TECHNICAL INFORMATION REPORT

Full Drainage

FOR

TARMAC HEIGHTS APARTMENTS

16016 34th Ave. South
SeaTac, WA 98188

M. Ali Shasti-Nazem

Digitally signed by M. Ali Shasti-Nazem
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Part 1 PROJECT OWNER AND PROJECT ENGINEER

Project Owner: Kamaljit Singh

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Email: sidhucustomhomes@gmail.com

Project Engineer: Ali Shasti, P.E.

Company: PES, LLC

Phone: (425) 919 - 8592

Part 2 PROJECT LOCATION AND DESCRIPTION

Project Name: TARMAC HEIGHTS APARTMENTS

DPER Permit #

Location: Township: 27

Range: 23 N

Section: 4 E

Site Address: 16016 34th Ave. S.
SeaTac, WA 98188

Part 3 TYPE OF PERMIT APPLICATION

- ☐ Land use
- ☒ Building (multi-family)
- ☒ Clearing and Grading
- ☒ Right-of-Way Use
- ☐ Other _____

Part 4 OTHER REVIEWS AND PERMITS

- ☐ DFW HPA
- ☐ COE 404
- ☐ DOE Dam Safety
- ☐ FEMA Floodplain
- ☐ COE Wetlands
- ☐ Other _____
- ☐ Shoreline Management
- ☐ Structural Rockery/Vault/_____
- ☐ ESA Section 7

Part 5 PLAN AND REPORT INFORMATION

Technical Information Report

Type of Drainage Review (check one):

- ☒ Full
- ☐ Targeted
- ☐ Simplified
- ☐ Large Project
- ☐ Directed

Date (include revision dates): 1/1/2024

Date of Final: 1/1/2024

Site Improvement Plan (Engr. Plans)

Plan Type (check one):

- ☒ Full
- ☐ Modified
- ☐ Simplified

Date (include revision dates): 12/10/2023

Date of Final: 1/1/2024

Part 6 SWDM ADJUSTMENT APPROVALS

Type (circle one): Standard / Experimental / Blanket

Description: (include conditions in TIR Section 2)

_____

_____

_____

Approved Adjustment No. _____ Date of Approval: _____

Part 7 MONITORING REQUIREMENTS

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Monitoring Required: Yes / **No**

Start Date: _____

Completion Date: _____

Describe: _____

_____

_____

Re: KCSWDM Adjustment No. _____

Part 8 SITE COMMUNITY AND DRAINAGE BASIN

Community Plan: _____

Special District Overlays: _____

Drainage Basin: Lower Green River Basin West

Stormwater Requirements: Conservation FC Area (Level 2) and Enhanced Basic Water Quality

_____

Part 9 ONSITE AND ADJACENT SENSITIVE AREAS

❑ River/Stream	_____	❑ Steep Slope	_____
❑ Lake	_____	❑ Erosion Hazard	_____
❑ Wetlands	_____	❑ Landslide Hazard	_____
❑ Closed Depression	_____	❑ Coal Mine Hazard	_____
❑ Floodplain	_____	❑ Seismic Hazard	_____
❑ Other	_____	❑ Habitat Protection	_____
	_____	❑	_____

Part 10 SOILS

Soil Type	Slopes	Erosion Potential
Sandy Loam	0 – 10%	Moderate
Silty Sand	0 – 10%	Moderate
_____	_____	_____
_____	_____	_____

❑ High Groundwater Table (within 5 feet) ❑ Sole Source Aquifer ❑ Other _____ ❑ Seeps/Springs

❑ Additional Sheets Attached

Part 11 DRAINAGE DESIGN LIMITATIONS

REFERENCE

❑ Core 2 – Offsite Analysis_____

❑ Sensitive/Critical Areas_____

❑ SEPA_____

☒ LID Infeasibility _____

❑ Other_____

LIMITATION / SITE CONSTRAINT

_____

_____

_____

_____

_____

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

❑ Additional Sheets Attached	
Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)	
Threshold Discharge Area: (name or description)	
Core Requirements (all 8 apply):	
Discharge at Natural Location	Number of Natural Discharge Locations:
Offsite Analysis	Level: **1** / 2 / 3 dated: Nov. 20, 2023
Flow Control (include facility summary sheet)	Level: 1 / **2** / 3 or Exemption Number: See TIR Report Flow Control BMPs: See Construction Plans
Conveyance System	Spill containment located at: N/A
Erosion and Sediment Control / Construction Stormwater Pollution Prevention	CSWPP/CESCL/ESC Site Supervisor: TBD Contact Phone: _____ After Hours Phone: _____
Maintenance and Operation Responsibility (circle one):	**Private** / Public If Private, Maintenance Log Required: Yes / **No**
Financial Guarantees and Liability	Provided: **Yes** / No
Water Quality (include facility summary sheet) or	Type (circle one): Basic / Sens. Lake / **Enhanced Basic** / Bog Exemption No. _____ Landscape Management Plan: Yes / **No**
Special Requirements (as applicable):	
Area Specific Drainage Requirements	Type: CDA / SDO / MDP / BP / LMP / Shared Fac. / **None** Name: _____
Floodplain/Floodway Delineation	Type (circle one): Major / Minor / Exemption / **None** 100-year Base Flood Elevation (or range): _____ Datum:
Flood Protection Facilities	Describe: N/A

Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)	
Source Control (commercial / industrial land use)	Describe land use: Residential Describe any structural controls:

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Oil Control

High-use Site: Yes / **No**
Treatment BMP: See construction Plans
Maintenance Agreement: Yes / **No**
with whom? _____

Describe: Conveyance pipes and catch basins to be maintained by the owner.

Part 13 EROSION AND SEDIMENT CONTROL REQUIREMENTS

MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION	MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION
☒ Clearing Limits	☒ Stabilize exposed surfaces
☒ Cover Measures	☒ Remove and restore Temporary ESC Facilities
☒ Perimeter Protection	☒ Clean and remove all silt and debris, ensure operation of Permanent Facilities, restore operation of Flow Control BMP Facilities as necessary
☒ Traffic Area Stabilization	☐ Flag limits of SAO and open space preservation areas
☐ Sediment Retention	☐ Other _____
☐ Surface Water Collection	
☐ Dewatering Control	
☒ Dust Control	
☐ Flow Control	
☒ Protection of Flow Control BMP Facilities (existing and proposed)	
☒ Maintain BMPs / Manage Project	

Part 14 STORMWATER FACILITY DESCRIPTIONS (Note: Include Facility Summary and Sketch)

Flow Control	Type/Description	Water Quality	Type/Description
☐ Detention	_____	☐ Vegetated Flowpath	_____
☐ Infiltration	C_2_11_A Facility	☐ Wetpool	_____
☐ Regional Facility	_____	☐ Filtration	Oil & Sediment Collection/C.B.
☐ Shared Facility	_____	☐ Oil Control	_____
☐ Flow Control BMPs	_____	☐ Spill Control	_____
☐ Other	_____	☐ Flow Control BMPs	_____
		☐ Other	_____

Part 15 EASEMENTS/TRACTS	Part 16 STRUCTURAL ANALYSIS

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

❑ Drainage Easement ❑ Covenant ❑ Native Growth Protection Covenant ❑ Tract ❑ Other _____		❑ Cast in Place Vault ❑ Retaining Wall ❑ Rockery > 4' High ❑ Structural on Steep Slope ❑ Other _____

Part 17 SIGNATURE OF PROFESSIONAL ENGINEER

I, or a civil engineer under my supervision, have visited the site. Actual site conditions as observed were incorporated into this worksheet and the attached Technical Information Report. To the best of my knowledge the information provided here is accurate.

Signed/Date

PROJECT DESCRIPTION:

The property is located at 16016 34th Ave. S. (Parcel No. 537980-1002) in SeaTac, Washington. The site is developed with one single-family residence and access driveway to 34th Ave. S. All existing facilities are to be demolished and removed.

The project proposes to construct thirteen units of multifamily apartments. Access to the proposed building will be provided via two entrances. The north entrance will access the first-level parking lot, and the south entrance the second-level parking lot. We propose modifying the existing driveways to match the proposed building entrances to create safe driving access.

EXISTING SITE CONDITIONS:

The existing site condition is such that stormwater runoff from the southeast corner of the property (approx. contour elevation of 400 feet) sheet flows to the northwest of the property (approx. contour elevation of 380 feet). There are two existing inlets on the east side of 34th Ave. S. receives a majority of the stormwater runoff from the site.

PROPOSED SITE CONDITIONS:

The project proposes to construct thirteen units of multifamily apartments. Access to the proposed building will be provided via two entrances. The north entrance will access the first-level parking lot, and the south entrance the second-level parking lot. We propose modifying the existing driveways to match the proposed building entrances to create safe driving access.

PROJECT AREAS:

Building (First Floor)	5,006 SF (0.115 Ac)
Paved Area	982 SF (0.023 Ac)
Landscape/Grass Area	3,027 SF (0.069 Ac)
Total Project Area	9,015 SF (0.207 Ac)

PERFORMANCE STANDARDS

CORE REQUIREMENTS:

Core Requirement #1: Discharge at the Natural Location

The existing site condition is such that stormwater runoff from the southeast corner of the property (approx. contour elevation of 400 feet) sheet flows to the northwest of the property (approx. contour elevation of 380 feet). There are two existing inlets on the east side of 34th Ave. S. receives stormwater runoff from the site.

The City of SeaTac GIS map indicates the stormwater system continues north and west on S. 160th St. The King County iMap and site inspection reveals no restrictions or flooding problem ¼ mile downstream the site.

The final discharge point of the stormwater runoff will remain intact.

Core Requirement #2: Offsite Analysis

In front of the property, the two existing inlets on the east side of 34th Ave. are connected via a 12" diameter CMP. The storm sewer system is part of the system that is connected further north and turns into an 18" diameter CMP storm pipe on South 160th Street. No restrictions or flooding were observed during multiple site visits, which was confirmed by reviewing the King County iMap.

Core Requirement #3: Flow Control

The site is located within Conservation Flow Control Area with Level 2 flow control standard. The Level 2 flow control standard requires the post-development site discharge durations match the pre-development discharge rates from 50% of the 2-year peak flow up to 50-year peak flow. The Level 2 flow control standard also requires the post-development site peak discharge rates to match the pre-development discharge rates of the 2 and 10-year return period. The pre-developed conditions will be modeled as historic forests.

Per the 2021 KCSWDM (pages 1-46), this project is exempt from the requirements for flow control based on the following 0.15-cfs difference between pre and post-development 100-year peak discharge. "2. The facility requirement in Conservation Flow Control Areas is waived for any ***threshold discharge area*** in which there is **no more than a 0.15-cfs difference** (when modeled using 15 minute time steps) or **no more than a 0.1-cfs difference** (when modeled using 1 hour time steps) in the sum of developed 100-year peak flows for those target surfaces subject to this requirement and the sum of ***historic site conditions*** 100-year peak flows (modeled using same time step unit (e.g. hourly or 15 minute) used to calculate the developed flow) for the same surface areas."

See the WWHM2012 drainage software data presented in Appendix C.

Core Requirement #4: Conveyance Systems

All conveyance systems will be designed and constructed to meet or exceed the minimum requirements of this section. The conveyance systems will have sufficient capacity to handle flow from the 100-year peak storm water runoff.

Core Requirement #5: Construction Stormwater Pollution Prevention

All new development and re-developed sites are responsible to control and prevent any erosion and sediments discharging offsite. This project will create more than 2,000 SF of new or replaced impervious area and disturb more than 7,000 SF of existing land. Therefore, a Stormwater Pollution Prevention Plan (SWPP) will be required for this project. The SWPP will include narrative and construction plans for the Contractor to be able to implement an erosion and sedimentation control facilities necessary for this site.

An NPDES NOI will not be required for this project with total areas of less than 1.0 acre.

Core Requirement #6: Operations and Maintenance

The Owner will be responsible for the Operation and Maintenance of the Entire Stormwater Management Systems located on private property (easements, tracts, etc.). To ensure that the Owner will adequately operate and maintain stormwater control facilities, an Operation and Maintenance Manual is provided within this report.

Core Requirement #7: Financial Guarantees and Liability

To ensure that all stormwater management systems will perform as designed during and post-construction, the Owner will provide financial guarantees as required by the KCSWDM and the City of SeaTac. The Owner will post a 120% performance bond before permit issuance and a 10% maintenance bond after construction completion to cover a one-year warranty period.

Core Requirement #8: Water Quality Standards

The site is located in the Lower Green River Basin West drainage area, considered Enhanced Basic Water Quality treatment per the Water Quality application map adopted by the City of SeaTac. This project will create much less than 5,000 SF of not fully dispersed pollution-generating impervious surface and less than ¾ acres (32,670 SF) of pollution-generating pervious surface. Therefore, it meets the requirements of Surface Area Exemption as defined in KCSWDM Section 1.2.8. There is no need to provide formal water quality facilities for this project. However, the runoff is collected through a gravel trench, detailed in C.2.11.A, as a strategy for water quality control.

The 14 Ft. long X 2 Ft. wide infiltration trench, as indicated on construction plan sheet 4, is provided to handle roof runoff. The infiltration system will be connected to the existing storm stub-out.

Both parking areas will be connected to the infiltration system after passing runoff through an oil and sediment structure. However, very little runoff will be generated by each parking lot.

Core Requirement #9: Flow Control BMPs

Per the attached geotechnical report (Appendix A) and the City of SeaTac website, the site is not feasible for LID. However, all roof and stormwater runoff will be routed through an infiltration trench before discharging to the city storm system.

SPECIAL REQUIREMENTS:

Special Requirement #1: Other Adopted Area Specific Requirements

There are no other area specific requirements that apply to this project.

Special Requirement #2: Flood Hazard Area Delineation

There are no Flood Hazard Area Delineation requirements that apply to this project.

Special Requirement #3: Flood Protection Facilities

There are no flood protection facilities that exist on this site. In addition, there are no proposal to build flood protection facilities such as levee, revetment, etc. as a part of this project. Therefore, no analysis related to Special Requirement# 3 will be provided.

Special Requirement #4: Source Controls

This is a residential site with minimal pollutant generated runoff.

Special Requirement #5: Oil Control

Parking areas are covered and generate minimum stormwater runoff; however, an oil and sediment structure are provided for the occasional parking wash, oil drips, etc.

APPENDIX A

MAINTENANCE REQUIREMENTS FOR FLOW CONTROL, CONVEYANCE, AND WQ FACILITIES

2021 Surface Water Design Manual 7/23/2021

NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure	Sediment	Sediment exceeds 60% of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin.	Sump of catch basin contains no sediment.
	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the catch basin by more than 10%.	No Trash or debris blocking or potentially blocking entrance to catch basin.
		Trash or debris in the catch basin that exceeds $^1/_3$ the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within catch basin.
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in walls or bottom	Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that catch basin is unsound.	Catch basin is sealed and is structurally sound.
		Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than $^1/_4$ inch wide at the joint of inlet/outlet pipe.
	Settlement/ misalignment	Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the catch basin at the joint of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

NO. 5 – CATCH BASINS AND MANHOLES

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Metal Grates (Catch Basins)	Unsafe grate opening	Grate with opening wider than $^{7}/_{8}$ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris.
	Damaged or missing	Grate missing or broken member(s) of the grate. **Any open structure requires urgent maintenance**.	Grate is in place and meets design standards.
Manhole Cover/Lid	Cover/lid not in place	Cover/lid is missing or only partially in place. **Any open structure requires urgent maintenance**.	Cover/lid protects opening to structure.
	Locking mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.

NO. 6 – CONVEYANCE PIPES AND DITCHES

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Pipes	Sediment & debris accumulation	Accumulated sediment or debris that exceeds 20% of the diameter of the pipe.	Water flows freely through pipes.
	Vegetation/roots	Vegetation/roots that reduce free movement of water through pipes.	Water flows freely through pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damage to protective coating or corrosion	Protective coating is damaged; rust or corrosion is weakening the structural integrity of any part of pipe.	Pipe repaired or replaced.
	Damaged	Any dent that decreases the cross section area of pipe by more than 20% or is determined to have weakened structural integrity of the pipe.	Pipe repaired or replaced.
Ditches	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment accumulation	Accumulated sediment that exceeds 20% of the design depth.	Ditch cleaned/flushed of all sediment and debris so that it matches design.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion damage to slopes	Any erosion observed on a ditch slope.	Slopes are not eroding.
	Rock lining out of place or missing (If Applicable)	One layer or less of rock exists above native soil area 5 square feet or more, any exposed native soil.	Replace rocks to design standards.

NO. 9 – FENCING

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Erosion or holes under fence	Erosion or holes more than 4 inches high and 12-18 inches wide permitting access through an opening under a fence.	No access under the fence.
Wood Posts, Boards and Cross Members	Missing or damaged parts	Missing or broken boards, post out of plumb by more than 6 inches or cross members broken	No gaps on fence due to missing or broken boards, post plumb to within 1½ inches, cross members sound.
	Weakened by rotting or insects	Any part showing structural deterioration due to rotting or insect damage	All parts of fence are structurally sound.
	Damaged or failed post foundation	Concrete or metal attachments deteriorated or unable to support posts.	Post foundation capable of supporting posts even in strong wind.
Metal Posts, Rails and Fabric	Damaged parts	Post out of plumb more than 6 inches.	Post plumb to within 1½ inches.
		Top rails bent more than 6 inches.	Top rail free of bends greater than 1 inch.
		Any part of fence (including post, top rails, and fabric) more than 1 foot out of design alignment.	Fence is aligned and meets design standards.
		Missing or loose tension wire.	Tension wire in place and holding fabric.
	Deteriorated paint or protective coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.	Structurally adequate posts or parts with a uniform protective coating.
	Openings in fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	Fabric mesh openings within 50% of grid size.

NO. 11 – GROUNDS (LANDSCAPING)

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash or litter	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Trees and Shrubs	Hazard	Any tree or limb of a tree identified as having a potential to fall and cause property damage or threaten human life. **A hazard tree identified by a qualified arborist must be removed as soon as possible.**	No hazard trees in facility.
	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	No blown down vegetation or knocked over vegetation. Trees or shrubs free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; dead or diseased trees removed.

NO. 24 – CATCH BASIN INSERT

Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Media Insert	Visible Oil	Visible oil sheen passing through media	Media inset replaced.
	Insert does not fit catch basin properly	Flow gets into catch basin without going through media.	All flow goes through media.
	Filter media plugged	Filter media plugged.	Flow through filter media is normal.
	Oil absorbent media saturated	Media oil saturated.	Oil absorbent media replaced.
	Water saturated	Catch basin insert is saturated with water, which no longer has the capacity to absorb.	Insert replaced.
	Service life exceeded	Regular interval replacement due to typical average life of media insert product, typically one month.	Media replaced at manufacturer's recommended interval.
	Seasonal maintenance	When storms occur and during the wet season.	Remove, clean and replace or install new insert after major storms, monthly during the wet season or at manufacturer's recommended interval.

APPENDIX B
GEOTECHNICAL/SOIL REPORT

Bruce S. MacVeigh, P.E.
Civil Engineer/Small Site Geotechnical
14245 59th Ave. S.
Tukwila, WA 98168
Cell: 206-571-8794

May 22, 2023

Subject: GEOTECHNICAL REPORT, Existing Parcel, 16016 34th Avenue S., SeaTac, WA 98188 (PN: 537980-1002) (Client: Kamal Singh)

General:

The purpose of this report is to evaluate the soils on the above property for general construction considerations, for storm drainage infiltration, for stability of existing slopes on the site and for erosion characteristics. While this office is providing general geotechnical information, the formal engineering design work for future development will be by others.

The proposed development will remove the older home and replace it with a 13-unit apartment building. Note that parking may be on the ground floor. The proposed single building will be located more or less at code setback lines. The design intent is to comply with all current Zoning Code and Building Code requirements.

The existing site has an area of 9,015 square feet or 0.21 acres and has an existing older residence constructed in 1940. This evaluation provides guidance for possible future development of the site.

The site is located on the east side of the 160XX block of 34th Avenue S. in SeaTac, Washington.

Site Condition:

The existing older residence is in a well-worn condition. The yard area is typically old mowed lawn with a light scattering of minor perimeter trees. There is an existing driveway into the site. All will be removed and replaced with the new development.

A current condition of the site is to be noted. The entire fronting section of 34th Avenue S. is at this time going through a complete right-of-way upgrade. Included with this upgrade are the installation of curbs and gutters, sidewalks, landscape strips, and street utilities. The upgrade will specifically install new street culvert and catch basin system along the site frontage matched to the new road width and configuration.

As part of this construction work, two aspects are noted. First, as mentioned, is the new fronting street storm system. Secondly, the site owner has assisted in the road construction by allowing the contractor to use the south portion of the site as an equipment and materials storage site. That portion is leveled with bare surface. *While accessible for soil logs, it was encumbered with construction materials.*

The site topography is a general downslope to the north and west. This matches the street and neighboring properties. The downslope varies from about 4 percent to about 8 percent. The site frontage matches the fronting street slope along its west line.

See attached IMap topographic map and surveyed Topographic Map.

Soils on site are a deep coarse sand, reference soil log information below. They would be generally suitable for on-site stormwater infiltration. However, based on the proposed relatively dense site use, areas for infiltration trenches or drywells, with setbacks, make these management methods infeasible. Noted is that there is the newly installed storm drainage system in the adjacent public streets.

Based on the significant overall slopes to the site's topography, significant earthwork would likely be required to for future development of the site.

Site Geology Information - Topographic Data:

Referenced is the topographic information from the King County IMap site. Also, a formal field topographic survey was available. See attached IMap topographic map and surveyed Topographic Map (reduced extract for reference).

Site Geology Information - Subsurface Data:

The source of information to evaluate subsurface soils was a set of three soil logs prepared on May 3, 2023. They were located in several available locations on the site. The log information may be considered as applying to all areas of the site. The soil log locations are shown on the attached IMap topographic map. See Soil Logs, attached.

A deep coarse sand was found uniformly to depths of 48-inches to 84-inches (the limits of log excavations). No deeper clay-based hardpan was encountered. All soils were dense and undisturbed.

No groundwater indicators were encountered.

The encountered soils are a permeable coarse sand. No underlying clay-based layer was encountered. This is typical of the varying pattern of soil deposition common in upper hilly locations along the east side of Puget Sound.

A typical expected soil would be an Alderwood Association type with an upper permeable layer, underlain with a clay-based layer. In this case, a reference to the King County Soil Survey (1973) shows the soils at the site are rated as Ardents/Alderwood Association 6% to 15% (AmC). Reference the encountered soils, the Survey description of the expected soils for this "mixed" association indicated that pockets of sand soil may be expected. As such, the referenced and encountered soils are reconciled.

(Note the attached extracts and soil mapping from the 1973 Survey cut off slightly to the east of the site. The area of the site lies in the Seattle Soil Survey which was not available for this report. This office has been involved in many similar site evaluations in this area and feel the reference to the Ardents/Alderwood Association 6% to 15% (AmC) is reasonably valid for this site. In any case, it is the actual encountered soils which provide the important information needed for this report.)

The encountered deep permeable coarse sands indicates on-site infiltration of stormwater is theoretically feasible for the site.

Site Geology Information - Site History:

The site reflects the general north-south glacier carving of Puget Sound region macro-topography evident in Puget Sound, the Duwamish Valley, the Kent Valley, Lake Washington, etc. The Alderwood Association, of which this appears to consist, is based on the general shaping of previous soils by glacier to create the valley forms, with bordering upland areas. This site would be in an upland area, and has likely encountered more than one glacial compaction event, with subsequent depositional outwash. The specifics of any site in the upland area required site-specific evaluation.

The developed and terraced site topography observed during site visit indicates no evidence of catastrophic slope failure. Indeed, slope failure would not be likely with the moderate slopes and highly permeable soils. The coarse sand soils cannot become saturated. No areas of obvious surface erosion or tell-tale exposed surface soils were observed.

Site Geology Information - Seismic Hazard:

Seismic hazards for slopes may be comprised of either general soil saturation or classic seismic liquefaction. With general saturation, failure occurs in either a direct diagonal slippage (shear failure) or at a saturated layer of loose silts which semi-liquefy and "pour" out of their original location in the hillside. The soils of this area do not appear susceptible to this mode of failure due to the well-drained coarse sands. They cannot have a deep surcharged saturation.

While the above cause of hillside failure is not limited to seismic movement, a seismic event could possibly trigger a failure which would not otherwise have occurred, however this is unlikely due to the site not having possible saturated soils. As noted above, there is no indication of this mode of failure occurring previously on this site or in the surrounding area. Based on the above, the possibility of hillside failure by this mode of seismic failure is low to non-existent.

The second mode of failure is caused by a water saturation of a uniformly graded larger grained non-cohesive soil, which in this condition is subject to seismic movement. For this site, the possibility of the coarse sands becoming saturated due to the sloping topography makes this condition impossible. The coarse sands are free draining, with significant slope. These conditions prevent saturation of the sand layer. While the coarse uniform sands are of the type allowing this type of movement, the above noted inability to become saturated prevents this mode of failure from occurring for this site. The possibility of seismic liquefaction failure for this site is negligible.

Based on the soils underlying future construction locations for the site, including residential and road construction, the potential for seismic liquefaction settlement is negligible. No special mitigation measures are recommended for construction on this site to mitigate seismic liquefaction.

Geotechnical Engineering Information - Slope Stability Studies and Opinions of Slope Stability:

No previous slope stability studies are known to have been prepared for this site.

As noted above, the site has soil and topography which makes the possibility of catastrophic failure negligible.

Reference slope stability, it is the opinion of this office, based on considerations discussed above, that the existing site is geologically stable for general future development.

Geotechnical Engineering Information - Proposed Angles of Cut and Fill Slopes and Site Grading Requirements:

Significant earthwork may be required for future foundation preparation and for utility trenching. The following are provided for general information.

It is recommended that the footing bases for new buildings be placed at or below a 2:1 slope from any adjacent steep downhill slopes created or encountered.

During temporary excavations for basements and foundations, a vertical cut face is acceptable. For deeper excavations, with potential cuts up to eight or ten feet in depth, it is recommended that cuts be backsloped at 1:1 or flatter at depths of more than four feet, per standard practice. Cuts of that depth are may be required for future site development.

Long term permanent cuts and fills involving native soils should be at a maximum of 2:1 unless otherwise approved by a licensed engineer familiar with the site. Permanent steep slopes may require designed yard retaining walls and/or basement walls as an alternate. Site grading should follow standard practice as regards erosion control, stockpiling of soils, and minimizing the areas to be cleared and disturbed to that necessary for approved construction.

Significant structural fill may be required for the future development. Should it be required, the following guidelines should be followed. Cut horizontal steps into the slope (for fills over 3 feet total), place non-clay materials in maximum 6" lifts, and mechanically compact to 95 percent. Note that for non-structural fill in yard areas, the 6" lifts and mechanical compaction may be omitted, although some settling will occur over time. Re-vegetation of finished slope areas should follow good landscaping practice.

Exposed coarse site sands or possible deeper clay-based soils will require soil amendment to establish new lawns and yard landscape areas.

Geotechnical Engineering Information - Structural Foundation Requirements and Estimated Foundation Settlement:

While a foundation bearing pressure of 2,000 PSF is likely suitable for undisturbed soils for this site, a soil bearing pressure of 1,500 PSF is recommended. All foundations should be placed on undisturbed soils a minimum of 18" below finished grade. All foundations should be placed at a 2:1 backslope or farther from the toe of any slope. Areas found to have unengineered old fill during construction should be evaluated prior to placement of foundations or roads/driveways in those areas.

Based on observed soils, a lateral resistance factor of 0.40 for lateral loading may be safely used for design of structural retaining walls and, where used, basement walls. Note that the basement floors, if any, will be cast concrete and will provide additional long term lateral resistance to movement of the walls and their footings. It is *recommended that the inside of the basement wall footings be backfilled against* prior to exterior backfilling as a good general construction practice. This backfilling may be omitted in shallow crawl space foundations.

Based on experience with similar soils used for wood frame residential construction, a settlement of less that 1/4 inch would be expected within a 50 foot length of foundation.

It should be noted that during the site visit by this office, the foundation for the existing house on the site showed little or no settlement (but also noting the building is a relatively light wood frame structure).

Geotechnical Engineering Information - Soil Compaction Criteria:

On-site selected coarse sands on site are suitable for deep structural fill. Compaction in foundation and vehicular traffic areas for all acceptable soils should be to 95%, *uniformly and mechanically compacted. The need for structural backfill* for this site, except in utility trenching, is minimal. As indicated above, backfilling of minor trenches with site coarse sands is acceptable, provided it is mechanically compacted in 6-inch lifts, and that it is done in only damp or dry weather. On-site clay-based soils, if encountered, are not suitable for any type of structural fill. Fill in yard areas is acceptable. Questions relating to the adequacy of compacted material should be evaluated by a licensed engineer inspection on site.

Geotechnical Engineering Information - Proposed Surface and Subsurface Drainage:

Drainage Requirements for Future Development:

Per current City of SeaTac guidance, runoff from new developed properties may be collected and routed to an existing public drainage system. Required is that the system exists and that positive gravity flow may reach the system.

The timing of this site development is fortuitous in that it allows confirmed locations of new street catch basins to be placed for future site drainage connection.

Projected Drainage for Future Development:

It is proposed that all collected runoff from new site impervious areas be directed to the new street system. As part of street drainage construction, a 6-inch (min.) drainage stubs from the new street system have been (or will be) led into the site. (This will avoid future cuts into the new sidewalk.) Layout and specifics per City street construction plans.

Details of the future on-site drainage design will be determined at time of Site Drainage Design by others.

Note that discussion reference water quality measures will be made under the site Drainage Design evaluation, in conjunction with site drainage plan preparation.

All foundations and cast concrete retaining walls should be protected by piped footing drains which lead to the site drainage system.

Geotechnical Engineering Information - Proposed Use of On Site Sewage System(s)

This site is served by public sewer and does not require the use of OSS systems (drainfields).

Geotechnical Engineering Information - Lateral Earth Pressures:

Due to the dense nature of the in-place soils, an active design lateral pressure for retaining walls of 35 PCF is suitable, with an at rest (passive) lateral pressure for foundation walls of 45 PCF recommended. All walls over 4 feet in total height must be designed by a licensed engineer and use the 1.5 safety factor per accepted practice. All walls with either a soil or vehicular traffic surcharge will require consideration of the surcharge, to be determined as part of the specific wall design.

Geotechnical Engineering Information - Vulnerability of Site to Erosion:

Undisturbed bare coarse sand soils on site are subject to surface erosion. Disturbed soils are subject to significant erosion. Disturbed soils on or near slope areas (including site soil stockpiles) are subject to heavy erosion. For the above reasons the exposure of disturbed soils on or near the slope areas (including soil stockpiles) should be protected with straw or tarping if left exposed for more than one week during the wet season.

All disturbed areas must have properly installed silt fencing on their downhill side. A standard stabilized rock construction entrance will be used on site to prevent mud and silt from the site entering the street drainage system.

With the use of erosion control measures, as mentioned above, the proposed construction should be able to take place without significant erosion to the site, or the transporting of silts off site.

Geotechnical Engineering Information - Suitability of On-Site Soils for Use as Fill:

The native coarse sands on site are suitable for structural fill if placed in six inch lifts which are mechanically compacted. The soil condition must be damp or dry, not wet or saturated.

Possible deeper on-site clay-based soils are not suitable for any type of structural fill. Fill in yard areas is acceptable. Questions relating to the adequacy of compacted material should be evaluated by a licensed engineer inspection on site.

Geotechnical Engineering Information - Laboratory Data and Soil Index Properties:

Field testing was done of soil samples encountered. Used were both wet and dry techniques. The site soils were found to be very coarse relatively clean sands. No deeper underlying clay-based soils were encountered.

Formal laboratory testing of soil samples was not deemed necessary for the evaluation of site soils for this site and type of construction.

Geotechnical Engineering Information - Building Limitations:

General future site construction may take place during wet weather provided the above specified erosion control measures are strictly employed. Arbitrary wet weather restrictions based on specific dates for this site and its development are not recommended.

Providing the above recommendations and construction criteria are adhered to in the design and placement of the residential structure and related site work, no site related building limitations are recommended for these sites.

No dewatering procedures are foreseen for future site development.

Summary:

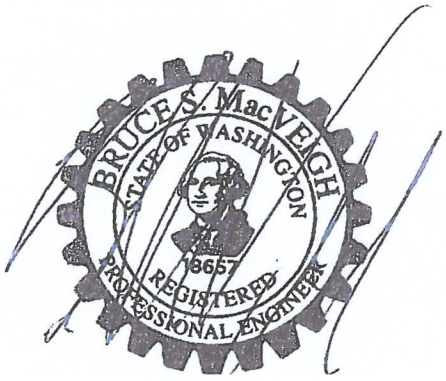
The site is suitable for conventional general development construction. Drainage of impervious surfaces, including roof and pavement areas, cannot use on-site *infiltration due to site area and setback limitations.*

Collected site runoff should be routed to the newly installed street system, which has stub tie-in especially provided for possible future drainage requirements for this site.

Questions relating to this report and to site related problems which may arise during construction of the new residences may be directed to this office.

B S MacVeigh, P.E.

Bruce S. MacVeigh, P.E.
Civil Engineer - #18657



kamal34thavesfullgeotech/2324

Site Soils: *(Provided for general information. Infiltration on site likely not proposed.)*

Three soil logs were prepared on the site on May 3, 2023. The logs are:

SL-1 *(At road construction cut)*
0 – 48"+ **SANDY LOAM**
NO GROUNDWATER INDICATORS

SL-2
0 – 36" **SILTY SAND**
36" – 84"+ **COARSE SAND** (PRETTY CLEAN)
NO GROUNDWATER INDICATORS

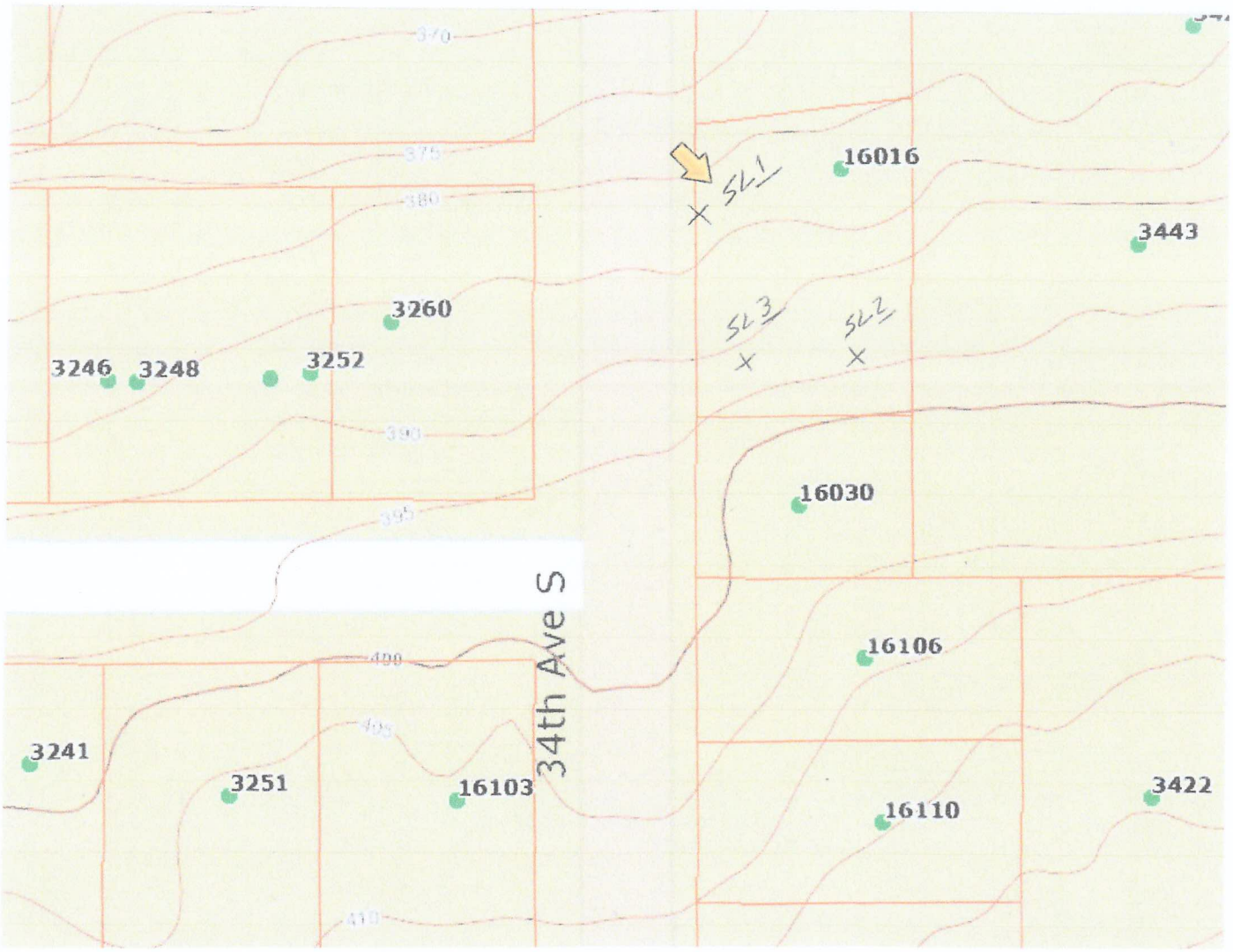
SL-3
0 – 36" **SILTY SAND**
36" – 84"+ **COARSE SAND** (PRETTY CLEAN)
NO GROUNDWATER INDICATORS

SOIL LOG 2 PHOTOGRAPH

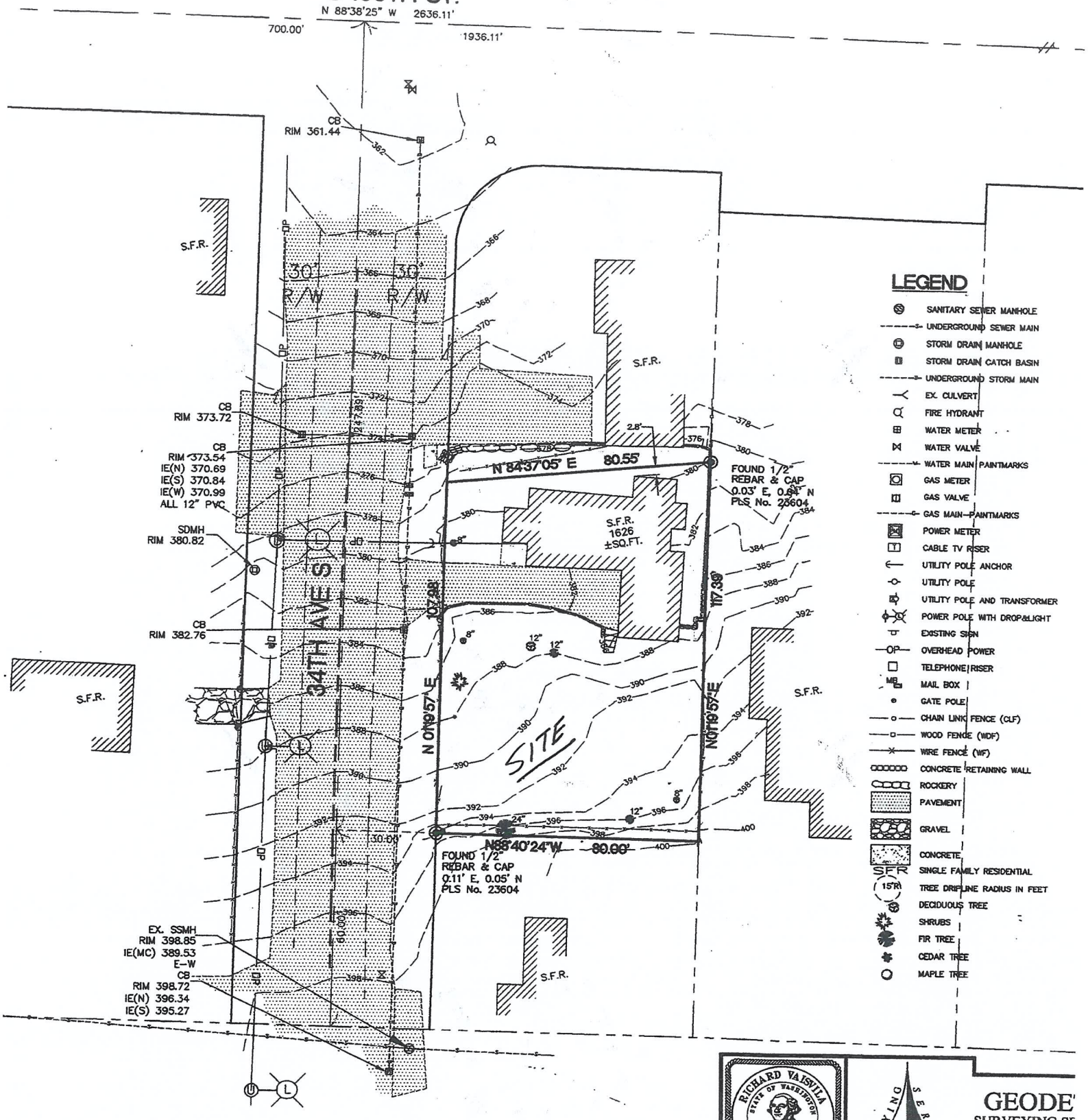
SOILS AT OTHER LOGS SIMILAR


International Blvd
99
S 160th St
S 161st St
34th Ave S
32nd Ave S


3249
16006
3428
16016
3443
3260
3246
3248
3252
16030
16106
3241
3251
16103
16110
3422


370
375
380
390
395
400
405
410
SL1
SL3
SL2
16016
3443
3260
3246
3248
3252
16030
16106
34th Ave S
3241
3251
16103
16110
3422

OF A PORTION OF
THE NW 1/4 OF THE NW 1/4 OF SEC. 27, T-23 N, R-4 E,
CITY OF SEATAC
WILLAMETTE MERIDIAN, KING COUNTY, WASHINGTON



LEGEND

- SANITARY SEWER MANHOLE
- UNDERGROUND SEWER MAIN
- STORM DRAIN MANHOLE
- STORM DRAIN CATCH BASIN
- UNDERGROUND STORM MAIN
- EX. CULVERT
- FIRE HYDRANT
- WATER METER
- WATER VALVE
- WATER MAIN PAINTMARKS
- GAS METER
- GAS VALVE
- GAS MAIN—PAINTMARKS
- POWER METER
- CABLE TV RISER
- UTILITY POLE ANCHOR
- UTILITY POLE
- UTILITY POLE AND TRANSFORMER
- POWER POLE WITH DROP&LIGHT
- EXISTING SIGN
- OP— OVERHEAD POWER
- TELEPHONE RISER
- MB MAIL BOX
- GATE POLE
- CHAIN LINK FENCE (CLF)
- WOOD FENCE (WDF)
- WIRE FENCE (WF)
- CONCRETE RETAINING WALL
- ROCKERY
- PAVEMENT
- GRAVEL
- CONCRETE
- SFR SINGLE FAMILY RESIDENTIAL
- 15'R TREE DRIPLINE RADIUS IN FEET
- DECIDUOUS TREE
- SHRUBS
- FIR TREE
- CEDAR TREE
- MAPLE TREE

RICHARD VAISVILLA
STATE OF WASHINGTON
39570
REGISTERED
PROFESSIONAL LAND SURVEYOR

SURVEYING SERVICE
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43.5/40 1.09/G

Extract

King County Soil Survey

1973

SOIL SURVEY

King County Area
Washington

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
in cooperation with
WASHINGTON AGRICULTURAL EXPERIMENT STATION
Issued November 1973

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, indicates the class of slope. Symbols without a slope letter are those of nearly level soils.

SYMBOL	NAME
AgB	Alderwood gravelly sandy loam, 0 to 6 percent slopes
AgC	Alderwood gravelly sandy loam, 6 to 15 percent slopes
AgD	Alderwood gravelly sandy loam, 15 to 30 percent slopes
AkF	Alderwood and Kitsap soils, very steep
AmB	Arents, Alderwood material, 0 to 6 percent slopes *
AmC	Arents, Alderwood material, 6 to 15 percent slopes *
An	Arents, Everett material *
BeC	Beausite gravelly sandy loam, 6 to 15 percent slopes
BeD	Beausite gravelly sandy loam, 15 to 30 percent slopes
BeF	Beausite gravelly sandy loam, 40 to 75 percent slopes
Bh	Bellingham silt loam
Br	Briscot silt loam
Bu	Buckley silt loam
Cb	Coastal Beaches
Ea	Earlmont silt loam
Ed	Edgewick fine sandy loam
EvB	Everett gravelly sandy loam, 0 to 5 percent slopes
EvC	Everett gravelly sandy loam, 5 to 15 percent slopes
EvD	Everett gravelly sandy loam, 15 to 30 percent slopes
EwC	Everett-Alderwood gravelly sandy loams, 6 to 15 percent slopes
InA	Indianola loamy fine sand, 0 to 4 percent slopes
InC	Indianola loamy fine sand, 4 to 15 percent slopes
InD	Indianola loamy fine sand, 15 to 30 percent slopes
KpB	Kitsap silt loam, 2 to 8 percent slopes
KpC	Kitsap silt loam, 8 to 15 percent slopes
KpD	Kitsap silt loam, 15 to 30 percent slopes
KsC	Klaus gravelly loamy sand, 6 to 15 percent slopes
Ma	Mixed alluvial land
NeC	Neilton very gravelly loamy sand, 2 to 15 percent slopes
Ng	Newberg silt loam
Nk	Nooksack silt loam
No	Norma sandy loam
Or	Orcas peat
Os	Oridia silt loam
OvC	Ovall gravelly loam, 0 to 15 percent slopes
OvD	Ovall gravelly loam, 15 to 25 percent slopes
OvF	Ovall gravelly loam, 40 to 75 percent slopes
Pc	Pilchuck loamy fine sand
Pk	Pilchuck fine sandy loam
Pu	Puget silty clay loam
Py	Puyallup fine sandy loam
RaC	Ragnar fine sandy loam, 6 to 15 percent slopes
RaD	Ragnar fine sandy loam, 15 to 25 percent slopes
RdC	Ragnar-Indianola association, sloping *
RdE	Ragnar-Indianola association, moderately steep *
Re	Renton silt loam
Rh	Riverwash
Sa	Salal silt loam
Sh	Sammamish silt loam
Sk	Seattle muck
Sm	Shalcar muck
Sn	Si silt loam
So	Snohomish silt loam
Sr	Snohomish silt loam, thick surface variant
Su	Sultan silt loam
Tu	Tukwila muck
Ur	Urban land
Wo	Woodinville silt loam

* The composition of these units is more variable than that of the others in the area, but it has been controlled well enough to interpret for the expected use of the soils.

Permeability is moderately rapid in the surface layer and subsoil and very slow in the substratum. Roots penetrate easily to the consolidated substratum where they tend to mat on the surface. Some roots enter the substratum through cracks. Water moves on top of the substratum in winter. Available water capacity is low. Runoff is slow to medium, and the hazard of erosion is moderate.

This soil is used for timber, pasture, berries, and row crops, and for urban development. Capability unit IVe-2; woodland group 3d1.

Alderwood gravelly sandy loam, 0 to 6 percent slopes (AgB).--This soil is nearly level and undulating. It is similar to Alderwood gravelly sandy loam, 6 to 15 percent slopes, but in places its surface layer is 2 to 3 inches thicker. Areas are irregular in shape and range from 10 acres to slightly more than 600 acres in size.

Some areas are as much as 15 percent included Norma, Bellingham, Tukwila, and Shalcar soils, all of which are poorly drained; and some areas in the vicinity of Enumclaw are as much as 10 percent Buckley soils.

Runoff is slow, and the erosion hazard is slight.

This Alderwood soil is used for timber, pasture, berries, and row crops, and for urban development. Capability unit IVe-2; woodland group 3d2.

Alderwood gravelly sandy loam, 15 to 30 percent slopes (AgD).--Depth to the substratum in this soil varies within short distances, but is commonly about 40 inches. Areas are elongated and range from 7 to about 250 acres in size.

Soils included with this soil in mapping make up no more than 30 percent of the total acreage. Some areas are up to 25 percent Everett soils that have slopes of 15 to 30 percent, and some areas are up to 2 percent Bellingham, Norma, and Seattle soils, which are in depressions. Some areas, especially on Squak Mountain, in Newcastle Hills, and north of Tiger Mountain, are 25 percent Beausite and Ovall soils. Beausite soils are underlain by sandstone, and Ovall soils by andesite.

Runoff is medium, and the erosion hazard is severe. The slippage potential is moderate.

This Alderwood soil is used mostly for timber. Some areas on the lower parts of slopes are used for pasture. Capability unit VIe-2; woodland group 3d1.

Alderwood and Kitsap soils, very steep (AkF).--This mapping unit is about 50 percent Alderwood gravelly sandy loam and 25 percent Kitsap silt loam. Slopes are 25 to 70 percent. Distribution of the soils varies greatly within short distances.

About 15 percent of some mapped areas is an included, unnamed, very deep, moderately coarse textured soil; and about 10 percent of some areas is a very deep, coarse-textured Indianola soil.

Drainage and permeability vary. Runoff is rapid to very rapid, and the erosion hazard is severe to very severe. The slippage potential is severe.

These soils are used for timber. Capability unit VIIe-1; woodland group 2d1.

Arents, Alderwood Material

Arents, Alderwood material consists of Alderwood soils that have been so disturbed through urbanization that they no longer can be classified with the Alderwood series. These soils, however, have many similar features. The upper part of the soil, to a depth of 20 to 40 inches, is brown to dark-brown gravelly sandy loam. Below this is a grayish-brown, consolidated and impervious substratum. Slopes generally range from 0 to 15 percent.

These soils are used for urban development.

Arents, Alderwood material, 0 to 6 percent slopes (AmB).--In many areas this soil is level, as a result of shaping during construction for urban facilities. Areas are rectangular in shape and range from 5 acres to about 400 acres in size.

Representative profile of Arents, Alderwood material, 0 to 6 percent slopes, in an urban area, 1,300 feet west and 350 feet south of the northeast corner of sec. 23, T. 25 N., R. 5 E.:

0 to 26 inches, dark-brown (10YR 4/3) gravelly sandy loam, pale brown (10YR 6/3) dry; massive; slightly hard, very friable, non-sticky, nonplastic; many roots; medium acid; abrupt, smooth boundary. 23 to 29 inches thick.

26 to 60 inches, grayish-brown (2.5Y 5/2) weakly consolidated to strongly consolidated glacial till, light brownish gray (2.5Y 6/2) dry; common, medium, prominent mottles of yellowish brown (10YR 5/6) moist; massive; no roots; medium acid. Many feet thick.

The upper, very friable part of the soil extends to a depth of 20 to 40 inches and ranges from dark grayish brown to dark yellowish brown.

Some areas are up to 30 percent included soils that are similar to this soil material, but either shallower or deeper over the compact substratum; and some areas are 5 to 10 percent very gravelly Everett soils and sandy Indianola soils.

This Arents, Alderwood soil is moderately well drained. Permeability in the upper, disturbed soil material is moderately rapid to moderately slow, depending on its compaction during construction. The substratum is very slowly permeable. Roots penetrate to and tend to mat on the surface of the consolidated substratum. Some roots enter the substratum through cracks. Water moves on top of the substratum in winter. Available water capacity is low. Runoff is slow, and the erosion hazard is slight.

This soil is used for urban development. Capability unit IVe-2; woodland group 3d2.

Arents, Alderwood material, 6 to 15 percent slopes (AmC).--This soil has convex slopes. Areas are rectangular in shape and range from 10 acres to about 450 acres in size.

Some areas are up to 30 percent included soils that are similar to this soil material, but either shallower or deeper over the compact substratum; and some areas are 5 to 10 percent very gravelly Everett soils and sandy Indianola soils.

Runoff is medium, and the erosion hazard is moderate to severe.

This soil is used for urban development. Capability unit IVe-2; woodland group 3d2.

Arents, Everett material (An).--This is a level to gently sloping, dark-brown gravelly or very gravelly sandy loam. It is very similar to Everett gravelly sandy loam (see Everett series), but it has been disturbed and altered through urban development. Multicolored very gravelly coarse sand is at a depth of 8 to 40 inches. Areas are commonly rectangular in shape, and range from 1 to 120 acres in size.

Representative profile of Arents, Everett material, in a homesite, 440 feet west and 100 feet north of the center of sec. 11, T. 24 N., R. 6 E.:

0 to 8 inches, dark-brown (7.5YR 3/4) gravelly sandy loam, brown (7.5YR 5/4) dry; massive; soft, very friable, nonsticky, nonplastic; few roots; 30 percent gravel content; slightly acid; clear, smooth boundary. 8 to 14 inches thick.

8 to 60 inches, grayish-brown and light olive-brown (2.5Y 5/2 and 5/4) very gravelly coarse sand, light gray and light yellowish brown (2.5Y 7/2 and 6/4) dry; single grain; loose, nonsticky, nonplastic; few roots; 55 percent gravel and 10 percent cobblestone content; medium acid.

The upper part of the soil ranges from dark brown to olive brown and from gravelly sandy loam to very gravelly loamy sand. The substratum ranges from black to olive brown.

This soil is somewhat excessively drained. The effective rooting depth is 60 inches or more. Permeability is rapid, and available water capacity is low. Runoff is slow, and the erosion hazard is slight.

This soil is used for urban development. Capability unit IVs-1; woodland group 3f3.

Beausite Series

The Beausite series is made up of well-drained soils that are underlain by sandstone at a depth of 20 to 40 inches. These soils formed in glacial deposits. They are rolling to very steep. Slopes are 6 to 75 percent. The vegetation is alder, fir, cedar, and associated brush and shrubs. The annual precipitation is 40 to 60 inches, and the mean annual temperature is about 50° F. The frost-free season ranges from 160 to 190 days. Elevation is 600 to 2,000 feet.

In a representative profile, the surface layer and the upper part of the subsoil are dark-brown to dark yellowish-brown gravelly sandy loam that extends to a depth of about 19 inches. The lower part of the subsoil is olive-brown very gravelly sandy loam. Fractured sandstone is at a depth of about 38 inches.

Beausite soils are used for timber and pasture. Some areas have been used for urban development.

Beausite gravelly sandy loam, 6 to 15 percent slopes (BeC).--Areas of this soil are 20 acres or more in size. Slopes are long and convex.

Representative profile of Beausite gravelly sandy loam, 6 to 15 percent slopes, in woodland, 570 feet south and 800 feet east of the northwest corner of sec. 29, T. 24 N., R. 6 E.:

01--2 inches to 1/2 inch, undecomposed leaf litter.

02--1/2 inch to 0, black (10YR 2/1) decomposed leaf litter.

A1--0 to 6 inches, dark-brown (10YR 3/3) gravelly sandy loam, brown (10YR 5/3) dry; weak, fine, granular structure; soft, very friable, nonsticky, nonplastic; many roots; slightly acid; clear, wavy boundary. 5 to 7 inches thick.

B21--6 to 19 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam, light yellowish brown (10YR 5/4) dry; massive; soft, very friable, nonsticky, nonplastic; many roots; slightly acid; clear, irregular boundary. 10 to 15 inches thick.

B22--19 to 38 inches, olive-brown (2.5Y 4/4) very gravelly sandy loam, light yellowish brown (2.5Y 6/4) dry; massive; soft, very friable, nonsticky, nonplastic; common roots; medium acid; abrupt, irregular boundary.

IIR--38 inches, fractured sandstone; medium acid.

The A horizon ranges from very dark grayish brown to very dark brown and dark brown. The B horizon ranges from dark grayish brown to dark yellowish brown and olive brown. It is gravelly and very gravelly sandy loam and gravelly loam. Depth to sandstone ranges from 20 to 40 inches.

Some areas are up to 20 percent included Alderwood soils, which have a consolidated substratum, and Ovall soils, which are underlain by andesite; some are up to 5 percent the wet Norma and Seattle soils; some are up to 5 percent Beausite soils that have a gravelly loam surface layer and subsoil; and some are up to 10 percent soils that are similar to Beausite soils, but are more than 40 inches deep over sandstone.

Roots penetrate easily to bedrock and enter a few cracks in the bedrock. Permeability is moderately rapid. Available water capacity is low. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for timber and pasture and for urban development. Capability unit IVe-2; woodland group 3d2.


16
15
Foster
Course
RIVER
NORTHERN PACIFIC
RENTON
Riverton Crest Cem
Glacier High Sch
273
Foster H Sch
BM 445
BM 152
BM 134
Ur
Ng
GREEN
Tukwila
City Hall
Tukwila Sch
181
BM 394
21
Riverton Heights
22
23
4 LANE
518
RENTON 2.8 MI.
10 MI. TO INTERSTATE 90
Pk
405
Reservoir
BM 297
27'30"
SITE
PACIFIC
Washington Memorial Cem
BM 340
AmC
S CENTER
26
28
McVan
27
AkF
Wo
PARKWAY
TLE TACOMA
AIRPORT
BM
BM 482
99
BM 23
Trailer Park
Bow Lake
34
35
(Joins sheet 11)
33
BM 382
GRAVEL PIT
Nk
T. 23 N.
T. 22 N.
BM 361
EvB
AgC
Angle Lake
Briscoe Sch
EvC
BM
3
2

APPENDIX C
WWHM2012 PROJECT REPORT

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: PES PN 2312-Tarmac Heights Apartments Site Name: Tamrac Heights Apartments
Site Address: 16016 34th Ave. S. City: SeaTac, WA 98188 Report Date: 12/31/2023
Gage: Seatac
Data Start: 1948/10/01
Data End: 2009/09/30
Timestep: 15 Minute
Precip Scale: 1.000
Version Date: 2023/03/31 Version: 4.2.19

POC Thresholds

Low Flow Threshold for POC1: 50 Percent of the 2 Year High
Flow Threshold for POC1: 50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	0.207
Pervious Total	0.207

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.207

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.023
Pervious Total	0.023

Impervious Land Use	acre
ROOF TOPS FLAT	0.119
DRIVEWAYS MOD	0.065
Impervious Total	0.184
Basin Total	0.207

Routing Elements

Predeveloped Routing

Mitigated Routing

Flow Frequency Method: Log Pearson Type III 17B

Return Period	Flow(cfs)
2 year	0.006163
5 year	0.010099
10 year	0.01263
25 year	0.01564
50 year	0.017726
100 year	0.019673

Flow Frequency Return Periods for Predeveloped. POC #1

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.075272
5 year	0.095727
10 year	0.109699
25 year	0.127896
50 year	0.141874
100 year	0.156232

100 year Post – pre = 0.156232 – 0.019673 = 0.136559 cfs

APPENDIX D

CONSTRUCTION STORMWATER POLLUTION PREVENTION EROSION AND SEDIMENT CONTROL (ESC)
STORMWATER POLLUTION PREVENTION AND SPILL CONTROL (SWPPS)

STORMWATER POLLUTION PREVENTION AND SPILL CONTROL (SWPPS):

The purpose of erosion and sediment control (ESC) is to prevent to the maximum extent practicable,

1) The transport of sediment to streams, wetlands, lakes, drainage systems, and adjacent properties during and following construction of a proposed project or other land disturbing activity.

2) In many circumstances it is difficult to completely prevent the transport of sediment to these features, either because of the difficulty in removing silt and clay-sized particles from runoff or because of large, infrequent storms that overwhelm the ESC facilities. It is the responsibility of those involved in the design and construction of any project to utilize a variety of strategies to minimize erosion and the transport of sediment to the maximum extent practicable. These strategies shall include overall project planning that reduces the risk of erosion through appropriate design and scheduling (see Section D.1) and traditional structural and cover measures, such as those described in Section D.2.1. of the King County Surface Water Design Manual – 2016.

3) For the purpose of this report, several Temporary Erosion and Sediment Control (TESC) standards and techniques will be utilized by the Contractor to minimize the potential amount of erosion and sedimentation generated by the site construction. These techniques for the Construction Stormwater Pollution and Prevention Plan (SWPPP) proposed by the Engineer of the Record for the construction site and must be implemented by the Contractor. In addition, above mentioned standards and techniques are dynamic in nature and must be reviewed, inspected, and maintained by the Contractor to insure workability and effectiveness. These techniques include, but not limited to properly installed Filter Fabric (Silt) Fence, Inlet Protection and Ground Cover practices.

THE 12 ELEMENTS OF THE CONSTRUCTION SWPPP

Element #1. Mark Clearing limits:

Clearing and grading will be limited to those areas that need to be disturbed for grading and construction access. All other areas of the site were preserved to remain intact until construction of the actual proposed facilities. See construction plans sheet 3 for silt fence/clearing limits.

Element #2. Establish Construction Entrance:

The proposed construction entrance on 34th Ave. S. must be built to provide access to all construction vehicles, materials and equipment staging. Access to the site must be limited to the rock construction entrance.

Element #3. Control Flow Rates:

Storm runoff during construction will be minimal and all necessary measures will be utilized to properly control flow rate to minimize impact to the existing storm sewer system.

Element #4. Installation of Sediment Controls:

Erosion and sediment control will be provided through a combination of silt fence and inlets protection.

Element #5. Soils Stabilization:

Temporary soil stabilization will be provided through the application of straw bales, plastic covering and hydroseeding. Prior to the beginning of the wet season (October 1), all disturbed areas will be reviewed by the Contractor to identify what areas need to be seeded in preparation for the winter season. All disturbed areas shall be seeded within one week of the beginning of the wet season.

Element #6. Slope Protection:

Slopes must be protected through the application of covers and prevention of any concentrated surface runoff flow.

Element #7. Inlets Protection:

All inlets (including proposed inlets) within the proximity of project site will be provided with inlet protection devices and must be maintained on a regular basis.

Element #8. Stabilize Channels and Outlets:

There are no channels or outlets to be stabilized during the construction of this project.

Element #9. Pollutant Control:

All construction equipment must be parked in one location when not in use. This area shall be inspected on a regular basis. Any leakage and/or slippage must be cleaned in a timely and professional manner. In addition, any pest control during landscaping must be kept to a minimum to prevent potential pollutant runoff.

Element #10. Control of Dewatering:

If dewatering is required, depending on the amount to be dewatering; the flow can be directed to on-site native vegetation area for clean up or dewatering flow can be directed to established storm conveyance system if approved by the Public Works Inspector.

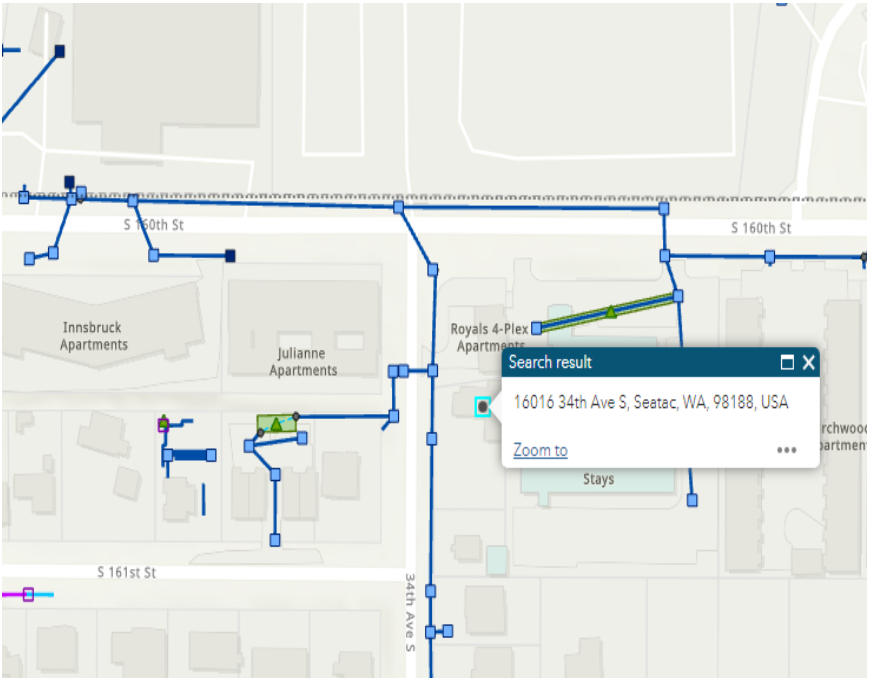
Element #11. BMP Maintenance:

All BMP's and SWPPP must be inspected and maintained on a regular basis as identified on construction plans. In addition, all BMP's must be inspected and maintained after any large storm events to ensure they are intact and functioning.

Element #12. Project Management:

The project must be managed in coordination and cooperation with all stakeholders to include but not limited to owner(s), contractor, engineer, CESEL and the City of SeaTac plans reviewers and site inspectors. Any unforeseen issues must be brought to the attention of the Engineer of Record for further review and discussion.

APPENDIX E
CITY OF SEATAC STORMWATER MAP

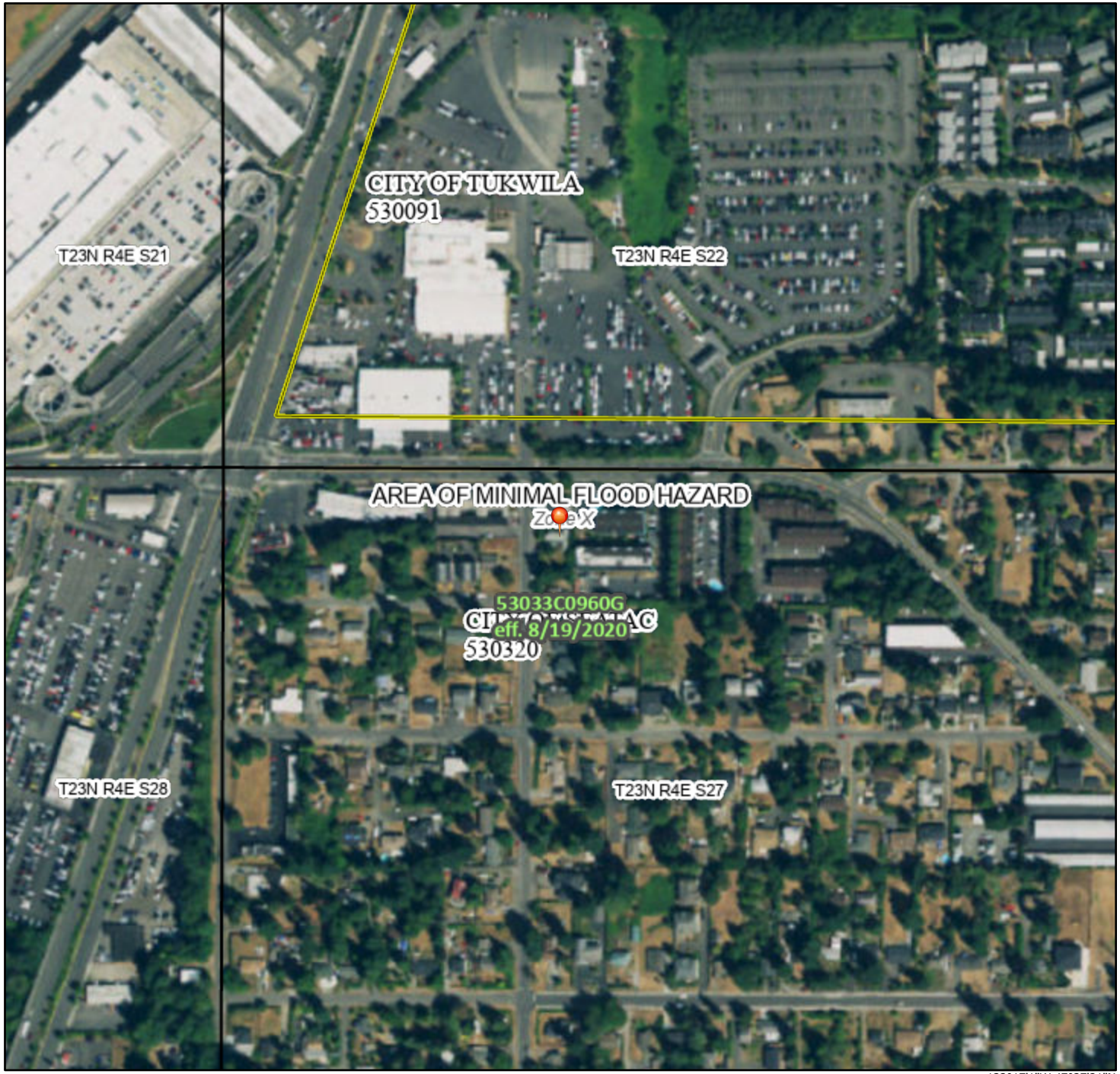

S 160th St
S 160th St
Innsbruck Apartments
Julianne Apartments
Royals 4-Plex Apartments
Search result
16016 34th Ave S, Seatac, WA, 98188, USA
Zoom to
Stays
S 161st St
34th Ave S

APPENDIX F
FEMA FLOOD MAP

National Flood Hazard Layer FIRMette

FEMA

122°17'38"W 47°27'45"N



Feet

0 250 500 1,000 1,500 2,000

1:6,000

122°17'1"W 47°27'21"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/10/2023 at 6:01 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.