File No. EA2022-120

CITY OF RICHLAND
Determination of Non-Significance

Description of Proposal: Clearing, grading and future construction of a 144-unit apartment complex with a community center, pool, parking lot and playground.

Proponent: Knutzen Engineering
Attn: Gavin Gervais
5401 Ridgeline Drive, Suite 160
Kennewick, WA 99338

Location of Proposal: The project site is located at 425 Bradley Blvd., Richland, WA upon Assessor's Parcel Nos. 114981012516005, 114981012516002, 114981012516001, 114981013473001 and 114981013473002.

Lead Agency: City of Richland

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

( ) There is no comment for the DNS.

(**X**) This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for fourteen days from the date of issuance.

( ) This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS.

Responsible Official: Mike Stevens
Position/Title: Planning Manager
Address: 625 Swift Blvd., MS #35, Richland, WA 99352
Date: June 30, 2022

Signature _____

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background [HELP]

1. Name of proposed project, if applicable:
   Cedar Homes Apartments

2. Name of applicant:
   Knutzen Engineering, Gavin Gervais

3. Address and phone number of applicant and contact person:
   5401 Ridgeline Drive, Suite 160, Kennewick, WA 99338

   (509) 222-0959

4. Date checklist prepared:
03/07/2022

5. Agency requesting checklist:
City of Richland

6. Proposed timing or schedule (including phasing, if applicable):
Construction to begin approximately June 2022 and finish December 2023.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
The project will require a short plat recording.

Boundary Line Adjustment

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

A geotechnical report was prepared by GN Northern, Inc in July of 2021. A hydrology report has been prepared to address stormwater management of the runoff generated on-site. An archaeological study may possibly be required.

Archaeological report submitted will be provided to DAHP and applicable Tribes

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.
None known.

10. List any government approvals or permits that will be needed for your proposal, if known.
The project will require a grading permit, ROW permit, building permit and a short plat. Ecology will require an erosivity waiver for construction stormwater permitting.

Likely BLA rather than short plat

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

This proposal includes construction of an apartment complex consisting of 144 dwelling units, a community center, pool, and playground. An asphalt parking lot and utility extensions will be constructed all with associated grading. This development will provide approximately 225 parking stalls. The site will be accessed from an existing 24-ft access easement at the south and two 35-ft driveways off Bradley Blvd. The 4.56-acre site spans five parcels and will be consolidated as part of this proposal.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The site is located on Benton County parcels 114981012516005, 114981012516002, 114981012516001, 114981013473001, and 114981013473002. The address of the site is 425 Bradley Blvd, Richland, WA 99352.

B. Environmental Elements [HELP]

1. *Earth* [help]

a. General description of the site:

(circle one): Flat, rolling, hilly, steep slopes, mountainous, other

b. What is the steepest slope on the site (approximate percent slope)?
The steepest slope on-site is approximately 7%, not counting for the undocumented fill piles. The majority of the site is approximately 2%.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.
The Geotech lists the native soils on-site as consisting of Sandy Silt and Silt with Sand (ML). Undocumented fill consisting of poorly graded gravel with silt (GP-GM) and sand or silty sand (SM) was also encountered across the site.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.
No.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.
There will be approximately 10,000 CY of soil excavation/fill on-site, including import of surfacing materials such as asphalt and concrete. Excavation will encompass 4.77 acres in area. Excavation is proposed to provide for level building pads.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.
Erosion could occur on site but will be minimized through implementation of BMPs during construction, including silt fencing, construction entrances, ground cover, wattles, site watering for dust control, catch basin inserts and protection. All storm water run-off will be contained and managed on site.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?
Approximately 70% of the 4.56-acre site will be covered in impervious surfaces including building, concrete, and asphalt.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
Standard erosion control and BMP methods will be used, such as catch basin protection, silt fencing, and stabilized construction entrances. Dust during construction will be controlled by the use of a water truck as necessary.

2. *Air* [help]

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.
During construction minor amounts of dust and exhaust from equipment activity may be released into the air. The completed project will not affect air quality.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.
None known.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:
Dust control measures will be implemented in accordance with recommendations by the Department of Ecology and the Benton County Clean Air Authority. Measures include but are not limited to watering, lowering speed, limit of construction vehicles, and reducing the amount of dust-generating activities on windy days.

3. *Water* [help]

a. Surface Water: [help]

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.
Yes, the Columbia River is approximately 350-ft from the site at the nearest point. The site is located within the waterfront district of the City of Richland shoreline designations.

Site is NOT located within Shoreline jurisdiction.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.
No.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.
None.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.
No.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.
The site has not been designated to lie within a 100-year floodplain. FEMA map 535533 0015 E designates the site as an area of minimal flooding, Zone C.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.
No.

b. Ground Water: [help]

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.
Groundwater will not be withdrawn at this site. The site will be supplied with domestic water from the City of Richland.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the

number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.
None.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.
New impervious area on-site including roofs of buildings, concrete walkways, and the asphalt parking lot. The stormwater system will consist of catch basins, conveyance pipes, CDS units for pre-treatment (if required), and subsurface infiltration trenches.

2) Could waste materials enter ground or surface waters? If so, generally describe.
Waste materials could not enter ground waters. The proposed stormwater systems will meet Eastern Washington Storm Water Management Manual and City of Richland design requirements.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.
No, all runoff will be retained on-site.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Runoff generated from pervious surfaces will either infiltrate into underlying soils or flow to on-site collection systems. Stormwater generated from impervious surfaces will be collected and treated prior to on-site infiltration and all will be in accordance with City and Eastern Washington Storm Water Management Manual design standards.

4. *Plants* [help]

a. Check the types of vegetation found on the site:

X deciduous tree: alder, maple, aspen, other
____ evergreen tree: fir, cedar, pine, other
X shrubs
____ grass
____ pasture
____ crop or grain
____ Orchards, vineyards or other permanent crops.
____ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____ water plants: water lily, eelgrass, milfoil, other
____ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?
The majority if not all of the existing trees on-site will be removed.

c. List threatened and endangered species known to be on or near the site.
None known per the Washington DNR Natural Heritage Program.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:
Native plants and trees will be planted in landscaped areas and around the perimeter of the site. The site will be landscaped in compliance with City of Richland standards.

e. List all noxious weeds and invasive species known to be on or near the site.
None known per the WSDA Noxious Weed Data Viewer.

5. *Animals* [help]

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other _____

Songbirds, ducks, small mammals

b. List any threatened and endangered species known to be on or near the site.
None know per the Washington Department of Fish and Wildlife (WDFW) PHS on the Web.

c. Is the site part of a migration route? If so, explain.
Yes, the Columbia Basin is part of a migration route for a number of fowl.

d. Proposed measures to preserve or enhance wildlife, if any:
None at this time.

e. List any invasive animal species known to be on or near the site.
None known per the WDFW PHS on the Web.

6. *Energy and Natural Resources* [help]

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.
Electrical will be used for lighting and all appliances. Natural gas will be used for heating.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.
No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:
All structures will meet current building codes and energy efficiency standards.

7. *Environmental Health* [help]

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

No.

1) Describe any known or possible contamination at the site from present or past uses.
None known.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.
None.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.
None known.

4) Describe special emergency services that might be required.
Typical emergency services provided through the City of Richland will be used for the completed project.

5) Proposed measures to reduce or control environmental health hazards, if any:
None at this time.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?
The noise level in the area is not perceived to have any adverse effect on the project. Noise is mainly generated by vehicle traffic on George Washington Way to the southwest.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.
Short term: Construction noises
Long term: Noise from traffic generated by residents and residents using the outdoor pool area for recreation.

3) Proposed measures to reduce or control noise impacts, if any:
Noise impacts from construction activities and ongoing operations are expected to be minimal. All operations will be conducted in a manner compliant with Benton County Policy and Washington State Maximum Environmental Noise Levels (Chapter 173-60-040 WAC).

8. *Land and Shoreline Use* [help]

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.
The site is currently vacant and was previously developed with a large building. The site is currently zoned WF-Waterfront and the proposed use is permitted in this zoning district. Similarly zoned properties are located north, south and east with medium density residential to the west.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or

nonforest use?
No.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:
No.

c. Describe any structures on the site.
A large building was previously located on the site. This is apparent from existing concrete stem walls/foundations.

d. Will any structures be demolished? If so, what?
The existing concrete foundations will be demolished as part of this project.

e. What is the current zoning classification of the site?
The site is currently zoned WF-Waterfront and the proposed use is permitted within this district.

f. What is the current comprehensive plan designation of the site?
The current comprehensive plan designation of the site is Waterfront.

g. If applicable, what is the current shoreline master program designation of the site?
The current shoreline master program designation of the site is Waterfront per the City of Richland Shoreline Map.

Site is NOT located within Shoreline jurisdiction.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.
The site is located within a Critical Aquifer Recharge Area (CARA), as determined by the City of Richland. A critical aquifer recharge area report will be prepared as required.

An Aquifer Recharge Area report has been submitted.

i. Approximately how many people would reside or work in the completed project?
Approximately 280 people will reside and another 10 people will work for the apartment complex.

j. Approximately how many people would the completed project displace?
None.

k. Proposed measures to avoid or reduce displacement impacts, if any:
None at this time.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:
The project will be permitted through local jurisdictions in accordance with all applicable zoning ordinances.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:
N/A.

9. *Housing* [help]

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.
Approximately 144 dwelling units will be provided with the completed apartment complex. These units will be middle to high income housing.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.
None would be eliminated.

c. Proposed measures to reduce or control housing impacts, if any:
None at this time.

10. *Aesthetics* [help]

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?
The tallest height on the proposed buildings will be approximately 37.5-ft. The exterior building materials consist of stained cedar horizontal trim boards, cement fiber panel siding and cement fiber horizontal lap siding.

b. What views in the immediate vicinity would be altered or obstructed?
No views are anticipated to be adversely affected. The proposed development will help bring the area up to current City standards and make the area look cleaner.

b. Proposed measures to reduce or control aesthetic impacts, if any:
Landscaping, setbacks, and building department façade requirements will be used to control aesthetics.

11. *Light and Glare* [help]

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?
Parking lot and building lighting would be proposed for night time.

b. Could light or glare from the finished project be a safety hazard or interfere with views?
No.

c. What existing off-site sources of light or glare may affect your proposal?
None known.

d. Proposed measures to reduce or control light and glare impacts, if any:
Lighting will be shielded downward to prevent light bleeding off-site.

12. *Recreation* [help]

a. What designated and informal recreational opportunities are in the immediate vicinity?
The site is located adjacent to the Columbia Point Golf Course. Howard Amon Park is located approximately 1,000-ft north of the site. Bike and walking paths are located along the Columbia River 350-ft from the site.

b. Would the proposed project displace any existing recreational uses? If so, describe.
No, the proposal would not displace any existing recreational uses.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:
Impact fees will be paid as required by the City of Richland.

13. *Historic and cultural preservation* [help]

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.
None know on-site per the Department of Archeology and Historic Preservation. The nearest eligible property (ID 98394) is located approximately 1,000-ft west at 310 Barth, Richland WA.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.
The site is considered an area of interest for multiple native tribes according to the WISAARD system of the DAHP. No evidence of artifacts has been found to our knowledge.

Archaeological Report has been submitted.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.
The WISAARD system of the DAHP was used to assess potential impacts.

Archaeological Report has been submitted.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.
Upon any discovery of potential or known archeological resources at the subject properties prior to or during future on-site construction, the developer, contractor, and/or any other parties involved in construction shall immediately cease all on-site construction, shall act to protect the potential or known historical and cultural resources area from outside intrusion, and shall notify, within a maximum period of twenty-four hours from the time of discovery, the City of Richland Community Development Department of said discovery.

14. *Transportation* [help]

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.
The site will be accessed from an existing 24-ft access easement at the south and two 35-ft driveways off Bradley Blvd. George Washington Way can be quickly accessed from Bradley Blvd and Comstock St.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?
Yes, the site is currently served by the Benton Franklin Transit, stops RC088, RC098 and RC097.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?
Approximately 225 parking stalls will be provided with the completed project. The proposal will not eliminate any parking stalls.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).
Yes, frontage improvements including curb, gutter, and sidewalk will be required along Bradley Blvd.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air

transportation? If so, generally describe.
No.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?
The completed development will generate approximately 1,108 average daily trips and peak volumes would occur in the pm hours. Land Use codes 220 and 495 of the 9th Edition ITE Trip Generation Manual were used to make the trip estimates for this proposal.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.
No.

h. Proposed measures to reduce or control transportation impacts, if any:
Transportation impact fees will be paid as required by the City of Richland.

15. *Public Services* [help]

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.
Yes, the completed development will utilize fire and police protection, as well as creating a need for pubic transit. Residents and employees will utilize healthcare and schools.

b. Proposed measures to reduce or control direct impacts on public services, if any.
The completed development will provide additional tax revenue for the City and will pay impact fees as necessary.

16. *Utilities* [help]

a. Circle utilities currently available at the site:
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____

c. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Electricity – Richland Energy Services

Natural Gas – Cascade Natural Gas

Sewer – City of Richland

Water – City of Richland

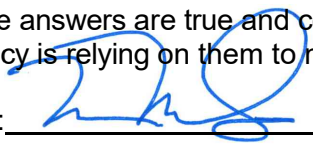
Cable – Charter

Telephone – Ziply

Internet – Charter/Ziply

C. Signature [HELP]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: 

Name of signee Nathan Machiela

Position and Agency/Organization Principal, Knutzen Engineering

Date Submitted: 5/20/2022

GENERAL NOTES

CITY OF RICHLAND NOTES

1. FOR CITY OF RICHLAND NOTES SEE SHEET C501

GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE INTERNATIONAL BUILDING CODE (IBC), THE CURRENT EDITION OF WSDOT STANDARD SPECIFICATION FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION M41-10, THE CITY STANDARDS AND SPECIFICATIONS, AND LOCAL RULES AND STANDARDS OF GOVERNING AGENCIES HAVING JURISDICTION.

1. PRIOR TO DIGGING VERIFY LOCATION AND DEPTH OF UTILITIES AND ANY OTHER UNDERGROUND INTERFERENCE. CALL TWO BUSINESS DAYS BEFORE YOU DIG AT 811.

2. STATEMENT OF ERRORS, AMBIGUITIES AND OMISSIONS: ANY ERRORS, AMBIGUITIES, AND OMISSION IN DRAWINGS AND/OR SPECIFICATIONS SHALL BE REPORTED TO KNUTZEN'S ENGINEERING FOR CORRECTION BEFORE ANY PART OF THE WORK IS STARTED. UNLESS EXPRESSLY STIPULATED NO ADDITIONAL ALLOWANCE WILL BE MADE IN THE CONTRACTOR AND/OR MANUFACTURE'S FAVOR BY VIRTUE OF ERRORS, AMBIGUITIES, AND/OR OMISSIONS WHICH SHOULD HAVE BEEN DISCOVERED DURING THE PREPARATION OF BID ESTIMATE AND DIRECTED TO THE ATTENTION OF KNUTZEN'S ENGINEERING IN A TIMELY MANNER. KNUTZEN'S ENGINEERING ACCEPTS NO RESPONSIBILITY FOR WORK DONE BY THE CONTRACTOR OR SUBCONTRACTORS CONTRARY TO THE PLANS OR SPECIFICATIONS. SUBSTITUTION OR CHANGES WILL NOT BE ACCEPTED UNLESS APPROVED IN WRITING. THE SUBCONTRACTOR SHALL REVIEW ALL SECTIONS OF SPECIFICATIONS AND ALL SHEETS OF THE PLANS FOR ANY INFORMATION OR DETAILS PERTAINING TO THEIR SPECIFIC TRADE.

3. CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF SITE CONDITIONS, INSTALLATION STANDARDS AND CONSTRUCTION CONDITIONS. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO SHOP FABRICATION AND/OR FIELD ERECTION. DISCREPANCIES BETWEEN SITE CONDITIONS AND THE CONSTRUCTION DRAWINGS SHALL BE CALLED TO THE ATTENTION OF THE ENGINEER. WORK DONE WITHOUT THE ENGINEERS APPROVAL IS THE RESPONSIBILITY OF THE CONTRACTOR. LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE DRAWINGS ARE APPROXIMATE ONLY. CONTRACTOR IS FULLY RESPONSIBLE FOR ANY AND ALL DAMAGE WHICH MIGHT OCCUR TO EXISTING UTILITIES.

4. CONTRACTOR IS TO PROVIDE A METHOD OF CONSTRUCTION OF OFF-SITE WORK THAT WILL ALLOW MINIMAL DISTURBANCE TO TRAFFIC FLOWS ON PUBLIC AND PRIVATE WAYS.

5. ALL SPECIAL INSPECTION AND TESTING SHALL BE PERFORMED BY AN INDEPENDENT INSPECTION AND TESTING AGENCY HIRED BY THE OWNER. CONTRACTOR TO COORDINATE WITH INSPECTION AND TESTING AGENCY FOR REQUIRED CONSTRUCTION INSPECTIONS AND MATERIAL TESTING.

6. CONTRACTOR SHALL PROTECT EXISTING PROPERTY CORNERS, IF CORNERS ARE DISTURBED THE CONTRACTOR SHALL BE RESPONSIBLE FOR HIRING A PROFESSIONAL LAND SURVEYOR TO RE-ESTABLISH THE PROPERTY CORNER(S).

7. THE CONTRACTOR SHALL REFERENCE RECOMMENDATIONS OF THE GEO-TECHNICAL ENGINEERS SOILS REPORT.

8. CONTRACTOR SHALL REPAIR OR REPLACE ANY DAMAGED CURBING OR SIDEWALK WITH IN THE RIGHT OF WAY PER CITY SPECIFICATIONS.

9. ALL ACCESSIBLE ACCESS PATHS, RAMPS, PARKING, AND SIGNAGE SHALL BE TO CURRENT ACCESSIBLE CODES.

EARTHWORK

1. ALL STRUCTURAL FILL OR BACKFILL SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D1557. ALL STRUCTURAL FILL AND BACKFILL SHALL BE PLACED IN MAXIMUM 8" LIFTS. MOISTURE CONDITIONED TO WITHIN 2% OF OPTIMUM MOISTURE CONTENT.

2. REMOVE ALL DEBRIS FROM THE AREA TO BE BACKFILLED PRIOR TO BACKFILLING.

3. SATISFACTORY NATIVE SOILS SHALL BE FREE OF ROCK OR GRAVELS LARGER THAN 3" IN ANY DIMENSION, DEBRIS, WASTE OR FROZEN MATERIAL, NATIVE VEGETATION, OR OTHER DELETERIOUS MATTER.

4. PLACE LOAD BEARING BACKFILL IN LAYERS NOT MORE THAN 8" THICK, LOOSE MEASUREMENT. SPREAD AND COMPACT EACH LAYER UNIFORMLY TO THE REQUIRED DENSITY.

5. THE CONTRACTOR SHALL BE RESPONSIBLE TO REPLACE IN KIND ANY UTILITIES AND OR IRRIGATION PIPING DISTURBED AND OR DAMAGED DURING THE WORK.

6. ALL AREAS TO RECEIVE STRUCTURAL IMPROVEMENTS, PARKING IMPROVEMENTS, AND ROADWAY IMPROVEMENTS SHALL BE STRIPPED OF ALL VEGETATION, ORGANIC MATERIAL, DEMOLITION DEBRIS, THE SOIL SHALL BE SCARIFIED TO A DEPTH OF 12 INCHES AND COMPACTED TO 92% MDD IN ACCORDANCE WITH ASTM D1557.

7. ALL EXPOSED CUT SLOPES SHALL BE STABILIZED WITH HYDROMULCH TO PREVENT EROSION.

8. STORM PONDS/SWALES SIDEWALLS SHALL BE COMPACTED TO 85% MDD PER ASTM D1557. THE POND BOTTOM SHALL BE SCARIFIED TO A DEPTH OF 18 INCHES WITH A RIPPER UPON COMPLETION OF THE PONDS/SWALES PUSH OUT.

9. GRADING TO BE COMPLETED PER 2018 IBC (APPENDIX J) AND THE GEOTECHNICAL REPORT PREPARED FOR THE SITE BY GN NORTHERN IN JULY 2021. (GNN PROJECT NO.221-1412)

SPECIAL INSPECTION

1. PER IBC 1705.6, PRIOR TO PLACEMENT OF PREPARED FILL, THE SPECIAL INSPECTOR SHALL DETERMINE THAT THE SITE HAS BEEN PREPARED IN ACCORDANCE WITH THE APPROVED SOILS REPORT.

2. PER IBC 1705.6, WHERE FILL EXCEEDS 12" IN DEPTH, THE SPECIAL INSPECTOR SHALL HAVE CONTINUOUS INSPECTION OF FILL PLACEMENT AND COMPACTION.

3. TESTING AGENCY WILL TEST COMPACTION OF SOILS IN PLACE ACCORDING TO ASTM D 1557, ASTM D 2167, ASTM D 2937, ASTM D 6938, AS APPLICABLE. TESTS WILL BE PERFORMED AT THE FOLLOWING LOCATIONS AND FREQUENCIES:

   A. FOUNDATION, PAVING, AND ADJACENT: AT SUBGRADE AND AT EACH COMPACTED FILL AND BACKFILL LAYER, AT LEAST 1 TEST FOR EVERY 5,000 SQ. FT. OR LESS OF PAVED AREA OR BUILDING SLAB, BUT IN NO CASE FEWER THAN 1 TEST PER DAY.

   B. TRENCH BACKFILL: AT EACH COMPACTED INITIAL AND FINAL BACKFILL LAYER, AT LEAST 1 TEST FOR EACH 150 FEET OR LESS OF TRENCH LENGTH, BUT NO LESS THAN 1 TEST PER DAY.

4. COMPACTION TESTING IS REQUIRED AT THE ABOVE SCHEDULE UNLESS GREATER TESTING IS RECOMMENDED BY STRUCTURAL DRAWINGS. LESS TESTING WOULD BE ACCEPTABLE IF APPROVED IN WRITING BY GEOTECHNICAL ENGINEER, SPECIAL INSPECTOR, FOUNDATION ENGINEER, AND KNUTZEN'S ENGINEERING.

Table 1705.6
REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

Type	Duration
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	C
2. Verify excavations are extended to proper depth and have reached proper material.	C
3. Perform classification and testing of compacted fill materials.	C
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	C
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	P

Continuous (C); Periodic (P)

EROSION CONTROL

1. PROVIDE TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES TO PREVENT SOIL EROSION AND DISCHARGE OF SOIL-BEARING WATER RUNOFF OR AIRBORNE DUST TO ADJACENT PROPERTIES, WALKWAYS, AND DESIGNATED STORMWATER SWALES ACCORDING TO REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION.

2. ESTABLISH CONSTRUCTION ACCESS.

   A. CONSTRUCTION VEHICLE ACCESS AND EXIT SHALL BE LIMITED TO ONLY NECESSARY LOCATIONS. ACCESS POINTS SHALL BE STABILIZED WITH QUARRY SPALL OR CRUSHED ROCK TO MINIMIZE THE TRACKING OF SEDIMENT ONTO PUBLIC ROADS, MINIMUM 30 FEET LONG.

   B. PUBLIC ROADS SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM ROADS BY SHOVELING OR PICKUP SWEEPING AND SHALL BE TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA. STREET WASHING WILL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER.

   D. STREET WASH WASTEWATER SHALL BE CONTROLLED BY PUMPING BACK ON-SITE, OR OTHERWISE BE PREVENTED FROM DISCHARGING INTO SYSTEMS TRIBUTARY TO STATE SURFACE WATERS.

   E. WHENEVER POSSIBLE, THE ENTRANCE SHALL BE CONSTRUCTED ON A FIRM, COMPACTED SUBGRADE. THIS CAN SUBSTANTIALLY INCREASE THE EFFECTIVENESS OF THE PAD AND REDUCE THE NEED FOR MAINTENANCE.

   F. QUARRY SPALLS SHALL BE ADDED IF THE PAD IS NO LONGER IN ACCORDANCE WITH THE SPECIFICATIONS.

   G. IF THE ENTRANCE IS NOT PREVENTING SEDIMENT FROM BEING TRACKED ONTO PAVEMENT, THEN ALTERNATIVE MEASURES TO KEEP THE STREETS FREE OF SEDIMENT SHALL BE USED. THIS MAY INCLUDE STREET SWEEPING, AN INCREASE IN THE DIMENSIONS OF THE ENTRANCE, OR THE INSTALLATION OF A WHEEL WASH.

   H. ANY QUARRY SPALLS THAT ARE LOOSENED FROM THE PAD, WHICH END UP ON THE ROADWAY, SHALL BE REMOVED IMMEDIATELY.

   I. UNTIL PROJECT COMPLETION AND SITE STABILIZATION, ALL CONSTRUCTION ACCESSES INTENDED AS PERMANENT ACCESS FOR MAINTENANCE SHALL BE PERMANENTLY STABILIZED.

3. CONTRACTOR SHALL INSTALL AND MAINTAIN TEMPORARY SILT FENCING TO PREVENT ANY WATER RUNOFF FROM ANY DISTURBED AREAS. AT A MINIMUM, SILT FENCE WILL BE ALONG THE DOWN SLOPE PROPERTY LINES. THE SILT FENCES SHALL BE CONSTRUCTED IN THE AREAS OF CLEARING, GRADING, OR DRAINAGE PRIOR TO STARTING THOSE ACTIVITIES. THE SILT FENCE SHALL PREVENT SOIL CARRIED BY RUNOFF WATER FROM GOING BENEATH, THROUGH, OR OVER THE TOP OF THE SILT FENCE, BUT SHALL ALLOW THE WATER TO PASS THROUGH THE FENCE.

4. CONTRACTOR SHALL BE RESPONSIBLE FOR DEVELOPING AND MAINTAINING A DUST CONTROL PLAN. DUST CONTROL SHALL BE IN ACCORDANCE WITH ALL LOCAL ORDINANCES. ALL DUST CONTROL MEASURES SHALL BE DONE WITH A PERSON OPERATED WATERING DEVICE (E.G. WATER TRUCK, WATER WAGON, ETC.) NO UNATTENDED WATERING ALLOWED. NO IRRIGATION LINES OR OTHER IRRIGATION/SPRINKLER TYPE WATERING DEVICES ALLOWED.

5. CONTRACTOR SHALL PROTECT EXISTING STORMWATER INLETS BY INSTALLING CATCH BASIN INSERTS.

6. INSPECT, REPAIR, AND MAINTAIN EROSION AND SEDIMENTATION CONTROL MEASURES DURING CONSTRUCTION UNTIL PERMANENT VEGETATION HAS BEEN ESTABLISHED.

7. REMOVE EROSION AND SEDIMENTATION CONTROLS ONCE THEY ARE NO LONGER NEEDED AND RESTORE AND STABILIZE AREAS DISTURBED DURING REMOVAL.

STORMWATER PREVENTION POLLUTION PLAN

1. CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING AND IMPLEMENTING A STORMWATER POLLUTION PREVENTION PLAN (SWPPP) IN ACCORDANCE WITH STORMWATER MANAGEMENT MANUAL FOR EASTERN WASHINGTON (SWMMEW).

2. WHENEVER INSPECTION AND OR MONITORING REVEALS THAT THE BMP'S IDENTIFIED IN THE CONSTRUCTION SWPPP ARE INADEQUATE, DUE TO THE ACTUAL DISCHARGE OF OUR POTENTIAL TO DISCHARGE A SIGNIFICANT AMOUNT OF ANY POLLUTANT, THE SWPPP SHALL BE MODIFIED, AS APPROPRIATE AND IN A TIMELY MANNER. J.

REVIEWED FOR BUILDING CODE COMPLIANCE

These plans have been checked for compliance with major building code items. The City's permit process has been established this way in order to expedite the start of construction, and this approval shall not be construed to be an approval to violate specific building code or other municipal ordinance provisions discovered during actual construction. Where these plans conflict with code provisions, the code provisions shall still apply. The permit holder and his contracted parties shall take full financial and all other liability for making corrections of errors and omissions to these plans and to the actual construction, including corrections mandated by other government agencies or other City departments. Permit holder shall comply with all requirements from other City departments prior to use or occupancy of the structure or building. Changes to these approved plans must be submitted to and approved by the City prior to construction of the change (additional fees apply).

Ty Jennings, CBO MCP — Plans Examiner
05/05/2022 — Date

**** PRECONSTRUCTION MTG REQUIRED ****

Before commencing any grading, a preconstruction meeting with the grading contractor, engineering representative, testing agency, and a CoR Building Inspector is required.

See permit card for details.

GER Grading Requirements

Grading shall be completed in accordance with Appendix J of the 2018 IBC and GN Northern, Inc.'s Geotechnical Site Investigation Report dated July 27, 2021 (GNN Proj. No. 221-1412)

Provide observation and testing reports as required by CoR Building Inspector for grading.

CITY OF RICHLAND STANDARD NOTES

THE FOLLOWING NOTES SHALL BE USED WHEN THEY ARE APPLICABLE TO THE PROJECT. ADDITIONAL NOTES SHALL BE ADDED BY THE DESIGN ENGINEER OR MAY BE REQUIRED BY THE CITY TO ADDRESS SPECIFIC CONCERNS FOR EACH PROJECT.

1. ALL MATERIALS AND WORKMANSHIP SHALL BE IN CONFORMANCE WITH THE LATEST REVISION OF THE CITY OF RICHLAND STANDARD SPECIFICATIONS AND DETAILS AND THE CURRENT EDITION OF THE STATE OF WASHINGTON STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION. PLEASE CONFIRM THAT YOU HAVE THE LATEST SET OF STANDARD SPECS AND DETAILS BY VISITING THE CITY'S WEB PAGE
2. ANY WORK WITHIN THE PUBLIC RIGHT-OF-WAY, UTILITY EASEMENT, OR INVOLVING THE CONSTRUCTION OF PUBLIC INFRASTRUCTURE WILL REQUIRE THE APPLICANT TO OBTAIN A RIGHT-OF-WAY PERMIT PRIOR TO CONSTRUCTION. A PLAN REVIEW AND INSPECTION FEE IN THE AMOUNT EQUAL TO 5% OF THE CONSTRUCTION COSTS OF THE WORK THAT WILL BE ACCEPTED AS PUBLIC INFRASTRUCTURE OR IS WITHIN THE RIGHT-OF-WAY OR EASEMENT WILL BE COLLECTED AT THE TIME THE PERMIT IS ISSUED. A STAMPED ITEMIZED ENGINEERS ESTIMATE (OPINION OF PROBABLE COST) SHALL BE SUED TO CALCULATE THE 5% FEE.
3. ONCE THE PLANS HAVE BEEN ACCEPTED BY THIS DEPARTMENT, A PRE-CONSTRUCTION CONFERENCE WILL BE REQUIRED PRIOR TO THE START OF ANY WORK WITHIN THE PUBLIC RIGHT-OF-WAY OR EASEMENT. CONTACT THE PUBLIC WORKS ENGINEERING DIVISION AT 942-7500 OR 942-7742 TO SCHEDULE A PRE-CONSTRUCTION CONFERENCE.
4. WHEN CONSTRUCTION IS SUBSTANTIALLY COMPLETE A PAPER SET OF "RECORD DRAWINGS" SHALL BE PREPARED BY A LICENSED SURVEYOR AND INCLUDE ALL CHANGES AND DEVIATIONS. PLEASE REFERENCE THE PUBLIC WORKS DOCUMENT "RECORD DRAWING REQUIREMENTS & PROCEDURES" FOR A COMPLETE DESCRIPTION OF THE RECORD DRAWING PROCESS. AFTER APPROVAL BY THE CITY OF THE PAPER COPY, A MYLAR COPY OF THE RECORD DRAWINGS SHALL BE SUBMITTED ALONG WITH A CAD COP OF THEM.
5. NO WORK ON THIS PROJECT SHALL COMMENCE UNTIL A CITY OF RICHLAND RIGHT-OF-WAY CONSTRUCTION PERMIT HAS BEEN ISSUED.
6. ALL TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS."
7. THE CONTRACTOR AND ALL SUB-CONTRACTORS SHALL BE LICENSED BY THE STATE OF WASHINGTON AND BONDED TO DO WORK IN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL PROVIDE THE CITY A CERTIFICATE OF INSURANCE PRIOR TO ISSUANCE OF THE RIGHT-OF-WAY CONSTRUCTION PERMIT. THE MINIMUM COVERAGES SHALL COMPLY WITH CITY'S INSURANCE REQUIREMENTS.
8. THE CONTRACTOR AND ALL SUB-CONTRACTORS SHALL HAVE A CURRENT CITY OF RICHLAND BUSINESS LICENSE.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY AND ALL CONSTRUCTION DEFICIENCIES FOR A PERIOD OF ONE-YEAR FROM THE DATE OF ACCEPTANCE BY THE CITY OF RICHLAND.
10. THE CONTRACTOR SHALL BE REQUIRED TO CALL 1-800-424-5555 OR "811" A MINIMUM OF TWO WORKING DAYS PRIOR TO COMMENCING ANY EXCAVATION ACTIVITIES TO DETERMINE FIELD LOCATIONS OF ALL UNDERGROUND UTILITIES.
11. ANY CHANGES OR MODIFICATIONS TO THE PROJECT PLANS SHALL FIRST BE APPROVED BY THE CITY ENGINEER OR HIS REPRESENTATIVE.
12. THE LOCATIONS OF ALL EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATIONS OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE ASSOCIATED WITH THE FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
13. THE FACE OF CURB SHALL BE STAMPED AT ALL UTILITY CROSSINGS, MAIN LINES AND SERVICE LINES AS FOLLOWS:
    "S" - SANITARY SEWER, "I" - IRRIGATION, "G" - GAS
    "W" - WATER, "C" - CONDUITS, "D" STORM DRAIN
14. ALL FIRE HYDRANTS AND GUARD POSTS SHALL BE PAINTED OSHA SAFETY YELLOW, QUICKSET ENAMEL NO. 3472 HYDRANT YELLOW AS MANUFACTURED BY FARWEST PAINT MANUFACTURING COMPANY OR APPROVED EQUAL.
15. FIRE HYDRANTS AND STREET LIGHTS SHALL BE INSTALLED AT 2-FEET BEHIND THE BACK OF SIDEWALK TO THE FACE OF EQUIPMENT WHERE THE SIDEWALK IS ADJACENT TO THE CURB AND 6 FEET BEHIND THE BACK OF CURB WHERE THE SIDEWALK IS NOT ADJACENT TO THE CURB UNLESS OTHERWISE NOTED ON THE PLANS.
16. ANY DAMAGED OR BADLY DETERIORATED CONCRETE CURB, GUTTER AND SIDEWALK WITHIN PUBLIC RIGHT OF WAY SHALL BE REMOVED AND REPLACED. THIS INCLUDES ANY CURB DAMAGED BY CONSTRUCTION EQUIPMENT DURING THE PROJECT.
17. 2-INCHES OF CRUSHED GRAVEL SHALL BE PLACED AND COMPACTED BENEATH ALL SIDEWALKS PRIOR TO PLACEMENT OF CONCRETE.
18. ALL STORM DRAINAGE MANHOLES WITH A GRATED LID SHALL BE CONSTRUCTED WITH "SUMP" IN THE BOTTOM OF THEM, AND ALL STORM MANHOLES WITH SOLID LIDS SHALL HAVE CHANNELED BASES, IN ACCORDANCE WITH THE STANDARD DETAILS.
19. IRRIGATION VALVE BOXES OR LIDS WITHIN THE ROADWAY OR PUBLIC RIGHT-OF-WAY NEED TO BE PER CITY OF RICHLAND SPEC: "RICH 931" CAST IRON LID SHALL HAVE "IRR" CAST INTO TOP.
20. A MINIMUM HORIZONTAL SEPARATION OF 10-FEET SHALL BE MAINTAINED BETWEEN WATER MAINS AND SEWER MAINS AND SERVICE LINES. WATER MAINS SHOULD CROSS OVER THE TOP OF SEWER MAINS WITH A MINIMUM VERTICAL SEPARATION OF 18-INCHES. ANY CROSSING WITH A VERTICAL SEPARATION OF LESS THAN 18-INCHES OR ANY CROSSING IN WHICH THE WATER MAIN CROSSES BELOW THE SEWER MAIN SHALL BE IN ACCORDANCE WITH WASHINGTON STATE DEPARTMENT OF ECOLOGY STANDARDS. PRESSURIZED SEWER MAINS SHALL NOT CROSS OVER POTABLE WATER MAINS IN ANY CASE. IF A MINIMUM VERTICAL SEPARATION OF 12-INCHES CANNOT BE MAINTAINED BETWEEN PIPES, CDF OR CONCRETE SHALL BE USED AS BACKFILL IN PLACE OF SOIL OR GRAVEL.
21. RESIDENTIAL SEWER SERVICES SHALL BE 4-INCH DIAMETER AND SHALL EXTEND 10-FEET BEYOND THE RIGHT-OF-WAY INTO THE LOT. THE END SHALL BE MARKED WITH MARKER POST INSTALLED IN ACCORDANCE WITH CITY STANDARD DETAILS
22. RESIDENTIAL WATER SERVICES SHALL BE 1-INCH IN DIAMETER AND SHALL EXTEND 1-FOOT BEYOND THE BACK OF SIDEWALK THROUGH THE CURB STOP. THE END SHALL BE MARKED WITH A BLUE MARKER POST INSTALLED IN ACCORDANCE WITH CITY STANDARD DETAILS.
23. THE CONTRACTOR SHALL TAKE ANY NECESSARY MEANS TO KEEP FROM TRACKING MUD AND DEBRIS OUT ONTO THE EXISTING STREETS, AND SHALL KEEP MUD AND ANY OTHER DEBRIS FROM HIS SITE FROM ENTERING THE EXISTING PUBLIC STORM DRAINAGE SYSTEM.
24. THE CONTRACTOR SHALL SUPPLY A DUST CONTROL PLAN PRIOR TO STARTING WORK IN ACCORDANCE WITH TRMC CHAPTER 9.16.046, SECTION J

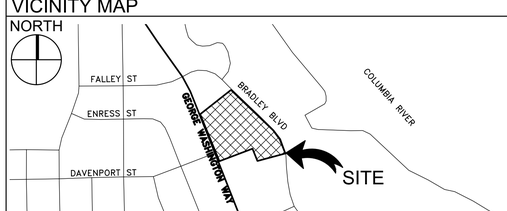
2.5 ALL DISTURBED AREAS SHALL BE HYDRO-SEEDED AT THE COMPLETION OF THE PROJECT.

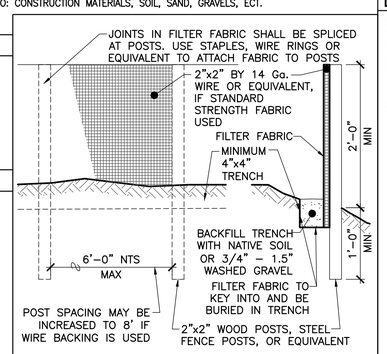
26. THE CONTRACTOR SHALL TAKE CARE TO PREVENT CONSTRUCTION SITE RUNOFF FROM THE ENTERING INTO THE CITY'S STORMWATER SYSTEM, IN ACCORDANCE WITH RMC CHAPTER 16.05. CONSTRUCTION MATERIALS THAT MAY INTRODUCE SEDIMENT INTO THE STORM SYSTEM MAY NOT BE STOCKPILED IN THE STREET. SUCH MATERIALS MAY INCLUDE BUT NOT BE LIMITED TO: CONSTRUCTION MATERIALS, SOIL, SAND, GRAVELS, ECT.

REFERENCE SOURCES

1. EASTERN WASHINGTON STORMWATER MANUAL CAN BE FOUND AT: (https://fortress.wa.gov/ecy/publications/documents/1810044.pdf).
2. THE CITY OF RICHLAND STANDARD SPECIFICATIONS AND DRAWINGS CAN BE FOUND AT: (https://www.ci.richland.wa.us/departments/public-works/engineering-and-private-development/standard-details).
3. THE CITY OF RICHLAND MUNICIPAL CODE CAN BE FOUND AT: (https://www.codepublishing.com/WA/Richland/).

VICINITY MAP





A5 SILT FENCE
SCALE: 1" = 1'-0" REF: C005

LEGEND AND ABBREVIATIONS

NEW	EXISTING	
		ACCESSIBLE PARKING MARKER
AVR	(E)AVR	AIR VAC RELIEF
AD	(E)AD	AREA DRAIN
GUY	(E)GUY	GUY WIRE
BOA	(E)BOA	BLOW OFF ASSEMBLY
BO	(E)BO	BOLLARD
		CAP
CB	(E)CB	CATCH BASIN ROUND/SQUARE
CB		CATCH BASIN SOLID
CO	(E)CO	CLEAN OUT
		CONTINUOUS DEFLECTIVE SEPARATION UNIT
DS	(E)DS	DOWN SPOUT
DW	(E)DW	DRY WELL
EM	(E)EM	ELECTRICAL METER
EV	(E)EV	ELECTRICAL VAULT
GM	(E)GM	GAS METER
FDC	(E)FDC	FIRE DEPARTMENT CONNECTION
FH	(E)FH	FIRE HYDRANT
FP	(E)FP	FLAG POLE
IV	(E)IV	IRRIGATION VALVE
LP	(E)LP	LIGHT POLE
SD SS MH	(E)SD (E)SS (E)MH	MANHOLE
		PAVEMENT ARROWS
PIV	(E)PIV	POST INDICATOR VALVE
PP	(E)PP	POWER POLE
		REDUCER
		SHRUB
		SLOPE DIRECTION/PIPE SLOPE
SB	(E)SB	STORM BUBBLER
SIGN	(E)SIGN	STREET SIGN
SL	(E)SL	STREET LIGHT
TP	(E)TP	TELEPHONE PEDESTAL
		THRUST BLOCK
XFMR	(E)XFMR	TRANSFORMER
		TREE
T C P J	T C P J	UTILITY BOX
VAN		VAN PAVEMENT MARKING
WV	(E)WV	WATER VALVE
WM/IM	(E)WM/IM	WATER/IRRIGATION METER
WP	MON	WORK/MONUMENT POINT
		YARD HYDRANT
NEW ASPHALT		EXISTING ASPHALT
NEW HEAVY ASPHALT		EXISTING CONCRETE
NEW HEAVY CONCRETE		EXISTING GRAVEL
NEW CONCRETE		EXISTING LAWN
NEW GRAVEL		EXISTING LANDSCAPE
NEW LAWN		EXISTING UNDEVELOPED
NEW LANDSCAPE		REMOVE LANDSCAPE
NEW PLAY ASPHALT		REMOVE ASPHALT
NEW NATIVE		REMOVE CONCRETE
NEW TRUNCATED DOMES		REMOVE GRAVEL
NEW RIP RAP		REMOVE LAWN
ABAND ABANDONED		REMOVE UNDEVELOPED
BOT BOTTOM		
BW BOTTOM OF WALL ELEVATION		PDP PERFORATED DRAIN PIPE
COM COMMUNICATIONS		PE POLYETHYLENE
(E) EXISTING		PS PRESSURE SEWER
FO FIBER OPTICS LINE		ROW RIGHT-OF-WAY
FF FINISH FLOOR		R RADIUS
FG FINISH GRADE		RWL RAIN WATER LEADER
FR FIRE RISER		SS SANITARY SEWER
FW FIRE WATER		SLV PIPE SLEEVE
GL GUTTER LINE		XXX.XX SPOT ELEVATION
IE INVERT ELEVATION		SD STORM DRAIN
IR IRRIGATION		T TELEPHONE
LS LANDSCAPE		TV TELEVISION
MON MONUMENT		TA TOP OF ASPHALT ELEVATION
NG NATURAL GAS		TC TOP OF CONCRETE ELEVATION
NIC NOT IN CONTRACT		TG TOP OF GRAVEL ELEVATION
NTS NOT TO SCALE		TW TOP OF WALL ELEVATION
OHP OVERHEAD POWER		TYP TYPICAL
P POWER		W WATER
		SAWCUT LINE
		NEW EASEMENT LINE
		PROPERTY LINE
	100	EXISTING CONTOUR
	100	NEW CONTOUR
		EXISTING FENCE
		NEW FENCE
		REMOVE FENCE
		REMOVE SURFACE FEATURE
		REMOVE UNDERGROUND UTILITY
		ABANDONED UNDERGROUND UTILITY
		EXISTING UNDERGROUND UTILITY
		NEW UNDERGROUND UTILITY
		RAIL ROAD TRACKS

DRAWING INDEX

KNUTZEN ENGINEERING
5401 RIDGELINE DR.
SUITE 160
KENNEWICK, WA 99338
1-509-222-0959
www.knutzenengineering.com

No.	REVISIONS	DATE	DESIGN	CHKD	APPD
1	CITY COMMENTS	05/04/22	RAM	PTK	PTK

NATHAN J. MACHIELA — STATE OF WASHINGTON — 19972 — REGISTERED PROFESSIONAL ENGINEER
05/04/22

GENERAL NOTES AND LEGEND

CEDAR AND SAGE HOMES, LLC
CEDAR HOMES APARTMENTS
425 BRADLEY BLVD, RICHLAND, WA 99352

APPROVAL		
DESIGN	RAM	04/06/22
CHECKED	NJM	04/06/22
APPROVED	NJM	04/06/22

SCALE: AS NOTED
CADFILE: 21189C01
JOB No. 21189 — REV. 1
DWG. No. C001
22-00932

\\2021\21189-425 Bradley Blvd\DWG\Mass Grading Plan Set\21189C01.dwg - May 04,2022 - 09:02am - rmc

425 BRADLEY

A PORTION OF THE NE 1/4 OF SEC. 14, TWN. 09 N., RGE. 18 E. W.M.
CITY OF RICHLAND, BENTON COUNTY, WASHINGTON.

LEGAL DESCRIPTION

FIRST AMERICAN TITLE INSURANCE COMPANY COMMITMENT/FILE NO. 4381–3740101 DATED MAY 6, 2021

PARCEL A

LOT 1, SHORT PLAT NO. 2516, ACCORDING TO THE SURVEY THEREOF RECORDED UNDER AUDITOR'S FILE NO. 2000–019897, RECORDS OF BENTON COUNTY, WASHINGTON.

PARCEL B

LOT 2, SHORT PLAT NO. 2516, ACCORDING TO THE SURVEY THEREOF RECORDED UNDER AUDITOR'S FILE NO. 2000–019897, RECORDS OF BENTON COUNTY, WASHINGTON.

PARCEL C

LOT 3, SHORT PLAT NO. 2516, ACCORDING TO THE SURVEY THEREOF RECORDED UNDER AUDITOR'S FILE NO. 2000–019897, RECORDS OF BENTON COUNTY, WASHINGTON, EXCEPT THE NORTHWESTERLY 67.00 FEET THEREOF.

PARCEL D

LOT 1, SHORT PLAT NO. 3473, ACCORDING TO THE SURVEY THEREOF RECORDED UNDER AUDITOR'S FILE NO. 2015–033827, RECORDS OF BENTON COUNTY, WASHINGTON.

PARCEL E

LOT 2, SHORT PLAT NO. 3473, ACCORDING TO THE SURVEY THEREOF RECORDED UNDER AUDITOR'S FILE NO. 2015–033827, RECORDS OF BENTON COUNTY, WASHINGTON.

VERTICAL DATUM

NAVD 88
CITY OF RICHLAND VERTICAL BENCHMARK 1589
ELEV: = 360.69

BASIS OF BEARING

WASHINGTON STATE PLANE COORDINATE SYSTEM, NAD 1983/11 SOUTH ZONE PER CITY OF RICHLAND MONUMENTS HORIZONTAL CONTROL HOLDING CITY MONUMENT NUMBERS 1589 AND 1581.

POINT NO.1589
N=344470.9770
E=1951350.3680
AT THE INTERSECTION OF BRADLEY W/ AMON PARK DR.

POINT NO.1581
N=345748.6760
E=1951160.3510
AT THE INTERSECTION OF LEE BLVD W/ HOWARD AMON PARK.

UTILITY NOTES

1. SURFACE UTILITY FACILITIES ARE SHOWN HEREON PER FIELD LOCATED VISIBLE EVIDENCE. THERE MAY BE UTILITIES THAT EXIST ON THIS SITE OTHER THAN THOSE GRAPHICALLY DEPICTED HEREON.

2. UNDERGROUND (BURIED) UTILITIES SHOWN HEREON ARE BASED ON COMBINATIONS OF VISIBLE SURFACE EVIDENCE, UTILITY LOCATOR MARKINGS AND RECORD DATA (SUCH AS AS–BUILT OR UTILITY DESIGN DRAWINGS). ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND, IN SOME CASES, ARE SHOWN AS STRAIGHT LINES BETWEEN FIELD LOCATED SURFACE UTILITY FACILITIES. UNDERGROUND UTILITIES MAY HAVE BENDS, CURVES OR CONNECTIONS WHICH ARE NOT SHOWN.

3. ALTHOUGH LOCATIONS OF UNDERGROUND UTILITIES BASED ON UTILITY LOCATOR MARKINGS AND RECORD DATA (SUCH AS AS–BUILT OR UTILITY DESIGN DRAWINGS) ARE DEEMED RELIABLE, AHBL, INC. ASSUMES NO LIABILITY FOR THE ACCURACY OF SAID DATA.

4. CALL 1–800–424–5555 BEFORE ANY CONSTRUCTION.

RELIANCE NOTE

THIS SURVEY WAS PREPARED AT THE REQUEST OF NATHAN MACHIELA FOR THE SOLE AND EXCLUSIVE USE OF KNUTZEN ENGINEERING. RIGHTS TO RELY UPON AND, OR USE THIS SURVEY DO NOT EXTEND TO ANY OTHER PARTY EXCEPT THROUGH EXPRESS RECERTIFICATION BY THE PROFESSIONAL LAND SURVEYOR WHOSE STAMP AND SIGNATURE APPEAR HEREON.

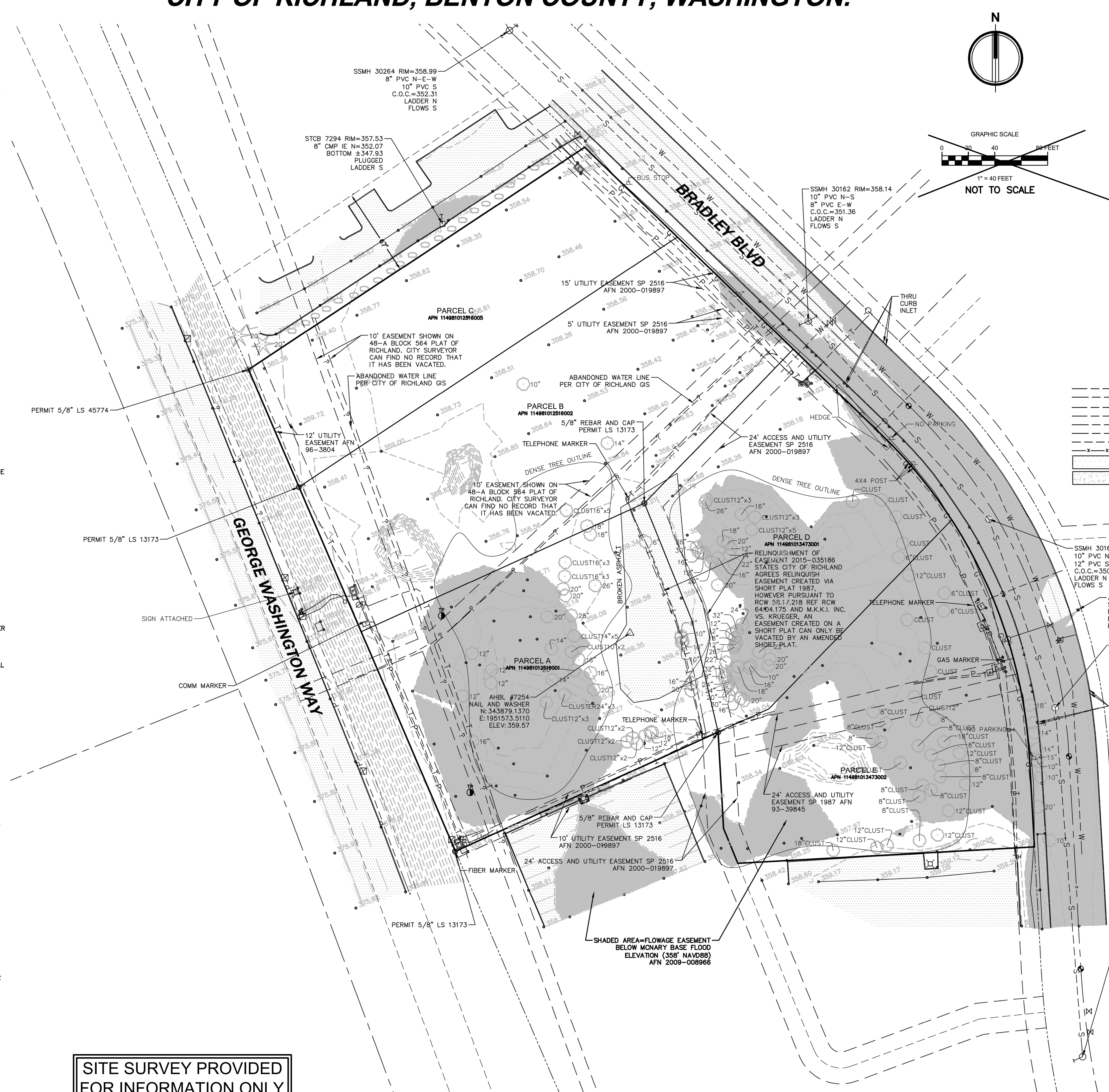
EQUIPMENT USED

3" TOTAL STATION UTILIZING STANDARD FIELD TRAVERSE METHODS FOR CONTROL AND STAKING.

SURVEYOR'S CERTIFICATE

I, JOHN W. BECKER, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF WASHINGTON, HEREBY CERTIFY THAT THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECT SUPERVISION IN JULY 2021 AT THE REQUEST OF KNUTZEN ENGINEERING.

JOHN W. BECKER, PLS 38480 DATE



LEGEND

- SECTION CORNER
- QUARTER SECTION CORNER
- FOUND MONUMENT AS NOTED
- FOUND SURFACE MONUMENT AS NOTED
- BENCHMARK
- HUB AND TACK
- SET NAIL AND WASHER
- SET REBAR AND CAP
- FOUND PROPERTY CORNER
- FOUND/ SET LEAD AND TACK
- BOLLARD
- MAIL BOX
- SIGN AS NOTED
- TEST PIT
- SANITARY SEWER CLEANOUT
- SANITARY SEWER MANHOLE
- STORM CLEANOUT
- STORM CATCH BASIN
- STORM MANHOLE
- CABLE RISER
- GAS METER
- GAS VALVE
- POWER TRANSFORMER
- GUY ANCHOR
- UTILITY POWER POLE
- JUNCTION BOX
- POWER MANHOLE
- POWER METER
- POWER VAULT
- LUMINAIRE
- TELEPHONE RISER
- BLOW OFF VALVE
- FIRE HYDRANT
- IRRIGATION CONTROL VALVE
- WATER METER
- WATER MANHOLE
- WATER VALVE
- CONIFEROUS TREE AS NOTED
- DECIDUOUS TREE AS NOTED
- SHRUB
- D — STORM LINE
- S — SEWER LINE
- W — WATER LINE
- G — GAS LINE
- P — ELECTRICAL LINE
- T — COMMUNICATION LINE
- OHP — OVERHEAD UTILITIES
- x — FENCE
- ASPHALT
- CONCRETE

SITE SURVEY PROVIDED FOR INFORMATION ONLY

City of Richland
Building Codes Review
05/05/2022
REVIEWED

AHBL
TACOMA · SEATTLE · SPOKANE · TRI-CITIES
5804 Road 90, Suite H Pasco, WA 99301
509.380.5883 TEL 253.383.2572 FAX www.ahbl.com WEB

Project Title: **425 BRADLEY**

Client: KNUTZEN ENGINEERING
5401 RIDGELINE DR
SUITE 160
KENNEWICK, WA 99338
NATHAN MACHIELA
(509) 222-0959

Job No. 2160220.90

Issue Set & Date: AUGUST 3, 2021

PRELIMINARY

Revisions:

Sheet Title: **TOPOGRAPHIC SURVEY**

Designed by:	Drawn by:	Checked by:
	TAD/EAF	JWB

Sheet No. 1 (1 of 1 Sheets)

KNUTZEN ENGINEERING
5401 RIDGELINE DR.
SUITE 160
KENNEWICK, WA 99338
1-509-222-0959
www.knutzenengineering.com

No.	REVISIONS	DATE	DESIGN	CHKD	APPD
1	CITY COMMENTS	05/04/22	RAM	PTK	PTK

05/04/22

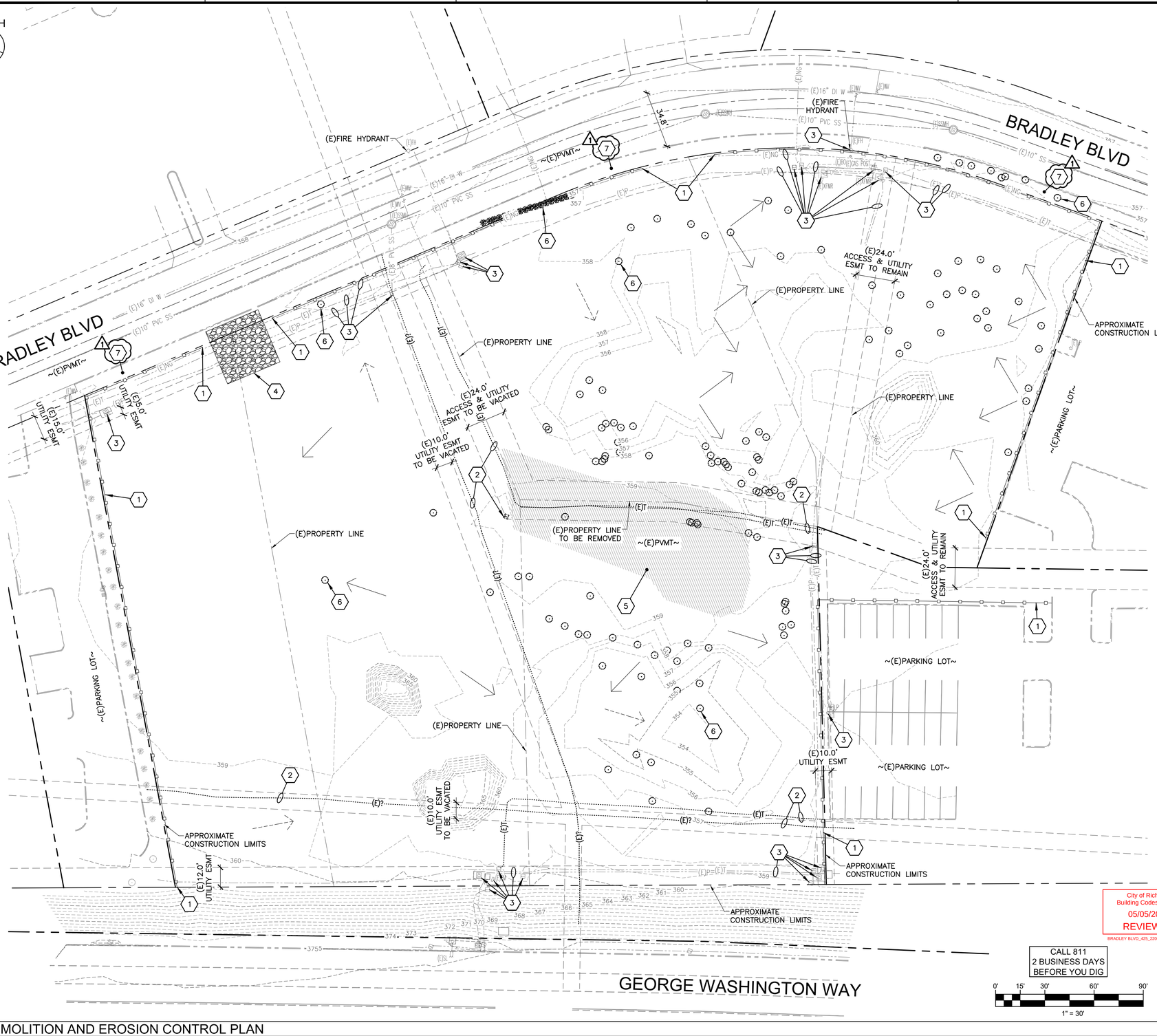
SURVEY
CEDAR AND SAGE HOMES, LLC
CEDAR HOMES APARTMENTS
425 BRADLEY BLVD, RICHLAND, WA 99352

APPROVAL		
DESIGN	RAM	04/06/22
CHECKED	NJM	04/06/22
APPROVED	NJM	04/06/22

SCALE: AS NOTED
CADFILE: 21189C01
JOB No. 21189
DWG. No. C003

A1 SURVEY
SCALE: NOT TO SCALE

\2021\21189-425 Bradley Blvd\DWG\Mass Grading Plan Set\21189C01.dwg - May 04,2022 - 09:03am - rmc



A1 DEMOLITION AND EROSION CONTROL PLAN
SCALE: 1" = 30'–0"

KEY NOTES

1. SILT FENCING SHALL BE INSTALLED AT LOCATIONS SHOWN AND AS NEEDED AT ANY LOCATIONS OF SITE WHERE SURFACE RUNOFF MAY ERODE SOILS AWAY FROM SITE, CONTRACTOR SHALL INSTALL ADDITIONAL SILT FENCING AS NECESSARY, REFER TO DETAIL A5/C001
2. ABANDON AND REMOVE (E)UTILITY STRUCTURE / PIPE. COORDINATE WITH UTILITY COMPANIES.
3. PROTECT UTILITY IN PLACE
4. CONSTRUCTION ACCESS, SEE CITY STD DETAIL S16
5. REMOVE ASHPALT AND DISPOSE OF PROPERLY
6. REMOVE TREE AND ROOT SYSTEM THEN BACKFILL, TYPICAL ACROSS SITE
7. EXISTING STORM DRAINAGE DITCH ALONG BRADLEY BLVD SHALL BE PROTECTED AND REMAIN UNFILLED

LEGEND

- EXISTING STORMWATER FLOW PATH
- NEW STORMWATER FLOW PATH
- LIMITS OF CONSTRUCTION LINE
- SILT FENCE
- CONSTRUCTION VEHICLE ACCESS POINTS TO PUBLIC ROADS
- CONSTRUCTION ACCESS EROSION CONTROL

NOTES

1. SEE SHEET C001 FOR GENERAL NOTES AND LEGEND.
2. MOST SUITABLE LOCATION FOR CONSTRUCTION ENTRANCE TO BE DETERMINED BY GENERAL CONTRACTOR. CONSTRUCTION ENTRANCE SHOWN ON DRAWING IS A SUGGESTED LOCATION ONLY. FINAL CONSTRUCTION LAY–DOWN AREA AND STOCKPILE AREA LOCATION AND SIZE TO BE DETERMINED BY THE GENERAL CONTRACTOR WITH APPROVAL OF OWNER.
3. CUT & FILL SLOPES SHOULD BE CONSTRUCTED WITH INCLINATION NO STEEPER THEN 2H:1V AND MUST BE PROTECTED FROM WIND AND EROSION.
4. PLACE TOPSOIL, COMPACT, AND PROVIDE TEMPORARY SOIL STABILIZATION. PERMANENT LANDSCAPING CAN BE INSTALLED ONCE LIKELIHOOD OF SEDIMENTATION DURING CONSTRUCTION IS REDUCED, UPSTREAM AREAS ARE FULLY STABILIZED, AND IRRIGATION SYSTEM IS OPERATIONAL.
5. EROSION, SEDIMENT, AND AIR QUALITY CONTROL SHALL COMPLY WITH THE COUNTY AND CITY AIR QUALITY CONTROL ORDINANCES, AND THE NOTES AND DETAILS ON THESE PLANS.
6. PROVIDE INLET PROTECTION ON ALL STORM DRAIN INLETS SURROUNDING SITE, INSPECT FABRIC REGULARLY AND REPLACE AS NECESSARY IF FOUND TO BE RIPPED OR TORN.
7. ANYTIME AN OPEN TRENCH AND DEMOLITION AREAS ARE PRESENT DURING NON WORK HOURS THE CONTRACTOR SHALL HAVE PORTABLE 6.0' CHAIN LINK CONSTRUCTION FENCE IN PLACE AROUND THE WORK AREA.
8. NOT ALL UNDERGROUND UTILITIES ON THESE DRAWINGS MAY BE SHOWN. FIELD LOCATE AND VERIFY ALL UNDERGROUND UTILITIES. COORDINATE ALL RELOCATION WORK WITH THE APPROPRIATE UTILITY COMPANY AND/OR OWNER PRIOR TO ANY EXCAVATION WORK.
9. NOT ALL ELECTRICAL WORK MAY BE SHOWN ON THE CIVIL SITE DRAWINGS, AND IS SHOWN FOR REFERENCE PURPOSES ONLY. REFER TO ELECTRICAL DRAWINGS IN THIS CONSTRUCTION PACKAGE FOR ELECTRICAL DEMOLITION, RELOCATION, AND NEW INSTALLATION. ELECTRICAL SITE DRAWINGS SHALL TAKE PRECEDENCE PERTAINING TO ANY ELECTRICAL WORK WHICH MAY BE SHOWN ON THE CIVIL SITE DRAWINGS.
10. ALL UTILITY MAINS MUST REMAIN OPERATIONAL DURING CONSTRUCTION. COORDINATE WITH THE CITY TO SCHEDULE SERVICE OUTAGES AS NEEDED.
11. CONTRACTOR TO REMOVE ANY ABANDONED UTILITY LINES AS NEEDED FOR NEW CONSTRUCTION AND PROPOSED GRADES.
12. CONTRACTOR TO REPAIR ANY (E)CURBING FOUND IN A DAMAGED CONDITION.

City of Richland
Building Codes Review
05/05/2022
REVIEWED
BRADLEY BLVD_425_2200932_GRD_Rev1

KNUTZEN ENGINEERING
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No.	REVISIONS	DATE	DESIGN	CHKD	APPD
1	CITY COMMENTS	05/04/22	RAM	PTK	PTK

NATHAN J. MACHIELA
STATE OF WASHINGTON
19872
REGISTERED
PROFESSIONAL ENGINEER
05/04/22

DEMOLITION & EROSION CONTROL PLAN

CEDAR AND SAGE HOMES, LLC
CEDAR HOMES APARTMENTS
425 BRADLEY BLVD, RICHLAND, WA 99352

APPROVAL		
DESIGN	RAM	04/06/22
CHECKED	NJM	04/06/22
APPROVED	NJM	04/06/22

SCALE: AS NOTED
CADFILE: 21189C01
JOB No. 21189
REV. 1
DWG. No. C005

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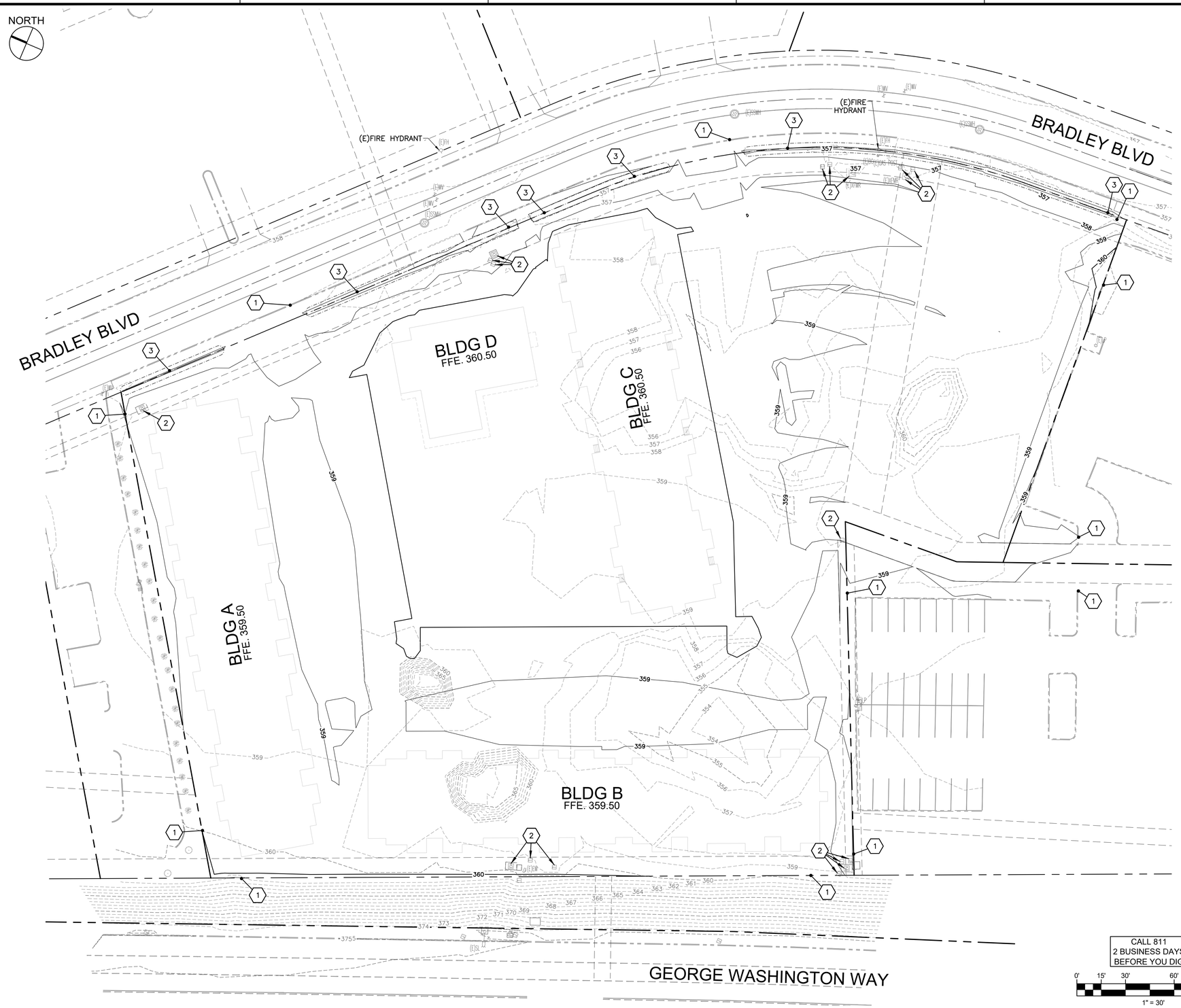
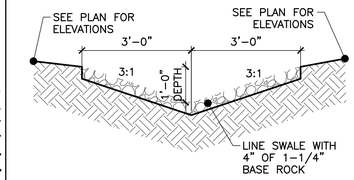


A1 MASS GRADING PLAN
SCALE: 1" = 30'-0"

KEY NOTES

1. MEET AND MATCH EXISTING ELEVATION
2. PRESERVE EXISTING ELEVATIONS OF EXISTING POWER UTILITY BOXES & PADS.
3. ROAD SIDE SWALE, 1' DEEP WITH 3:1 SIDE SLOPES, PER SECTION B6/-, LINE SWALE WITH 4" OF 1-1/4" BASE ROCK



B6 SWALE SECTION
SCALE: 1/2" = 1'-0"

City of Richland
Building Codes Review
05/05/2022
REVIEWED
BRADLEY BLVD_425_2200932_GRD_Rev1

NOTES

1. SEE DRAWING C001 FOR GENERAL NOTES AND LEGEND.
2. SPOT ELEVATIONS AND CONTOURS ARE TO THE TOP OF SIDEWALK, CURB, OR PAVEMENT FINISHED SURFACE UNLESS NOTED OTHERWISE.
3. FIELD VERIFY ALL MEASUREMENTS AND INVERTS PRIOR TO START OF WORK. IMMEDIATELY NOTIFY ARCHITECT OF DISCREPANCIES BEFORE WORK COMMENCES.
4. DO NOT EXCEED MAXIMUM SLOPE OF 4:1 IN ALL AREAS OF SITE.
5. DO NOT COMPACT SOILS IN SWALE AREAS BEYOND 85% OF MDD PER ASTM D1557.

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No.	REVISIONS	DATE	DESIGN	CHKD	APPD
1	CITY COMMENTS	05/04/22	RM	PTK	PTK

NATHAN J. MACHIELA
STATE OF WASHINGTON
19872
REGISTERED
PROFESSIONAL ENGINEER
05/04/22

MASS GRADING PLAN

CEDAR AND SAGE HOMES, LLC
CEDAR HOMES APARTMENTS
425 BRADLEY BLVD, RICHLAND, WA 99352

APPROVAL		
DESIGN	RAM	04/06/22
CHECKED	NJM	04/06/22
APPROVED	NJM	04/06/22

SCALE: AS NOTED
CADFILE: 21189C01
JOB No. 21189
REV. 1
DWG. No. C111

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Northern, Inc.
Consulting Engineers Environmental Scientists Geologists
Construction Materials Testing Geophysical Services

GEOTECHNICAL SITE INVESTIGATION REPORT

PROPOSED RIVER FRONT APARTMENTS
425 BRADLEY BOULEVARD
RICHLAND, WASHINGTON

GNN PROJECT NO. 221-1412

JULY 2021

Prepared for

KNUTZEN ENGINEERING
5401 RIDGELINE DRIVE, SUITE 160
KENNEWICK, WASHINGTON 99338

Prepared by

GN NORTHERN, INC.
CONSULTING GEOTECHNICAL ENGINEERS
KENNEWICK, WASHINGTON
(509) 734-9320

Northern, Inc.

At GN Northern our mission is to serve our clients in the most efficient, cost effective way using the best resources and tools available while maintaining professionalism on every level. Our philosophy is to satisfy our clients through hard work, dedication, and extraordinary efforts from all of our valued employees working as an extension of the design and construction team.

July 27, 2021

Knutzen Engineering
5401 Ridgeline Drive, Suite 160
Kennewick, WA 99336

Attn: Nathan Machiela, PE, Principal Engineer

Subject: Geotechnical Site Investigation Report
Proposed River Front Apartments
425 Bradley Boulevard
Richland, Washington

GNN Project No. 221-1412

Dear Mr. Machiela,

As requested, GN Northern (GNN) has completed a geotechnical site investigation for the proposed new River Front Apartments project to be constructed at 425 Bradley Boulevard in the City of Richland, Washington.

Based on the findings of our subsurface study, we conclude that the site is suitable for the proposed development provided that our geotechnical recommendations presented in this report and any subsequent geotechnical investigation are followed during the design and construction phases of the project.

This report describes in detail the results of our investigation, summarizes our findings, and presents our recommendations regarding remedial earthwork, and the design and construction of foundations on the proposed building lots. It is important that GNN be retained to provide engineering consultation during the design, and field geotechnical monitoring and compaction testing services during remedial earthwork to ensure proper implementation of the geotechnical recommendations.

If you have any questions regarding this report, please contact us at 509-734-9320.

Respectfully submitted,

GN Northern, Inc.

Brian W. Binsfield, PE
Geotechnical Engineer

Karl A. Harmon, LEG, PE
Senior Geologist/Engineer

TABLE OF CONTENTS

Page No.

APPENDICES

1.0 PURPOSE AND SCOPE OF SERVICES

This report has been prepared for the proposed new River Front Apartments project to be constructed at 425 Bradley Boulevard in the City of Richland, Washington; site location is shown on the *Vicinity Map* (Figure 1, Appendix I). Our investigation was conducted to collect information regarding subsurface soil/groundwater conditions, present our professional opinion regarding the suitability of the subsurface materials to support the planned development and provide recommendations for geotechnical considerations and bearing capacity for the proposed construction.

GN Northern, Inc. has prepared this report for use by the client and their design consultants in the design of the proposed development. Do not use or rely upon this report for other locations or purposes without the written consent of GNN.

Our study was conducted in general accordance with our *Proposal for Geotechnical Site Investigation Report and Infiltration Testing* dated June 21, 2021; notice to proceed was provided in the form of a signed proposal by Mr. Machiela via email on June 24, 2021.

You provided a *Preliminary Layout* (dated 5/7/2021) showing the proposed development via email on June 17th. Field exploration, consisting of ten (10) exploratory test-pits and two (2) infiltration tests, was completed on July 14, 2021. The test-pit locations are shown on the *Site Exploration Map* (Figure 2, Appendix I). Detailed test-pit logs are presented in Appendix II, and results of our laboratory testing are presented in Appendix III.

This report has been prepared to summarize the data obtained during this study and to present our recommendations based on the proposed construction and the subsurface conditions encountered. Results of the field exploration and laboratory testing were analyzed to develop recommendations for site development, earthwork, and foundation bearing capacity. Design parameters and a discussion of the geotechnical engineering considerations related to construction are included.

2.0 PROPOSED SITE DEVELOPMENT

Based on the information provided, we understand that the proposed River Front Apartment complex is planned on a 198,595 SF parcel and will consist of three 3-story apartment buildings, a clubhouse building and a swimming pool. The two 48-unit apartment buildings will have a

footprint of 16,600 SF. The 36-unit apartment building will have a footprint of 13,300 SF. The club house building will have a footprint of approximately 6,800 SF. The project will have parking throughout the site with a total of 198 parking stalls. The apartment complex will be accessed via Bradley Blvd. to the east.

We anticipate the building to be constructed using wood-frame construction with slab-on-grade. Structural loading information was not available at the time of this report. Based on our experience with similar projects, we expect wall loads to be on the order of 3.0 to 4.0 klf and maximum column loads for the structure to be less than 80 kips. If loading conditions differ from those described herein, GNN should be given an opportunity to perform re-analysis. Settlement tolerances for the structure is assumed to be limited to 1 inch, with differential settlement limited to ½ inch.

3.0 FIELD EXPLORATION

Our field exploration, consisting of ten (10) exploratory test-pits and two (2) infiltration tests, was completed on July 14, 2021. The test-pit locations are shown on the *Site Exploration Map* (Figure 2, Appendix I). A local public utility clearance was obtained prior to the field exploration. Test-pits were excavated by DDB, LLC using a Case CX55B excavator to depths of approximately 8 and 10 feet below ground surface (BGS). The test-pits were logged by a GNN geotechnical engineer. Upon completion, the test-pits were loosely backfilled with excavated soils. Detailed test-pit logs are presented in Appendix II.

The soils observed during our field exploration were classified according to the Unified Soil Classification System (USCS), utilizing the field classification procedures as outlined in ASTM D2488. A copy of the USCS Classification Chart is included in Appendix II. Photographs of the site and exploration are presented in Appendix IV. Depths referred to in this report are relative to the existing ground surface elevation at the time of our investigation. The surface and subsurface conditions described in this report are as observed at the time of our field investigation.

4.0 LABORATORY TESTING

Representative samples of the subsurface soils obtained from our field exploration were selected for testing to determine the index properties of the soils in general accordance with ASTM procedures. The following laboratory tests were performed:

Table 1: Laboratory Tests Performed

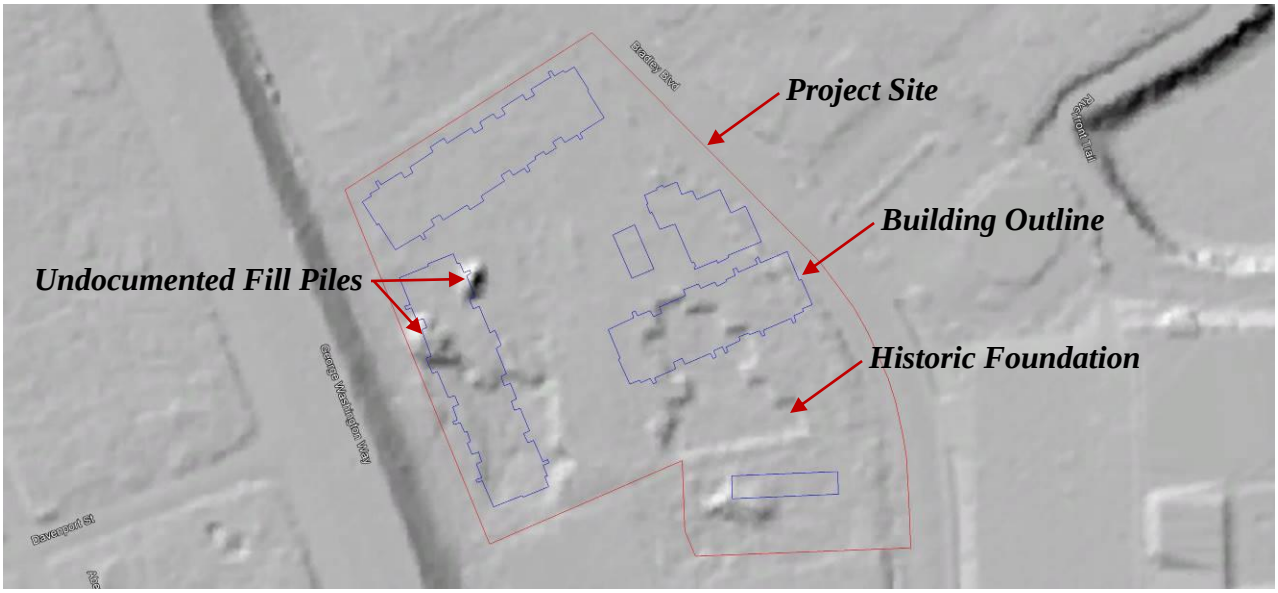
Test	To determine
Particle Size Distribution (ASTM D6913)	Soil classification based on proportion of sand, silt, and clay-sized particles
Natural Moisture Content (ASTM D2216)	Soil moisture content indicative of in-situ condition at the time samples were taken

Results of the laboratory tests are included on the test-pit logs and are also presented in graphic form in Appendix III attached to the end of the report.

5.0 SITE CONDITIONS

The proposed River Front Apartment development consists of an approximate 198,595 SF parcel located in the City of Richland, Washington. The site is situated in the NE ¼ of the NE ¼ of Section 14, Township 9 North and Range 28 East, Willamette Meridian. The project site is bounded by George Washington way to the west, Bradley Blvd. to the east, the Columbia River Eye Center to the north and the parking lot for several professional office buildings to the south.

The site appears to have been formerly occupied by a large building with a possible partial basement in the middle of the site. Evidence of the apparent former building is seen by the presence of concrete stem walls/foundations and pieces of concrete around the perimeter of a large depression. Evidence of the apparent former building is seen in a LiDAR image of the site. On the west side of the apparent former building, near the middle of the site, the site is paved with an approximate 2-inch layer of asphalt. The south half of the site is heavily forested, while the north half has only a few sparse trees. The remainder of the site is covered with weeds and sagebrush. Several large soil stockpiles are present near the middle of the western portion of the site and along the south side of the former building location. Numerous boulders were also observed in the middle of the north half of the site. The majority of the site is relatively flat, with the western side of the site sloping up steeply to George Washington Way.



LiDAR image from WA State DNR LiDAR Portal with proposed building layouts

5.1 Regional Geology

The site is located in the Tri-Cities area of the Yakima Fold Belt region of the Columbia Basin Plateau. The subsurface stratigraphy of the region is comprised of a thick series of folded, Miocene-age flood basalt lava flows and interbedded sediments (collectively known as the Columbia River Basalt Group [CRBG]) overlain by unconsolidated deposits of late Miocene to recent age. In the Tri-Cities area, the uppermost layers of the CRBG are fractured basalt bedrock. Regionally, the top surface of the local basalt is known to slope to the east toward the Columbia River, although local variations exist in the area. Overlying sediments in the project area include surficial deposits of Quaternary alluvium and Pleistocene-age outburst flood deposits, commonly identified as the Missoula Flood Deposits.

5.2 Seismic Considerations

The Washington Geologic Information Portal identifies the site as having a National Earthquake Hazards Reduction Program (NEHRP) Site Class D designation. The "Site Class" is a classification based on the properties of the upper 100 feet of the soil and bedrock materials at a site. Based on the assumption that subsurface materials underlying those observed during our field exploration have similar qualities, a Site Class D appears appropriate for the site. Therefore, as per the *2018 International Building Code* (IBC), a Site Class 'D' may be used for seismic design purposes. Site Class 'D' corresponds to 'stiff soil'. Table 2 below presents the recommended

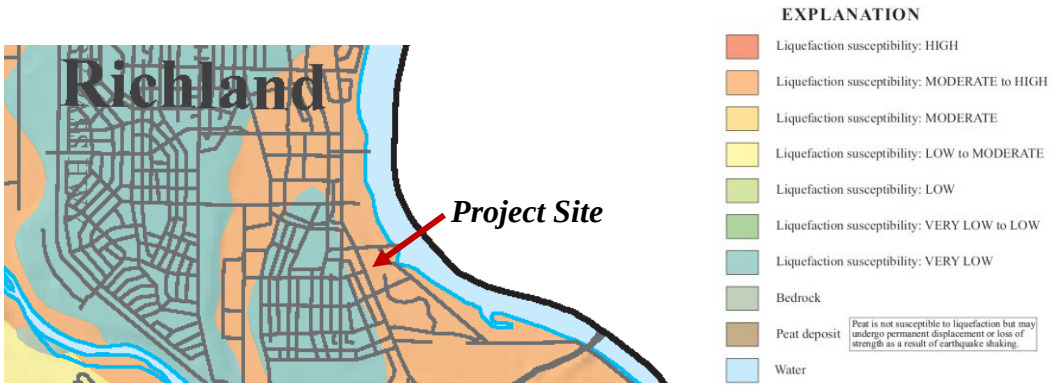
seismic design parameters in accordance with ASCE 7-16 for a code-based response spectrum with a return period of 2,475 years.

Table 2: Code-Based Seismic Design Parameters

Seismic Design Parameter	Value (unit)	Definition
S_S	0.415 (g)	MCE spectral response acceleration at short periods
S_1	0.159 (g)	MCE spectral response acceleration at 1-second period
F_a	1.468 (unitless)	Site coefficient for short periods
F_v	2.283 (unitless)	Site coefficient for 1-second period
S_{MS}	0.609 (g)	MCE spectral response acceleration at short periods as adjusted for site effects
S_{M1}	0.362 (g)	MCE spectral response acceleration at 1-second period as adjusted for site effects
S_{DS}	0.406 (g)	Design spectral response acceleration at short periods
S_{D1}	0.241 (g)	Design spectral response acceleration at 1-second period
PGA	0.184 (g)	MCE_G peak ground acceleration
F_{PGA}	1.432	Site amplification factor at PGA
PGA_M	0.264 (g)	Site modified peak ground acceleration
PGA_D	0.5	Factored deterministic acceleration value

5.3 Evaluation of Seismic Induced Soil Liquefaction

The site is currently mapped as having a "Moderate to High" liquefaction susceptibility, identified by the Washington State DNR's *Liquefaction Susceptibility Map of Benton County, Washington (2004)*, as shown below. Due to potential risk of liquefaction at the site, to better define the depth of liquefiable soils, a detailed liquefaction analysis should be performed. We recommend conducting one exploratory boring to a depth of 50 feet BGS with continuous STP sampling or advancing a cone penetration test (CPT) probe to a depth of 50 feet BGS to evaluate liquefaction potential at the site.



We assume that the proposed apartment structures will have fundamental periods of vibration less than 0.5 seconds. If this is not the case, we should be notified for reevaluation of Site Class. Per ASCE 7-16, for design of structures having fundamental periods of vibration less than 0.5 seconds on potentially liquefiable sites, site specific response analysis is not required. A detailed liquefaction analysis is beyond the scope of our current services for this project.

6.0 SUBSURFACE CONDITIONS

Based on the findings of our field exploration, subsurface soil conditions across the site are relatively uniform. The native site soils typically consist of Sandy Silt and Silt with Sand (ML). The soils were observed to have a relative in-place density of 'medium dense' and were typically observed to be 'damp' to 'moist'. Undocumented fill soil was encountered in six of the test-pits. The fill ranged from 9 inches to 2 feet in thickness, and was generally identified poorly graded gravel with silt and sand (GP-GM) or silty sand (SM). Test-pit logs in Appendix II show detailed descriptions and stratification of the soils encountered. It shall be noted that our site exploration was limited due to dense vegetation and trees in the southern portion of the site.

6.1 NRCS Soil Survey

The soil survey map of the site prepared by the Natural Resources Conservation Service (NRCS) identifies the near surface site soils as *Pasco fine sandy loam, 0 to 2 percent slopes,* and *Scooteney silt loam, gravelly subsoil, 0 to 2 percent slopes.* The parent material for these soils are described as *alluvium* and *loess.* According to the NRCS map (Soil Survey, Appendix V), the typical soil profile for these soils is described as *fine sandy loam* over *silt loam* and *silt loam* over *very gravelly loam,* respectively. NRCS data indicates that these units generally consist of *poorly drained* and *well drained* materials, respectively.

6.2 Groundwater

Groundwater was not encountered within any of the test pits to a maximum depth of approximately 10 feet BGS. To further assist in our evaluation, we reviewed the Washington Department of Ecology Well Log database of nearby well logs (see Appendix VI) to estimate groundwater levels in the vicinity. Based on our review of nearby well logs, groundwater is believed to be in the range of 9 to 12 feet BGS in the site vicinity. Groundwater levels primarily will be controlled by the

adjacent Columbia River water level stage. Ground water levels indicated are for the specific locations at the time of explorations and may not be indicative of other times and/or locations.

7.0 SOIL INFILTRATION TESTING

Soil infiltration testing was performed at two (2) locations as shown on the *Site Exploration Map* (Figure 2, Appendix I) attached to this report. The infiltration tests were conducted using a single ring infiltrometer consisting of a 10-inch diameter steel pipe driven into the ground at the test depth. After an initial pre-soak period, a constant water level was maintained in the ring with the use of a float valve and timed intervals of the water demand volumes were recorded. Continuous readings of the water volumes required to maintain the constant head were recorded until a relatively constant rate was achieved, and the average infiltration rate was recorded. The test results are indicative of the infiltration characteristics of the subsurface soils encountered at the test location and depth. The following table presents the results of the infiltration tests performed at the site:

Table 3: Infiltration Test Results

Test ID	Test Depth	Soil Type	Percent Fines	Field Infiltration Rate
TP-3	4 feet BGS	Sandy Silt (ML)	55.4	**3.0 inches/hour**
TP-10	4 feet BGS	Silt with Sand (ML)	77.9	**2.8 inches/hour**

The infiltration rates presented herein represents the un-factored field soil infiltration rate. An appropriate factor of safety should be applied to the field infiltration rate to determine long-term design infiltration rate. Determination of safety factors for long-term design infiltration should consider the following: pretreatment, potential for bio-fouling, system maintainability, horizontal and vertical variability of soils, and type of infiltration testing. Typical factors of safety for these soils generally range from 2 to 3.

8.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical recommendations are based on our current understanding of the proposed project as described in Section 2.0 of this report. The report is prepared to comply with the 2018 International Building Code Section 1803, Geotechnical Investigations, and as required by Subsection 1803.2, Investigations Required. Please note that Soil Design Parameters and

Recommendations presented in this report are predicated upon appropriate geotechnical monitoring and testing of the site preparation and foundation and building pad construction by a representative of GNN's Geotechnical-Engineer-of-Record (GER). Any deviation and nonconformity from this requirement may invalidate, partially or in whole, the following recommendations. We recommend that we be engaged to review grading plans in order to provide revised, augmented, and/or additional geotechnical recommendations as required.

Due to potential concerns for the presence of hazardous waste/materials at the project site from unknown former site development, we recommend a Phase I Environmental Sites Assessment be performed for the subject property.

8.1 Site Development – Grading

Site grading shall incorporate the requirements of IBC 2018 Appendix J. The project GER or a representative of the GER should observe site clearing, grading, and the bottoms of excavations before placing fills. Local variations in soil conditions may warrant increasing the depth of over-excavation and recompaction. Seasonal weather conditions may adversely affect grading operations. To improve compaction efforts and prevent potential pumping and unstable ground conditions, we suggest performing site grading during dryer periods of the year.

Soil conditions shall be evaluated by in-place density testing, visual evaluation, probing, and proof-rolling of the imported fill and re-compacted on-site soil as it is prepared to check for compliance with recommendations of this report. A moisture-density curve shall be established in accordance with the ASTM D1557 method for all onsite soils and imported fill materials used as structural fill. Existing onsite gravelly soils include oversize material that may limits the ability to perform compaction testing and will require proof compaction inspections to confirm a dense and non-yielding condition.

Clearing and Grubbing: At the start of site grading, the construction areas should be cleared and stripped of all vegetation, roots, topsoil, organic matter, any encountered undocumented fills or trash/debris, any existing soil stockpiles, foundation elements/stem walls of the of the apparent former building(s), and abandoned underground utilities. All topsoil and fine-grained soils with organic material (vegetation and roots) shall be completely removed from the proposed

construction areas. Monitoring by a representative of the GER at the time of the site clearing activities may allow reduction in the required quantity of stripping depending upon the encountered depth of organic material (roots) and the organic content of the soils. A representative of the GER should observe site clearing, grading, and the bottoms of excavations before placing fill.

Re-Use of Onsite Soils as Engineered Fill: The onsite silt soils, free of significant organics, deleterious materials including construction debris, are generally suitable for use as general and engineered fill and backfill. Engineered fill should be placed in maximum 8-inch lifts (loose) and compacted to at least 95% relative compaction (ASTM D1557) near its optimum moisture content. The fine-grained silty soils are considered highly moisture-sensitive, and will therefore require compaction to be performed within a strict range of ±1% of optimum moisture to achieve the proper degree of compaction. Compaction should be verified by testing.

Use of Imported Soils as Engineered Fill: If needed, imported fill soils should be non-expansive, granular soils meeting the USCS classifications of SM, SP-SM, or SW-SM with a maximum rock size of 4 inches, minimum 70% passing the No. 4 sieve, and 5 to 20% passing the No. 200 sieve. The GER should evaluate the import fill soils before hauling to the site. The imported fill should be placed in lifts no greater than 8 inches in loose thickness and compacted to at least 95% of the maximum dry density (ASTM D1557) near optimum moisture content.

8.2 Temporary Excavations

It shall be the responsibility of the contractor to maintain safe temporary slope configurations since the contractor is at the job site, able to observe the nature and conditions of the slopes and be able to monitor the subsurface conditions encountered. Unsupported vertical cuts deeper than 4 feet are not recommended if worker access is necessary. The cuts shall be adequately sloped, shored, or supported to prevent injury to personnel from caving and sloughing. The contractor and subcontractors shall be aware of and familiar with applicable local, state, and federal safety regulation including the current OSHA Excavation and Trench Safety Standards, and OSHA Health and Safety Standards for Excavations, 29 CFR Part 1929, or successor regulations.

According to chapter 296-155 of the Washington Administrative Code (WAC), it is our opinion that the near-surface soil encountered at the site is classified as Type C soils. We recommend that temporary, unsupported, open cut slopes shall be no steeper than 1.5 feet horizontal to 1.0 feet vertical (1.5H:1V) in Type C soils. No heavy equipment should be allowed near the top of temporary cut slopes unless the cut slopes are adequately braced. Where unstable soils are encountered, flatter slopes may be required.

8.3 Utility Excavation, Pipe Bedding and Trench Backfill

To provide suitable support and bedding for the pipe, we recommend the utilities be founded on suitable bedding material consisting of clean sand and/or sand & gravel mixture. Pipe bedding and pipe zone materials shall conform to Section 9-03.12(3) of the Washington State Department of Transportation (WSDOT) 2018 Standard Specifications. Pipe bedding should provide a firm uniform cradle for support of the pipes. A minimum 4-inch thickness of bedding material beneath the pipe should be provided. Prior to installation of the pipe, the pipe bedding should be shaped to fit the lower part of the pipe exterior with reasonable closeness to provide uniform support along the pipe. Pipe bedding material should be used as pipe zone backfill and placed in layers and tamped around the pipes to obtain complete contact. To protect the pipe, bedding material should extend at least 6 inches above the top of the pipe.

Placement of bedding material is particularly critical where maintenance of precise grades is essential. Backfill placed within the first 12 inches above utility lines should be compacted to at least 90% of the maximum dry density (ASTM D1557), such that the utility lines are not damaged during backfill placement and compaction. In addition, rock fragments greater than 1 inch in maximum dimension should be excluded from this first lift. The remainder of the utility excavations should be backfilled and compacted to 95% of the maximum dry density as determined by ASTM D1557.

8.4 Imported Crushed Rock Structural Fill

Imported structural fill shall consist of well-graded, crushed aggregate material meeting the grading requirements of 2018 WSDOT Standard Spec. Section 9-03.9(3) (1¼-inch minus Base Course Material) presented here:

Table 4: WSDOT Standard Spec. 9-03.9(3)

Sieve Size	Percent Passing (by Weight)
1¼ Inch Square	99 - 100
1 Inch Square	80 - 100
5/8 Inch Square	50 – 80
U.S. No. 4	25 - 45
U.S. No. 40	3 – 18
U.S. No. 200	Less than 7.5

A fifty (50) pound sample of each imported fill material shall be collected by GNN personnel prior to placement to ensure proper gradation and establish the moisture-density relationship (proctor curve).

8.5 Compaction Requirements for Structural/ Engineered Fill

All fill or backfill shall be approved by a representative of the GER, placed in uniform lifts, and compacted to a minimum 95% of the maximum dry density as determined by ASTM D1557. The compaction effort must be verified by a representative of the GER in the field using a nuclear density gauge in accordance with ASTM D6938. The thickness of the loose, non-compacted, lift of structural fill shall not exceed 8 inches for heavy-duty compactors or 4 inches for hand operated compactors.

8.6 Building Pad Preparation

After excavation to remove the existing vegetation, and stem walls/foundation elements from several of the building areas, up to 5 feet of structural fill may be required to achieve the design grade. In order to reduce the risk of differential settlement from variable thickness of fills across the building pads, the maximum differential of the thickness of fill material within the building pads shall be limited to 50%; i.e. if the thickest fill within a given portion of the building pad is 6 feet, then no portion of the building pad shall be constructed with less than 3 feet of fill material across the footprint. Allowance shall be made for placement of minimum 18-inches of imported crushed rock structural fill beneath all foundations and 9-inches beneath concrete floor slabs.

Prior to placement of new engineered fill material, the exposed native subgrades shall be scarified to a minimum depth of 12 inches, then moisture conditioned to near-optimum and re-compacted to at least 95% relative compaction (ASTM D1557) and to a dense and non-yielding surface. Foundation subgrade preparations and crushed rock structural fill should extend laterally a

minimum distance of two (2) feet beyond the outer edges of the footings on all sides. Building pad excavations shall expose the native undisturbed silt soils or structural fill. A representative of our geotechnical engineer shall confirm the suitability of the exposed subgrade.

8.7 Foundations Design Parameters and Allowable Bearing Capacity

In our opinion, the proposed apartment building structures and club house may be supported on conventional shallow foundations bearing on a layer of imported crushed rock placed atop recompacted dense subgrade. The minimum footing depth shall be 24 inches below adjacent exterior finished grades for frost protection and bearing capacity considerations.

To provide a uniform bearing support and minimize the risk of differential settlement, all foundations shall bear on a minimum of 18 inches of imported 1¼" minus crushed rock structural fill extending to a re-compacted subgrade.

Footings constructed in accordance with the above recommendations may be designed for an allowable **2,000 pounds per square foot (psf)** bearing pressure. The allowable bearing pressure presented above may be increased by 1/3 for short-term, transient loading conditions. Based on assumed structural loading, we estimate total settlement for footings constructed in accordance with this recommendation to be less than 1-inch. We anticipate differential settlement will be about half of total settlements between adjacent columns and along approximately 20 feet of continuous footings. We assume there is no stress overlap from adjacent footings. Footings located less than two times the footing width (2B) from each other will increase stresses beneath the adjacent footing, resulting in increased settlement. We expect elastic settlements to generally occur as loads are applied.

Lateral forces on foundations from short term wind and seismic loading would be resisted by friction at the base of foundations and passive earth pressure against the buried portions. We recommend an allowable passive earth pressure for compacted onsite fill of **200 pcf**. This lateral foundation resistance value includes a factor of safety of 1.5. We recommend a coefficient of friction of **0.45** be used between cast-in-place concrete and imported crushed rock. An appropriate factor of safety should be used to calculate sliding resistance at the base of footings.

8.8 Slab-on-Grade Floors

Concrete slabs-on-grade shall be supported on 9 inches of imported crushed rock structural fill placed atop a recompacted subgrade or structural fill in accordance with the grading recommendations of this report. The crushed rock material shall be ¾-inch minus aggregate meeting *WSDOT Specification* section 9-03.9 (3), "Crushed Surfacing Top Course". Prior to placing any slabs, the top 12 inches of the exposed subgrade shall be compacted to a minimum in-place dry density of 95% of the maximum laboratory dry density determined by ASTM D1557. We recommend a modulus of subgrade reaction equal to **120 pounds per cubic inch (pci)** based on a value for gravel presented in the Portland Cement Association publication No. EB075.01D. Slab thickness, reinforcement and joint spacing shall be determined by a licensed engineer based on the intended use and loading.

An appropriate vapor retarder (10-mil polyethylene liner) shall be used (ASTM E1745/E1643) beneath areas receiving moisture sensitive resilient flooring/VCT where prevention of moisture migration through slab is essential. The slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder. The architect shall determine the need and use of a vapor retarder.

8.9 Lateral Earth Pressure

We recommend the following lateral earth pressures, in terms of equivalent fluid pressure, for design of retaining walls or below-grade structures, these pressure values assume drained condition:

At-Rest = 60 psf/ft of embedment

Active = 40 psf/ft of embedment

We assume that the structural wall backfill is adequately drained to avoid saturation and introduction of hydrostatic pressures. For calculation of active pressures, we assume that the wall can deflect in order to develop an active condition. Use at-rest pressures for restrained or braced walls. The horizontal resultant force (pressure x H/2 where H is height of buried wall) should be applied at an H/3 distance from the base of the wall.

If any surface, surcharge loads are closer than one-half of the wall height (horizontal distance) to the edge of the below-grade and/or retaining wall, increase the design wall pressure by *q*/2 over

the whole area of the retaining wall. In this expression, *q* is the surface surcharge load in psf. GNN should review anticipated surcharge loading to confirm that the appropriate design values are considered. The horizontal surcharge resultant force (pressure x H where H is height of buried wall) should be applied at an H/2 distance from the base of the wall.

8.10 Flexible Pavement

Based on the findings of our site investigation, we anticipate that the pavement subgrade will consist of gravelly artificial fill soils and native silty soils. After stripping to remove vegetation and roots, the surficial gravelly artificial fill soils may be left in place as a subbase layer. We recommend the exposed subgrade shall be compacted/densified to a dense and non-yielding surface and shall be proof-rolled with a tandem-axle loaded dump truck or a water truck with a minimum 30-ton static weight and minimum 100 psi tire pressure and observe deflections, pumping and rutting for indications of inadequate subgrade performance. Any soft spots, pumping or yielding areas observed during proof-rolling shall be over-excavated a minimum 12 inches and shall be backfilled with compacted granular structural fill.

Acceptance criteria for proof-rolling shall include no rutting greater than 3/4-inch and no "pumping" of the soil behind the wheels. Permanent rutting in excess of 1-inch shall be considered failure (unsatisfactory compaction). In addition, elastic (rebound) movement or rutting in excess of 1-inch with substantial cracking or substantial lateral movement shall also be considered failure. Adjust the lift thickness, as directed by the geotechnical engineer, until the subgrade exhibits firm unyielding conditions under a loaded dump truck or a water truck. Proof-rolling shall be performed in the presence of a representative of the GNN's geotechnical engineer.

The finished surface shall be smooth, uniform and free of localized weak and soft spots. The subgrade must be graded to the required contours and grade in a manner as will insure a hard, uniform, well compacted surface. All subgrade deficiency corrections and drainage provisions shall be made prior to constructing the aggregate base course. All underground utilities shall be protected prior to grading. The following table presents recommended light duty and heavy-duty pavement sections for this project:

Table 5: Recommended Asphalt Concrete Paving Sections

Traffic	Asphalt Thickness (inches)	Crushed Aggregate Base Course (inches)	Subgrade
Heavy Duty†	3.5	12*	Scarify, moisture conditioned and recompacted to a dense and non-yielding surface
Standard Duty††	2.5	8*	

†Heavy duty applies to pavements section for entrance drives, fire truck lane, and trash enclosure drive lanes.
††Standard duty applies to general parking areas, *The upper 2" of crushed rock should be top course rock placed over the base course layer.

Pavement design recommendations assume proper and positive drainage and construction monitoring and are based on AASHTO Design parameters for a 20-year design period. Asphalt pavements tend to develop thermal and fatigue cracking over time from environmental factors and traffic loads. Asphalt, being a viscoelastic material, weakens from temperature influx. Timely preventative measures for continual flexible maintenance such as crack filling and seal coating at 8-10 year intervals to control the progression of surface cracking and distress to prevent water from infiltrating into the base course and subgrade shall be considered. Performing this intermediate level of maintenance will net at least a 20-year service life/performance.

All fills used to raise low areas shall be approved onsite soils or imported granular fill and shall be placed under engineering control conditions. The finished surface shall be smooth, uniform and free of localized weak/soft spots. All subgrade deficiency corrections and drainage provisions shall be made prior to placing the aggregate base course. All underground utilities shall be protected prior to grading.

The HMAC utilized for the project should be designed and produced in accordance with Section 5-04 Hot Mix Asphalt of the WSDOT 2018 Standards Specifications. Aggregate Base material shall comply with Section 9-03.9(3) Crushed Surfacing of the *WSDOT 2018 Standards Specification*s. Aggregate base or pavement materials should not be placed when the surface is wet.

8.11 Subgrade Protection

The degree to which construction grading problems develop is expected to be dependent, in part, on the time of year that construction proceeds and the precautions which are taken by the

contractor to protect the subgrade. The near-surface fine-grained soils currently present on site may be moisture and disturbance sensitive due to their fines content and may become unstable (pumping) if allowed to increase in moisture content and are disturbed (rutted) by construction traffic if wet. If necessary, the construction access road shall be covered with a layer of ballast or quarry spalls. The soils are also susceptible to erosion in the presence of moving water. The soils shall be stabilized to minimize the potential of erosion into the foundation excavation. The site shall be graded to prevent water from ponding within construction areas and/or flowing into excavations. Accumulated water must be removed immediately along with any unstable soil. Foundation concrete shall be placed and excavations backfilled as soon as possible to protect the bearing grade. We further recommend that soils that become unstable are to be either removed and replaced with structural compacted gravel fill, or mechanically stabilized with a coarse crushed aggregate and compacted into the subgrade.

8.12 Surface Drainage

With respect to surface water drainage, we recommend that the ground surface be sloped to drain away from future structures. Final exterior site grades shall promote free and positive drainage from the building areas. Water shall not be allowed to pond or to collect adjacent to foundations or within the immediate building area. We recommend that a gradient of at least 5% for a minimum distance of 10 feet from the building perimeter be provided, except in paved locations. In paved areas, a minimum gradient of 1% should be provided unless provisions are included for collection/disposal of surface water adjacent to the structure. Catch basins, drainage swales, or other drainage facilities should be aptly located. All surface water such as that coming from roof downspouts and catch basins be collected in tight drain lines and carried to a suitable discharge point, such as a storm drain system. Surface water and downspout water should not discharge into a perforated or slotted subdrain, nor should such water discharge onto the ground surface adjacent to the building. Cleanouts should be provided at convenient locations along all drain lines.

9.0 ADDITIONAL SERVICES

The Client should maintain an adequate program of geotechnical consultation, construction monitoring, and soils testing during the final design and construction phases to ensure compliance with GNN's geotechnical recommendations. For this purpose, GNN, the Geotechnical Engineer-of-Record, shall be retained as the geotechnical consultant from beginning to end of the project to maintain continuity of services.

GNN can provide construction monitoring and testing as additional services. The costs of these services are not included in our present fee arrangement, but can be obtained from our office. The recommended construction monitoring and testing includes, but is not necessarily limited to, the following:

- Consultation during the design stages of the project.
- Review of the grading and drainage plans to monitor compliance and proper implementation of the recommendations in GNN's Report.
- Observation and quality control testing during site preparation, grading, and placement of engineered fill as required by the local building ordinances.
- Geotechnical engineering consultation as needed during construction.

10.0 LIMITATIONS OF THE GEOTECHNICAL SITE INVESTIGATION REPORT

This GEOTECHNICAL SITE INVESTIGATION REPORT ("Report") was prepared for the exclusive use of the Client. GN Northern, Inc.'s (GNN) findings, conclusions and recommendations in this Report are based on selected points of field exploration, laboratory testing, and GNN's understanding of the proposed project at the time the Report is prepared. Furthermore, GNN's findings and recommendations are based on the assumption that soil, rock and/or groundwater conditions do not vary significantly from those found at specific exploratory locations. Variations in soil, bedrock and/or groundwater conditions could exist between and beyond the exploration points. The nature and extent of these variations may not become evident until during or after construction. Variations in soil, bedrock and groundwater may require additional studies, consultation, and revisions to GNN's recommendations in the Report.

In many cases the scope of geotechnical exploration and the test locations are selected by others without consultation from the geotechnical engineer/consultant. GNN assumes no responsibility and, by preparing this Report, does not impliedly or expressly validate the scope of exploration and the test locations selected by others.

This Report's findings are valid as of the issued date of this Report. However, changes in conditions of the subject property or adjoining properties can occur due to passage of time, natural processes, or works of man. In addition, applicable building standards/codes may change over time. Accordingly, findings, conclusions, and recommendations of this Report may be invalidated, wholly or partially, by changes outside of GNN's control. Therefore, this Report is subject to review and shall not be relied upon after a period of **five (5) years** from the issued date of the Report.

In the event that any changes in the nature, design, or location of structures are planned, the findings, conclusions and recommendations contained in this Report shall not be considered valid unless the changes are reviewed by GNN and the findings, conclusions, and recommendations of this Report are modified or verified in writing.

This Report is issued with the understanding that the owner or the owner's representative has the responsibility to bring the findings, conclusions, and recommendations contained herein to the

attention of the architect and design professional(s) for the project so that they are incorporated into the plans and construction specifications, and any follow-up addendum for the project. The owner or the owner's representative also has the responsibility to verify that the general contractor and all subcontractors follow such recommendations during construction. It is further understood that the owner or the owner's representative is responsible for submittal of this Report to the appropriate governing agencies. The foregoing notwithstanding, no party other than the Client shall have any right to rely on this Report and GNN shall have no liability to any third party who claims injury due to reliance upon this Report, which is prepared exclusively for Client's use and reliance.

GNN has provided geotechnical services in accordance with generally accepted geotechnical engineering practices in this locality at this time. GNN expressly disclaims all warranties and guarantees, express or implied.

Client shall provide GNN an opportunity to review the final design and specifications so that earthwork, drainage, and foundation recommendations may be properly interpreted and implemented in the design and specifications. If GNN is not accorded the review opportunity, GNN shall have no responsibility for misinterpretation of GNN's recommendations.

Although GNN can provide environmental assessment and investigation services for an additional cost, the current scope of GNN's services does not include an environmental assessment or an investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or adjacent to the subject property.

APPENDICES

Appendix I

Vicinity Map (Figure 1)

Site Exploration Map (Figure 2)

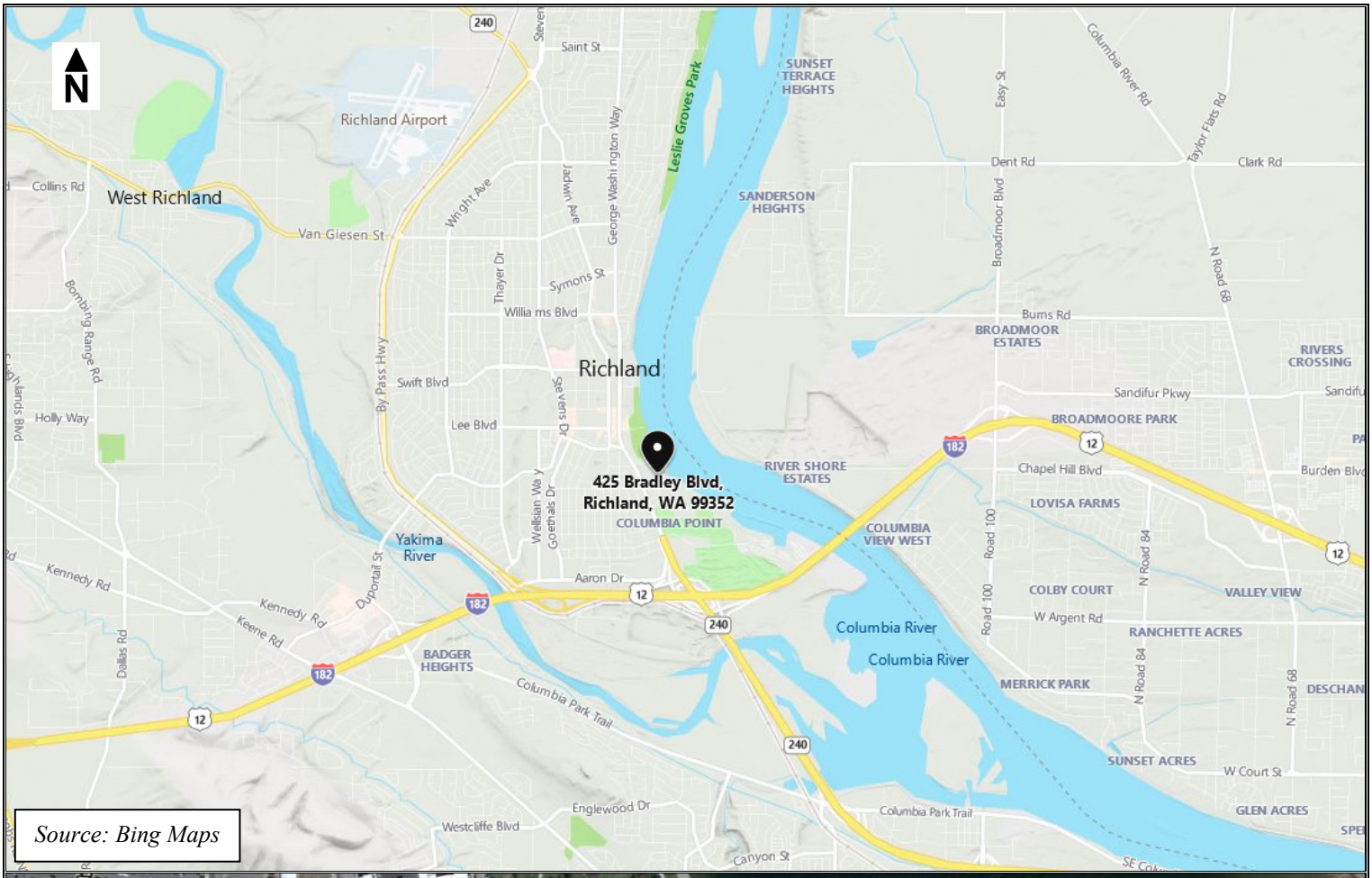


FIGURE 1: VICINITY MAP **PROJECT NO. 221-1412**

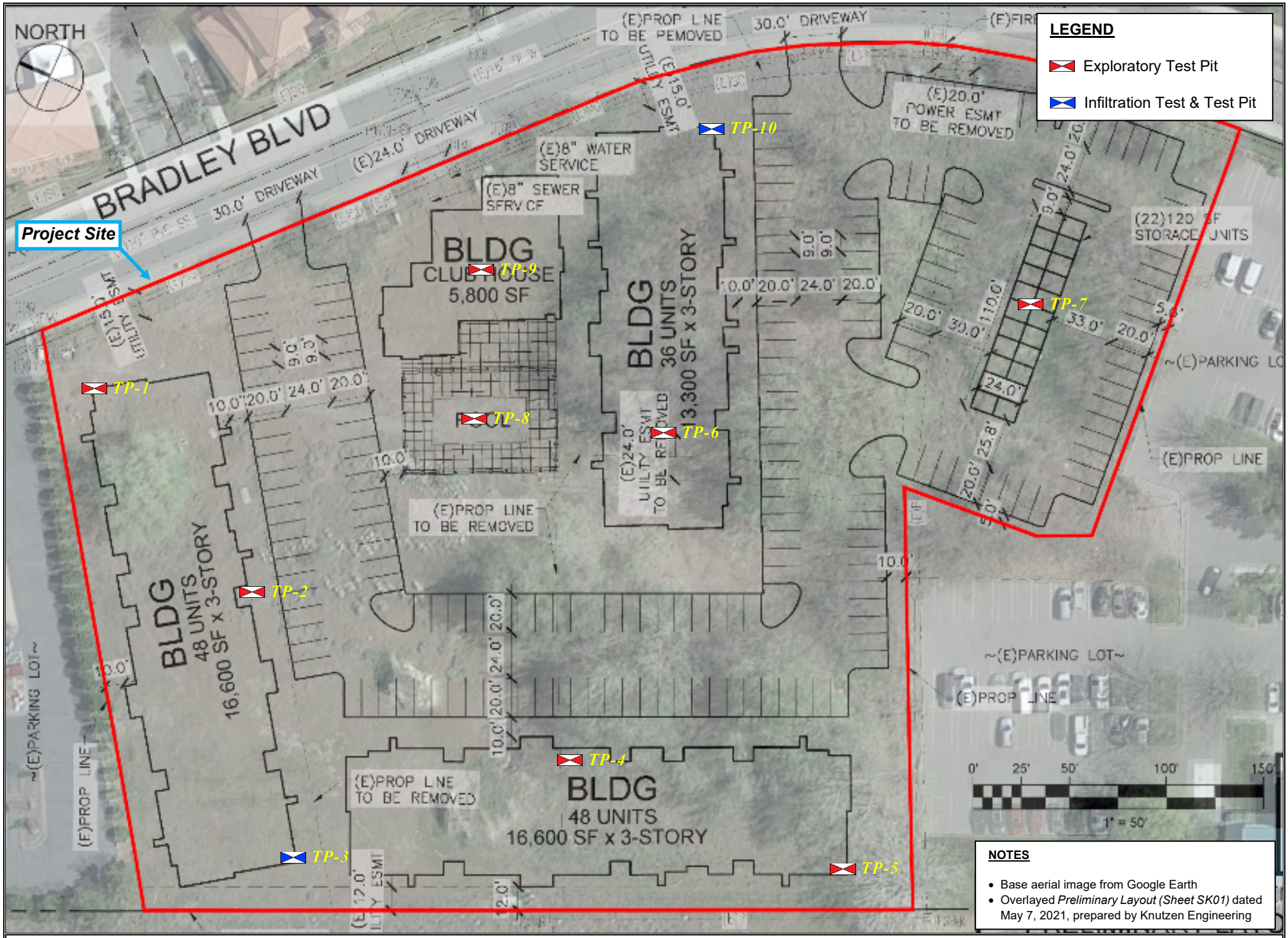


FIGURE 2: SITE EXPLORATION MAP **PROJECT NO. 221-1412**

Appendix II
Exploratory Test-Pit Logs
Key Chart (for Soil Classification)

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-1

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270598°, -119.269724°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, dry, appears medium dense
0.8					358.3
					SANDY SILT, (ML) light brown, dry to damp, appears medium dense, (APPARENT NATIVE SOIL)
2.5	GB	MC = 6% Fines = 53%			
					- becomes moist
5.0			ML		
7.5					
10.0					10.0
					349.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
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Fax: (509) 248-4220

TEST PIT NUMBER TP-2

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270269°, -119.270000°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SANDY SILT, (ML) light brown, dry to moist, appears medium dense
2.5				
5.0				
7.5				
10.0				10.0 / 349.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
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Fax: (509) 248-4220

TEST PIT NUMBER TP-3

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 360 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270065°, -119.270470°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			SM		FILL: SILTY SAND WITH GRAVEL, (SM) brown, fine grained, dry, appears medium dense
1.5					358.5
			SP-SM		FILL: POORLY GRADED SAND WITH SILT AND GRAVEL, (SP-SM) gray, fine to medium grained, dry, appears medium dense
2.0					358.0
2.5			ML		SANDY SILT, (ML) light brown, moist, appears medium dense, (APPARENT NATIVE SOIL)
	GB	MC = 6% Fines = 55%			
5.0					
7.5					
8.0					352.0
			GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, damp, appears medium dense to dense
9.0					351.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 9.0 feet.

GN Northern, Inc.
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Telephone: (509) 248-9798
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TEST PIT NUMBER TP-4

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 358 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269762°, -119.270092°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					SILT WITH SAND, (ML) tan, dry to damp, appears medium dense
2.5	GB	MC = 3% Fines = 75%	ML		
5.0					
7.5					
10.0					10.0 348.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
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Yakima, Washington 98902
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TEST PIT NUMBER TP-5

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269349°, -119.270051°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				SANDY SILT, (ML) tan, damp, appears medium dense
2.5		ML		
5.0				
7.0				352.0
7.5		GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, damp, appears medium dense to dense
8.0				351.0

- Test pit terminated at ~8' BGS due to bucket refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 8.0 feet.

GN Northern, Inc.
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Yakima, Washington 98902
Telephone: (509) 248-9798
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TEST PIT NUMBER TP-6

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 360 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269829°, -119.269390°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, dry, appears medium dense
1.0				359.0
		ML		SANDY SILT, (ML) light brown, moist, appears medium dense, (APPARENT NATIVE SOIL)
2.5				
5.0				
7.5				
10.0				10.0 350.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-7

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 360 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269413°, -119.268863°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SANDY SILT, (ML) light brown, dry to moist, appears medium dense
2.5				
5.0				
7.5				- becomes moist
10.0				10.0 350.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-8

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270071°, -119.269499°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0					
				0.2 ~2" ASPHALT	358.8
		GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, dry, appears medium dense	
				0.8	358.3
2.5				SANDY SILT, (ML) light brown, moist, appears medium dense, (APPARENT NATIVE SOIL)	
5.0		ML			
7.5					
10.0				10.0	349.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-9

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270153°, -119.269223°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, dry, appears medium dense
1.0				358.0
		ML		SANDY SILT, (ML) light brown, moist, appears medium dense, (APPARENT NATIVE SOIL)
2.5				
5.0				
7.5				
10.0				10.0 349.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-10

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269914°, -119.268745°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			SM		FILL: SILTY SAND WITH GRAVEL, (SM) gray brown, fine grained, damp, appears medium dense
1.0					358.0
					SILT WITH SAND, (ML) light brown, moist, appears medium dense, roots to ~2' BGS
2.5					
	GB	MC = 11% Fines = 78%			- infiltration test performed at ~4' BGS
5.0			ML		
7.5					
9.0					350.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 9.0 feet.

Northern, Inc.
Kennewick, Yakima, Spokane, Hermiston (OR)

KEY CHART

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COARSE-GRAINED SOILS			FINE-GRAINED SOILS		
DENSITY	**N (BLOWS/FT)**	**FIELD TEST**	**CONSISTENCY**	**N (BLOWS/FT)**	**FIELD TEST**
Very Loose	0 – 4	Easily penetrated with ½-inch reinforcing rod pushed by hand	Very Soft	0 – 2	Easily penetrated several inches by thumb
Loose	4 – 10	Difficult to penetrate with ½-inch reinforcing rod pushed by hand	Soft	2 – 4	Easily penetrated one inch by thumb
Medium -Dense	10 – 30	Easily penetrated with ½-inch rod driven with a 5-lb hammer	Medium-Stiff	4 – 8	Penetrated over ½-inch by thumb with moderate effort
Dense	30 – 50	Difficult to penetrate with ½-inch rod driven with a 5-lb hammer	Stiff	8 – 15	Indented about ½-inch by thumb but penetrated with great effort
Very Dense	> 50	penetrated only a few inches with ½-inch rod driven with a 5-lb hammer	Very Stiff	15 – 30	Readily indented by thumb
			Hard	> 30	Indented with difficulty by thumbnail

USCS SOIL CLASSIFICATION

MAJOR DIVISIONS				GROUP DESCRIPTION
Coarse-Grained Soils <50% passes #200 sieve	**Gravel** and **Gravelly Soils** <50% coarse fraction passes #4 sieve	**Gravel** (with little or no fines)	GW	Well-graded **Gravel**
			GP	Poorly Graded **Gravel**
		Gravel (with >12% fines)	GM	Silty **Gravel**
			GC	Clayey **Gravel**
	Sand and **Sandy Soils** >50% coarse fraction passes #4 sieve	**Sand** (with little or no fines)	SW	Well-graded **Sand**
			SP	Poorly graded **Sand**
		Sand (with >12% fines)	SM	Silty **Sand**
			SC	Clayey **Sand**
Fine-Grained Soils >50% passes #200 sieve	**Silt** and **Clay** Liquid Limit < 50		ML	**Silt**
			CL	Lean **Clay**
			OL	Organic **Silt** and C**lay** (low plasticity)
	Silt and **Clay** Liquid Limit > 50		MH	Inorganic **Silt**
			CH	Inorganic **Clay**
			OH	Organic **Clay** and **Silt** (med. to high plasticity)
Highly Organic Soils			PT	**Peat**
				Top Soil

LOG SYMBOLS

	2S	2" OD Split Spoon (SPT)
	3S	3" OD Split Spoon
	NS	Non-Standard Split Spoon
	ST	Shelby Tube
	CR	Core Run
	BG	Bag Sample
	TV	Torvane Reading
	PP	Penetrometer Reading
	NR	No Recovery
	GW	Groundwater Table

MODIFIERS

DESCRIPTION	RANGE
Trace	<5%
Little	5% – 12%
Some	>12%

MOISTURE CONTENT

DESCRIPTION	FIELD OBSERVATION
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but not visible water
Wet	Visible free water

SOIL CLASSIFICATION INCLUDES

1. Group Name
2. Group Symbol
3. Color
4. Moisture content
5. Density / consistency
6. Cementation
7. Particle size (if applicable)
8. Odor (if present)
9. Comments

MAJOR DIVISIONS WITH GRAIN SIZE

SIEVE SIZE						
12"	3"	3/4"	4	10	40	200
GRAIN SIZE (INCHES)						
12	3	0.75	0.19	0.079	0.0171	0.0029

Boulders	Cobbles	Gravel		Sand			Silt and Clay
		Coarse	Fine	Coarse	Medium	Fine	

Conditions shown on boring and testpit logs represent our observations at the time and location of the fieldwork, modifications based on lab test, analysis, and geological and engineering judgment. These conditions may not exist at other times and locations, even in close proximity thereof. This information was gathered as part of our investigation, and we are not responsible for any use or interpretation of the information by others.

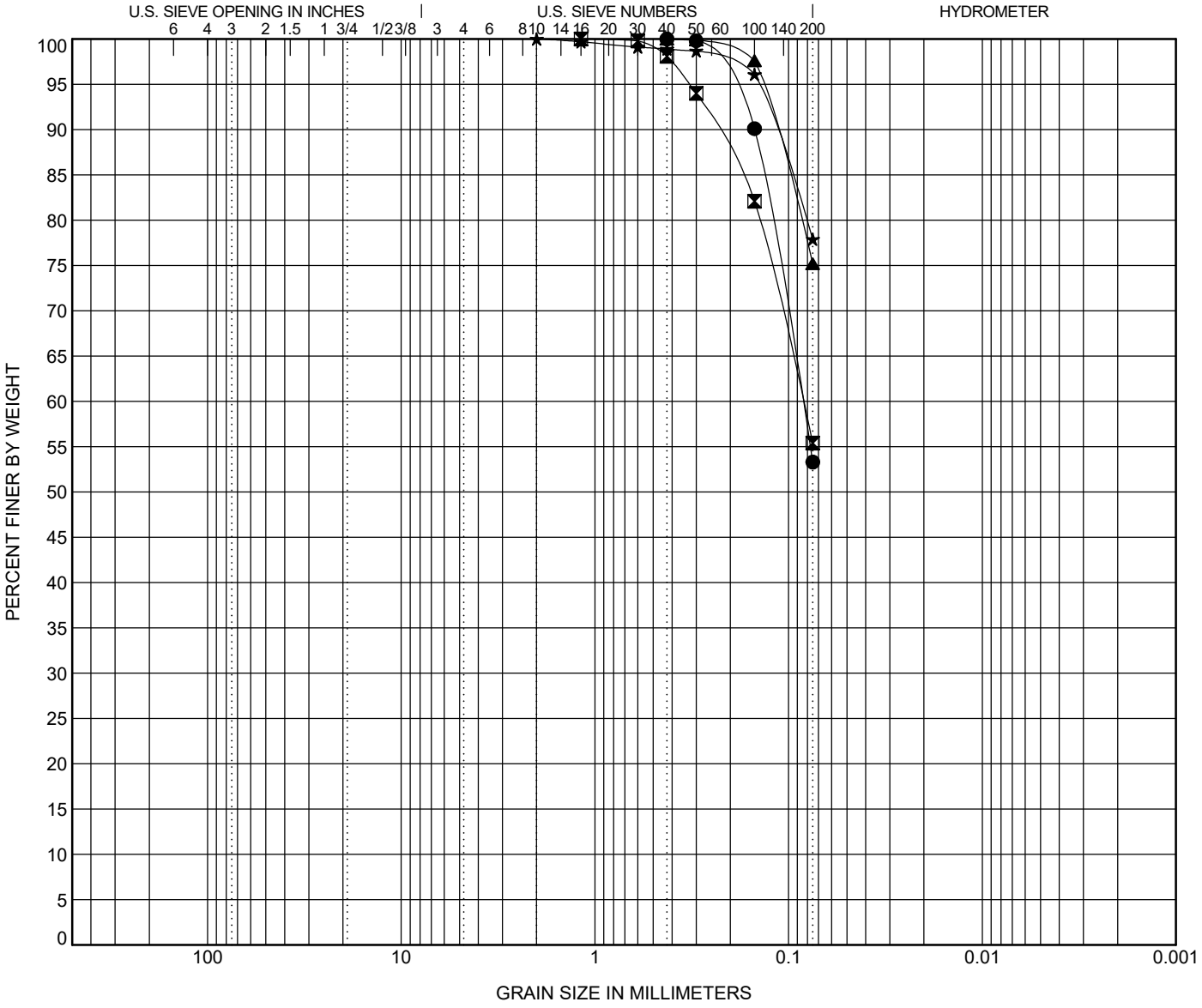
Appendix III
Laboratory Testing Results

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

GRAIN SIZE DISTRIBUTION

CLIENT Knutzen Engineering **PROJECT NAME** New Apartment Development

PROJECT NUMBER 221-1412 **PROJECT LOCATION** 425 Bradley Blvd, Richland, WA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**TP-1**	**2.0**	**SANDY SILT (ML)**					
⊠	**TP-3**	**4.0**	**SANDY SILT (ML)**					
▲	**TP-4**	**3.0**	**SILT WITH SAND (ML)**					
★	**TP-10**	**4.0**	**SILT WITH SAND (ML)**					

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-1**	**2.0**	**0.425**	**0.085**			**0.0**	**46.7**	**53.3**	
⊠	**TP-3**	**4.0**	**1.18**	**0.085**			**0.0**	**44.6**	**55.4**	
▲	**TP-4**	**3.0**	**0.425**				**0.0**	**24.8**	**75.2**	
★	**TP-10**	**4.0**	**2**				**0.0**	**22.1**	**77.9**	

Appendix IV
Site & Exploration Photographs

Exposed subsurface soil profile within test pit TP-1

Exposed subsurface soil profile within test pit TP-4

Exposed subsurface soil profile within test pit TP-7

Exposed subsurface soil profile within test pit TP-8

Infiltration test setup within test pit TP-10

Infiltration test setup within test pit TP-3

PLATE 1: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 221-1412**

View of site conditions near test pit TP-2, looking south

View of site conditions near test pit TP-6, looking east

View of site conditions near middle of site looking east

Excavation of test pit TP-8, view looking south

View of site conditions near test pit TP-3, looking southeast

View of site conditions near test pit TP-3, looking south

PLATE 2: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 221-1412**

Appendix V
NRCS Soil Survey

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Benton County Area, Washington

425 Bradley Boulevard, Richland, WA

July 27, 2021

Custom Soil Resource Report
Soil Map

Benton County Area, Washington

PaA—Pasco fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2bcw
Elevation: 250 to 700 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 136 to 190 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Pasco and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pasco

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

SdA—Scooteney silt loam, gravelly subsoil, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2bdk
Elevation: 400 to 1,300 feet

Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Scooteney and similar soils: 90 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scooteney

Setting

Landform: Terraces
Parent material: Gravelly alluvium and loess

Typical profile

H1 - 0 to 4 inches: silt loam
H2 - 4 to 15 inches: silt loam
H3 - 15 to 38 inches: gravelly silt loam
H4 - 38 to 60 inches: very gravelly loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 2c
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Wamba

Percent of map unit: 2 percent
Landform: Terraces
Hydric soil rating: Yes

Appendix VI
Washington Department of Ecology Well Logs

6076

Time Oil Co.

PROJECT: Property No. 01-356 W.O. 12-01238-03 WELL NO. MW-14

Elevation reference: City of Richland Datum Well completed: 15 November 1995
Ground surface elevation: 355.05 feet Casing elevation: 354.84 feet

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	Grass over damp, silty, fine SAND						
5	Loose, damp, brown, silty, fine SAND		A	6	-		
10	Very loose, wet, brown, silty, fine SAND		B	2	0.0	ATD	
15	Very loose, wet, brown, silty, fine SAND		C	4	0.0		
20	Very dense, wet, gray-brown, gravelly SAND		D	62	0.0		
	(no odor)						
25	Medium dense, wet, black, fine to medium SAND		E	17	-		
	Bottom of boring at 24.5 feet.						

Top of screen at 7'

extend sand pack to 24.5'

Flush-mounted steel monument
Ground surface
Top of casing
Cement
Bentonite
Casing (Schedule-40 2-inch I.D. PVC)
10-20 sand filter pack
Screen (2-inch I.D. PVC with 0.02-inch slots)
Threaded end cap

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151 TIME OIL CO.
START CARD # R 02520
SE¼ SE¼ SEC 11 T9N R28E
WELL TAG # ABZ139

LEGEND

I 2-inch O.D. split-spoon sample

X Sample not recovered

ATD Observed groundwater level ATD = at time of drilling

AGRA Earth & Environmental # 1724
JIM ERDMAN
E. 520 North Foothills Drive, Suite 600
Spokane, Washington 99207

Drilling started: 14 November 1995 Drilling completed: 15 November 1995 Logged by: DCJ

82451

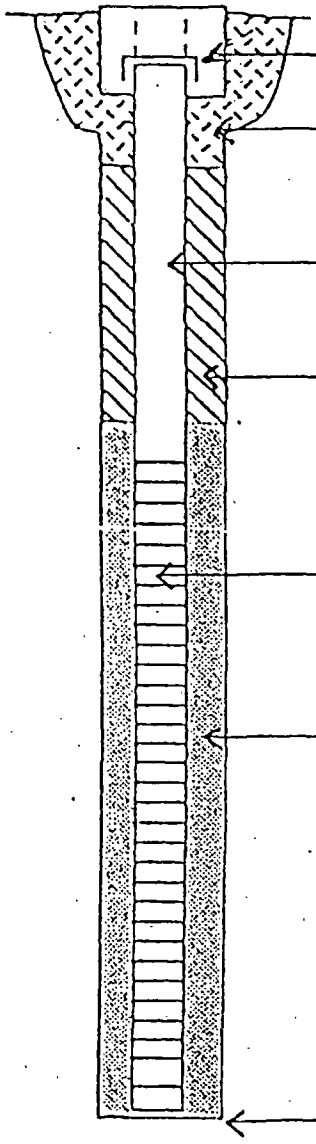
RESOURCE PROTECTION WELL REPORT

START CARD NO. R49607

PROJECT NAME: Jackpot Foods
WELL IDENTIFICATION NO. AFT 738
DRILLING METHOD: HSA
DRILLER: Brian G. Gose
FIRM: Cascade Drilling, Inc.
SIGNATURE: [signature]
CONSULTING FIRM: GeoEngineers - Spokane
REPRESENTATIVE: Bruce Williams

COUNTY: BENTON
LOCATION: SE¼ SE¼ Sec 11 Twn 9N R 28E R
STREET ADDRESS OF WELL: 500 George Washington Way, Richland
WATER LEVEL ELEVATION: 10'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 10/25/00
DEVELOPED: Yes

0643

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	WELL COVER CONCRETE SURFACE SEAL DEPTH = 3/ft PVC BLANK 2 "x 22' BACKFILL 17 ft. TYPE: bent. Chips PVC SCREEN 2"x 5' SLOT SIZE: .020 GRAVEL PACK 7 ft. MATERIAL: 3/17 sand WELL DEPTH 27 ' "	0 - 15 ft. Brown sand + silt. 15 - 27 ft. Brown sand + gravels w/ some silt. - ft.

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/99) 82451

Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. E008007

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in box)*

☒ Construction 276339

☐ Decommission

ORIGINAL INSTALLATION Notice of Intent Number:

Type of Well *("x in box)*

☒ Resource Protection

☐ Geotech Soil Boring A

Property Owner City of Richland

Site Address Comstock Street & Bradley Blvd

Consulting Firm Shannon & Wilson

City Richland County Benton

Unique Ecology Well IDTag No. N/A

Location NE1/4-1/4 NE1/4 Sec 14 Twn 9N R 28

EWM ☒ or WWM ☐

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Min _____ Sec _____

Long Deg _____ Min _____ Sec _____

☒ Driller ☐ Engineer ☐ Trainee

Name (Print Last, First Name) Harnden, Anisa

Driller/Engineer /Trainee Signature Anisa Harnden

Driller or Trainee License No. 2508

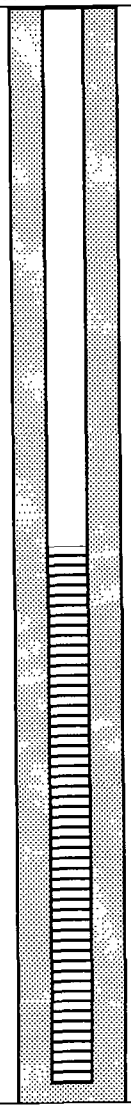
Tax Parcel No. 114981020564009

Cased or Uncased Diameter 2" Static Level 12'

Work/Decommission Start Date 9/26/07

Work/Decommission Completed Date 9/26/07

If trainee, licensed driller's Signature and License Number:

Construction Design	Well Data	Formation Description
	Drove a retractable ***stainless steel / PVC*** screen down to depth and collected a water sample. Boring Depth: 17' Screen: 13-16 Slot Size: .010 Type: Stainless Steel, Temporary Removed all rods and casing from boring and backfilled with bentonite.	0-8 Sand & gravel 8-16 Silty Sand

DEPT OF ECOLOGY Received OCT 11 2007 CENTRAL REGION OFFICE

SCALE: 1"= N/A PAGE 2 OF 5

ECY 050-12 (Rev. 7/06)

Critical Aquifer Recharge Area Report

Cedar Homes Apartments

425 Bradley Blvd
Richland, WA 99352

Prepared For:

Cedar and Sage Homes, LLC
PO Box 2655
Eagle, ID 83616

Prepared By:

Nathan Machiela, PE
Robert McLeod
Project No. 21189

Preparation Date:

May 27, 2022

Table of Contents

Appendices

1.0 Project Overview

The Cedar and Sage Apartments project is located at 425 Bradley Blvd, Richland, WA 99352. The project covers 5 Benton County parcels; numbers 114981012516005, 114981012516002, 114981013473001, 114981012516001 and 114981013473002. The 4.56-acres site is currently undeveloped and zoned WF – Waterfront. The property is bordered by George Washington Way and WF - Waterfront zoned properties, developed with commercial buildings and associated parking lots. The project proposes three new residential apartment buildings, each three-stories tall, providing 144-units total. A pool and community center are proposed on-site for residents. Civil improvements include paved parking areas, utility services, and sidewalks. The project will cover approximately 70% of the site with impervious surfaces. The site will be accessed off Bradley Blvd, which connects to George Washington Way. Construction for the proposed improvements is expected to take place in Fall of 2022. Refer to *Appendix A* for the Vicinity Map and *Appendix B* for the Site Plan.

The site is located completely within an Aquifer Recharge Critical Area, as shown by the City of Richland's online critical area mapping. As identified in the City's Wellhead Protection Program, the site is located in the 5-year time of travel zone for the Wellsian Way Wellfield (SO2). See *Appendix C* for the map taken from the City's Wellhead Protection Program.

2.0 Site Geology

The existing site topography is flat with approximately 4' of elevation change across the site. There is no evidence of on-site storm runoff leaving the site. Additionally, there is no evidence of the site receiving storm runoff from off-site sources.

GN Northern prepared a Geotechnical Site Investigation Report for the project site in July 2021. They performed 10 exploratory test-pits, extending 8 – 10 feet below ground surface. Particle Size Distribution and Natural Moisture Content tests were performed on soil samples taken from the site. GN Northern classified on-site soils as Sandy Silt and Silt with Sand (ML). No bedrock was encountered in any of the test pits. See *Appendix D* for the Geotechnical Report.

3.0 Groundwater

No groundwater was encountered in the test pits to a maximum depth of approximately 10 feet BGS. Based on their review of nearby well logs, GN northern believes groundwater ranges between 9 to 12 feet below ground surface in the site vicinity. The groundwater level likely rises and falls with the change of seasons and primarily depends on the Columbia River water level stage. Well logs are included at the end of the Geotechnical Report prepared by GN Northern.

A report provided by USGS identifies the general hydraulic gradient in the area as towards the northeast. See *Appendix E* for exhibits showing shallow water table level contours, Saddle Mountain basalt water level contours and Wanapum basalt contours.

4.0 Project Impact and Mitigation Plan

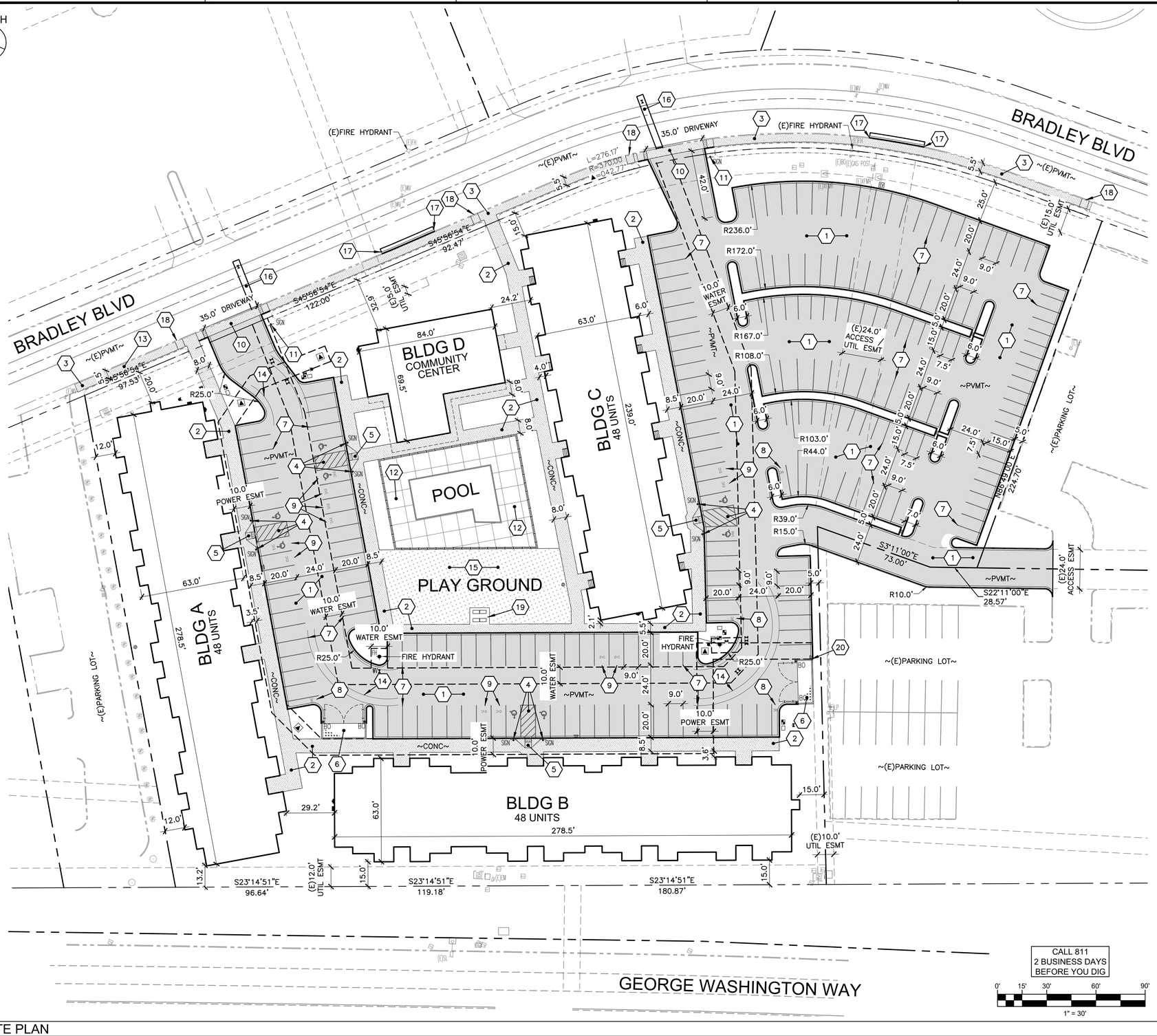
Due to the presence of shallow groundwater, it is likely that stormwater produced by the site's impervious surfaces could enter the underground aquifer. No storage or usage of harmful chemicals are proposed on-site. The principal component of the site's mitigation plan is ensuring pollutants do not enter groundwater through the stormwater management plan. The stormwater plan for the site collects and infiltrates all stormwater runoff through conveyance systems and underground infiltration trenches, compliant with the Stormwater Management Manual for Eastern Washington.

The site is expected to generate approximately 89-trips during the peak traffic hour per Land Use Code 220 of the 9th Edition Trip Generation Manual of the ITE. Based on the number of trips, the site is classified as a low pollutant loading site, per table 5.22 of the SMMEW. Each Particle Size Distribution Test returned a clay / silt percentage greater than 50%. A Cation Exchange Capacity was not provided. Based on the clay / silty percentage, the vadose zone is classified as high treatment capacity per Table 5.22 of the SMMEW. Base on the pollutant loading and treatment capacity classifications, the required pre-treatment is a two-stage drywell, per table 5.23 of the SMMEW. Catch basins with inverted tees are proposed at the entrances of the underground infiltration trenches, satisfying the requirements of a two-stage drywell. The infiltration trenches will be designed to maintain 5-feet of separation from the expected ground water table. Proper stormwater facility maintenance instructions are provided on the corresponding construction drawings for the project. Based on the site's soil characteristics, the proposed land usage, and the proposed stormwater facilities, the proposed project should have no significant impact to the Critical Aquifer Recharge Area. No additional plans are proposed to limit the impact on the aquifer at this time.

APPENDIX A
Vicinity Map

Vicinity Map

APPENDIX B
Site Plan



KEY NOTES

1. STANDARD ASPHALT SECTION – 2-1/2" THICK ASPHALT OVER 6" TOP COURSE PER WSDOT 9-03.9(3)
2. STANDARD CONCRETE SECTION – 4" THICK CONCRETE SIDEWALK OVER 4" TOP COURSE PER WSDOT 9-03.9(3). TROWEL CONTROL JOINTS AT 5' O.C. AND INSTALL EXPANSION JOINTS AT 30' O.C.
3. SIDEWALK PER COR STD ST1
4. PAINT WHITE 4" WIDE PARKING STRIPING, LETTERING, AND ACCESSIBLE PARKING SYMBOLS PER ADA REQUIREMENTS AS SHOWN ON PLAN. INSTALL ACCESSIBLE PARKING SIGNS, SEE DETAILS D3/C501 & D5/C501
5. ACCESSIBLE RAMP, SEE DETAIL D4/C501
6. TRASH ENCLOSURE PER COR STD SW-2B AND SW-3
7. PAINT 4" WHITE PARKING STRIPE, TYP
8. PAINT 4" WIDE WHITE MOTORCYCLE STALLS WITH 24" TALL PAINTED WHITE LETTERING
9. FUTURE RESERVED ALTERNATIVE FUEL VEHICLES PARKING AREA. ELECTRICAL INFRASTRUCTURE ONLY. PER WAC 51-50-0427
10. DRIVEWAY, PER COR STD DETAIL ST2A
11. "STOP" SIGN, PER MUTCD R2-1, PER COR STD DETAIL ST23
12. POOL, SPA, FENCING,PATIO, AND CONCRETE WALKS, REFER TO ARCHITECTURAL FOR SPECIFICATIONS
13. POUR CONCRETE BUS STOP PAD. COORDINATE WITH BEN-FRANKLIN TRANSIT FOR DETAILS
14. FIRE TRUCK TURNING RADIUS, INNER RADIUS = 27'-0", OUTSIDE RADIUS = 44'-7", OVERHANG BUCK RADIUS = 48'-9"
15. PLAYGROUND AREA. REFER TO LANDSCAPING FOR SPECIFICATIONS.
16. HMA PATCH PER COR STD U2. REPAIR STREET STRIPING PER WSDOT STD M-20.10. USE WHITE THERMOPLASTIC STRIPING
17. CURB & GUTTER PER COR STD ST1, HMA PATCH PAVEMENT AS NEEDED PER COR STD U2
18. SIDEWALK INLET PER DETAIL B2/C501, CONTRACTOR TO SAWCUT & REMOVE (E)CURBING & PAVEMENT AS NECESSARY FOR INSTALLATION. PROVIDE NEAT CUT EDGE AND REPAIR TO LIKE CONDITION
19. MAILBOXES, REFER TO ARCHITECTURAL
20. INSTALL (2)6" PVC PIPES AT GROUND LEVEL, 1' APART AT SE CORNER OF TRASH ENCLOSURE TO ALLOW STORMWATER TO FLOW THROUGH ENCLOSURE WALL.

NOTES

1. SEE SHEET C001 FOR GENERAL NOTES AND LEGEND.
2. CURB RETURN RADII ARE 5.0' RADIUS UNLESS NOTED OTHERWISE.
3. DIMENSIONS ARE TO FACE OF CURB, UNLESS NOTED OTHERWISE. FIELD VERIFY ALL MEASUREMENTS AND INVERTS PRIOR TO START OF WORK.
4. A SEALED EXPANSION JOINT MATERIAL SHALL BE USED AT JOINTS WHERE NEW CONCRETE ABUTS EXISTING CONCRETE (TYP), SEE WSDOT STD PLAN A-40.10-04 FOR REINFORCEMENT BAR SPACING AND JOINTS.
5. WHERE NEW SIDEWALK, DRIVEWAY OR ACCESSIBLE RAMP TIES INTO (E)SIDEWALK, REMOVE AND REPLACE ADDITIONAL SIDEWALK PANEL FOR ADA TRANSITION IF REQUIRED.
6. REFER TO LANDSCAPE FOR FENCING, GATES AND/OR MOW STRIP.
7. PARKING ANALYSIS:

- PARKING STALLS REQUIRED: 222 STALLS (1.5 PER UNIT, 1.0 PER STUDIO, POOL: 1.0 PER 300 SF, REC AREA :1.0 PER 5,000 SF, ASSEMBLY :1.0 PER 300 SF)
- PARKING STALLS PROVIDED: 225 TOTAL STALLS (151 STD STALLS, 12 EVC STALLS, 53 COMPACT STALLS, 1 VAN ADA STALL, 7 ADA STALLS, 4 MOTORCYCLE STALLS)

A1 SITE PLAN
SCALE: 1" = 30'-0"

KNUTZEN ENGINEERING
5401 RIDGELINE DR.
SUITE 160
KENNEWICK, WA 99338
1-509-222-0959
www.knutzenengineering.com

No.	REVISIONS	DATE	DESIGN	CHKD	APPD

NATHAN J. MACHELA
STATE OF WASHINGTON
PRELIMINARY
19972
REGISTERED
PROFESSIONAL ENGINEER
03/17/22

SITE PLAN

CEDAR AND SAGE HOMES, LLC
CEDAR HOMES APARTMENTS
425 BRADLEY BLVD, RICHLAND, WA 99352

APPROVAL		
DESIGN	RAM	03/17/22
CHECKED	NJM	03/17/22
APPROVED	NJM	03/17/22

SCALE: AS NOTED
CADFILE: 21189C01
JOB No. 21189
REV. 0
DWG. No. C101

\\2021\21189-425 Bradley Blvd\DWG\21189C01.dwg - Mar 17,2022 - 07:55pm - rmc

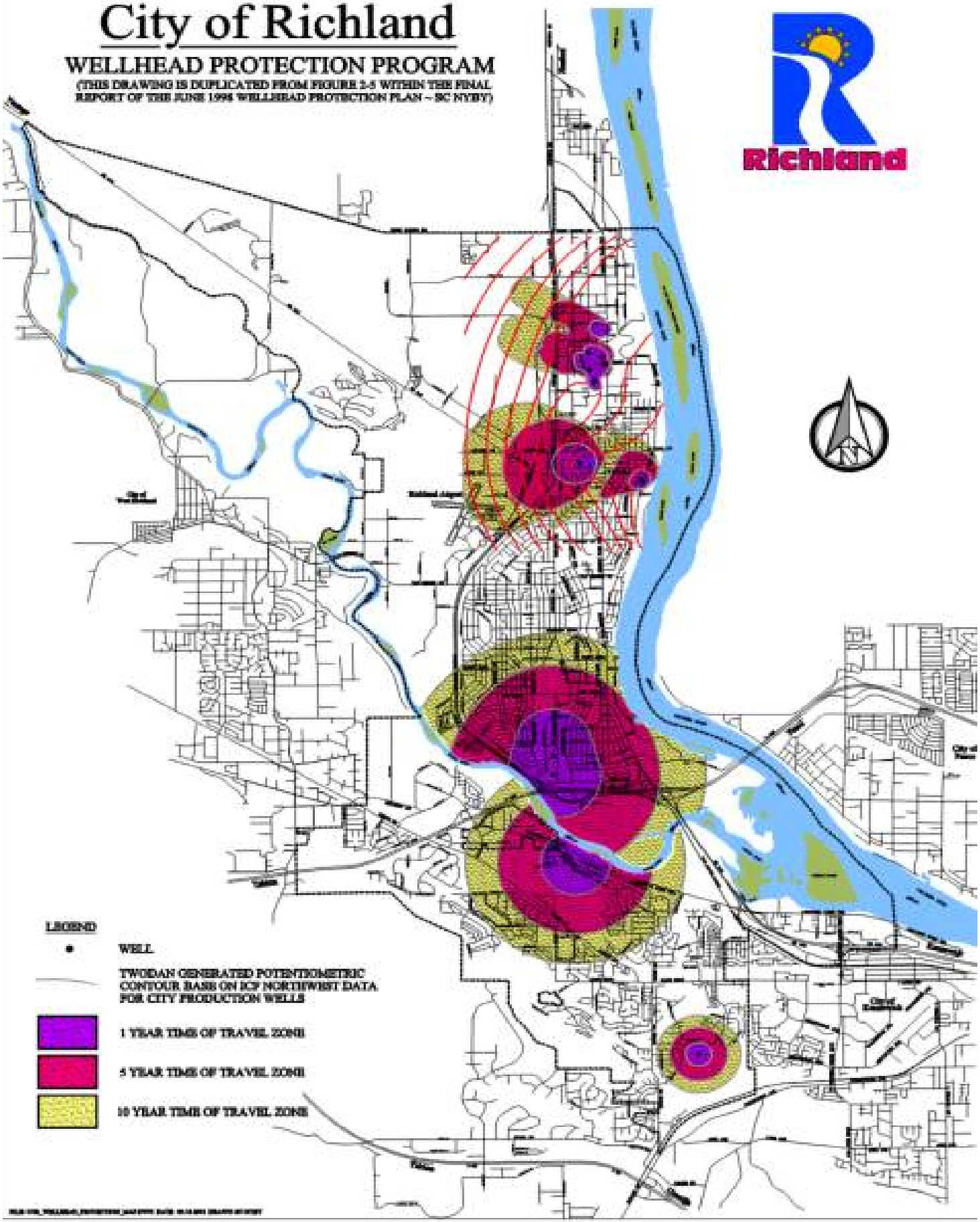
APPENDIX C
Wellhead Map

City of Richland

WELLHEAD PROTECTION PROGRAM

(THIS DRAWING IS DUPLICATED FROM FIGURE 2-5 WITHIN THE FINAL REPORT OF THE JUNE 1998 WELLHEAD PROTECTION PLAN – SC NYBY)

Richland



APPENDIX D
Geotechnical Report

Northern, Inc.
Consulting Engineers Environmental Scientists Geologists
Construction Materials Testing Geophysical Services

GEOTECHNICAL SITE INVESTIGATION REPORT

PROPOSED RIVER FRONT APARTMENTS
425 BRADLEY BOULEVARD
RICHLAND, WASHINGTON

GNN PROJECT NO. 221-1412

JULY 2021

Prepared for

KNUTZEN ENGINEERING
5401 RIDGELINE DRIVE, SUITE 160
KENNEWICK, WASHINGTON 99338

Prepared by

GN NORTHERN, INC.
CONSULTING GEOTECHNICAL ENGINEERS
KENNEWICK, WASHINGTON
(509) 734-9320

Northern, Inc.

At GN Northern our mission is to serve our clients in the most efficient, cost effective way using the best resources and tools available while maintaining professionalism on every level. Our philosophy is to satisfy our clients through hard work, dedication, and extraordinary efforts from all of our valued employees working as an extension of the design and construction team.

July 27, 2021

Knutzen Engineering
5401 Ridgeline Drive, Suite 160
Kennewick, WA 99336

Attn: Nathan Machiela, PE, Principal Engineer

Subject: Geotechnical Site Investigation Report
Proposed River Front Apartments
425 Bradley Boulevard
Richland, Washington

GNN Project No. 221-1412

Dear Mr. Machiela,

As requested, GN Northern (GNN) has completed a geotechnical site investigation for the proposed new River Front Apartments project to be constructed at 425 Bradley Boulevard in the City of Richland, Washington.

Based on the findings of our subsurface study, we conclude that the site is suitable for the proposed development provided that our geotechnical recommendations presented in this report and any subsequent geotechnical investigation are followed during the design and construction phases of the project.

This report describes in detail the results of our investigation, summarizes our findings, and presents our recommendations regarding remedial earthwork, and the design and construction of foundations on the proposed building lots. It is important that GNN be retained to provide engineering consultation during the design, and field geotechnical monitoring and compaction testing services during remedial earthwork to ensure proper implementation of the geotechnical recommendations.

If you have any questions regarding this report, please contact us at 509-734-9320.

Respectfully submitted,

GN Northern, Inc.

Brian W. Binsfield, PE
Geotechnical Engineer

Karl A. Harmon, LEG, PE
Senior Geologist/Engineer

KARL A. HARMON
STATE OF WASHINGTON
41534
REGISTERED
PROFESSIONAL ENGINEER
LEG
Expires 08/02/2021

TABLE OF CONTENTS

Page No.

APPENDICES

1.0 PURPOSE AND SCOPE OF SERVICES

This report has been prepared for the proposed new River Front Apartments project to be constructed at 425 Bradley Boulevard in the City of Richland, Washington; site location is shown on the *Vicinity Map* (Figure 1, Appendix I). Our investigation was conducted to collect information regarding subsurface soil/groundwater conditions, present our professional opinion regarding the suitability of the subsurface materials to support the planned development and provide recommendations for geotechnical considerations and bearing capacity for the proposed construction.

GN Northern, Inc. has prepared this report for use by the client and their design consultants in the design of the proposed development. Do not use or rely upon this report for other locations or purposes without the written consent of GNN.

Our study was conducted in general accordance with our *Proposal for Geotechnical Site Investigation Report and Infiltration Testing* dated June 21, 2021; notice to proceed was provided in the form of a signed proposal by Mr. Machiela via email on June 24, 2021.

You provided a *Preliminary Layout* (dated 5/7/2021) showing the proposed development via email on June 17th. Field exploration, consisting of ten (10) exploratory test-pits and two (2) infiltration tests, was completed on July 14, 2021. The test-pit locations are shown on the *Site Exploration Map* (Figure 2, Appendix I). Detailed test-pit logs are presented in Appendix II, and results of our laboratory testing are presented in Appendix III.

This report has been prepared to summarize the data obtained during this study and to present our recommendations based on the proposed construction and the subsurface conditions encountered. Results of the field exploration and laboratory testing were analyzed to develop recommendations for site development, earthwork, and foundation bearing capacity. Design parameters and a discussion of the geotechnical engineering considerations related to construction are included.

2.0 PROPOSED SITE DEVELOPMENT

Based on the information provided, we understand that the proposed River Front Apartment complex is planned on a 198,595 SF parcel and will consist of three 3-story apartment buildings, a clubhouse building and a swimming pool. The two 48-unit apartment buildings will have a

footprint of 16,600 SF. The 36-unit apartment building will have a footprint of 13,300 SF. The club house building will have a footprint of approximately 6,800 SF. The project will have parking throughout the site with a total of 198 parking stalls. The apartment complex will be accessed via Bradley Blvd. to the east.

We anticipate the building to be constructed using wood-frame construction with slab-on-grade. Structural loading information was not available at the time of this report. Based on our experience with similar projects, we expect wall loads to be on the order of 3.0 to 4.0 klf and maximum column loads for the structure to be less than 80 kips. If loading conditions differ from those described herein, GNN should be given an opportunity to perform re-analysis. Settlement tolerances for the structure is assumed to be limited to 1 inch, with differential settlement limited to ½ inch.

3.0 FIELD EXPLORATION

Our field exploration, consisting of ten (10) exploratory test-pits and two (2) infiltration tests, was completed on July 14, 2021. The test-pit locations are shown on the *Site Exploration Map* (Figure 2, Appendix I). A local public utility clearance was obtained prior to the field exploration. Test-pits were excavated by DDB, LLC using a Case CX55B excavator to depths of approximately 8 and 10 feet below ground surface (BGS). The test-pits were logged by a GNN geotechnical engineer. Upon completion, the test-pits were loosely backfilled with excavated soils. Detailed test-pit logs are presented in Appendix II.

The soils observed during our field exploration were classified according to the Unified Soil Classification System (USCS), utilizing the field classification procedures as outlined in ASTM D2488. A copy of the USCS Classification Chart is included in Appendix II. Photographs of the site and exploration are presented in Appendix IV. Depths referred to in this report are relative to the existing ground surface elevation at the time of our investigation. The surface and subsurface conditions described in this report are as observed at the time of our field investigation.

4.0 LABORATORY TESTING

Representative samples of the subsurface soils obtained from our field exploration were selected for testing to determine the index properties of the soils in general accordance with ASTM procedures. The following laboratory tests were performed:

Table 1: Laboratory Tests Performed

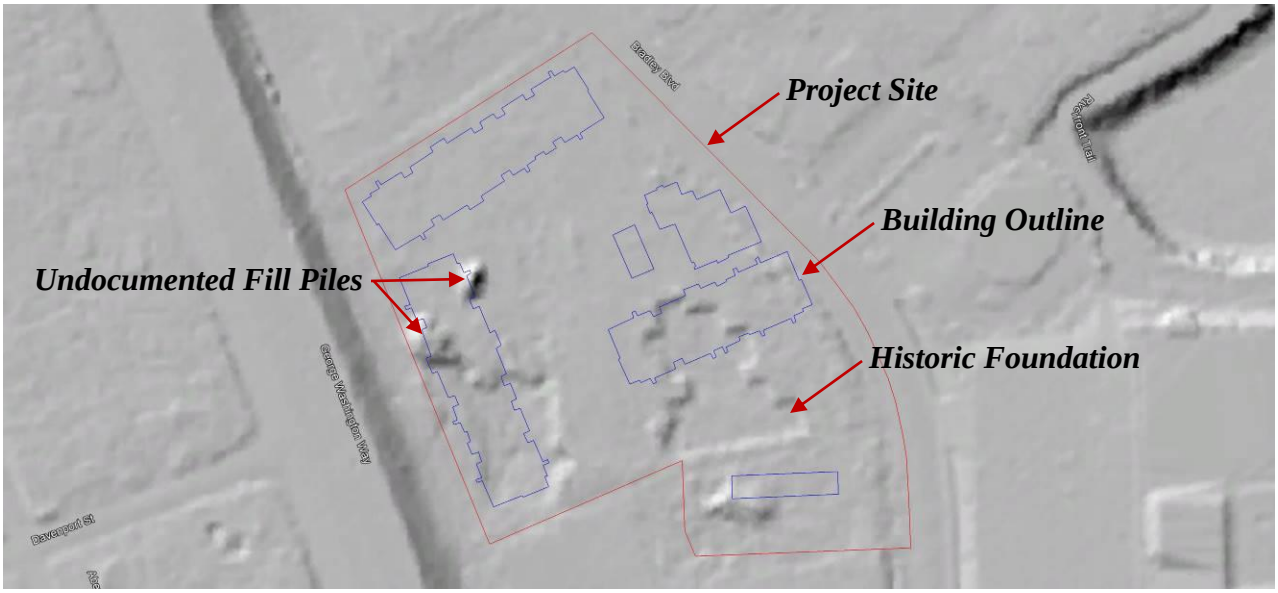
Test	To determine
Particle Size Distribution (ASTM D6913)	Soil classification based on proportion of sand, silt, and clay-sized particles
Natural Moisture Content (ASTM D2216)	Soil moisture content indicative of in-situ condition at the time samples were taken

Results of the laboratory tests are included on the test-pit logs and are also presented in graphic form in Appendix III attached to the end of the report.

5.0 SITE CONDITIONS

The proposed River Front Apartment development consists of an approximate 198,595 SF parcel located in the City of Richland, Washington. The site is situated in the NE ¼ of the NE ¼ of Section 14, Township 9 North and Range 28 East, Willamette Meridian. The project site is bounded by George Washington way to the west, Bradley Blvd. to the east, the Columbia River Eye Center to the north and the parking lot for several professional office buildings to the south.

The site appears to have been formerly occupied by a large building with a possible partial basement in the middle of the site. Evidence of the apparent former building is seen by the presence of concrete stem walls/foundations and pieces of concrete around the perimeter of a large depression. Evidence of the apparent former building is seen in a LiDAR image of the site. On the west side of the apparent former building, near the middle of the site, the site is paved with an approximate 2-inch layer of asphalt. The south half of the site is heavily forested, while the north half has only a few sparse trees. The remainder of the site is covered with weeds and sagebrush. Several large soil stockpiles are present near the middle of the western portion of the site and along the south side of the former building location. Numerous boulders were also observed in the middle of the north half of the site. The majority of the site is relatively flat, with the western side of the site sloping up steeply to George Washington Way.



LiDAR image from WA State DNR LiDAR Portal with proposed building layouts

5.1 Regional Geology

The site is located in the Tri-Cities area of the Yakima Fold Belt region of the Columbia Basin Plateau. The subsurface stratigraphy of the region is comprised of a thick series of folded, Miocene-age flood basalt lava flows and interbedded sediments (collectively known as the Columbia River Basalt Group [CRBG]) overlain by unconsolidated deposits of late Miocene to recent age. In the Tri-Cities area, the uppermost layers of the CRBG are fractured basalt bedrock. Regionally, the top surface of the local basalt is known to slope to the east toward the Columbia River, although local variations exist in the area. Overlying sediments in the project area include surficial deposits of Quaternary alluvium and Pleistocene-age outburst flood deposits, commonly identified as the Missoula Flood Deposits.

5.2 Seismic Considerations

The Washington Geologic Information Portal identifies the site as having a National Earthquake Hazards Reduction Program (NEHRP) Site Class D designation. The "Site Class" is a classification based on the properties of the upper 100 feet of the soil and bedrock materials at a site. Based on the assumption that subsurface materials underlying those observed during our field exploration have similar qualities, a Site Class D appears appropriate for the site. Therefore, as per the *2018 International Building Code* (IBC), a Site Class 'D' may be used for seismic design purposes. Site Class 'D' corresponds to 'stiff soil'. Table 2 below presents the recommended

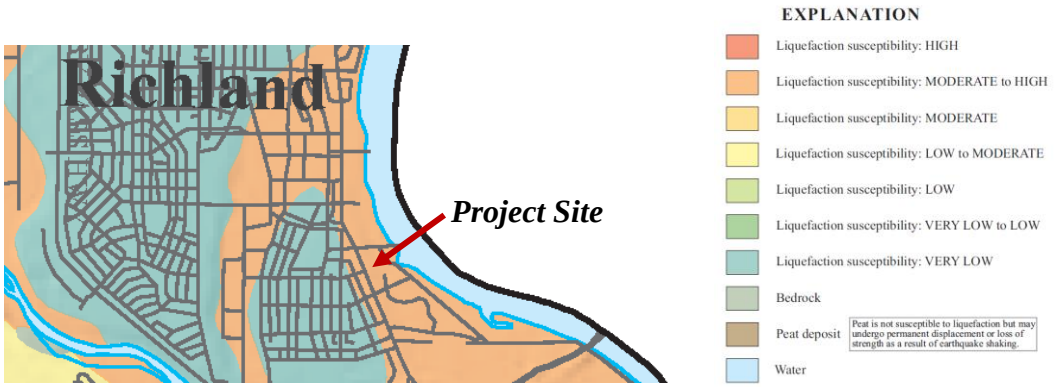
seismic design parameters in accordance with ASCE 7-16 for a code-based response spectrum with a return period of 2,475 years.

Table 2: Code-Based Seismic Design Parameters

Seismic Design Parameter	Value (unit)	Definition
S_S	0.415 (g)	MCE spectral response acceleration at short periods
S_1	0.159 (g)	MCE spectral response acceleration at 1-second period
F_a	1.468 (unitless)	Site coefficient for short periods
F_v	2.283 (unitless)	Site coefficient for 1-second period
S_{MS}	0.609 (g)	MCE spectral response acceleration at short periods as adjusted for site effects
S_{M1}	0.362 (g)	MCE spectral response acceleration at 1-second period as adjusted for site effects
S_{DS}	0.406 (g)	Design spectral response acceleration at short periods
S_{D1}	0.241 (g)	Design spectral response acceleration at 1-second period
PGA	0.184 (g)	MCE_G peak ground acceleration
F_{PGA}	1.432	Site amplification factor at PGA
PGA_M	0.264 (g)	Site modified peak ground acceleration
PGA_D	0.5	Factored deterministic acceleration value

5.3 Evaluation of Seismic Induced Soil Liquefaction

The site is currently mapped as having a "Moderate to High" liquefaction susceptibility, identified by the Washington State DNR's *Liquefaction Susceptibility Map of Benton County, Washington (2004)*, as shown below. Due to potential risk of liquefaction at the site, to better define the depth of liquefiable soils, a detailed liquefaction analysis should be performed. We recommend conducting one exploratory boring to a depth of 50 feet BGS with continuous STP sampling or advancing a cone penetration test (CPT) probe to a depth of 50 feet BGS to evaluate liquefaction potential at the site.



We assume that the proposed apartment structures will have fundamental periods of vibration less than 0.5 seconds. If this is not the case, we should be notified for reevaluation of Site Class. Per ASCE 7-16, for design of structures having fundamental periods of vibration less than 0.5 seconds on potentially liquefiable sites, site specific response analysis is not required. A detailed liquefaction analysis is beyond the scope of our current services for this project.

6.0 SUBSURFACE CONDITIONS

Based on the findings of our field exploration, subsurface soil conditions across the site are relatively uniform. The native site soils typically consist of Sandy Silt and Silt with Sand (ML). The soils were observed to have a relative in-place density of 'medium dense' and were typically observed to be 'damp' to 'moist'. Undocumented fill soil was encountered in six of the test-pits. The fill ranged from 9 inches to 2 feet in thickness, and was generally identified poorly graded gravel with silt and sand (GP-GM) or silty sand (SM). Test-pit logs in Appendix II show detailed descriptions and stratification of the soils encountered. It shall be noted that our site exploration was limited due to dense vegetation and trees in the southern portion of the site.

6.1 NRCS Soil Survey

The soil survey map of the site prepared by the Natural Resources Conservation Service (NRCS) identifies the near surface site soils as *Pasco fine sandy loam, 0 to 2 percent slopes,* and *Scooteney silt loam, gravelly subsoil, 0 to 2 percent slopes.* The parent material for these soils are described as *alluvium* and *loess.* According to the NRCS map (Soil Survey, Appendix V), the typical soil profile for these soils is described as *fine sandy loam* over *silt loam* and *silt loam* over *very gravelly loam,* respectively. NRCS data indicates that these units generally consist of *poorly drained* and *well drained* materials, respectively.

6.2 Groundwater

Groundwater was not encountered within any of the test pits to a maximum depth of approximately 10 feet BGS. To further assist in our evaluation, we reviewed the Washington Department of Ecology Well Log database of nearby well logs (see Appendix VI) to estimate groundwater levels in the vicinity. Based on our review of nearby well logs, groundwater is believed to be in the range of 9 to 12 feet BGS in the site vicinity. Groundwater levels primarily will be controlled by the

adjacent Columbia River water level stage. Ground water levels indicated are for the specific locations at the time of explorations and may not be indicative of other times and/or locations.

7.0 SOIL INFILTRATION TESTING

Soil infiltration testing was performed at two (2) locations as shown on the *Site Exploration Map* (Figure 2, Appendix I) attached to this report. The infiltration tests were conducted using a single ring infiltrometer consisting of a 10-inch diameter steel pipe driven into the ground at the test depth. After an initial pre-soak period, a constant water level was maintained in the ring with the use of a float valve and timed intervals of the water demand volumes were recorded. Continuous readings of the water volumes required to maintain the constant head were recorded until a relatively constant rate was achieved, and the average infiltration rate was recorded. The test results are indicative of the infiltration characteristics of the subsurface soils encountered at the test location and depth. The following table presents the results of the infiltration tests performed at the site:

Table 3: Infiltration Test Results

Test ID	Test Depth	Soil Type	Percent Fines	Field Infiltration Rate
TP-3	4 feet BGS	Sandy Silt (ML)	55.4	**3.0 inches/hour**
TP-10	4 feet BGS	Silt with Sand (ML)	77.9	**2.8 inches/hour**

The infiltration rates presented herein represents the un-factored field soil infiltration rate. An appropriate factor of safety should be applied to the field infiltration rate to determine long-term design infiltration rate. Determination of safety factors for long-term design infiltration should consider the following: pretreatment, potential for bio-fouling, system maintainability, horizontal and vertical variability of soils, and type of infiltration testing. Typical factors of safety for these soils generally range from 2 to 3.

8.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical recommendations are based on our current understanding of the proposed project as described in Section 2.0 of this report. The report is prepared to comply with the 2018 International Building Code Section 1803, Geotechnical Investigations, and as required by Subsection 1803.2, Investigations Required. Please note that Soil Design Parameters and

Recommendations presented in this report are predicated upon appropriate geotechnical monitoring and testing of the site preparation and foundation and building pad construction by a representative of GNN's Geotechnical-Engineer-of-Record (GER). Any deviation and nonconformity from this requirement may invalidate, partially or in whole, the following recommendations. We recommend that we be engaged to review grading plans in order to provide revised, augmented, and/or additional geotechnical recommendations as required.

Due to potential concerns for the presence of hazardous waste/materials at the project site from unknown former site development, we recommend a Phase I Environmental Sites Assessment be performed for the subject property.

8.1 Site Development – Grading

Site grading shall incorporate the requirements of IBC 2018 Appendix J. The project GER or a representative of the GER should observe site clearing, grading, and the bottoms of excavations before placing fills. Local variations in soil conditions may warrant increasing the depth of over-excavation and recompaction. Seasonal weather conditions may adversely affect grading operations. To improve compaction efforts and prevent potential pumping and unstable ground conditions, we suggest performing site grading during dryer periods of the year.

Soil conditions shall be evaluated by in-place density testing, visual evaluation, probing, and proof-rolling of the imported fill and re-compacted on-site soil as it is prepared to check for compliance with recommendations of this report. A moisture-density curve shall be established in accordance with the ASTM D1557 method for all onsite soils and imported fill materials used as structural fill. Existing onsite gravelly soils include oversize material that may limits the ability to perform compaction testing and will require proof compaction inspections to confirm a dense and non-yielding condition.

Clearing and Grubbing: At the start of site grading, the construction areas should be cleared and stripped of all vegetation, roots, topsoil, organic matter, any encountered undocumented fills or trash/debris, any existing soil stockpiles, foundation elements/stem walls of the of the apparent former building(s), and abandoned underground utilities. All topsoil and fine-grained soils with organic material (vegetation and roots) shall be completely removed from the proposed

construction areas. Monitoring by a representative of the GER at the time of the site clearing activities may allow reduction in the required quantity of stripping depending upon the encountered depth of organic material (roots) and the organic content of the soils. A representative of the GER should observe site clearing, grading, and the bottoms of excavations before placing fill.

Re-Use of Onsite Soils as Engineered Fill: The onsite silt soils, free of significant organics, deleterious materials including construction debris, are generally suitable for use as general and engineered fill and backfill. Engineered fill should be placed in maximum 8-inch lifts (loose) and compacted to at least 95% relative compaction (ASTM D1557) near its optimum moisture content. The fine-grained silty soils are considered highly moisture-sensitive, and will therefore require compaction to be performed within a strict range of ±1% of optimum moisture to achieve the proper degree of compaction. Compaction should be verified by testing.

Use of Imported Soils as Engineered Fill: If needed, imported fill soils should be non-expansive, granular soils meeting the USCS classifications of SM, SP-SM, or SW-SM with a maximum rock size of 4 inches, minimum 70% passing the No. 4 sieve, and 5 to 20% passing the No. 200 sieve. The GER should evaluate the import fill soils before hauling to the site. The imported fill should be placed in lifts no greater than 8 inches in loose thickness and compacted to at least 95% of the maximum dry density (ASTM D1557) near optimum moisture content.

8.2 Temporary Excavations

It shall be the responsibility of the contractor to maintain safe temporary slope configurations since the contractor is at the job site, able to observe the nature and conditions of the slopes and be able to monitor the subsurface conditions encountered. Unsupported vertical cuts deeper than 4 feet are not recommended if worker access is necessary. The cuts shall be adequately sloped, shored, or supported to prevent injury to personnel from caving and sloughing. The contractor and subcontractors shall be aware of and familiar with applicable local, state, and federal safety regulation including the current OSHA Excavation and Trench Safety Standards, and OSHA Health and Safety Standards for Excavations, 29 CFR Part 1929, or successor regulations.

According to chapter 296-155 of the Washington Administrative Code (WAC), it is our opinion that the near-surface soil encountered at the site is classified as Type C soils. We recommend that temporary, unsupported, open cut slopes shall be no steeper than 1.5 feet horizontal to 1.0 feet vertical (1.5H:1V) in Type C soils. No heavy equipment should be allowed near the top of temporary cut slopes unless the cut slopes are adequately braced. Where unstable soils are encountered, flatter slopes may be required.

8.3 Utility Excavation, Pipe Bedding and Trench Backfill

To provide suitable support and bedding for the pipe, we recommend the utilities be founded on suitable bedding material consisting of clean sand and/or sand & gravel mixture. Pipe bedding and pipe zone materials shall conform to Section 9-03.12(3) of the Washington State Department of Transportation (WSDOT) 2018 Standard Specifications. Pipe bedding should provide a firm uniform cradle for support of the pipes. A minimum 4-inch thickness of bedding material beneath the pipe should be provided. Prior to installation of the pipe, the pipe bedding should be shaped to fit the lower part of the pipe exterior with reasonable closeness to provide uniform support along the pipe. Pipe bedding material should be used as pipe zone backfill and placed in layers and tamped around the pipes to obtain complete contact. To protect the pipe, bedding material should extend at least 6 inches above the top of the pipe.

Placement of bedding material is particularly critical where maintenance of precise grades is essential. Backfill placed within the first 12 inches above utility lines should be compacted to at least 90% of the maximum dry density (ASTM D1557), such that the utility lines are not damaged during backfill placement and compaction. In addition, rock fragments greater than 1 inch in maximum dimension should be excluded from this first lift. The remainder of the utility excavations should be backfilled and compacted to 95% of the maximum dry density as determined by ASTM D1557.

8.4 Imported Crushed Rock Structural Fill

Imported structural fill shall consist of well-graded, crushed aggregate material meeting the grading requirements of 2018 WSDOT Standard Spec. Section 9-03.9(3) (1¼-inch minus Base Course Material) presented here:

Table 4: WSDOT Standard Spec. 9-03.9(3)

Sieve Size	Percent Passing (by Weight)
1¼ Inch Square	99 - 100
1 Inch Square	80 - 100
5/8 Inch Square	50 – 80
U.S. No. 4	25 - 45
U.S. No. 40	3 – 18
U.S. No. 200	Less than 7.5

A fifty (50) pound sample of each imported fill material shall be collected by GNN personnel prior to placement to ensure proper gradation and establish the moisture-density relationship (proctor curve).

8.5 Compaction Requirements for Structural/ Engineered Fill

All fill or backfill shall be approved by a representative of the GER, placed in uniform lifts, and compacted to a minimum 95% of the maximum dry density as determined by ASTM D1557. The compaction effort must be verified by a representative of the GER in the field using a nuclear density gauge in accordance with ASTM D6938. The thickness of the loose, non-compacted, lift of structural fill shall not exceed 8 inches for heavy-duty compactors or 4 inches for hand operated compactors.

8.6 Building Pad Preparation

After excavation to remove the existing vegetation, and stem walls/foundation elements from several of the building areas, up to 5 feet of structural fill may be required to achieve the design grade. In order to reduce the risk of differential settlement from variable thickness of fills across the building pads, the maximum differential of the thickness of fill material within the building pads shall be limited to 50%; i.e. if the thickest fill within a given portion of the building pad is 6 feet, then no portion of the building pad shall be constructed with less than 3 feet of fill material across the footprint. Allowance shall be made for placement of minimum 18-inches of imported crushed rock structural fill beneath all foundations and 9-inches beneath concrete floor slabs.

Prior to placement of new engineered fill material, the exposed native subgrades shall be scarified to a minimum depth of 12 inches, then moisture conditioned to near-optimum and re-compacted to at least 95% relative compaction (ASTM D1557) and to a dense and non-yielding surface. Foundation subgrade preparations and crushed rock structural fill should extend laterally a

minimum distance of two (2) feet beyond the outer edges of the footings on all sides. Building pad excavations shall expose the native undisturbed silt soils or structural fill. A representative of our geotechnical engineer shall confirm the suitability of the exposed subgrade.

8.7 Foundations Design Parameters and Allowable Bearing Capacity

In our opinion, the proposed apartment building structures and club house may be supported on conventional shallow foundations bearing on a layer of imported crushed rock placed atop recompacted dense subgrade. The minimum footing depth shall be 24 inches below adjacent exterior finished grades for frost protection and bearing capacity considerations.

To provide a uniform bearing support and minimize the risk of differential settlement, all foundations shall bear on a minimum of 18 inches of imported 1¼" minus crushed rock structural fill extending to a re-compacted subgrade.

Footings constructed in accordance with the above recommendations may be designed for an allowable **2,000 pounds per square foot (psf)** bearing pressure. The allowable bearing pressure presented above may be increased by 1/3 for short-term, transient loading conditions. Based on assumed structural loading, we estimate total settlement for footings constructed in accordance with this recommendation to be less than 1-inch. We anticipate differential settlement will be about half of total settlements between adjacent columns and along approximately 20 feet of continuous footings. We assume there is no stress overlap from adjacent footings. Footings located less than two times the footing width (2B) from each other will increase stresses beneath the adjacent footing, resulting in increased settlement. We expect elastic settlements to generally occur as loads are applied.

Lateral forces on foundations from short term wind and seismic loading would be resisted by friction at the base of foundations and passive earth pressure against the buried portions. We recommend an allowable passive earth pressure for compacted onsite fill of **200 pcf**. This lateral foundation resistance value includes a factor of safety of 1.5. We recommend a coefficient of friction of **0.45** be used between cast-in-place concrete and imported crushed rock. An appropriate factor of safety should be used to calculate sliding resistance at the base of footings.

8.8 Slab-on-Grade Floors

Concrete slabs-on-grade shall be supported on 9 inches of imported crushed rock structural fill placed atop a recompacted subgrade or structural fill in accordance with the grading recommendations of this report. The crushed rock material shall be ¾-inch minus aggregate meeting *WSDOT Specification* section 9-03.9 (3), "Crushed Surfacing Top Course". Prior to placing any slabs, the top 12 inches of the exposed subgrade shall be compacted to a minimum in-place dry density of 95% of the maximum laboratory dry density determined by ASTM D1557. We recommend a modulus of subgrade reaction equal to **120 pounds per cubic inch (pci)** based on a value for gravel presented in the Portland Cement Association publication No. EB075.01D. Slab thickness, reinforcement and joint spacing shall be determined by a licensed engineer based on the intended use and loading.

An appropriate vapor retarder (10-mil polyethylene liner) shall be used (ASTM E1745/E1643) beneath areas receiving moisture sensitive resilient flooring/VCT where prevention of moisture migration through slab is essential. The slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder. The architect shall determine the need and use of a vapor retarder.

8.9 Lateral Earth Pressure

We recommend the following lateral earth pressures, in terms of equivalent fluid pressure, for design of retaining walls or below-grade structures, these pressure values assume drained condition:

At-Rest = 60 psf/ft of embedment

Active = 40 psf/ft of embedment

We assume that the structural wall backfill is adequately drained to avoid saturation and introduction of hydrostatic pressures. For calculation of active pressures, we assume that the wall can deflect in order to develop an active condition. Use at-rest pressures for restrained or braced walls. The horizontal resultant force (pressure x H/2 where H is height of buried wall) should be applied at an H/3 distance from the base of the wall.

If any surface, surcharge loads are closer than one-half of the wall height (horizontal distance) to the edge of the below-grade and/or retaining wall, increase the design wall pressure by *q*/2 over

the whole area of the retaining wall. In this expression, *q* is the surface surcharge load in psf. GNN should review anticipated surcharge loading to confirm that the appropriate design values are considered. The horizontal surcharge resultant force (pressure x H where H is height of buried wall) should be applied at an H/2 distance from the base of the wall.

8.10 Flexible Pavement

Based on the findings of our site investigation, we anticipate that the pavement subgrade will consist of gravelly artificial fill soils and native silty soils. After stripping to remove vegetation and roots, the surficial gravelly artificial fill soils may be left in place as a subbase layer. We recommend the exposed subgrade shall be compacted/densified to a dense and non-yielding surface and shall be proof-rolled with a tandem-axle loaded dump truck or a water truck with a minimum 30-ton static weight and minimum 100 psi tire pressure and observe deflections, pumping and rutting for indications of inadequate subgrade performance. Any soft spots, pumping or yielding areas observed during proof-rolling shall be over-excavated a minimum 12 inches and shall be backfilled with compacted granular structural fill.

Acceptance criteria for proof-rolling shall include no rutting greater than 3/4-inch and no "pumping" of the soil behind the wheels. Permanent rutting in excess of 1-inch shall be considered failure (unsatisfactory compaction). In addition, elastic (rebound) movement or rutting in excess of 1-inch with substantial cracking or substantial lateral movement shall also be considered failure. Adjust the lift thickness, as directed by the geotechnical engineer, until the subgrade exhibits firm unyielding conditions under a loaded dump truck or a water truck. Proof-rolling shall be performed in the presence of a representative of the GNN's geotechnical engineer.

The finished surface shall be smooth, uniform and free of localized weak and soft spots. The subgrade must be graded to the required contours and grade in a manner as will insure a hard, uniform, well compacted surface. All subgrade deficiency corrections and drainage provisions shall be made prior to constructing the aggregate base course. All underground utilities shall be protected prior to grading. The following table presents recommended light duty and heavy-duty pavement sections for this project:

Table 5: Recommended Asphalt Concrete Paving Sections

Traffic	Asphalt Thickness (inches)	Crushed Aggregate Base Course (inches)	Subgrade
Heavy Duty†	3.5	12*	Scarify, moisture conditioned and recompacted to a dense and non-yielding surface
Standard Duty††	2.5	8*	

†Heavy duty applies to pavements section for entrance drives, fire truck lane, and trash enclosure drive lanes.
††Standard duty applies to general parking areas, *The upper 2" of crushed rock should be top course rock placed over the base course layer.

Pavement design recommendations assume proper and positive drainage and construction monitoring and are based on AASHTO Design parameters for a 20-year design period. Asphalt pavements tend to develop thermal and fatigue cracking over time from environmental factors and traffic loads. Asphalt, being a viscoelastic material, weakens from temperature influx. Timely preventative measures for continual flexible maintenance such as crack filling and seal coating at 8-10 year intervals to control the progression of surface cracking and distress to prevent water from infiltrating into the base course and subgrade shall be considered. Performing this intermediate level of maintenance will net at least a 20-year service life/performance.

All fills used to raise low areas shall be approved onsite soils or imported granular fill and shall be placed under engineering control conditions. The finished surface shall be smooth, uniform and free of localized weak/soft spots. All subgrade deficiency corrections and drainage provisions shall be made prior to placing the aggregate base course. All underground utilities shall be protected prior to grading.

The HMAC utilized for the project should be designed and produced in accordance with Section 5-04 Hot Mix Asphalt of the WSDOT 2018 Standards Specifications. Aggregate Base material shall comply with Section 9-03.9(3) Crushed Surfacing of the *WSDOT 2018 Standards Specification*s. Aggregate base or pavement materials should not be placed when the surface is wet.

8.11 Subgrade Protection

The degree to which construction grading problems develop is expected to be dependent, in part, on the time of year that construction proceeds and the precautions which are taken by the

contractor to protect the subgrade. The near-surface fine-grained soils currently present on site may be moisture and disturbance sensitive due to their fines content and may become unstable (pumping) if allowed to increase in moisture content and are disturbed (rutted) by construction traffic if wet. If necessary, the construction access road shall be covered with a layer of ballast or quarry spalls. The soils are also susceptible to erosion in the presence of moving water. The soils shall be stabilized to minimize the potential of erosion into the foundation excavation. The site shall be graded to prevent water from ponding within construction areas and/or flowing into excavations. Accumulated water must be removed immediately along with any unstable soil. Foundation concrete shall be placed and excavations backfilled as soon as possible to protect the bearing grade. We further recommend that soils that become unstable are to be either removed and replaced with structural compacted gravel fill, or mechanically stabilized with a coarse crushed aggregate and compacted into the subgrade.

8.12 Surface Drainage

With respect to surface water drainage, we recommend that the ground surface be sloped to drain away from future structures. Final exterior site grades shall promote free and positive drainage from the building areas. Water shall not be allowed to pond or to collect adjacent to foundations or within the immediate building area. We recommend that a gradient of at least 5% for a minimum distance of 10 feet from the building perimeter be provided, except in paved locations. In paved areas, a minimum gradient of 1% should be provided unless provisions are included for collection/disposal of surface water adjacent to the structure. Catch basins, drainage swales, or other drainage facilities should be aptly located. All surface water such as that coming from roof downspouts and catch basins be collected in tight drain lines and carried to a suitable discharge point, such as a storm drain system. Surface water and downspout water should not discharge into a perforated or slotted subdrain, nor should such water discharge onto the ground surface adjacent to the building. Cleanouts should be provided at convenient locations along all drain lines.

9.0 ADDITIONAL SERVICES

The Client should maintain an adequate program of geotechnical consultation, construction monitoring, and soils testing during the final design and construction phases to ensure compliance with GNN's geotechnical recommendations. For this purpose, GNN, the Geotechnical Engineer-of-Record, shall be retained as the geotechnical consultant from beginning to end of the project to maintain continuity of services.

GNN can provide construction monitoring and testing as additional services. The costs of these services are not included in our present fee arrangement, but can be obtained from our office. The recommended construction monitoring and testing includes, but is not necessarily limited to, the following:

- Consultation during the design stages of the project.
- Review of the grading and drainage plans to monitor compliance and proper implementation of the recommendations in GNN's Report.
- Observation and quality control testing during site preparation, grading, and placement of engineered fill as required by the local building ordinances.
- Geotechnical engineering consultation as needed during construction.

10.0 LIMITATIONS OF THE GEOTECHNICAL SITE INVESTIGATION REPORT

This GEOTECHNICAL SITE INVESTIGATION REPORT ("Report") was prepared for the exclusive use of the Client. GN Northern, Inc.'s (GNN) findings, conclusions and recommendations in this Report are based on selected points of field exploration, laboratory testing, and GNN's understanding of the proposed project at the time the Report is prepared. Furthermore, GNN's findings and recommendations are based on the assumption that soil, rock and/or groundwater conditions do not vary significantly from those found at specific exploratory locations. Variations in soil, bedrock and/or groundwater conditions could exist between and beyond the exploration points. The nature and extent of these variations may not become evident until during or after construction. Variations in soil, bedrock and groundwater may require additional studies, consultation, and revisions to GNN's recommendations in the Report.

In many cases the scope of geotechnical exploration and the test locations are selected by others without consultation from the geotechnical engineer/consultant. GNN assumes no responsibility and, by preparing this Report, does not impliedly or expressly validate the scope of exploration and the test locations selected by others.

This Report's findings are valid as of the issued date of this Report. However, changes in conditions of the subject property or adjoining properties can occur due to passage of time, natural processes, or works of man. In addition, applicable building standards/codes may change over time. Accordingly, findings, conclusions, and recommendations of this Report may be invalidated, wholly or partially, by changes outside of GNN's control. Therefore, this Report is subject to review and shall not be relied upon after a period of **five (5) years** from the issued date of the Report.

In the event that any changes in the nature, design, or location of structures are planned, the findings, conclusions and recommendations contained in this Report shall not be considered valid unless the changes are reviewed by GNN and the findings, conclusions, and recommendations of this Report are modified or verified in writing.

This Report is issued with the understanding that the owner or the owner's representative has the responsibility to bring the findings, conclusions, and recommendations contained herein to the

attention of the architect and design professional(s) for the project so that they are incorporated into the plans and construction specifications, and any follow-up addendum for the project. The owner or the owner's representative also has the responsibility to verify that the general contractor and all subcontractors follow such recommendations during construction. It is further understood that the owner or the owner's representative is responsible for submittal of this Report to the appropriate governing agencies. The foregoing notwithstanding, no party other than the Client shall have any right to rely on this Report and GNN shall have no liability to any third party who claims injury due to reliance upon this Report, which is prepared exclusively for Client's use and reliance.

GNN has provided geotechnical services in accordance with generally accepted geotechnical engineering practices in this locality at this time. GNN expressly disclaims all warranties and guarantees, express or implied.

Client shall provide GNN an opportunity to review the final design and specifications so that earthwork, drainage, and foundation recommendations may be properly interpreted and implemented in the design and specifications. If GNN is not accorded the review opportunity, GNN shall have no responsibility for misinterpretation of GNN's recommendations.

Although GNN can provide environmental assessment and investigation services for an additional cost, the current scope of GNN's services does not include an environmental assessment or an investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or adjacent to the subject property.

APPENDICES

Appendix I

Vicinity Map (Figure 1)

Site Exploration Map (Figure 2)

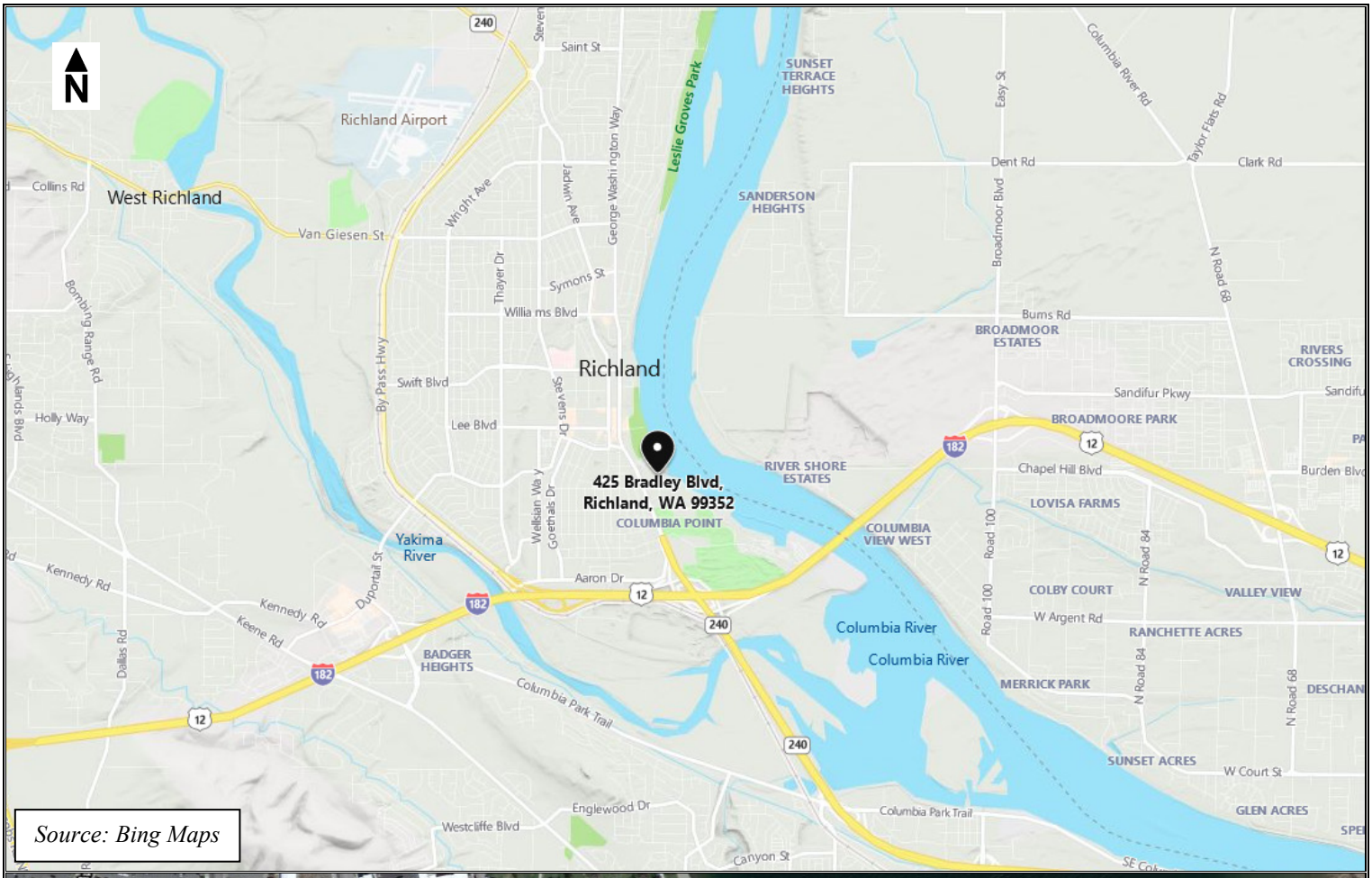


FIGURE 1: VICINITY MAP **PROJECT NO. 221-1412**

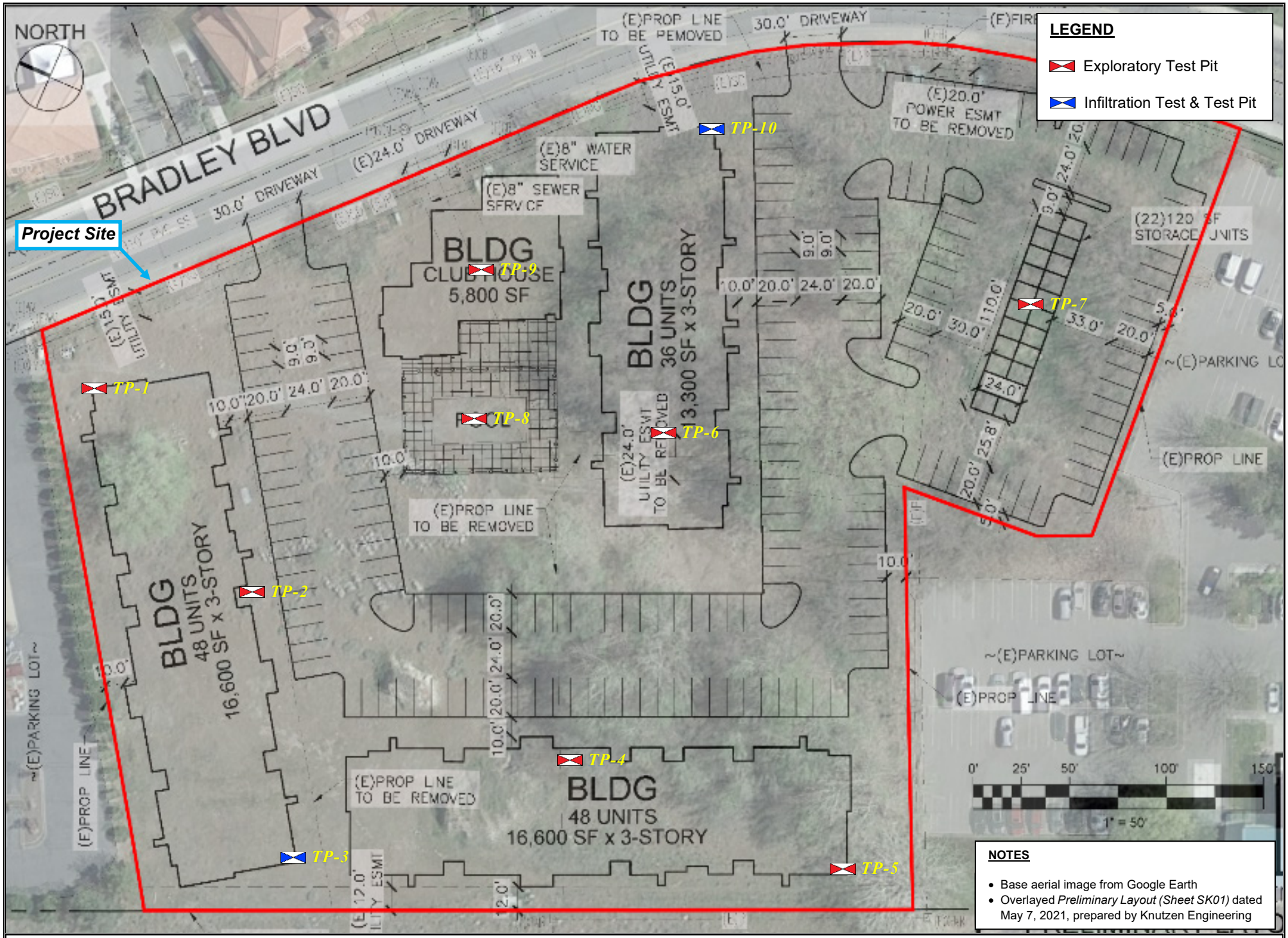


FIGURE 2: SITE EXPLORATION MAP **PROJECT NO. 221-1412**

Appendix II
Exploratory Test-Pit Logs
Key Chart (for Soil Classification)

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-1

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270598°, -119.269724°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, dry, appears medium dense
0.8					358.3
					SANDY SILT, (ML) light brown, dry to damp, appears medium dense, (APPARENT NATIVE SOIL)
2.5	GB	MC = 6% Fines = 53%			
					- becomes moist
5.0			ML		
7.5					
10.0					10.0
					349.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-2

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270269°, -119.270000°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SANDY SILT, (ML) light brown, dry to moist, appears medium dense
2.5				
5.0				
7.5				
10.0				10.0 / 349.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-3

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 360 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270065°, -119.270470°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			SM		FILL: SILTY SAND WITH GRAVEL, (SM) brown, fine grained, dry, appears medium dense
1.5					358.5
			SP-SM		FILL: POORLY GRADED SAND WITH SILT AND GRAVEL, (SP-SM) gray, fine to medium grained, dry, appears medium dense
2.0					358.0
2.5			ML		SANDY SILT, (ML) light brown, moist, appears medium dense, (APPARENT NATIVE SOIL)
	GB	MC = 6% Fines = 55%			
5.0					
7.5					
8.0					352.0
			GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) brown, damp, appears medium dense to dense
9.0					351.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 9.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-4

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 358 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269762°, -119.270092°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					SILT WITH SAND, (ML) tan, dry to damp, appears medium dense
2.5	GB	MC = 3% Fines = 75%	ML		
5.0					
7.5					
10.0					10.0 348.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-5

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269349°, -119.270051°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				SANDY SILT, (ML) tan, damp, appears medium dense
2.5		ML		
5.0				
7.0				352.0
7.5		GP-GM		POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, damp, appears medium dense to dense
8.0				351.0

- Test pit terminated at ~8' BGS due to bucket refusal
- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 8.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-6

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 360 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269829°, -119.269390°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, dry, appears medium dense
1.0				359.0
		ML		SANDY SILT, (ML) light brown, moist, appears medium dense, (APPARENT NATIVE SOIL)
2.5				
5.0				
7.5				
10.0				10.0 350.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-7

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 360 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269413°, -119.268863°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SANDY SILT, (ML) light brown, dry to moist, appears medium dense
2.5				
5.0				
7.5				- becomes moist
10.0				10.0 350.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
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Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-8

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270071°, -119.269499°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0					
				0.2 ~2" ASPHALT	358.8
		GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, dry, appears medium dense	
				0.8	358.3
2.5				SANDY SILT, (ML) light brown, moist, appears medium dense, (APPARENT NATIVE SOIL)	
5.0		ML			
7.5					
10.0				10.0	349.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
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Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-9

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.270153°, -119.269223°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) light brown, dry, appears medium dense
1.0				358.0
		ML		SANDY SILT, (ML) light brown, moist, appears medium dense, (APPARENT NATIVE SOIL)
2.5				
5.0				
7.5				
10.0				10.0 349.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 10.0 feet.

GN Northern, Inc.
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Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-10

CLIENT Knutzen Engineering
PROJECT NAME New Apartment Development
PROJECT NUMBER 221-1412
PROJECT LOCATION 425 Bradley Blvd, Richland, WA
DATE STARTED 7/14/21 **COMPLETED** 7/14/21
GROUND ELEVATION 359 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR DDB, LLC
GROUND WATER LEVELS:
EXCAVATION METHOD Case CX55B Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.269914°, -119.268745°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			SM		FILL: SILTY SAND WITH GRAVEL, (SM) gray brown, fine grained, damp, appears medium dense
1.0					358.0
					SILT WITH SAND, (ML) light brown, moist, appears medium dense, roots to ~2' BGS
2.5					
	GB	MC = 11% Fines = 78%			- infiltration test performed at ~4' BGS
5.0			ML		
7.5					
9.0					350.0

- Groundwater not encountered at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 9.0 feet.

Northern, Inc.
Kennewick, Yakima, Spokane, Hermiston (OR)

KEY CHART

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COARSE-GRAINED SOILS			FINE-GRAINED SOILS		
DENSITY	**N (BLOWS/FT)**	**FIELD TEST**	**CONSISTENCY**	**N (BLOWS/FT)**	**FIELD TEST**
Very Loose	0 – 4	Easily penetrated with ½-inch reinforcing rod pushed by hand	Very Soft	0 – 2	Easily penetrated several inches by thumb
Loose	4 – 10	Difficult to penetrate with ½-inch reinforcing rod pushed by hand	Soft	2 – 4	Easily penetrated one inch by thumb
Medium -Dense	10 – 30	Easily penetrated with ½-inch rod driven with a 5-lb hammer	Medium-Stiff	4 – 8	Penetrated over ½-inch by thumb with moderate effort
Dense	30 – 50	Difficult to penetrate with ½-inch rod driven with a 5-lb hammer	Stiff	8 – 15	Indented about ½-inch by thumb but penetrated with great effort
Very Dense	> 50	penetrated only a few inches with ½-inch rod driven with a 5-lb hammer	Very Stiff	15 – 30	Readily indented by thumb
			Hard	> 30	Indented with difficulty by thumbnail

USCS SOIL CLASSIFICATION

MAJOR DIVISIONS				GROUP DESCRIPTION
Coarse-Grained Soils <50% passes #200 sieve	**Gravel** and **Gravelly Soils** <50% coarse fraction passes #4 sieve	**Gravel** (with little or no fines)	GW	Well-graded **Gravel**
			GP	Poorly Graded **Gravel**
		Gravel (with >12% fines)	GM	Silty **Gravel**
			GC	Clayey **Gravel**
	Sand and **Sandy Soils** >50% coarse fraction passes #4 sieve	**Sand** (with little or no fines)	SW	Well-graded **Sand**
			SP	Poorly graded **Sand**
		Sand (with >12% fines)	SM	Silty **Sand**
			SC	Clayey **Sand**
Fine-Grained Soils >50% passes #200 sieve	**Silt** and **Clay** Liquid Limit < 50		ML	**Silt**
			CL	Lean **Clay**
			OL	Organic **Silt** and C**lay** (low plasticity)
	Silt and **Clay** Liquid Limit > 50		MH	Inorganic **Silt**
			CH	Inorganic **Clay**
			OH	Organic **Clay** and **Silt** (med. to high plasticity)
Highly Organic Soils			PT	**Peat**
				Top Soil

LOG SYMBOLS

	2S	2" OD Split Spoon (SPT)
	3S	3" OD Split Spoon
	NS	Non-Standard Split Spoon
	ST	Shelby Tube
	CR	Core Run
	BG	Bag Sample
	TV	Torvane Reading
	PP	Penetrometer Reading
	NR	No Recovery
	GW	Groundwater Table

MODIFIERS

DESCRIPTION	RANGE
Trace	<5%
Little	5% – 12%
Some	>12%

MOISTURE CONTENT

DESCRIPTION	FIELD OBSERVATION
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but not visible water
Wet	Visible free water

SOIL CLASSIFICATION INCLUDES

1. Group Name
2. Group Symbol
3. Color
4. Moisture content
5. Density / consistency
6. Cementation
7. Particle size (if applicable)
8. Odor (if present)
9. Comments

MAJOR DIVISIONS WITH GRAIN SIZE

SIEVE SIZE						
12"	3"	3/4"	4	10	40	200
GRAIN SIZE (INCHES)						
12	3	0.75	0.19	0.079	0.0171	0.0029

Boulders	Cobbles	Gravel		Sand			Silt and Clay
		Coarse	Fine	Coarse	Medium	Fine	

Conditions shown on boring and testpit logs represent our observations at the time and location of the fieldwork, modifications based on lab test, analysis, and geological and engineering judgment. These conditions may not exist at other times and locations, even in close proximity thereof. This information was gathered as part of our investigation, and we are not responsible for any use or interpretation of the information by others.

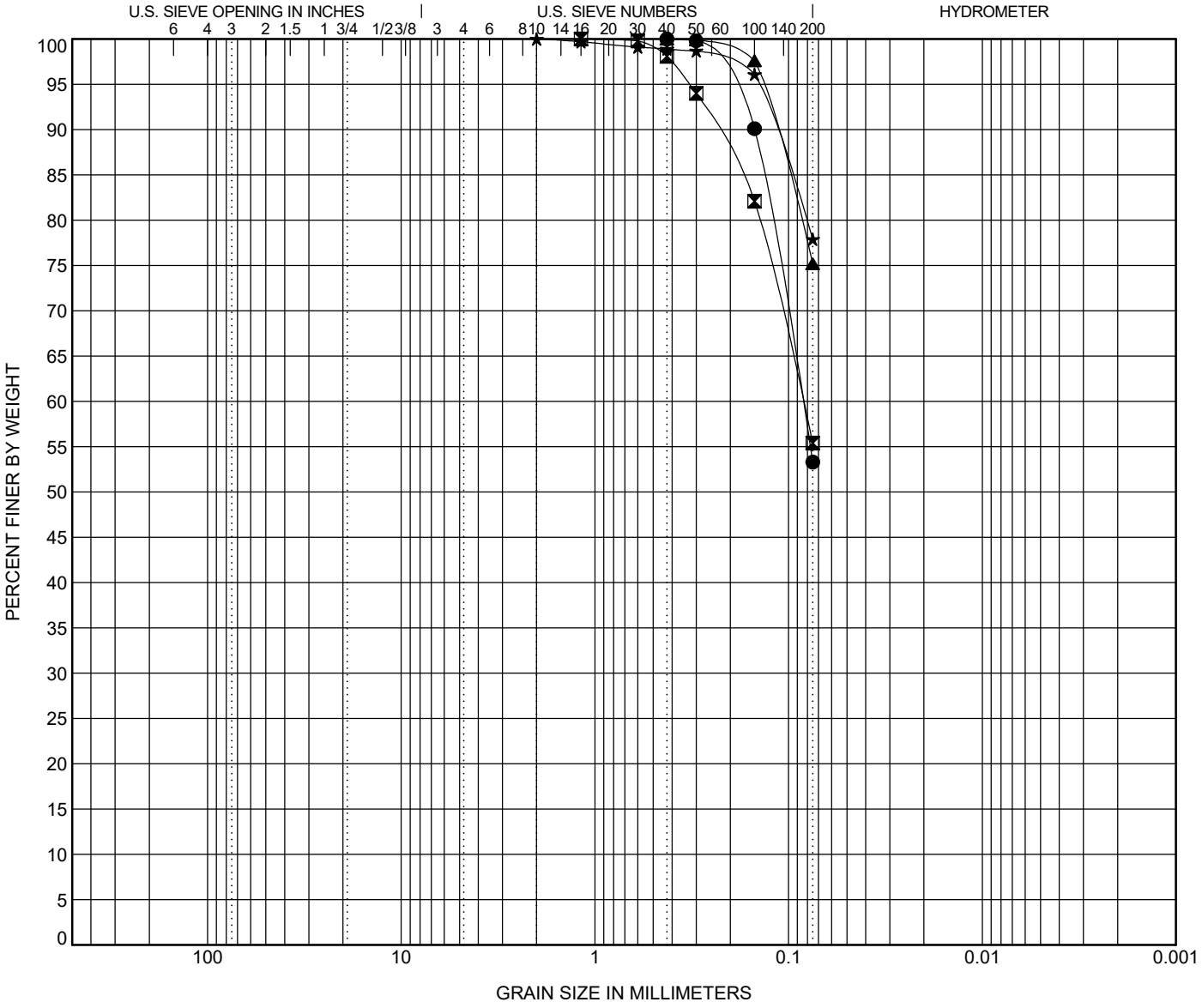
Appendix III
Laboratory Testing Results

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
Fax: (509) 248-4220

GRAIN SIZE DISTRIBUTION

CLIENT Knutzen Engineering **PROJECT NAME** New Apartment Development

PROJECT NUMBER 221-1412 **PROJECT LOCATION** 425 Bradley Blvd, Richland, WA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**TP-1**	**2.0**	**SANDY SILT (ML)**					
⊠	**TP-3**	**4.0**	**SANDY SILT (ML)**					
▲	**TP-4**	**3.0**	**SILT WITH SAND (ML)**					
★	**TP-10**	**4.0**	**SILT WITH SAND (ML)**					

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-1**	**2.0**	**0.425**	**0.085**			**0.0**	**46.7**	**53.3**	
⊠	**TP-3**	**4.0**	**1.18**	**0.085**			**0.0**	**44.6**	**55.4**	
▲	**TP-4**	**3.0**	**0.425**				**0.0**	**24.8**	**75.2**	
★	**TP-10**	**4.0**	**2**				**0.0**	**22.1**	**77.9**	

Appendix IV
Site & Exploration Photographs

Exposed subsurface soil profile within test pit TP-1

Exposed subsurface soil profile within test pit TP-4

Exposed subsurface soil profile within test pit TP-7

Exposed subsurface soil profile within test pit TP-8

Infiltration test setup within test pit TP-10

Infiltration test setup within test pit TP-3

PLATE 1: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 221-1412**

View of site conditions near test pit TP-2, looking south

View of site conditions near test pit TP-6, looking east

View of site conditions near middle of site looking east

Excavation of test pit TP-8, view looking south

View of site conditions near test pit TP-3, looking southeast

View of site conditions near test pit TP-3, looking south

PLATE 2: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 221-1412**

Appendix V
NRCS Soil Survey

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Benton County Area, Washington

425 Bradley Boulevard, Richland, WA

July 27, 2021

Custom Soil Resource Report
Soil Map

Benton County Area, Washington

PaA—Pasco fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2bcw
Elevation: 250 to 700 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 136 to 190 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Pasco and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pasco

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Hydric soil rating: No

SdA—Scooteney silt loam, gravelly subsoil, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2bdk
Elevation: 400 to 1,300 feet

Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Scooteney and similar soils: 90 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scooteney

Setting

Landform: Terraces
Parent material: Gravelly alluvium and loess

Typical profile

H1 - 0 to 4 inches: silt loam
H2 - 4 to 15 inches: silt loam
H3 - 15 to 38 inches: gravelly silt loam
H4 - 38 to 60 inches: very gravelly loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 2c
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Wamba

Percent of map unit: 2 percent
Landform: Terraces
Hydric soil rating: Yes

Appendix VI
Washington Department of Ecology Well Logs

6076

Time Oil Co.

PROJECT: Property No. 01-356 W.O. 12-01238-03 WELL NO. MW-14

Elevation reference: City of Richland Datum Well completed: 15 November 1995
Ground surface elevation: 355.05 feet Casing elevation: 354.84 feet

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	Grass over damp, silty, fine SAND						
5	Loose, damp, brown, silty, fine SAND		A	6	-		
10	Very loose, wet, brown, silty, fine SAND		B	2	0.0	ATD	
15	Very loose, wet, brown, silty, fine SAND		C	4	0.0		
20	Very dense, wet, gray-brown, gravelly SAND		D	62	0.0		
	(no odor)						
25	Medium dense, wet, black, fine to medium SAND		E	17	-		
	Bottom of boring at 24.5 feet.						

Top of screen at 7'

extend sand pack to 24.5'

Flush-mounted steel monument
Ground surface
Top of casing
Cement
Bentonite
Casing (Schedule-40 2-inch I.D. PVC)
10-20 sand filter pack
Screen (2-inch I.D. PVC with 0.02-inch slots)
Threaded end cap

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151 TIME OIL CO.
START CARD # R 02520
SE¼ SE¼ SEC 11 T9N R28E
WELL TAG # ABZ139

LEGEND

I 2-inch O.D. split-spoon sample

X Sample not recovered

ATD Observed groundwater level ATD = at time of drilling

AGRA Earth & Environmental # 1724
JIM ERDMAN
E. 520 North Foothills Drive, Suite 600
Spokane, Washington 99207

Drilling started: 14 November 1995 Drilling completed: 15 November 1995 Logged by: DCJ

82451

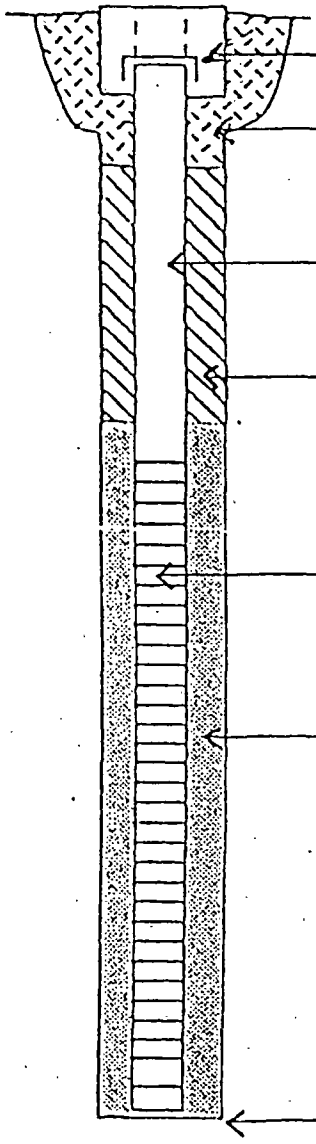
RESOURCE PROTECTION WELL REPORT

START CARD NO. R49607

PROJECT NAME: Jackpot Foods
WELL IDENTIFICATION NO. AFT 738
DRILLING METHOD: HSA
DRILLER: Brian G. Gose
FIRM: Cascade Drilling, Inc.
SIGNATURE: [signature]
CONSULTING FIRM: GeoEngineers - Spokane
REPRESENTATIVE: Bruce Williams

COUNTY: BENTON
LOCATION: SE¼ SE¼ Sec 11 Twn 9N R 28E R
STREET ADDRESS OF WELL: 500 George Washington Way, Richland
WATER LEVEL ELEVATION: 10'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 10/25/00
DEVELOPED: Yes

0643

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	WELL COVER CONCRETE SURFACE SEAL DEPTH = 3/ft PVC BLANK 2 "x 22' BACKFILL 17 ft. TYPE: bent. Chips PVC SCREEN 2"x 5' SLOT SIZE: .020 GRAVEL PACK 7 ft. MATERIAL: 3/17 sand WELL DEPTH 27 ' "	0 - 15 ft. Brown sand + silt. 15 - 27 ft. Brown sand + gravels w/ some silt. - ft.

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/99) 82451

Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. E008007

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *("x" in box)*

☒ Construction 276339

☐ Decommission

ORIGINAL INSTALLATION Notice of Intent Number:

Type of Well *("x in box)*

☒ Resource Protection

☐ Geotech Soil Boring A

Property Owner City of Richland

Site Address Comstock Street & Bradley Blvd

Consulting Firm Shannon & Wilson

City Richland County Benton

Unique Ecology Well IDTag No. N/A

Location NE1/4-1/4 NE1/4 Sec 14 Twn 9N R 28

EWM ☒ or WWM ☐

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s, t, r still REQUIRED) Lat Deg _____ Min _____ Sec _____

Long Deg _____ Min _____ Sec _____

☒ Driller ☐ Engineer ☐ Trainee

Name (Print Last, First Name) Harnden, Anisa

Driller/Engineer /Trainee Signature Anisa Harnden

Driller or Trainee License No. 2508

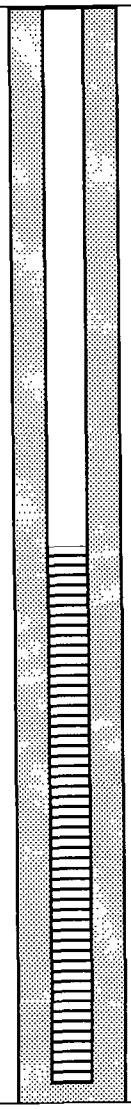
Tax Parcel No. 114981020564009

Cased or Uncased Diameter 2" Static Level 12'

Work/Decommission Start Date 9/26/07

Work/Decommission Completed Date 9/26/07

If trainee, licensed driller's Signature and License Number:

Construction Design	Well Data	Formation Description
	Drove a retractable ***stainless steel / PVC*** screen down to depth and collected a water sample. Boring Depth: 17' Screen: 13-16 Slot Size: .010 Type: Stainless Steel, Temporary Removed all rods and casing from boring and backfilled with bentonite.	0-8 Sand & gravel 8-16 Silty Sand

DEPT OF ECOLOGY Received OCT 11 2007 CENTRAL REGION OFFICE

SCALE: 1"= N/A PAGE 2 OF 5

ECY 050-12 (Rev. 7/06)

APPENDIX E
USGS Maps

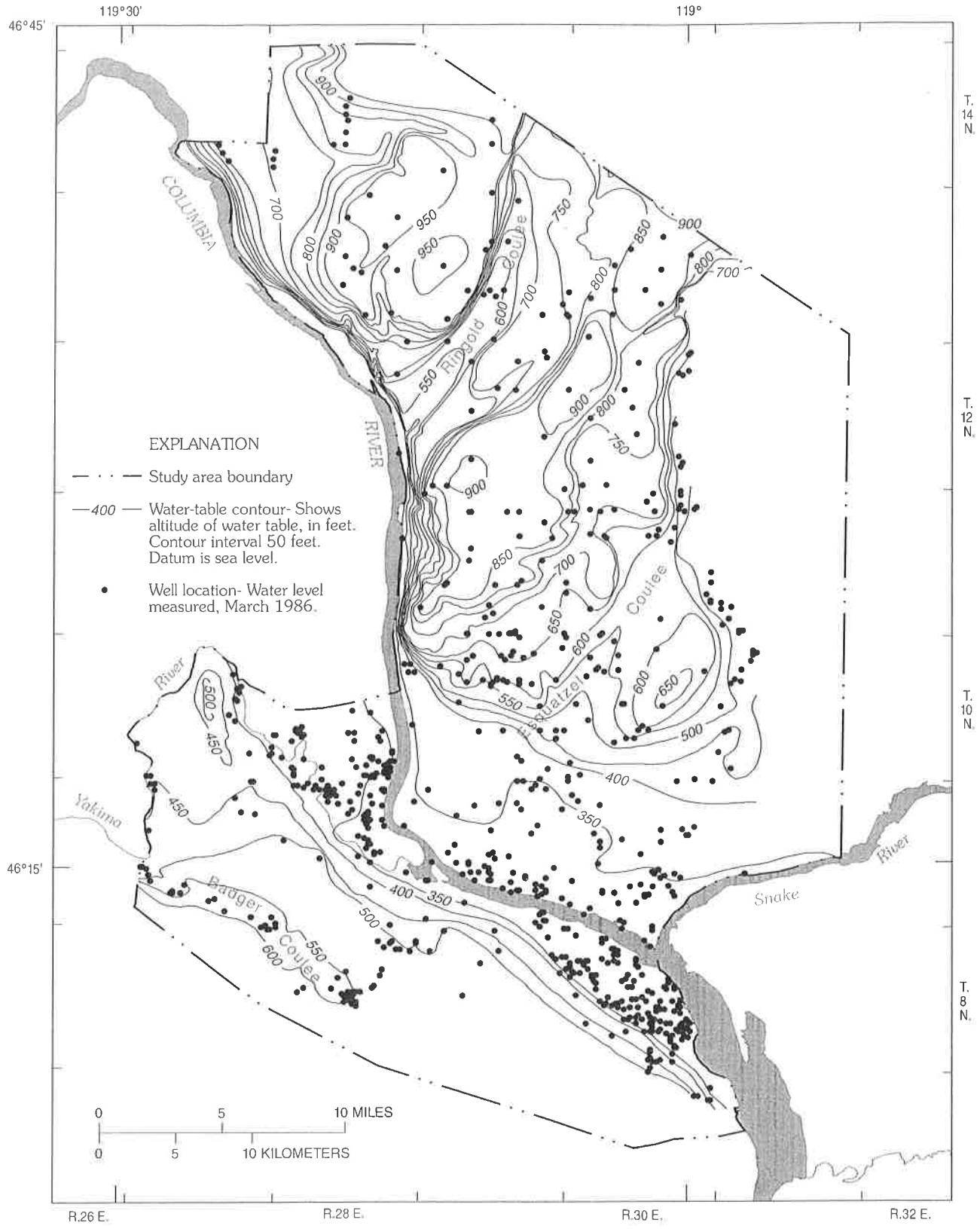


Figure 26.--Water-table altitude, March 1986.

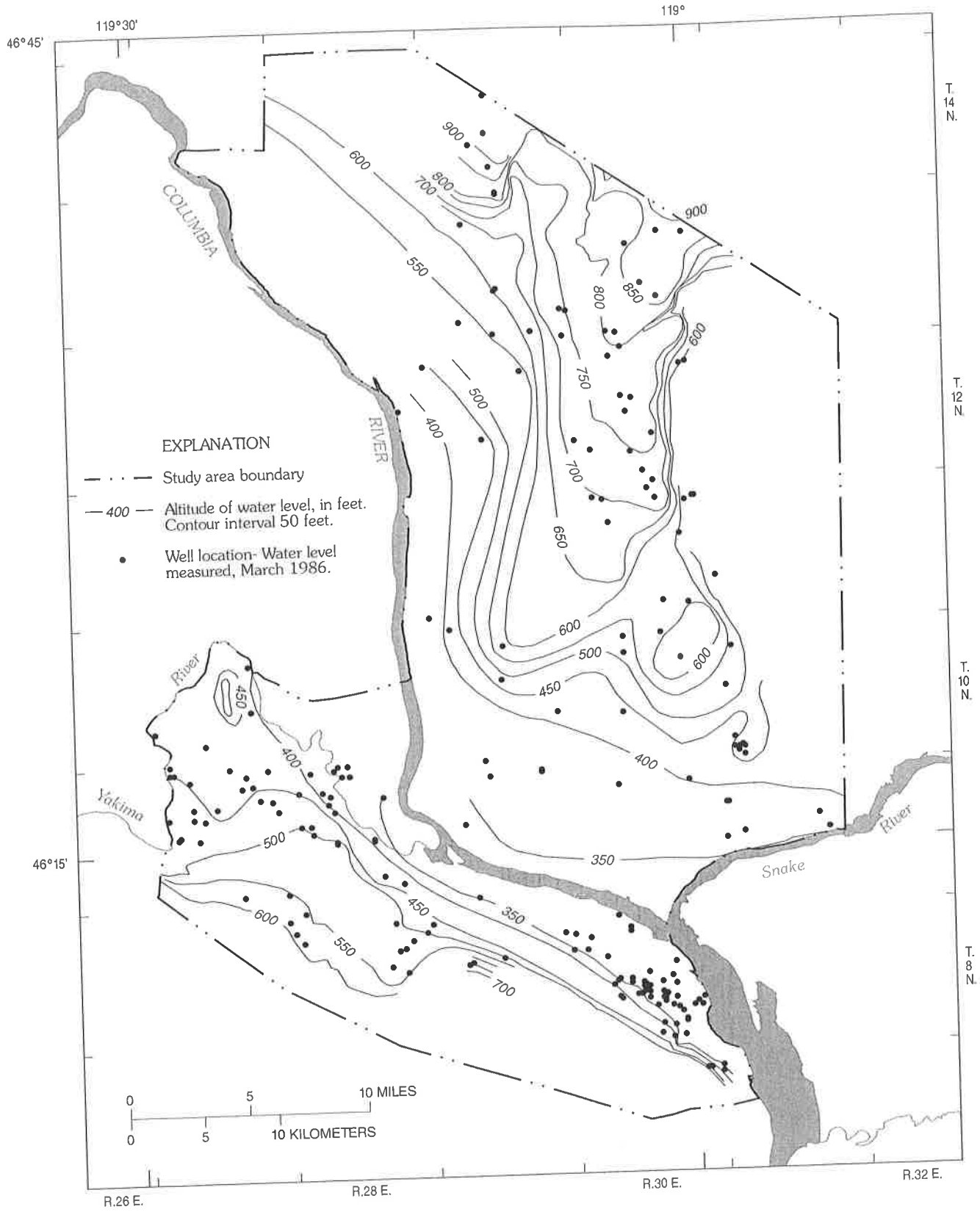


Figure 27.--Water-level altitudes in the Saddle Mountains Basalt, March 1986.

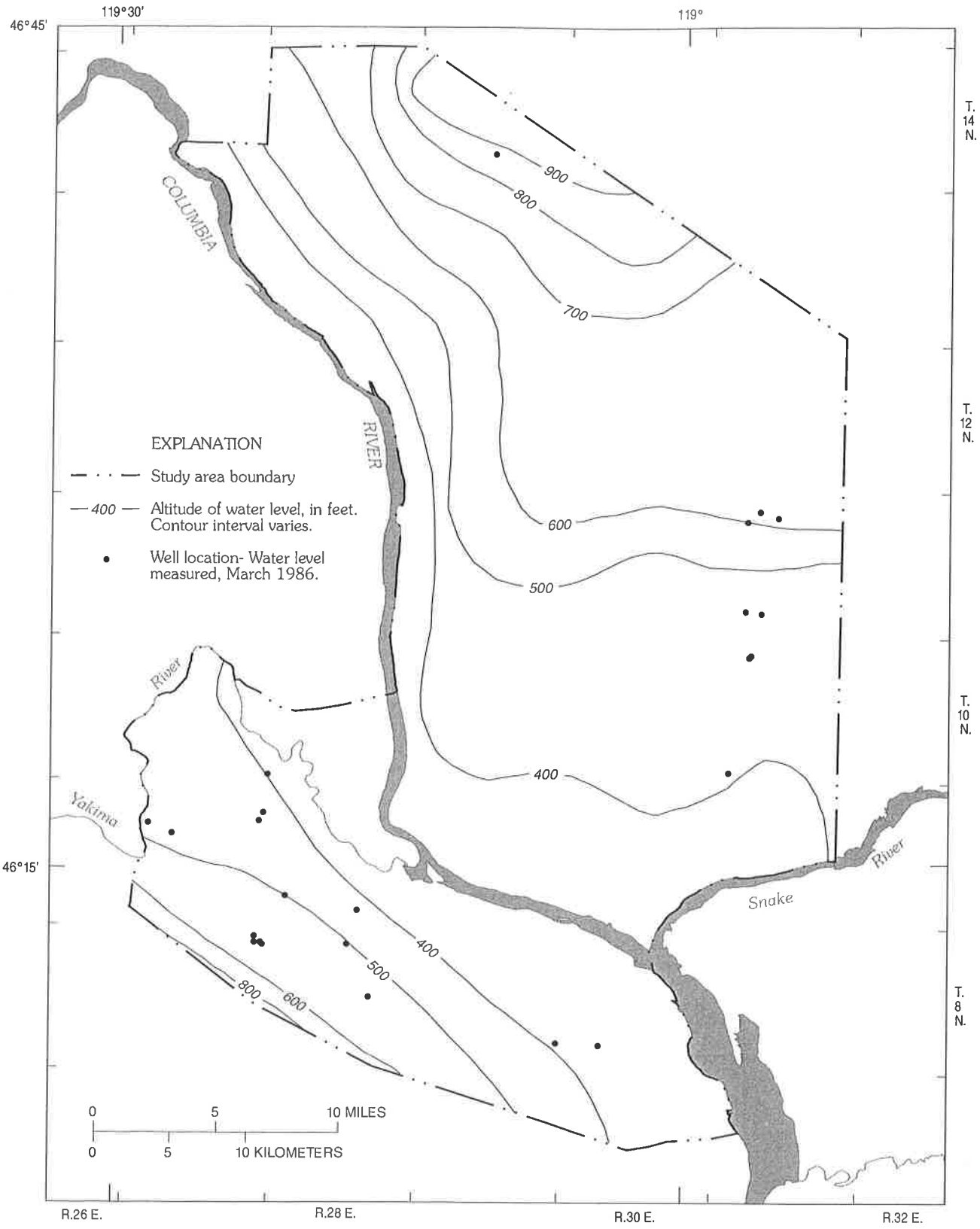


Figure 28.--Water-level altitudes in the Wanapum Basalt, March 1986 (Modified from Bauer, Vaccaro, and Lane, 1985).