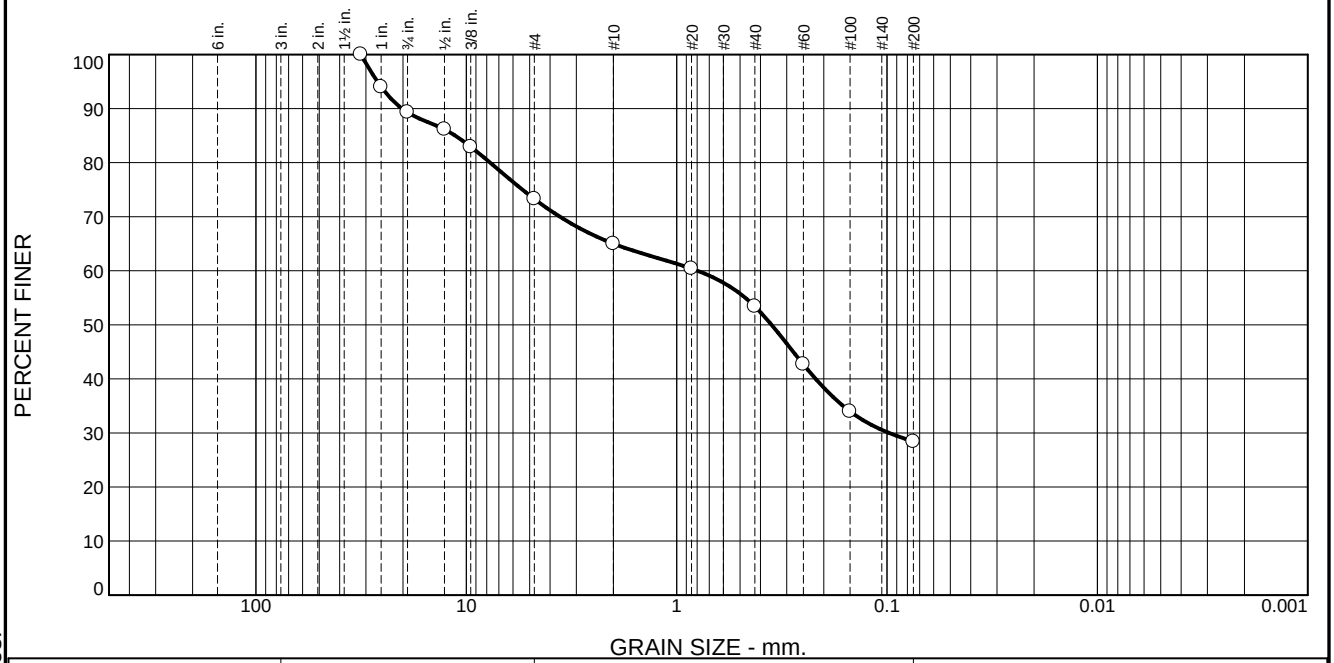
Seattle, Washington
PN: 7625704390

Appendix B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.7	16.0	8.3	11.6	25.0	28.4	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.25	100.0		
1	94.0		
.75	89.3		
.5	86.2		
0.375	82.9		
#4	73.3		
#10	65.0		
#20	60.4		
#40	53.4		
#60	42.7		
#100	34.0		
#200	28.4		

* (no specification provided)

Material Description

Silty SAND with gravel (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 20.2316 D_{85}= 11.2986 D_{60}= 0.7974
D_{50}= 0.3540 D_{30}= 0.0978 D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 23.5%

Date Received: 12/19/23 **Date Tested:** 12/22/23

Tested By: MAW

Checked By: EJF

Title: PM

Location: Pit-1, S-3 **Date Sampled:** 12/19/23
Sample Number: 104590 **Depth:** 4'

GeoResources, LLC

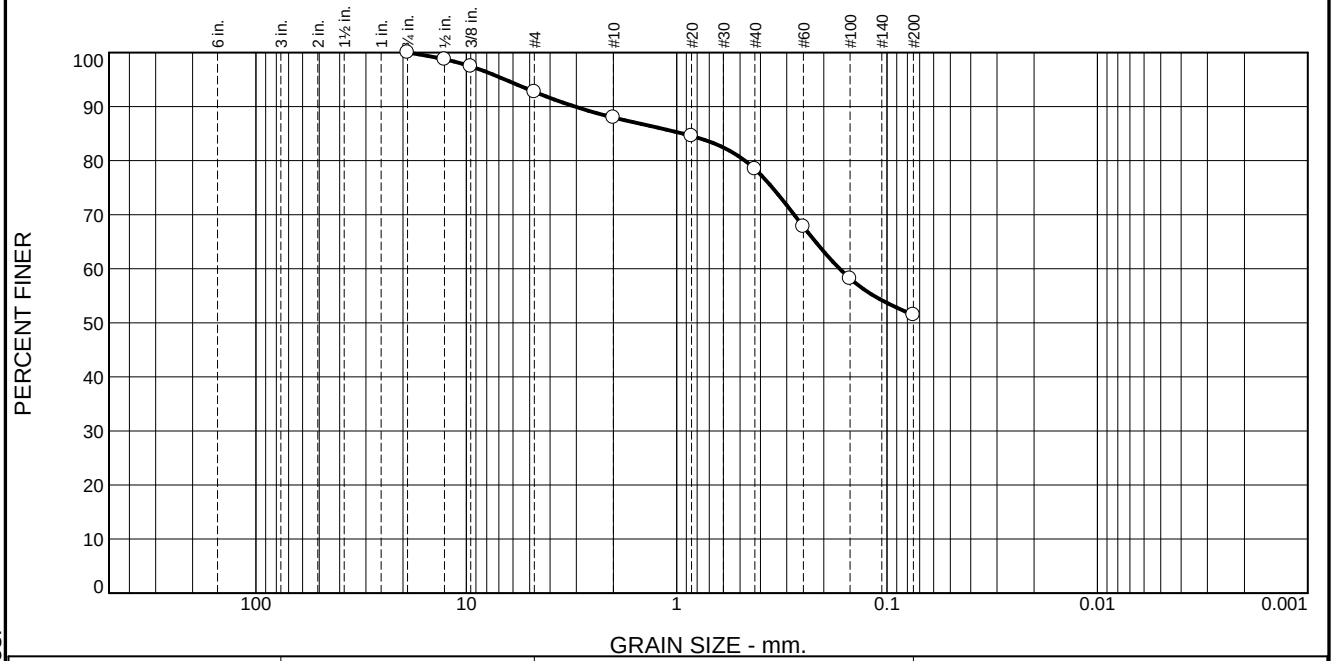
Fife, WA

Client: Dean Biddle
Project: Proposed Townhomes

Project No: Biddle.44thAveSW **Figure** B-1

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.3	4.7	9.5	27.0	51.5	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	98.7		
0.375	97.4		
#4	92.7		
#10	88.0		
#20	84.6		
#40	78.5		
#60	67.8		
#100	58.2		
#200	51.5		

* (no specification provided)

Material Description

Sandy SILT (ML)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 3.0427 D_{85}= 0.9348 D_{60}= 0.1681
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 20.8%

Date Received: 12/19/23 **Date Tested:** 12/22/23

Tested By: MAW

Checked By: EJF

Title: PM

Location: Pit-2, S-3 **Date Sampled:** 12/19/23
Sample Number: 104591 **Depth:** 4'

GeoResources, LLC

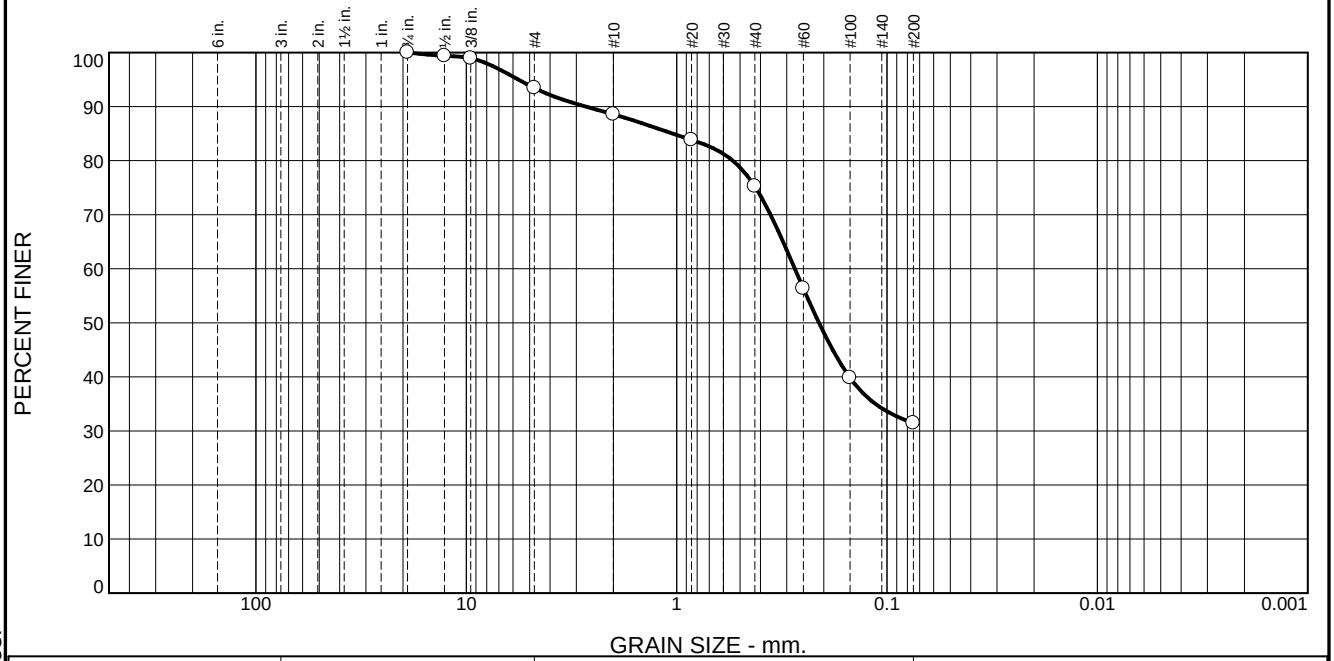
Fife, WA

Client: Dean Biddle
Project: Proposed Townhomes

Project No: Biddle.44thAveSW **Figure** B-2

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.6	4.8	13.4	43.8	31.4	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	99.4		
0.375	98.9		
#4	93.4		
#10	88.6		
#20	83.8		
#40	75.2		
#60	56.4		
#100	39.8		
#200	31.4		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 2.7051 D_{85}= 1.0435 D_{60}= 0.2745
D_{50}= 0.2108 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 18.3%

Date Received: 12/19/23 **Date Tested:** 1/9/23

Tested By: MAW

Checked By: EJF

Title: PM

Location: Pit-1 **Date Sampled:** 12/19/23
Sample Number: 104633 **Depth:** 6'

GeoResources, LLC

Fife, WA

Client: Dean Biddle
Project: Proposed Townhomes

Project No: Biddle.44thAveSW **Figure** B-3

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

Appendix C

City of Seattle Pilot Infiltration Test (PIT) Checklists

City of Seattle
Department of Construction and Inspections
Applicant Services Center
700 Fifth Ave, Suite 2000, P.O. Box 34019
Seattle, WA 98124-4019
www.seattle.gov/sdci

Phone: 206-684-8850

City of Seattle
Pilot Infiltration Test (PIT) Checklist

Call before you dig – Utility Locates 811

Project Address: 6539 44th Avenue Southwest Date: 12/20/2023

Permit Number: _____

Other Project Information: Proposed Townhomes

This Infiltration Test was performed by:

Company Name: GeoResources Primary Contact Name: Andrew E. Schnitger

Phone Number: (253) 896 - 1011 Email Address: andrews@georesources.us

☑ Include site map or drainage control plan, with test locations clearly marked.

The intent of this checklist is to provide a summary of stormwater BMP infiltration testing requirements associated with the Pilot Infiltration Test (PIT). All projects and associated plans are also subject to the minimum requirements outlined in the City of Seattle Stormwater Manual and SMC Chapters 22.800 – 22.808, as well as the specific subsurface investigation and infiltration testing requirements outlined in Volume 3, Chapter 3 and Appendix D of the 2021 City of Seattle Stormwater Manual. See also Appendix C for site constraints that preclude infiltration facility feasibility (such as site slope > 8%).

This checklist does not preclude the use of professional judgment to evaluate and manage risk associated with design, construction, and operation of infiltration BMPs. Justification for testing procedures that deviate from the minimum investigation requirements specified in Appendix D shall be documented in a stamped and signed letter from a State of Washington licensed professional (licensed professional engineer, engineering geologist, geologist, or hydrogeologist) who has experience in infiltration and groundwater testing and infiltration facility design.

Before you start call Utility Locates 811 to request locates of utilities at your site.

SMALL PILOT INFILTRATION TEST (SMALL PIT) AND LARGE PILOT INFILTRATION TEST (LARGE PIT):
Note: The test methods outlined below may be modified due to site conditions if recommended by the licensed professional and the reasoning is documented in the testing report.

1. Indicate type of test:
- ☐ Small PIT
- ☐ Large PIT

2. Date and time of tests: 12/20/2023 8:00AM

3. Is the infiltration test within the footprint of the proposed infiltration facility? (Yes / No)

4. If "no," is testing being conducted within 50 feet of the proposed infiltration facility? (Yes / No)
Explain why: Location of infiltration facility not chosen at the time of test

5. What is the total proposed impervious area (does not include permeable pavement surfaces) to be infiltrated on the site? NA _____ ft^2

(Note: acceptance testing is required if testing was performed greater than 50 feet from the proposed infiltration facility, and greater than 5,000 ft^2 infiltrated on the site [see City of Seattle Stormwater Manual, Volume 3, Section 3.2].)

6. ☑ Dig an infiltration test pit

7. Test pit excavated to bottom elevation of the proposed infiltration facility (Yes / No)
(See City of Seattle Stormwater Manual, Appendix D for additional details.)

8. Test pit surface dimensions (ft): Length: 4 _____ Width: 3 _____ Depth: 4 _____

9. Test pit bottom dimensions (ft): Length: 4 _____ Width: 3 _____

10. Test pit bottom area (ft^2): 12 _____

11. Small PIT only: Is the surface area of the test pit bottom at least 12 ft^2? (Yes / No)

12. Large PIT only: Is the surface area of the test pit bottom at least at least 32 ft^2? (Yes / No)

a. If "no," indicate why: _____

13. Large PIT only: The test pit bottom area should be as close to the bottom area of the proposed infiltration facility as is feasible.

a. Bottom area of proposed infiltration facility: _____ ft^2
b. Bottom area of test pit: _____ ft^2

14. Identify device used to measure water level in test pit:

☐ Pressure transducer (recommended for areas with slow draining soils), or
☑ Vertical rod (min 5 ft long, ½-inch increments, placed in center of pit)

15. Identify method of delivering water to the bottom of the test pit (e.g., rigid pipe with a splash plate):
rigid pipe _____

(The method of delivery must reduce erosion in the test pit that could cause clogging of the infiltration receptor)

16. **Testing Procedure:**

a. **Pre-soak period**: Add water to maintain water level at least 12 inches above the bottom of the test pit for at least 6 hours. Record the time and depth of water hourly in the table below.

Time of Measurement (hh:mm)	Depth of Water (inches)
08:00	12
09:00	12
10:00	12
11:00	12
12:00	12
13:00	12
14:00	12

b. **Steady-state period**: The steady-state data is used to establish the measured infiltration rate (see step 17)

i. Add water to the test pit at a rate that will maintain a depth of 12 inches above the bottom of the test pit for 1 full hour. During this hour, record the time, depth of water, cumulative volume, and instantaneous flow rate every 15-minutes in the table below.

ii. Calculate the infiltration rate for each 15-minute interval. First convert the flow rate to in^3/hr and the test pit bottom area (recorded in step 10) into in^2. Divide the flow rate by the bottom area and record the result in the table below.

Time of Measurement (hh:mm)	Depth of Water (inches)	Cumulative Volume (gallons)	Flow Rate (gpm)	Infiltration Rate (in/hr)
0:00	12	---	---	---
0:15	12	9.4	0.6	5
0:30	12	18.8	0.6	5
0:45	12	28.1	0.6	5
1:00	12	38.0	0.6	5

[1] gallon = 231 in^3, 1 ft^2 = 144 in^2

c. **Falling head period**: The falling head data is used to confirm the measured infiltration rate calculated from the steady- state data.

i. At the end of the steady-state period, turn off the water and immediately record the time and depth of water in the table below. Record the time and depth of water every 15-minutes for a minimum of 1 hour, or until the pit is empty. (Note: in areas with slow draining soils, a pressure transducer is recommended to improve the accuracy of change in depth readings. In addition, users are encouraged to extend the testing period and use longer intervals to improve accuracy.)

ii. Calculate the infiltration rate for each 15-minute interval (change in depth at each interval x 4) and record the results in the table below. Alternatively, users may also record the total time for fixed intervals of changes in depth, and use those values to compute the infiltration rates.

Time of Measurement (15-minute minimum intervals)	Depth of Water (inches)	Infiltration Rate (in/hr)
16:00	12.0	---
16:10	11.0	6
16.20	10.2	4.8
16.30	9.4	4.8
16.40	8.6	4.8
16.50	7.8	4.8
17:00	7.0	4.8

d. **Check for high groundwater / immediate groundwater mounding:**

1. ☑ Within 24 hours after the falling head period, excavate the bottom of the pit *(Minimum excavation depths are provided in the City of Seattle Stormwater Manual, Appendix D, Section D-2.)*
2. Is standing water or seepage visible in the excavation hole? (Yes / No)
3. If "yes," record depth: x

Note: Additional Groundwater Monitoring requirements may apply. See Table 3.1 and Table 3.2 in Volume 3, Section 3.2 of the City of Seattle Stormwater Manual.

17. Data Analysis/"Measured Infiltration Rate" Selection *(use the falling head data to confirm the measured*

infiltration rate calculated from the steady- state data):

a. Steady-state measured infiltration rate: Provide the lowest infiltration rate from steady-state table above: 5 in/hr
b. Selected "Measured Infiltration Rate" 5 in/hr
(Include an explanation if the selected rate deviates from the steady-state rate in step 16a.)

c. If the lowest measured infiltration rate is less than the minimum rate associated with an infiltration BMP, that BMP cannot be used.
d. If the measured infiltration rate is less than all minimum infiltration rates for infiltration BMPs (see Table 1 in the Reference Tables at the end of this document), no further investigation is required.

18. Calculate "Design Infiltration Rate": The design infiltration rate shall be calculated by applying the appropriate correction factor to the above measured infiltration rate (see the *City of Seattle Stormwater Manual, Appendix D, Section D-4).*

a. Select a correction factor.
b. Calculate the Design Infiltration Rate below.

☑ Design infiltration rate = 5 (Measured infiltration rate (in/hr)) x 0.2 (Correction Factor*) = 1.0 in/hr

*A Correction Factor of 0.5 must be used for all projects unless a lower value is warranted by site conditions, as recommended and documented by a licensed professional, and shall not be less than 0.2. See Appendix D, Section D-4.2.

19. Supporting Documents and Additional Analysis Required:

a. Include a report for the Small and Large PIT that includes documentation of the testing procedure (including this checklist and any supporting documentation), analysis, and results to assess infiltration feasibility, and an explanation of the correction factor used to determine the design infiltration rate. In addition, include the following information.
b. One or more of the following analysis/reports will be required. *See Table 3.1 and Table 3.2 in Volume 3, Section 3.2 of the City of Seattle Stormwater Manual.* Indicate which analysis/reports are required below and include them in the report.

- ☑ **Standard Subsurface Investigation Report** (*Appendix D, Section D-2.4)*
- ☐ **Comprehensive Subsurface Investigation Report** (*Appendix D, Section D-2.5)*
- ☐ **Groundwater Monitoring Report (***Appendix D, Section D-5)*
- ☐ **Characterization of Infiltration Receptor** (*Appendix D, Section D-6)*
- ☐ **Groundwater Mounding and Seepage Analysis** (*Appendix D, Section D-7)*

SIGNATURES ARE REQUIRED

The Small and Large PIT report shall be prepared by a licensed professional.

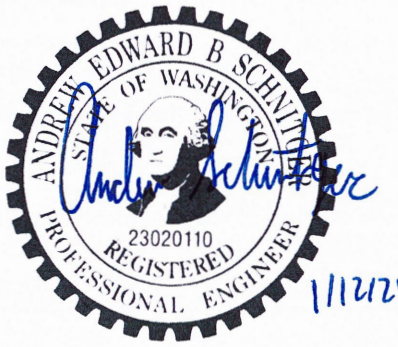
I certify that I have followed the procedures outlined in this document to determine the infiltration BMP infiltration rate.

Infiltration Test performed by:

Print Name Andrew Schnitger

Signature Andrew Schnitger Date 01/12/2024

Professional Stamp:



1/12/24

REFERENCE TABLES

Table 1. Minimum Measured Infiltration Rates (Taken from the 2021 City of Seattle Stormwater Manual, Vol. 3, Section 3.2 – Table 3.3)

Infiltration BMP	Minimum Measured Infiltration Rate for On-site List Approach (in/hr)	Minimum Allowed Measured Infiltration Rate for Meeting Flow Control, Water Quality Treatment, and On-site Performance Standards (in/hr)
Infiltration Trenches	5	5
Drywells	5	5
Infiltrating Bioretention without underdrain	0.6	0.6
Infiltrating Bioretention with underdrain	0.3	No minimum
Rain Gardens	0.3	Not applicable (only for On-site List Approach)
Permeable Pavement Facility	0.3	0.3[b]
Permeable Pavement Surface	0.3[a]	No minimum
Sidewalk/Trail Compost-Amended Strip	0.3[a]	No minimum
Perforated Stub-out Connections	0.3	Not applicable (only for On-site List Approach)
Infiltration Basins	Not applicable	0.6
Infiltration Chambers/Vaults	Not applicable	0.6

[a] Infiltration testing not required, only necessary to prove infeasibility.

[b] No minimum infiltration rate if underdrain is installed.

City of Seattle
Department of Construction and Inspections
Applicant Services Center
700 Fifth Ave, Suite 2000, P.O. Box 34019
Seattle, WA 98124-4019
www.seattle.gov/sdci

Phone: 206-684-8850

City of Seattle
Pilot Infiltration Test (PIT) Checklist

Call before you dig – Utility Locates 811

Project Address: 6539 44th Avenue Southwest Date: 12/20/2023

Permit Number: _____

Other Project Information: Proposed Townhomes

This Infiltration Test was performed by:

Company Name: GeoResources Primary Contact Name: Andrew E. Schnitger

Phone Number: (253) 896 - 1011 Email Address: andrews@georesources.us

☑ Include site map or drainage control plan, with test locations clearly marked.

The intent of this checklist is to provide a summary of stormwater BMP infiltration testing requirements associated with the Pilot Infiltration Test (PIT). All projects and associated plans are also subject to the minimum requirements outlined in the City of Seattle Stormwater Manual and SMC Chapters 22.800 – 22.808, as well as the specific subsurface investigation and infiltration testing requirements outlined in Volume 3, Chapter 3 and Appendix D of the 2021 City of Seattle Stormwater Manual. See also Appendix C for site constraints that preclude infiltration facility feasibility (such as site slope > 8%).

This checklist does not preclude the use of professional judgment to evaluate and manage risk associated with design, construction, and operation of infiltration BMPs. Justification for testing procedures that deviate from the minimum investigation requirements specified in Appendix D shall be documented in a stamped and signed letter from a State of Washington licensed professional (licensed professional engineer, engineering geologist, geologist, or hydrogeologist) who has experience in infiltration and groundwater testing and infiltration facility design.

Before you start call Utility Locates 811 to request locates of utilities at your site.

SMALL PILOT INFILTRATION TEST (SMALL PIT) AND LARGE PILOT INFILTRATION TEST (LARGE PIT):
Note: The test methods outlined below may be modified due to site conditions if recommended by the licensed professional and the reasoning is documented in the testing report.

1. Indicate type of test:
- ◉ Small PIT
- ○ Large PIT

2. Date and time of tests: 12/20/2023 8:00AM

3. Is the infiltration test within the footprint of the proposed infiltration facility? (Yes / No)

4. If "no," is testing being conducted within 50 feet of the proposed infiltration facility? (Yes / No)
Explain why: Location of infiltration facility not chosen at the time of test

5. What is the total proposed impervious area (does not include permeable pavement surfaces) to be infiltrated on the site? NA _____ ft^2

(Note: acceptance testing is required if testing was performed greater than 50 feet from the proposed infiltration facility, and greater than 5,000 ft^2 infiltrated on the site [see City of Seattle Stormwater Manual, Volume 3, Section 3.2].)

6. ☑ Dig an infiltration test pit

7. Test pit excavated to bottom elevation of the proposed infiltration facility (Yes / No)
(See City of Seattle Stormwater Manual, Appendix D for additional details.)

8. Test pit surface dimensions (ft): Length: 4 _____ Width: 3 _____ Depth: 4 _____

9. Test pit bottom dimensions (ft): Length: 4 _____ Width: 3 _____

10. Test pit bottom area (ft^2): 12 _____

11. Small PIT only: Is the surface area of the test pit bottom at least 12 ft^2? (Yes / No)

12. Large PIT only: Is the surface area of the test pit bottom at least at least 32 ft^2? (Yes / No)

a. If "no," indicate why: _____

13. Large PIT only: The test pit bottom area should be as close to the bottom area of the proposed infiltration facility as is feasible.

a. Bottom area of proposed infiltration facility: _____ ft^2
b. Bottom area of test pit: _____ ft^2

14. Identify device used to measure water level in test pit:

☐ Pressure transducer (recommended for areas with slow draining soils), or
☑ Vertical rod (min 5 ft long, ½-inch increments, placed in center of pit)

15. Identify method of delivering water to the bottom of the test pit (e.g., rigid pipe with a splash plate):
rigid pipe _____

(The method of delivery must reduce erosion in the test pit that could cause clogging of the infiltration receptor)

16. **Testing Procedure:**

a. **Pre-soak period**: Add water to maintain water level at least 12 inches above the bottom of the test pit for at least 6 hours. Record the time and depth of water hourly in the table below.

Time of Measurement (hh:mm)	Depth of Water (inches)
08:00	12
09:00	12
10:00	12
11:00	12
12:00	12
13:00	12
14:00	12

b. **Steady-state period**: The steady-state data is used to establish the measured infiltration rate (see step 17)

i. Add water to the test pit at a rate that will maintain a depth of 12 inches above the bottom of the test pit for 1 full hour. During this hour, record the time, depth of water, cumulative volume, and instantaneous flow rate every 15-minutes in the table below.

ii. Calculate the infiltration rate for each 15-minute interval. First convert the flow rate to in^3/hr and the test pit bottom area (recorded in step 10) into in^2. Divide the flow rate by the bottom area and record the result in the table below.

Time of Measurement (hh:mm)	Depth of Water (inches)	Cumulative Volume (gallons)	Flow Rate (gpm)	Infiltration Rate (in/hr)
0:00	12	---	---	---
0:15	12	3.4	0.2	1.8
0:30	12	6.9	0.2	1.8
0:45	12	10.3	0.2	1.8
1:00	12	13.8	0.2	1.8

[1] gallon = 231 in^3, 1 ft^2 = 144 in^2

c. **Falling head period**: The falling head data is used to confirm the measured infiltration rate calculated from the steady- state data.
   i. At the end of the steady-state period, turn off the water and immediately record the time and depth of water in the table below. Record the time and depth of water every 15-minutes for a minimum of 1 hour, or until the pit is empty. (Note: in areas with slow draining soils, a pressure transducer is recommended to improve the accuracy of change in depth readings. In addition, users are encouraged to extend the testing period and use longer intervals to improve accuracy.)
   ii. Calculate the infiltration rate for each 15-minute interval (change in depth at each interval x 4) and record the results in the table below. Alternatively, users may also record the total time for fixed intervals of changes in depth, and use those values to compute the infiltration rates.

Time of Measurement (15-minute minimum intervals)	Depth of Water (inches)	Infiltration Rate (in/hr)
16:00	12.0	---
16:10	11.7	1.8
16.20	11.5	1.2
16.30	11.3	1.2
16.40	11.1	1.2
16.50	10.9	1.2
17:00	10.7	1.2

d. **Check for high groundwater / immediate groundwater mounding:**
   1. ☑ Within 24 hours after the falling head period, excavate the bottom of the pit *(Minimum excavation depths are provided in the City of Seattle Stormwater Manual, Appendix D, Section D-2.)*
   2. Is standing water or seepage visible in the excavation hole? (Yes / No)
   3. If "yes," record depth: x

Note: Additional Groundwater Monitoring requirements may apply. See Table 3.1 and Table 3.2 in Volume 3, Section 3.2 of the City of Seattle Stormwater Manual.

17. Data Analysis/"Measured Infiltration Rate" Selection *(use the falling head data to confirm the measured*

infiltration rate calculated from the steady- state data):

a. Steady-state measured infiltration rate: Provide the lowest infiltration rate from steady-state table above: 1.8 in/hr

b. Selected "Measured Infiltration Rate" 1.3 in/hr
(Include an explanation if the selected rate deviates from the steady-state rate in step 16a.)
Soils in the upper 1 foot of the test have a higher infiltration rate and were infiltrating water laterally.

c. If the lowest measured infiltration rate is less than the minimum rate associated with an infiltration BMP, that BMP cannot be used.

d. If the measured infiltration rate is less than all minimum infiltration rates for infiltration BMPs (see Table 1 in the Reference Tables at the end of this document), no further investigation is required.

18. Calculate "Design Infiltration Rate": The design infiltration rate shall be calculated by applying the appropriate correction factor to the above measured infiltration rate (see the *City of Seattle Stormwater Manual, Appendix D, Section D-4).*

a. Select a correction factor.

b. Calculate the Design Infiltration Rate below.

☑ Design infiltration rate = 1.3 (Measured infiltration rate (in/hr)) x 0.2 (Correction Factor*) = 0.26 in/hr

*A Correction Factor of 0.5 must be used for all projects unless a lower value is warranted by site conditions, as recommended and documented by a licensed professional, and shall not be less than 0.2. See Appendix D, Section D-4.2.

19. Supporting Documents and Additional Analysis Required:

a. Include a report for the Small and Large PIT that includes documentation of the testing procedure (including this checklist and any supporting documentation), analysis, and results to assess infiltration feasibility, and an explanation of the correction factor used to determine the design infiltration rate. In addition, include the following information.

b. One or more of the following analysis/reports will be required. *See Table 3.1 and Table 3.2 in Volume 3, Section 3.2 of the City of Seattle Stormwater Manual.* Indicate which analysis/reports are required below and include them in the report.

- ☑ **Standard Subsurface Investigation Report** (*Appendix D, Section D-2.4)*
- ☐ **Comprehensive Subsurface Investigation Report** (*Appendix D, Section D-2.5)*
- ☐ **Groundwater Monitoring Report (***Appendix D, Section D-5)*
- ☐ **Characterization of Infiltration Receptor** (*Appendix D, Section D-6)*
- ☐ **Groundwater Mounding and Seepage Analysis** (*Appendix D, Section D-7)*

SIGNATURES ARE REQUIRED

The Small and Large PIT report shall be prepared by a licensed professional.

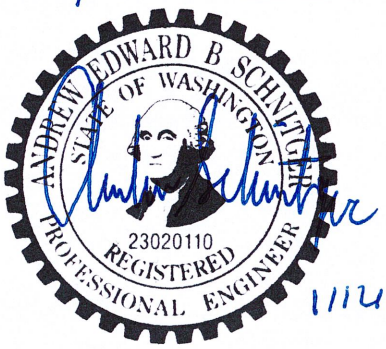
I certify that I have followed the procedures outlined in this document to determine the infiltration BMP infiltration rate.

Infiltration Test performed by:

Print Name Andrew Schnitger

Signature Andrew Schnitger Date 01/12/2024

Professional Stamp:



1/12/24

REFERENCE TABLES

Table 1. Minimum Measured Infiltration Rates (Taken from the 2021 City of Seattle Stormwater Manual, Vol. 3, Section 3.2 – Table 3.3)

Infiltration BMP	Minimum Measured Infiltration Rate for On-site List Approach (in/hr)	Minimum Allowed Measured Infiltration Rate for Meeting Flow Control, Water Quality Treatment, and On-site Performance Standards (in/hr)
Infiltration Trenches	5	5
Drywells	5	5
Infiltrating Bioretention without underdrain	0.6	0.6
Infiltrating Bioretention with underdrain	0.3	No minimum
Rain Gardens	0.3	Not applicable (only for On-site List Approach)
Permeable Pavement Facility	0.3	0.3[b]
Permeable Pavement Surface	0.3[a]	No minimum
Sidewalk/Trail Compost-Amended Strip	0.3[a]	No minimum
Perforated Stub-out Connections	0.3	Not applicable (only for On-site List Approach)
Infiltration Basins	Not applicable	0.6
Infiltration Chambers/Vaults	Not applicable	0.6

[a] Infiltration testing not required, only necessary to prove infeasibility.

[b] No minimum infiltration rate if underdrain is installed.