Geotechnical Investigation

560 Bozarth Avenue
Woodland, Washington

Prepared for:
Windsor Engineers
24 January 2022

MIA C MAHEDY
STATE OF WASHINGTON
42135
REGISTERED
PROFESSIONAL ENGINEER

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SUPPORTING DATA

1.0 PROJECT AND SITE DESCRIPTIONS

Rapid Soil Solutions Inc (RSS) has prepared this geotechnical report for the proposed new apartment building and associated parking lot on the Cowlitz County parcel assigned the parcel number of 505030200 and property ID number of 3093691. The site is currently vacant and undeveloped. The site can be found in the western half of the City of Woodland, Washington in Cowlitz County. The site is situated on the eastern side of 5th Street roughly 120 feet north of its intersection with Bozarth Ave. The site was historically utilized as the side yard to the dwelling assigned the street address of 620 5th Street. South of the subject site are two apartment buildings assigned the street address of 560 Bozarth Ave (Buildings A and B). RSS understands that the proposed new apartment, once constructed, will be part of the same complex with the two adjacent structures. RSS understands that the proposed new structure will be in the eastern end of the site with a 46' by 65' building envelope. The proposed parking area and associated sidewalks are located in the western end of the site, in an area measuring roughly 90' by 70'; the proposed parking area and new sidewalks will extend into the south-adjacent parcel.

The subject site is located roughly 0.23 miles northwest of Horseshoe Lake, 0.49 miles southwest of Intersate-5, 0.63 miles west of the Lewis River, and is 0.29 miles west of Goerig Street. The abbreviated legal description of the site is “816 (WOODLAND OUTLOT) -WDOL -32B 24 -5N -1W KRAFT DLC. AKA ROS 35/62 TR 3.”. The site can be found in Section 24, Township 5-North, Rane 1-West (W.M.) in Cowlitz County. The latitude and longitude of the site are 45.902344 and -122.751575 (45°54'08.4"N, 122°45'05.7"W).

2.0 SITE CONDITIONS

2.1 Surface Conditions

The subject site is positioned on low-relief slopes between the Lewis River and the Columbia River, in the Columbia River valley slightly south of the Kalama Gap (a narrow stretch of the Columbia River valley). The site is tucked into the western end of the City of Woodland, Washington and is part of the downtown/urban neighborhood referred to as ‘Woodland West of I-5’. Surrounding properties include multi-family residential, single-family residential, religious campuses (St. Philips Catholic Church), and educational institutions (Columbia Elementary, Woodland Coop Preschool, Woodland Public Middle school). Properties within the local blocks are comprised primarily of residential lots and small retail businesses. Most structures are limited in height to two stories. Local roadways are AC-paved two-lane road with curbs and sidewalks. Scattered trees can be found around the local blocks, but most properties contain small structures and short cropped grasses.

The local slopes are generally low-relief, situated within the alluvial plain between the Lewis and Columbia Rivers. There is very little topographic relief across the neighborhood and minimal grade change from the site to the banks of the Columbia River. Local morphology is typical of the floodplains along the Columbia River.

General Site Conditions

The subject site encompasses 0.27 acres across a single Cowlitz County tax parcel. A gravel driveway extends into the subject site from 5th Street; this driveway was historically utilized to access the adjacent single-family dwelling (620 5th Street). A new gravel driveway has been completed within the north-adjacent parcel for the ingress/egress for the dwelling. The majority of the parcel contain short cropped grasses. A large tree was recently felled within the site, and large trunk and stump remnants still remain on site. A hedge is situated at the southeastern margin of the site. A short chain link fence extends along the eastern margin of the site.

Slopes on site are very low, with an elevation change of less than two feet across the site. No standing or flowing water is mapped on site. No standing or flowing water is observed on site. No structures are located within the subject site.

Figure 1: Existing conditions at the subject site, aerial image collected from Cowlitz County Maps Online

Figure 2: Existing conditions at the subject site, image collected January 11th, 2021.

Historic Site Conditions

Historic aerial imagery dating back to 1951 was referenced as part of this investigation.

This imagery suggests that the local community was rural to suburban in 1951. The site appears to be the southern end of a medium sized residential lot at the edge of a residential urban-suburban neighborhood. The local streets were developed prior to 1951. The apartments south of the subject site were developed between 1951 and 1970. The original dwelling north of the subject site (west of the modern dwelling) was demolished between 1970 and 1981; the new dwelling (in the modern origination) was constructed by 1990.

Imagery from 1990 through 2020 suggest no major changes to the subject site. No structures were observed on site in the referenced historic aerial imagery. The tree on site was removed some time after the most recent aerial image, dated June 2021.

Slopes

The subject site is situated on nearly level slopes extending between the Lewis River and the Columbia River. The Google Earth DEM suggest that both the sections of the Columbia River and the Lewis River closest to the subject site are roughly 10 feet above sea level. The upland areas between the two rivers spans about 3.1 miles and accommodates an elevation change of roughly 15 feet, from 30' above sea level around downtown Woodland to 15 feet above sea level in the field overlooking the Columbia River. Grading, particularly for roadways, creates narrow strips of slightly higher elevations within the overall west-trending slopes. The google earth DEM suggests that there is up to 2 feet of elevation change from the northwestern corner of the site to the southeastern corner. The average slope is less than 2%. RSS observed the slopes within the subject site to be nearly level. Minor grading appears to have occurred along the adjacent roadways. Some artificial smoothing may have occurred within the site.

Lidar imagery of the subject site and surrounding slopes, collected in 2019, indicates that the subject site and surrounding slopes are nearly level. The roadways can be seen in the bare earth hill shade lidar imagery. The largest grade changes occur in association with the banks of Lewis River and Horseshoe Lake (east of the site) and at the railroad tracks (west of the site).

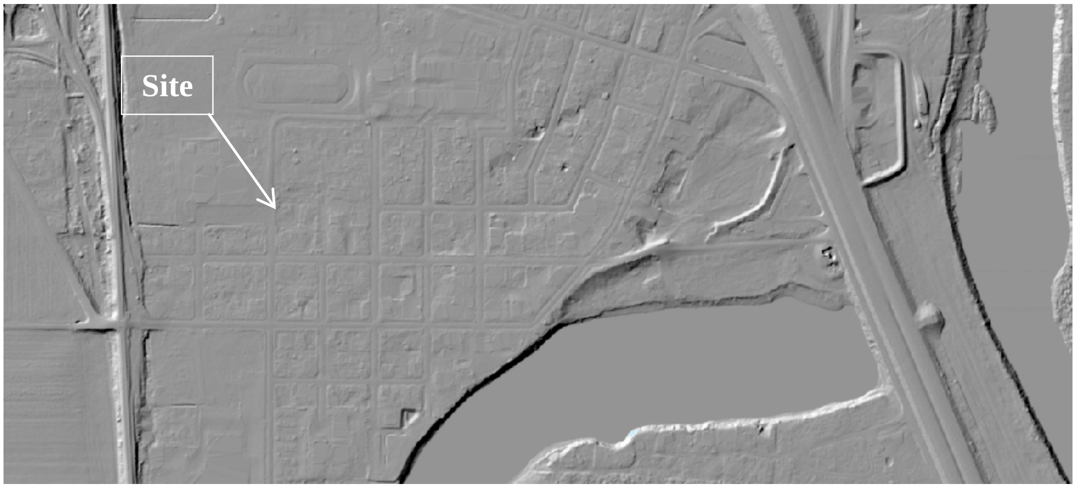


Figure 3: Lidar imagery of the subject site and surrounding slopes.

2.2 Regional Geology

Current geologic literature classifies the slopes underlaying the subject site as Holocene and Pleistocene aged alluvium of the Columbia River floodplain. The site is located in the northern end of the Portland Basin, a roughly 2000-km^2 topographic and structural depression forming one of several sediment-filled structural basins that collectively constitute the Puget-Willamette Lowland. The low-relief slopes of the subject site contain unconsolidated sediments transported and deposited by the nearby Columbia River. The depositional patters of the local floodplains are primarily controlled by cyclical variation in base river level as a response to climate-induced sea level fluctuations.

Geologic History

The subject site is generally situated in the northern end of the Portland Basin. This basin is one of several topographic and structural depressions that collectively constitute the Puget-Willamette forearc trough. This topographic and structural basin generally has low topographic relief. The basin formed due to tectonic compressional stress that both intimated the basin's formation and produced prolonged the enlargement of the basin. As the Portland Basin continued to subside during the late Miocene and Pliocene, it filled with continental fluvial and lacustrine sediments that were transported through the Cascade Range by the ancestral Columbia River as well as with locally derived detritus carried in by tributaries draining the surrounding highlands. These sediments were deposited primarily in fluvial environments, mostly by the rivers and streams that traversed the Portland basin as it was developing. This resulted in a thick accumulation of material preserving a complex record of deposition and erosion (aggradation and incision).

At the end of the last glacial maximum, an ice damn in western Montana began to melt. The periodic failure of the ice damn retaining Glacial Lake Missoula resulted in dozens of gigantic floods that stretched from their origin in Montana generally following the Columbia River and eventually reaching the Pacific Ocean. The hydraulically restrictive Oregon Coast Range causes the sediment filled waters to temporarily pond across much of the Willamette forearc trough including the Portland, Tualatin and Willamette basins. The floodwaters, which reached an elevation of 400 feet above sea level, soured many areas down to bedrock and buried others beneath thick layers of gravel, sand and silt that can be divided into a fine-grained unit and a course-grained unit. Dramatic scour features and giant bars can be seen within the Portland Basin, and demonstrate the great influence the floodwaters had on shaping the Quaternary geomorphology of the region. The sediments are generally comprised of unconsolidated silt, sand, and gravels and were emplaced between about 21,000 to 12,000 years ago. This inundation of floodwaters and sediments dramatically altered the sedimentary composition and local slope morphology.

Repeated episodes of glacial melting and eruptions of Mount St. Helens may have also triggered alluviation events in the Lewis River and the local segment of the Columbia River systems.

Site Geology

Sediments carried by the modern river consist largely of silt and sand eroded from pre-Tertiary terranes east of the Cascade Range. Additional sedimentary materials are sources from the adjacent Cascade Range and Coast Range mountains. Holocene aged deposits appear to consist of sediments derived from similar sources.

The local alluvium is generally described as ‘unconsolidated, poorly sorted to well-sorted, massive to laminated, commonly cross-stratified sand, silt, and minor gravels of Columba River floodplain’. Locally, recent alluvium can also include fine-grained lacustrine, aeolian, and organic-rich marsh deposits. Artificial fill may also be present in some areas mapped as containing alluvium.

Local well logs, collected from the Washington State Well Report viewer, generally report subgrades consistent with floodplain alluvium. Some of the well logs note shallow groundwater; when noted, soils are described as wet at depths of 10'-14'.

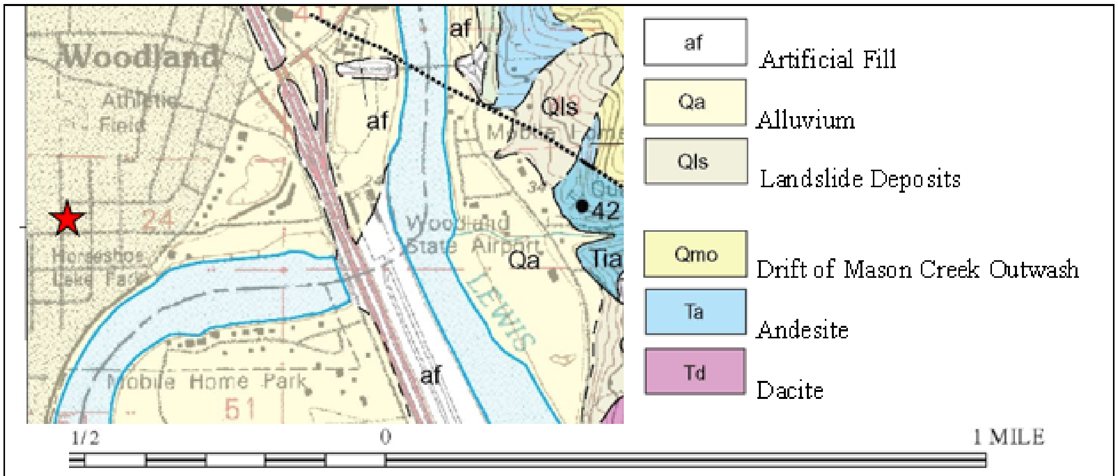


Figure 4: Geology at the subject site, excerpt from Evarts (2004).

2.3 Field Exploration and Subsurface Conditions

2.3.1 Field Explorations

RSS conducted field explorations of the subject on January 11th, 2022. RSS traversed the site on foot. RSS found the slopes to be nearly level, as described by the above listed references. Trunk and stump remnants from a recently felled large tree were found near the center of the site. The driveway dominates the western end of the site, while a short-cropped grass lawn dominates the eastern end of the site.

The driveway entering the property is gravel and is relatively smooth. Minor puddles and one small depression were observed in the gravel driveway. Heavy rain showers preceded the site visit conducted by RSS. Beyond the northern edge of the maintained gravel driveway, the gravels extend below a thin layer of organics and soils; this extends at least of the collection of large trunk segments of the recently felled tree.

The grass lawn is smooth and generally without any noticeable topographic relief of sunken grades. The extraordinarily slopes inside the subject site are consistent in elevation and relief with the surrounding properties. RSS found conditions on site to be consistent with those identified in the refenced documentation.

2.3.2 Subsurface Conditions

A total of two (2) shallow hand auger boring was conducted at the subject site. Both borings were conducted to a depth of 4 feet. The borings were roughly positioned at the eastern end of the proposed structure (HA#1) and the western margin of the proposed new structure (HA#2). The subgrade in both borings were consistent, containing interbedded sands with variable amounts of fines. Bedding generally varied from 4" to 8" thick. Find grained sand dominates the identified materials, but some beds contain nearly zero fine grained materials and more medium grained sand while some of the shallower beds could be classified as silty SAND. The overall abundance of fines generally decreases with depths. The top 0.5' to 1' of the borings contain various top materials (gravels in HA#2 and organic soils in HA#1).

The locations of the borings are shown on Figure 2 in the Appendix. A Geologist in Training (GIT) observed the borings and logged the subsurface materials. The soil descriptions were reviewed by a professional engineer. The logs were created using the Unified Soil Classification and Visual Manual Procedure (ASTM-D 2488). Samples were transported in sealed plastic bags. Moisture content of the collected samples ranged from 10.6% to 25.8%.

2.3.3 Groundwater

Shallow groundwater was not encountered.

3.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

3.1 Foundation Design

The building foundations may be installed on either engineered fill or firm native subgrade that is found at a depth of about 9inches to 12 inches. This depth may be locally variable and should be confirmed by a geotechnical engineer or their representative at the time of construction.

Continuous wall and isolated spread footings should be at least 16 and 24 inches wide, respectively. The bottom of exterior footings should be at least 16 inches below the lowest adjacent exterior grade. The bottom of interior footings should be at least 12 inches below the base of the floor slab.

Footings placed on engineered fill or firm native sub-grade should be designed for an allowable bearing capacity of 2*,000 pounds per square foot* (**psf**). The recommended allowable bearing pressure can be increased by 1/3 for short-term loads such as those resulting from wind or seismic forces.

Lateral loads on footings can be resisted by passive earth pressure on the sides of the structures and by friction at the base of the footings. An allowable lateral bearing pressure of 200 *pounds per cubic foot* (**psf/f**) below grade may be used. Adjacent floor slabs, pavements or the upper 12-inch depth of adjacent, unpaved areas should not be considered when calculating passive resistance.

3.2 Retaining Walls and Embedded Walls

Default lateral soil load for the design of basement and retaining walls supporting level backfill shall be 35 psf/ft for laterally unrestrained retaining walls and 60 psf/ft for laterally restrained retaining walls.

For embedded building walls, a superimposed seismic lateral force should be calculated based on a dynamic force of $5H^2$ pounds per lineal foot of wall, where H is the height of the wall in feet and applied at 1/3 H from the base of the wall. The wall footings should be designed in accordance with the guidelines provided in the "Foundation Design" section of this report. These design parameters have been provided assuming that back-of-wall drains will be installed to prevent buildup of hydrostatic pressures behind all walls.

The backfill material placed behind the walls and extending a horizontal distance equal to at least half of the height of the retaining wall should consist of granular retaining wall backfill as specified in the "Structural Fill" section of this report. The wall backfill should be compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D698. However, backfill located within a horizontal distance of 3 feet from the retaining walls should only be compacted to approximately 92 percent of the maximum dry density, as determined by ASTM D698. Backfill placed within 3 feet of the wall should be compacted in lifts less than 6 inches thick using hand-operated tamping equipment (e.g., jumping jack or vibratory plate compactors). If flat work (e.g., sidewalks or pavements) will be placed atop the wall backfill, we recommend that the upper 2 feet of material be compacted to 95 percent of the maximum dry density, as determined by ASTM D698.

A minimum 12-inch-wide zone of drain rock, extending from the base of the wall to within 6 inches of finished grade, should be placed against the back of all retaining walls. Perforated collector pipes should be embedded at the base of the drain rock. The drain rock should meet the requirements provided in the "Structural Fill" section of this report. The perforated collector pipes should discharge at an appropriate location away from the base of the wall. The discharge pipe(s) should not be tied directly into storm water drain systems, unless measures are taken to prevent backflow into the wall's drainage system. Settlements of up to 1 percent of the wall height commonly occur immediately adjacent to the wall as the wall rotates and develops active lateral earth pressures.

Engineering values summary

Bearing capacity soil	2,000psf
Coefficient of friction soil	0.32
Active pressure	40pcf
Passive pressure	300pcf

A safety factor of 1.5 is included in the above values.

3.3 Seismic Design Criteria

We understand that the seismic design criteria for this project is based on the ASCE 7-16 Section 1615 and the USGS web site using a Lat of 45.902344 and a Long of -122.751575, soil site class D.

	Short Period	**1 Second**
Maximum Credible Earthquake Spectral Acceleration	S_S = 0.82 g	S_1 = 0.392 g
Adjusted Spectral Acceleration	S_{MS} = 0.984 g	S_{M1} = null
Design Spectral Response Acceleration Perimeters	S_{DS} = 0.656 g	S_{D1}= null

3.4 Geohazard Review

The Washington Geologic Information Portal was reviewed on 19 January 2022 to investigate mapped geologic hazards. Cowlitz County EPIC was also reviewed on 19 January 2022 to investigate mapped geologic hazards

The subject site is located within a flood zone mapped by FEMA as ‘protected by Levee or Dike’ (X).

The soils at the subject stie are classified as falling within a NEHRP seismic site class of ‘D to E’. This site class indicates that the average shear wave velocity in the upper 100 feet corresponds to a D site class (600-1,200 feet per second) and the mean shear wave velocity minus one standard deviation within the upper 100 feet corresponds to an E site class (<600 feet per second). A D site class is found in stiff soils, such as mid to late Pleistocene granular sediment or property engineered fill while an E site class corresponds to soft soils such as Holocene granular sediments, pre-1985 artificial fill, and some Late Quaternary muds, sands, gravels, silts and muds. An E site class is expected to experience significant amplification of shaking. The liquefaction susceptibly of the soils at the subject site is classified as ‘moderate to high’.

No landslides are mapped on or around the subject site. Bare earth lidar imagery does not yield observations of morphology suggesting landslides are present on or around the subject site.

4.0 CONSTRUCTION RECOMMENDATIONS

4.1 Site Preparation

A site stripping inspection is required for when grading starts. A stripping inspection ensures that all the topsoil is removed if any filling takes place.

4.1.1 Proof Rolling

Following stripping and prior to placing aggregate base course, pavement the exposed sub-grade should be evaluated by proof rolling. The sub-grade should be proof rolled to identify soft, loose, or unsuitable areas. ***Please give 48-hour notice to observe the proof rolling via phone call to number on this report.*** Soft or loose zones identified during the field evaluation should be compacted to an unyielding condition or be excavated and replaced with structural fill, as discussed in the *Structural Fill* section of this report.

4.1.2 Wet Weather Conditions

The near-surface soils will be difficult during or after extended wet periods or when the moisture content of the surface soil is more than a few percentage points above optimum. Soils that have been disturbed during site preparation activities, or soft or loose zones identified during probing or proof rolling, should be removed and replaced with compacted structural fill. Track-mounted excavating equipment will be required during wet weather. The imported granular material should be placed in one lift over the prepared, undisturbed sub-grade and compacted using a smooth drum, non-vibratory roller. Additionally, a geo-textile fabric should be placed as a barrier between the sub-grade and imported granular material in areas of repeated traffic.

4.2 Excavation

Subsurface conditions of accessible cleared areas of the project site show predominately Silty SAND to the depth explored (4.0 feet). Excavations in the upper soils may be readily accomplished with conventional earthwork equipment with smooth faced bucket.

4.3 Structural Fills

Fills should be placed over sub-grade prepared in compliance with Section 4.1 of this report. Material used, as structural fill should be free of organic matter or other unsuitable materials and should meet specifications provided in OSSC, depending upon the application. A discussion of these materials is in the following sections.

4.3.1 Native Soils

Laboratory testing indicates that the moisture content of the near-surface is greater than the optimum moisture content of the soil required for satisfactory compaction. This is depending on the weather conditions at the time of excavation. See section 4.3.2 for imported granular fill.

4.3.2 Imported Granular Fill

The imported granular material must be reasonably well graded to between coarse and fine material and have less than 5% by weight passing the US Standard No.200 Sieve. Imported granular material should be placed in lifts 8 to12 inches and be compacted to at least 92% of the maximum dry density, as determined by ASTM D 1557. Where imported granular material is placed over wet or soft soil sub-grades, we recommend that a geo-textile serve as a barrier between the sub-grade and imported granular material.

4.4 Drainage Considerations

The Contractor shall be made responsible for temporary drainage of surface water and groundwater as necessary to prevent standing water and/or erosion at the working surface. We recommend removing only the foliage necessary for construction to help minimize erosion. Slope the ground surface around the structures to create a minimum gradient of 2% away from the building foundations for a distance of at least 5 feet. Surface water should be directed away from all buildings into drainage swales or into a storm drainage system. RSS recommends all house foundation have a continuous foundation drain.

5.0 CONSTRUCTION OBSERVATIONS

Satisfactory pavement and earthwork performance depends on the quality of construction. Sufficient monitoring of the activities of the contractor is a key part of determining that the work is completed in accordance with the construction drawings and specifications. I recommend that a geotechnical engineer observe general excavation, stripping, fill placement, and sub-grades in addition to base. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions requires experience. Therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

6.0 LIMITATIONS

This report has been prepared for the exclusive use of the addressee, and their architects and engineers for aiding in the design and construction of the proposed development. It is the addressee's responsibility to provide this report to the appropriate design professionals, building officials, and contractors to ensure correct implementation of the recommendations.
The opinions, comments and conclusions presented in this report were based upon information derived from our literature review, field investigation, and laboratory testing. Conditions between, or beyond, our exploratory borings may vary from those encountered. Unanticipated soil conditions and seasonal soil moisture variations are commonly encountered and cannot be fully determined by merely taking soil samples or soil borings. Such variations may result in changes to our recommendations and may require that additional expenditures be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

If there is a substantial lapse of time between the submission of this report and the start of work at the site; if conditions have changed due to natural causes or construction operations at, or adjacent to, the site; or, if the basic project scheme is significantly modified from that assumed, it is recommended this report be reviewed to determine the applicability of the conclusions and recommendations.

The work has been conducted in general conformance with the standard of care in the field of geotechnical engineering currently in practice in the Pacific Northwest for projects of this nature and magnitude. No warranty, express or implied, exists on the information presented in this report. By utilizing the design recommendations within this report, the addressee acknowledges and accepts the risks and limitations of development at the site, as outlined within the report.

References

Google Maps Online: https://www.google.com/maps
Google Earth (2022)
Cowlitz County Assessor's Property Info - https://www.co.cowlitz.wa.us/1223/PropertyParcel-Information
Cowlitz County Property Records - https://www.co.cowlitz.wa.us/1621/Property-Records
Cowlitz County Building & Planning EPIC Map
Cowlitz County Assessor’s Map
DNR Lidar Portal: http://lidarportal.dnr.wa.gov/
Washington State Geologic Portal - https://www.dnr.wa.gov/geologyportal
USGS Topographic viewer - https://ngmdb.usgs.gov/topoview/
USDA Web Soil Survey - https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
Evarts, R.C., 2004, Geologic map of the Woodland quadrangle, Clark and Cowlitz Counties, Washington: U.S. Geological Survey, Scientific Investigations Map SIM-2827, scale 1:24,000.
Everts, R.C., 2002, Geologic map of the Deer Island quadrangle, Columbia County, Oregon and Cowlitz County, Washington: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2392, scale 1:24,000.
Wilkinson, W.D., Lowry, W.D., and Baldwin, E.M., 1946, Geology of the St. Helens [15'] quadrangle: Oregon Department of Geology and Mineral Industries, Bulletin 31, scale 1:62,500.
Phillips, W.M., 1987, Geologic map of the Vancouver quadrangle, Washington: Washington Division of Geology and Earth Resources, Open File Report 87-10, scale 1:100,000.
Walsh, T.J., Korosec, M.A., Phillips, W.M., Logan, R.L., and Schasse, H.W., 1987, Geologic map of Washington--Southwest quadrant: Washington Division of Geology and Earth Resources, Geologic Map GM-34, scale 1:250,000.

APPENDIX

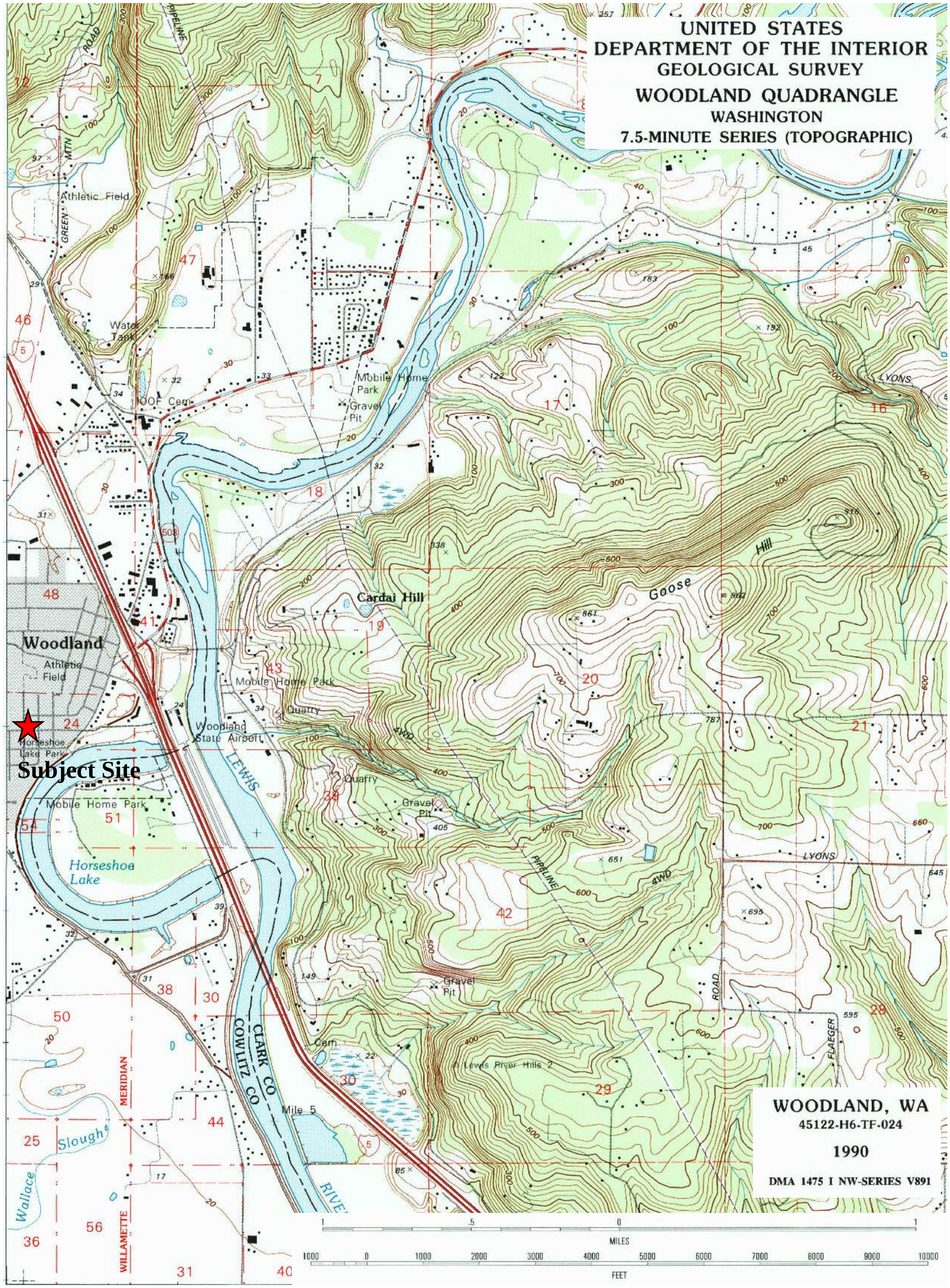


Figure 1: Subject site location on the SW quarter of the Woodland Quadrangle

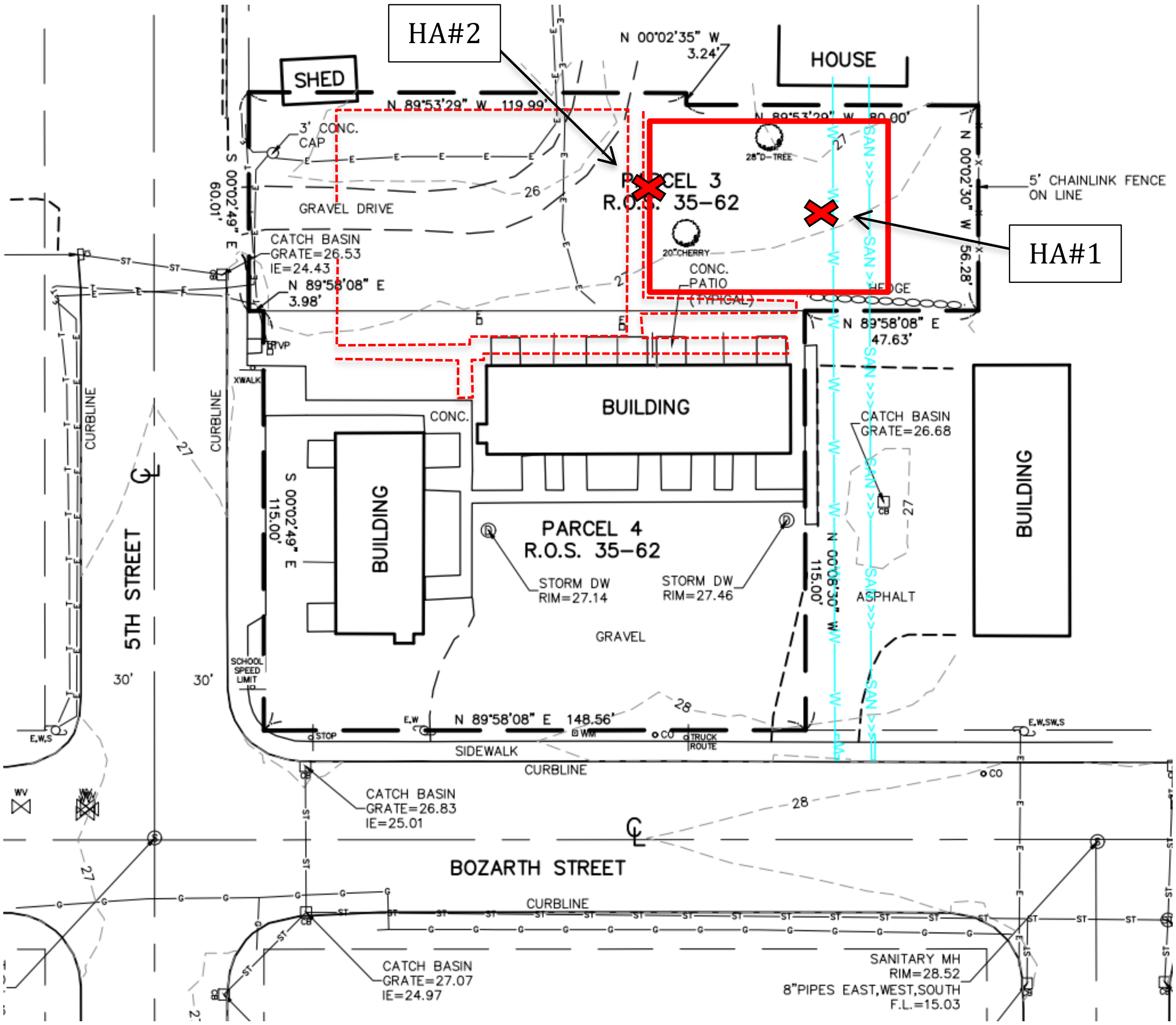


Figure 2: Subject site existing conditions as surveyed by Brown Surveying PLLC on 11-11-2021 and approximate boring lcoations with proposed building footprint, parking area and sidewalks.

Lab Results

Project Name: Bozarth Apartments

Sample Date 1/11/2022

Moisture

	Sample number	HA#1A	HA#1B	HA#2A	HA#2B	
1	Date and time in oven	1/11/22 2:20 PM	1/11/22 2:20 PM	1/11/22 2:20 PM	1/11/22 2:20 PM	
2	Date and time out of oven	1/12/22 1:45 PM	1/12/22 1:45 PM	1/12/22 1:45 PM	1/12/22 1:45 PM	
3	Depth (ft)	2	4	2	4	
4	Tare No.	10	11	12	13	
5	Tare Mass	232	231	232	233	
6	Tare plus sample moist	1062	1000	1012	992	
7	Tare plus sample dry	892	926	894	914	
8	Mass of water (g)	170	74	118	78	
9	Mass of soil (g)	660	695	662	681	
10	Water Content (%)	25.8	10.6	17.8	11.5	

Grain Size Analysis: Dry Sieve Method

Sample Number: HA#2A Depth: 2

Total Sample Weight (g): 628

Sieve #	Weight (g)	% Retained	
>1/4"	0	0	Gravels and Larger
1/4" to #40	5	1	Medium-Coarse Sand
#40 to #200	582	93	**Fine Sand**
< #200	41	7	Fines (Silt & Clay)
> #200	587	93	

Sample Number: HA#2B` Depth: 4'

Total Sample Weight (g): 618

Sieve #	Weight (g)	% Retained	
>1/4"	0	0	Gravels and Larger
1/4" to #40	127	21	Medium-Coarse Sand
#40 to #200	468	76	**Fine Sand**
< #200	23	4	Fines (Silt & Clay)
> #200	595	96	

Grain Size Analysis: Wet Sieve Method

Sample: HA#2A Depth: 2'

Total Sample Weight (g): 168.72

Sieve #	Weight (g)	% Retained
(course grained) >#200	139.69	82.79
(fines) <#200	29.03	17.21

Classification: Fine Sand

Sample: HA#2B Depth: 4'

Total Sample Weight (g): 176.49

Sieve #	Weight (g)	% Retained
(course grained) >#200	165.96	94.03
(fines) <#200	10.53	5.97

Classification: Fine Sand

Rapid Soil Solutions INC

HA#1

Surface Elevation:
Boring Date: 11 January 2022
Boring Location: Woodland, WA
Drilling Method: Hand Auger

Depth	Remarks	Moisture (%)	Dry Density	Blow Counts	Sample Type	Water Table		
0						GWT not encountered	TP	Damp, medium stuff, medium rich brown, fine grained, clayey SILT with orgnaics and grass roots.
							ML	Damp, medium stiff to stiff, medium-light brown, fine grained, clayey SILT with trace fine grained sand.
1								
							ML-SM	Damp, medium stiff to stiff, medium-light brown, fine grained, sandy SILT to silty SAND.
2		25.8					SM	Damp, medium dense to dense, medium-light brown to grey, fine grained SAND. Interbedded horizons of 4-8" tall, with variable amounds of silts. Bedding includes brown to grey variations in color.
3								
4		10.6						Boring completed at depth of 4 feet.
5								
6								
7								

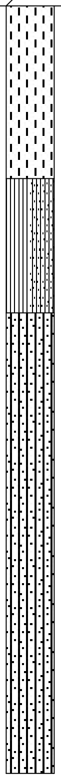
LOG OF BORING

RAPID SOIL SOLUTIONS	**Bozarth Apartments** **Windsor Engineers**	**Plate 1**

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Users\Owner\Documents\In Progress Reports\560 Bozarth Ave 11Jan22\Bozarth Apts Logs.log Date: 1/18/2022

HA#2

Surface Elevation:
Boring Date: 11 January 2022
Boring Location: Woodland, WA
Drilling Method: Hand Auger



Depth	Remarks	Moisture (%)	Dry Density	Blow Counts	Sample Type	Water Table		
0						GWT not encountered	FL	Damp, dense, imported GRAVEL and medium-rich brown silt.
1							ML-SM	Damp, medium stiff to stiff, medium-light brown, fine grained, sandy SILT to silty SAND.
							SM	Damp, medium dense to dense, medium-light brown to grey, fine grained SAND. Interbedded horizons of 4-8" tall, with variable amounds of silts. Bedding includes brown to grey variations in color.
2	83% SAND	17.8						
3								
4	94% SAND	11.5						Boring completed at depth of 4 feet.
5								
6								
7								

LOG OF BORING

RAPID SOIL SOLUTIONS	**Bozarth Apartments** **Windsor Engineers**	**Plate 2**

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Users\Owner\Documents\In Progress Reports\560 Bozarth Ave 11Jan22\Bozarth Apts Logs.log Date: 1/18/2022