File No. EA2021-135

CITY OF RICHLAND
Determination of Non-Significance

Description of Proposal: Clearing, grading and construction of a 20' wide by 1,305' long residential driveway and the establishment of a single-family residential building site. Approximately 23,000 cyds of grading/filling will occur. Approximately 2.00 acres of temporary impacts and approximately 1.02 acres of permanent impacts will occur to land classified as marginal quality or heavily degraded quality Fish & Wildlife Habitat Conservation Area. As mitigation for the proposed impacts, the applicant is proposing to set-aside 4.04 acres of properly functioning habitat via a conservation covenant.

Proponent: James Sterling
890 George Washington Way
Richland, WA 99352

Location of Proposal: The project will occur at 4608 E 210 PR NE, within the City of Richland, Washington. The Assessor's Tax Parcel Nos. for the project site are 120984000006000, 120983013533006 and 120983013387003.

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: April 12, 2022 **Comments Due:** April 27, 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

1. Name of proposed project, if applicable:
   Sterling Homesite

2. Name of applicant:
   Applicant: James Sterling
   Agent: Bjorn Hedges

3. Address and phone number of applicant and contact person:

Applicant: **James Sterling**
890 George Washington Way
Richland, WA 99352
(509) 406-5950

Agent: **Bjorn Hedges**
H3 PLLC
(509) 396-6505
Bjorn.hedges@gmail.com

4. Date checklist prepared:
June 2021 (Revised 11/12/2021; Revised 02/04/2022)

5. Agency requesting checklist:
City of Richland

6. Proposed timing or schedule (including phasing, if applicable):
Spring/Summer 2022

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
Building permit for one residential home on parcel #120984000006000 (shown on Plan/Profile)

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.
A geotechnical report has been completed by GN Northern, providing limitations on cut/fill slopes and depths. A critical areas assessment and habitat review has been completed by PBS Engineering, identifying areas of properly functioning shrub-steppe habitat.

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

10. List any government approvals or permits that will be needed for your proposal, if known.
Grading Permit (parallel with the SEPA), building permit (when Plans are available).

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.) **The applicant proposes the construction of a 20' wide gravel driveway, from an existing driveway on parcel #120983013533006, and parcel #120983013387003, to parcel #120984000006000, with home site grading on parcel #120984000006000. Total driveway length will be approximately 1,305'. Home site approximately 200'.**

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.

Site address **4608 210 PR, Richland, WA 99352**
Parcel #: **120984000006000**
Legal Description: THE WEST HALF OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 20, TOWNSHIP 9 NORTH, RANGE 28 EAST, WILLAMETTE MERIDIAN, RECORDS OF BENTON COUNTY, WASHINGTON. EXCEPT THE SOUTH 300.00 FEET THEREOF. SUBJECT EASEMENTS RESTRICTIONS AND RESERVATIONS OF RECORD. (BOUNDARY LINE ADJUSTMENT AF# 2019-006653, 3/19/19)

Site address **22321 N DALLAS RD, RICHLAND, WA 99352**
Parcel #: **120983013533005**

Legal Description: LOT 1, SHORT PLAT 3533, ACCORDING TO THE SURVEY THEREOF RECORDED IN VOLUME 1 OF SHORT PLATS, PAGE 3533, UNDER AUDITOR'S FILE NO. 2017-019092, (BOUNDARY LINE ADJUSTMENT AF# 2019-006652, 3/19/19)

Site address: **5000 Sterling Heights, Richland, WA 99352**
Parcel #: **120983013387003**

Legal description: LOT 1, SHORT PLAT 3387, ACCORDING TO THE SURVEY THEREOF RECORDED IN VOLUME 1 OF SHORT PLATS, PAGE 3387, UNDER AUDITOR'S FILE NO. 2012-040327, (BOUNDARY LINE ADJUSTMENT AF# 2019-006654, 3/19/19)

Site address: **4901 Sterling Heights, Richland, WA 99352**
Parcel #: **120983013533006**

Legal Description: LOT 4, SHORT PLAT 3533, ACCORDING TO THE SURVEY THEREOF RECORDED IN VOLUME 1 OF SHORT PLATS, PAGE 3533, UNDER AUDITOR'S FILE NO. 2017-019092, (BOUNDARY LINE ADJUSTMENT AF# 2019-006655, 3/19/19)

B. Environmental Elements

1. Earth

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)?
65%. However, the alignment was selected within an area to minimize cut/fill slopes. Additionally, a roughed-in dirt road exists near the proposed alignment, most of this existing roadway will be used to key in the new driveway fill slope.

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.
Native Silt (ML) and Silt with Sand (ML) as per GN Northern report, dated 07/09/21.

d. Are there surface indicatipons or history of unstable soils in the immediate vicinity? If so, describe.
None observed

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.
Earthwork will include grading the driveway.
Approximate grading quantities:

Cut = 15,050 CY; Fill = 7,785 CY (any excess Cut to be used for slope flattening.
Net = 0 CY (no import or export)
Source of fill is from on-site excavation.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.!
Erosion could occur on this site but will be minimized through implementation of BMP's during construction including silt fencing, water for dust control, and check dams.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?
If driveway is hard-surfaced (1,305' x 20' + home site = 1.0 acres = 2.1%)

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
Erosion control BMPs such as rock check dams and silt fences will be utilized.

2. Air

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.
Some heavy machinery exhaust and dust particulates generated primarily by construction equipment. After construction the ongoing emissions will primarily come from passenger vehicle exhaust.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.
Generally, no. Vehicle trips on Dallas Rd may affect the homeowners; however, this type of impact would not be uncommon for this type of development.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:
All construction equipment will be in proper working order and regulated for emissions by the manufacturer and local emission laws. Vehicles entering and leaving the site will also be regulated for emissions by state and local emission laws. Dust control BMPs will be implemented as necessary during construction.

3. Water

a. Surface Water:

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.
No

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.
N/A

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.
This project will not require surface water withdrawals or diversions.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.
The proposal does not lie within a 100-year floodplain.

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 known or anticipated discharge of waste materials to surface waters.

b. Ground Water:

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.
No

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.
No waste material will be discharged into the ground from septic tanks or other sources.

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.
The proposed site improvements will increase the impervious surface area of the site, causing an increase in stormwater runoff volumes and velocities. Storm drainage improvements for the project will consist of a roadside ditch and 12" and 18" diameter cross-culverts, utilizing surface and/or subsurface infiltration.

2) Could waste materials enter ground or surface waters? If so, generally describe.
Suspended soils and hydrocarbons associated with automobiles may potentially enter the ground waters via storm water.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.
No, runoff will discharge at the natural location.

ci. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:
None

4. Plants

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

____deciduous tree: alder, maple, aspen, other
____evergreen tree: fir, cedar, pine, other
__X__shrubs
__X__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?
Shrubs and grass will be removed in the area where the road will be constructed.

c. List threatened and endangered species known to be on or near the site.
No known threatened or endangered are known to be on or near the site. This area has been identified as a Fish & Wildlife Habitat Conservation Area.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

We will be working with WSFWS for mitigation, which may include 4 acres of deed restricted property, preventing future development.

e. List all noxious weeds and invasive species known to be on or near the site.

The site is covered with cheatgrass which is known to be an invasive specie.

5. Animals

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:

Bull Snake, coyote

b. List any threatened and endangered species known to be on or near the site.

No known threatened or endangered species are known to be on or near the site. The PHS database includes the Townsend's Ground Squirrel (State Candidate Specie) and Shrub-Steppe Habitat.

c. Is the site part of a migration route? If so, explain.

City of Richland is in the Pacific Flyway which is a major north-south flyway for migratory birds in America. Generally, this site is considered part of the Pacific Flyway.

d. Proposed measures to preserve or enhance wildlife, if any:

The "Properly Functioning Quality" shrub-steppe habitat, as identified by PBS, will be left undisturbed. Cut/Fill slopes will be reclaimed in the poor or marginal habitat.

e. List any invasive animal species known to be on or near the site.

No known invasive animal species are known to be on or near the site.

6. Energy and Natural Resources

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 required for home site lighting and appliances and will likely be heated with electricty.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No, the project will not affect the potential use of solar energy by adjacent properties.

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:

The home will meet current building codes and energy efficiency standards of the State.

7. Environmental Health

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.

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

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.
No known existing hazardous chemicals or conditions occur on this site.

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 are proposed.

4) Describe special emergency services that might be required.
No special services are anticipated.

5) Proposed measures to reduce or control environmental health hazards, if any:
State regulations regarding safety and the handling of hazardous materials will be followed during the construction process. Equipment refueling areas would be located in areas where spill could be quickly contained and where the risk of hazardous materials entering the surface water is minimized.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?
The primary source of noise near the project is the vehicular traffic along Dallas Rd and I-182.

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 noise associated with the operation of heavy machinery and the removal of materials would be created during the execution of the proposed work. No long-term noise impacts are anticipated from the proposed work.

3) Proposed measures to reduce or control noise impacts, if any:
Construction activity will be limited to permitted construction hours and construction equipment will not be allowed to idle for continuous periods of time, which will help mitigate the impacts of potential construction noise. All operations will be compliant with City of Richland Code and Chapter 173-60-040 WAC.

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c. **Land and Shoreline Use**

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.

Current use of the site and adjacent properties is residential. The proposal will not affect current land uses.

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?
The subject site is not considered working farmlands or forest lands.

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 impacts are anticipated.

c. Describe any structures on the site.
Parcel #120983013533006 contains a structure and 120983013387003 contains a single-family home.

d. Will any structures be demolished? If so, what?
No structures will be demolished.

e. What is the current zoning classification of the site?
R-1-12 Single Family Residential

f. What is the current comprehensive plan designation of the site?
LDR- Low Density Residential

g. If applicable, what is the current shoreline master program designation of the site?
Not applicable, shoreline not within 200 feet of subject property.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.
Yes, these properties have been identified as a Fish & Wildlife Habitat Conservation Area and a Geological Sensitive Area as per Chapter 22.10 R.M.C. A Critical Areas Assessment has mitigated for the Properly Functioning Habitat; A Geotechnical report has defined the limits for civil work. The site is also adjacent to the Badger Mountain Natural Preserve.

i. Approximately how many people would reside or work in the completed project?
Assuming an average family size of three people, three for the one home.

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

k. Proposed measures to avoid or reduce displacement impacts, if any:
No measures to avoid or reduce displacement impacts are proposed.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:
Land use review by the City of Richland will occur concurrently with SEPA and grading application review; mitigation to protect properly functioning Critical Area habitat.

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

No measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance are proposed.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.
One high income house.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.
No housing units will be eliminated.

c. Proposed measures to reduce or control housing impacts, if any:
No measures to reduce or control housing impacts are proposed.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?
Approximately 35 feet.

b. What views in the immediate vicinity would be altered or obstructed?
None.

c. Proposed measures to reduce or control aesthetic impacts, if any:
No measures are proposed.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?
Minimal glare would occur from sunlight reflected off of moving cars. During the evening, headlights of traveling vehicles may have a brief impact. House lighting during the dark hours of the day will likely occur daily.

b. Could light or glare from the finished project be a safety hazard or interfere with views?
Not as proposed.

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

d. Proposed measures to reduce or control light and glare impacts, if any:
None proposed.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?
Badger Mountain, south of the project, is popular for hiking.

b. Would the proposed project displace any existing recreational uses? If so, describe.
The proposed project will 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:
None proposed.

13. Historic and cultural preservation

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.
There are no known preservation registered buildings near the site.

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.
None known.

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.
ESM utilized GIS data from WISAARD to assess potential cultural historic resource impacts near the project site.

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.
If any such historic or cultural evidence is encountered during construction or installation of improvements, work will be halted in the area and a state-approved archeologist/historian will be engaged to investigate, evaluate and/or move or curate such resources, as appropriate.

14. Transportation

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 can be accessed through Dallas Rd.

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?
The subject site is not currently served by public transit. The closest transit stop is for bus route 110 at Kennedy Rd at Sunlake Ct.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?
No parking spaces are proposed to be created or eliminated.

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).
No

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?
Approximately 10 per day.

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:
None are proposed.

15. Public Services

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.
No increased need for public services is foreseen.

b. Proposed measures to reduce or control direct impacts on public services, if any.
N/A

16. Utilities

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

b. 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.
6" sewer line parallel to roadway (within roadway prism), tie into existing main.

C. Signature

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 Bjorn Hedges, P.E.

Position and Agency/Organization Agent assisted by: TREVOR STIFF, PE
ESM CONSULTING ENGINEERS
253.569.0244 cell

Date Submitted: 06/25/2021 (Revised 11-12-2021; 02-04-2022)

COMMUNITY DEVELOPMENT DEPARTMENT
625 Swift Blvd, Richland, WA 99352
Phone: 509-942-7794 Fax: 509-942-7764

GRADING PERMITS

Grading permits are regulated by Appendix J of the 2015 IBC. Fees are according to the fee schedule of the 1997 UBC Appendix Chapter 33, Table A-33-A (plan review fee) and Table A-33-B (grading permit).

SUBMITTAL REQUIREMENTS:

1. **Application for Grading Permit**
2. **Affidavit for Grading Operations**
3. **Site Plan -** A site plan showing existing grade and finished grade in contour intervals of sufficient clarity to indicate the nature and extent of the work shall be submitted. The grades must also show in detail that it complies with all the requirements for slopes and setbacks in Appendix J. The site plan must also show the existing grades on adjoining properties in sufficient detail to identify how grade changes will conform to the requirements of Appendix J. The City requires 6 sets of the site plan to be submitted.
4. **Geotechnical Report -** A soils report prepared by a registered design professional shall be provided. It must contain the minimum following information:
   a. Existing soils types and distribution of existing soils.
   b. Conclusions and recommendations for grading procedures, specifically describing that all Appendix J requirements are being met.
   c. Soil design criteria for any structures (walls, etc.) or embankments, required to accomplish the proposed grading.
   d. Slope stability studies and recommendations, specifically describing that all Appendix J requirements are being met, including recommendations and conclusions regarding site geology.
   e. Liquefaction study (required only where mapped maximum earthquake Ss is greater than 0.5g).
5. **SEPA required if more than 500 CY being moved.**

Inspection Process after Permit Issuance

In addition to periodic inspections by the City (pre-fill placement, all buried items—such as filter fabrics, etc.—prior to burial, and at least one inspection of one layer of fill placement during compaction), the owner shall hire either a certified special inspector or a registered design professional to inspect all work in accordance with Section 1705.6 of the 2015 IBC (site preparation, during fill placement, in-place density evaluations). Written field reports and density test reports by either the special inspector or by the registered design professional shall be submitted to the City following each site visit. A final inspection by the City will occur when all the work is done, all written reports have been submitted, AND written final letter from the special inspector or registered design professional is received. Final letter shall document compliance with the Geotechnical Report.

Please read and have your professionals read and apply each section of Appendix J concerning excavations, fills, and especially SETBACKS and drainage, terracing, and erosion. The plans and reports submitted before permit issuance must clearly show how each of these sections is being addressed in your proposal.

CITY OF RICHLAND

www.ci.richland.wa.us

Application for Grading Permit

PROJECT NAME / OWNER NAME James J Sterling			
Owner's or Tenant's Mailing Address / City / State / Zip 890 George Washington Way, Richland, WA 99352			Phone Number 509-406-5950
Fax Number n/a	Cell Number n/a		EMail sh22321@aol.com
Property Owner (if different from Project Owner) Same			Phone Number Same
Property Owner's current Address / City / State / Zip Same			
Project Contact Name & Company Bjorn Hedges	Contact Number 509-396-6505		EMail bjorn.hedges@gmail.com
ADDRESS OF PROPERTY 4608 210 PR, RICHLAND, WA 99352			
Tax Parcel # 120984000006000, 12098301353306, 120983013387003	Subdivision N/A	Lot N/A	Block N/A
Lender Information – required for projects over $5000 in valuation per RCW 19.27.095 If a lender or bond company is not loaning monies on this project, please check here: ☒			
LENDING INSTITUTION – Name/Address N/A			Phone Number N/A
Description of project: (fully describe the type of grading to be done, fill to be used, wetlands, etc.)			
The applicant proposes the construction of a 20' wide gravel driveway, from an existing driveway on parcel #120983013533006, and parcel #120983013387003, to parcel #120984000006000, with home site grading on parcel #120984000006000. Total driveway length will be approximately 1,305'. Home site approximately 200'.			
Total excavation < 20,000 C.Y.			
CONTRACTOR FOR PROJECT (please note that all sub-contractors also must have a City of Richland business license)			
Name VISION ENTERPRISES			City Business License **Required prior to permit issuance** ☒ Yes ☐ No
Address/City/State/Zip 209411 E. TERRIL ROAD , KENNEWICK, WA 99337			Phone 509-727-6953
Fax Number N/A	Cell Number 509-727-6953		EMail VISIONENTERPRISES1998@MSN.COM
CIVIL ENGINEER (required for certain grading permits, see Appendix J of the 2015 IBC)			
Name BJORN HEDGES	St License # 38785	Phone Number 509-396-6505	Fax Number N/A
Address/City/State/Zip 1237 COUNTRY RIDGE DRIVE, RICHLAND, WA 99352			EMail BJORN.HEDGES@GMAIL.COM
SOILS ENGINEER (required for certain grading permits, see Appendix J of the 2015 IBC)			
Name KARL HARMON	St License # 41534	Phone Number 509-734-9320	Fax Number N/A
Address/City/State/Zip 2618 W. KENNEWICK AVE., KENNEWICK, WA 99336			EMail IMAGSI@GNNORTHERN.COM
Billing Account: - check party responsible for fees: ☒ Owner ☐ Contractor ☐ Applicant			**FOR OFFICE USE ONLY** **PERMIT#** **INITIALS**

☒ I understand that this permit application is valid for 180 days. If the permit is not obtained within 180 days, all submittal documents will be discarded.

Signature of Owner or Authorized Agent

02-04-2022
Date

COMMUNITY DEVELOPMENT DEPARTMENT
625 Swift Blvd., Richland, WA 99352
Phone: 509-942-7794 Fax: 509-942-7764

AFFIDAVIT FOR GRADING OPERATIONS

REQUIREMENTS FOR CITY INSPECTION OF GRADING

THE WEST HALF OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 20, TOWNSHIP 9 NORTH, RANGE 28 EAST, WILLAMETTE MERIDIAN, RECORDS OF BENTON COUNTY, WASHINGTON. EXCEPT THE SOUTH 300.00 FEET THEREOF. SUBJECT EASEMENTS RESTRICTIONS AND RESERVATIONS OF RECORD. (BOUNDARY LINE ADJUSTMENT AF# 2019-006653, 3/19/19)

Address or legal description of property where project is being proposed

DRIVEWAY ACCESS AND SEWER TO ASSESSOR PARCEL #120984000006000

Description of project (i.e., new commercial building, addition, new residence, etc.)

EXPLANATION OF CITY INSPECTION REQUIREMENTS

In accordance with the Appendix J of the IBC, it is the City's policy that grading operations shall require a permit. "Grading" is the movement of soil in the form of excavation and/or placement of fill. The City recognizes that grading is a necessary and beneficial activity when appropriately managed to reduce harmful effects to the community and the environment. Under an issued grading permit, multiple inspections will be specified. These City inspections are in addition to the required on-site observation and written field reports by the soils engineer AND are in addition to any required soils compaction testing by third-party testing agencies. To verify that you understand the requirements to receive a grading permit and to have the grading work inspected by the City, we are requiring the contractor, owner, or owner's agent who picks up the grading permit to sign this affidavit attesting that they understand the potential penalties allowed by law for failure to call for City inspection of the grading work.

The preliminary meeting noted in item #1 on the "green" permit sign-off card is ***MANDATORY.*** This meeting helps establish with the City inspector what the parameters of the grading operations will be, what kind of inspections will be needed, and how often.

As allowed by law in RMC Title 21 and building code Section 109, failure to call for inspections may result in fines of up to $5000/day and other legal penalties to be levied against the owner of the property, as well as notices to "stop work".

The City does not want to hinder development work, but serious grading problems have occurred because of failure to follow permit requirements. The City does not want to delay your project, so please follow these inspection requirements.

AFFIDAVIT

By signing below, I hereby affirm that I have read and understand the inspection requirements. I further attest and affirm that I understand the legal ramifications, including penalties as noted by law, for failure to call for City inspection of the grading work for which this permit is being issued. My signature below represents a good faith effort to ensure that the grading contractor will call for City inspection of the grading work as noted on the permit sign-off card ("green card"). I will keep this sign-off card and the field set of approved plans on the job site for the City inspector to use during inspections. If a sub-contractor is hired to accomplish the grading work, I hereby affirm that all information relating to City inspections as noted herein and as noted on the permit sign-off card will be given to the sub-contractor. If I am not the owner of the property for which this permit is being issued, then by my signature, I attest that I am an authorized agent of the owner and have authority to sign this affidavit on behalf of the owner.

07-14-2021

Signature of owner (or authorized representative of owner or corporation) Date

Project Name: STERLING

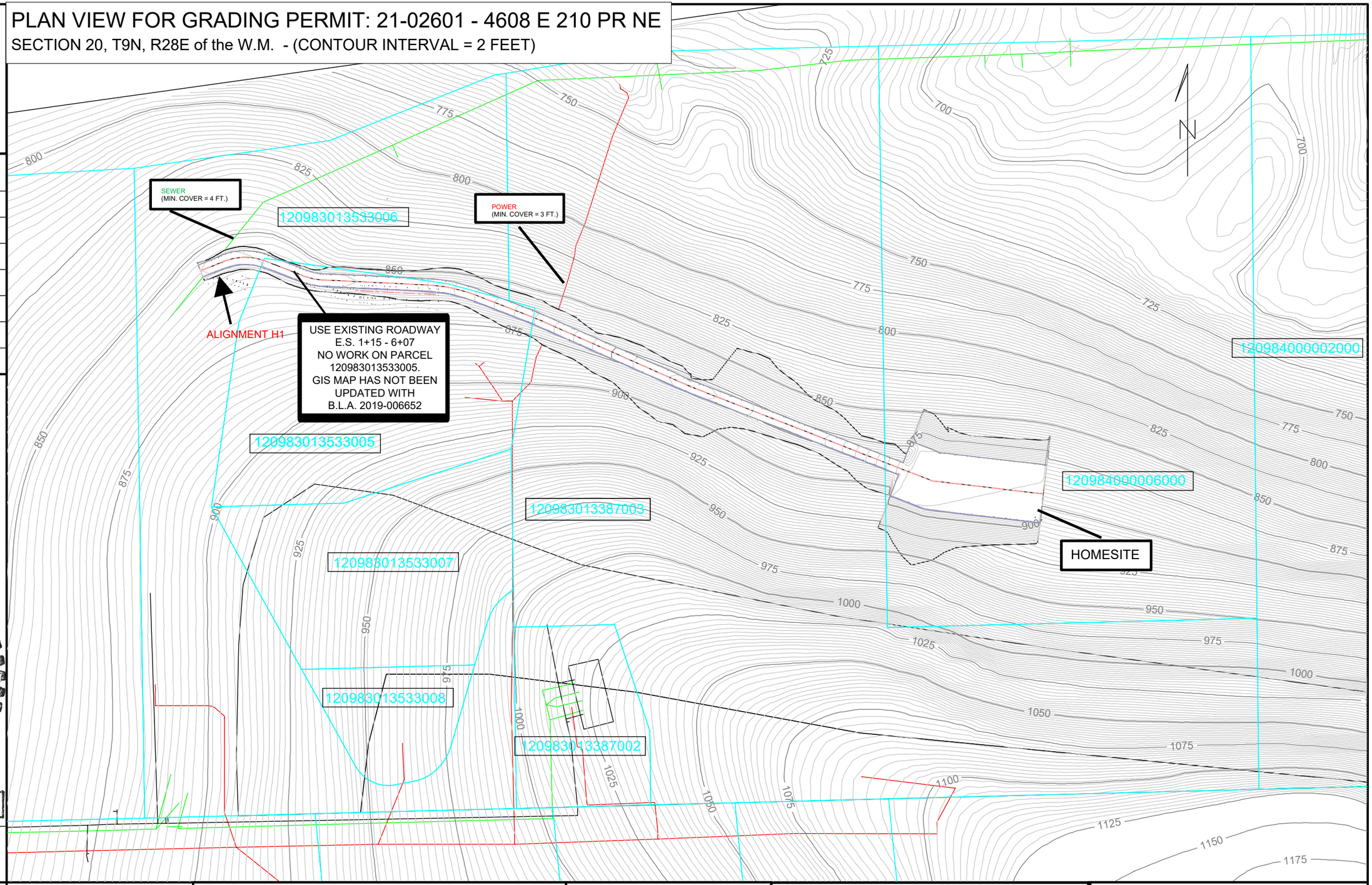
Geo ID: 120983013533006
Geo ID: 120983013387003
Geo ID: 120984000006000

PLAN VIEW FOR GRADING PERMIT: 21-02601 - 4608 E 210 PR NE

SECTION 20, T9N, R28E of the W.M. - (CONTOUR INTERVAL = 2 FEET)

Plan Legend

- Plan L-line
- Road Edges
- Clearing Limits
- Plan Culverts
- Property Line
- SEWER
- POWER



BJORN G. HEDGES
STATE OF WASHINGTON
38765
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES 08-26-2023

Station Range	
0.0	0.0

Plan Scale 1:2000

Notes:
SEE GN NORTHERN REPORT DATED: 07/09/2021
SEE ENGINEER'S REPORT DATE: 07/14/2021

PLAN 1

Company Name: H3 PLLC

Address: 1237 Country Ridge Drive
Richland, WA 99352

Designed By: BGH

Sheet 1 of 3

02/04/2022

Project Name: STERLING

Geo ID: 120983013533006
Geo ID: 120983013387003
Geo ID: 120984000006000

PLAN VIEW FOR GRADING PERMIT: 21-02601 - 4608 E 210 PR NE
FROM CRITICAL AREAS REPORT RECOMMENDATIONS: "Given that the property contains a variety of different quality of habitats, development should be focused within those areas of marginal or degraded habitat."

Plan Legend

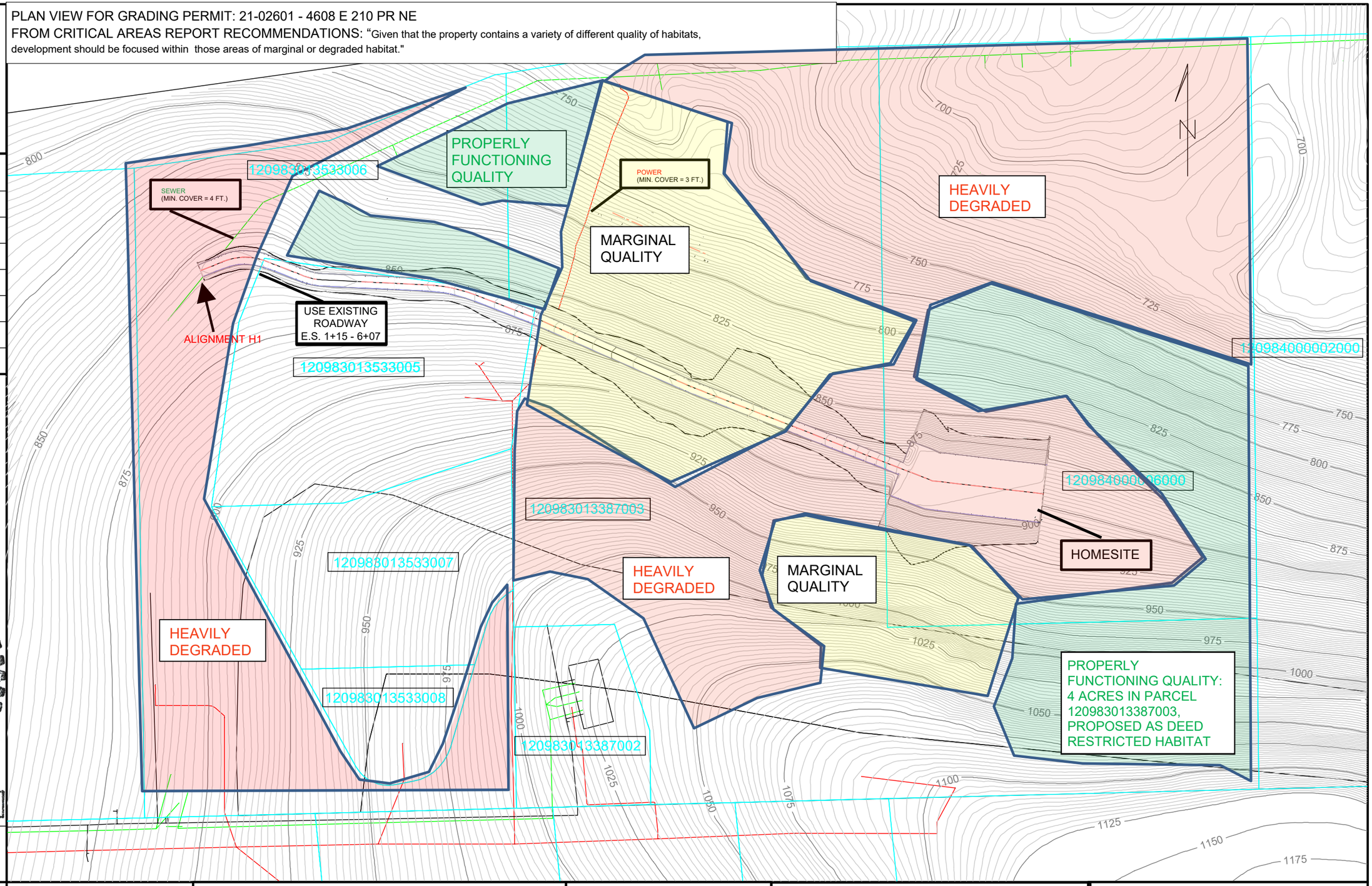
- Plan L-line
- Road Edges
- Clearing Limits
- Plan Culverts
- Property Line
- SEWER
- POWER

DISTURBED ACREAGE:

- 1.3 ACRES IN "MARGINAL QUALITY" HABITAT
- 1.6 ACRES IN "HEAVILY DEGRADED" HABITAT
- OF WHICH, 0.97 ACRES PERMANENTLY DISTURBED (20' ROAD; HOMESITE)

BJORN G. HEDGES
STATE OF WASHINGTON
38765
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES 08-26-2023



Station Range		Plan Scale 1:2000	Notes: SEE GN NORTHERN REPORT DATED: 07/09/2021 SEE CRITICAL AREAS REPORT DATED: 09/09/21	PLAN 2 CRITICAL AREAS	Company Name: H3 PLLC Address: 1237 Country Ridge Drive Richland, WA 99352	Designed By: BGH	
0.0	0.0					Sheet 2 of 3	02/04/2022

Project Name: STERLING

Geo ID: 120983013533006
Geo ID: 120983013387003
Geo ID: 120984000006000

Plan Legend

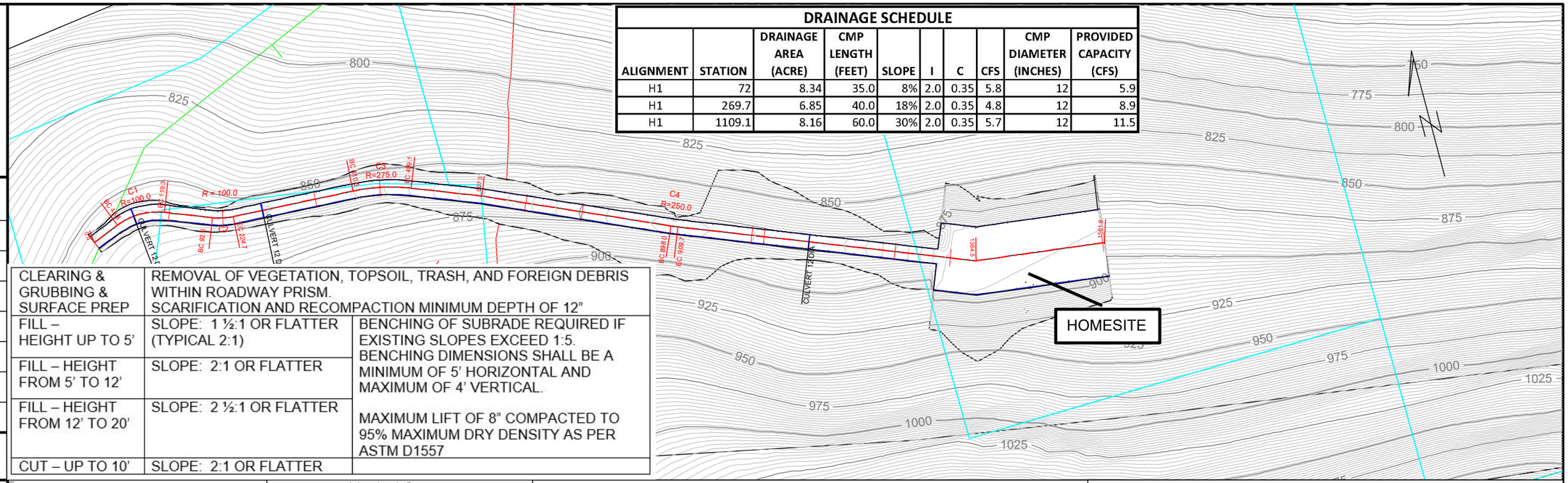
- Plan L-line Locatio
- Plan Road Edges
- Plan Clearing Limit
- Plan Culverts
- Property Line
- SEWER
- POWER

Profile Legend

- Profile Subgrade
- Profile Culverts

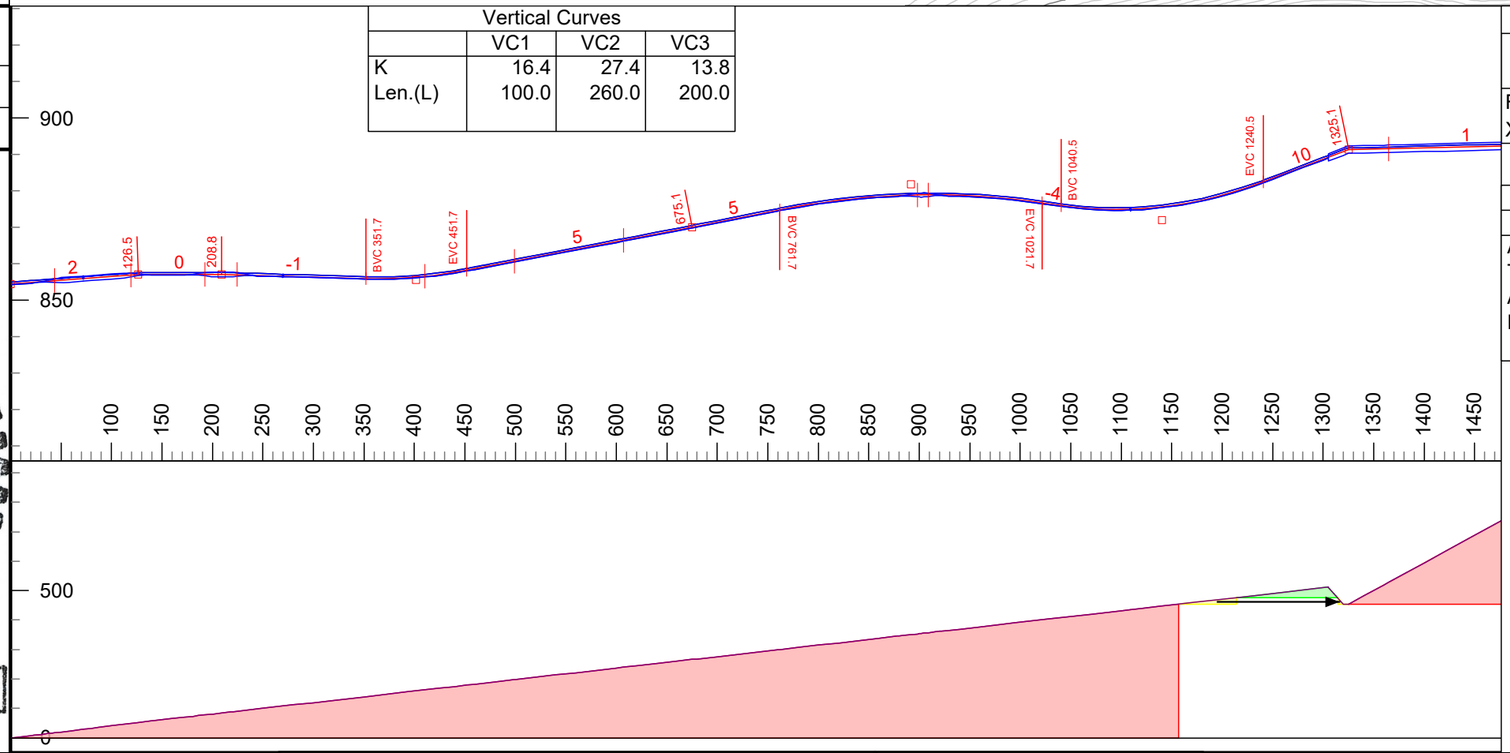
DRAINAGE SCHEDULE

ALIGNMENT	STATION	DRAINAGE AREA (ACRE)	CMP LENGTH (FEET)	SLOPE	I	C	CFS	CMP DIAMETER (INCHES)	PROVIDED CAPACITY (CFS)
H1	72	8.34	35.0	8%	2.0	0.35	5.8	12	5.9
H1	269.7	6.85	40.0	18%	2.0	0.35	4.8	12	8.9
H1	1109.1	8.16	60.0	30%	2.0	0.35	5.7	12	11.5



CLEARING & GRUBBING & SURFACE PREP	REMOVAL OF VEGETATION, TOPSOIL, TRASH, AND FOREIGN DEBRIS WITHIN ROADWAY PRISM. SCARIFICATION AND RECOMPACTION MINIMUM DEPTH OF 12"	
FILL – HEIGHT UP TO 5'	SLOPE: 1 ½:1 OR FLATTER (TYPICAL 2:1)	BENCHING OF SUBRADE REQUIRED IF EXISTING SLOPES EXCEED 1:5. BENCHING DIMENSIONS SHALL BE A MINIMUM OF 5' HORIZONTAL AND MAXIMUM OF 4' VERTICAL. MAXIMUM LIFT OF 8" COMPACTED TO 95% MAXIMUM DRY DENSITY AS PER ASTM D1557
FILL – HEIGHT FROM 5' TO 12'	SLOPE: 2:1 OR FLATTER	
FILL – HEIGHT FROM 12' TO 20'	SLOPE: 2 ½:1 OR FLATTER	
CUT – UP TO 10'	SLOPE: 2:1 OR FLATTER	

Vertical Curves			
	VC1	VC2	VC3
K	16.4	27.4	13.8
Len.(L)	100.0	260.0	200.0



Template Assignments			
ID	L-Stn From	L-Stn To	Description
RES	..	1305.1	Resource Low Volume
XX0	1305.1	..	CULDESAC

Horizontal Curves				
	C1	C2	C3	C4
Angle (I)	43.3	18.4	18.4	2.5
Tangent (T)	39.6	16.2	44.6	5.4
Arc. Len.(L)	75.5	32.1	88.4	10.7
Radius (R)	100.0	100.0	275.0	250.0

	Cut Vol.	Fill Vol.
Total	15,064.0 C.Y.	7,785.0 C.Y.

BJORN G. HEDGES
STATE OF WASHINGTON
38785
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES 08-26-2023

Station Range		Plan Scale 1:2000	Notes:	Horizontal Alignment: H1	Company Name: H3 PLLC	Designed By: BGH	
0.0	1561.6	Profile Vert Scale 1:500 Profile Horz Scale 1:1800	SEE GN NORTHERN REPORT DATED: 07/09/2021 SEE ENGINEER'S REPORT DATE: 07/14/2021		Address: 1237 Country Ridge Drive Richland, WA 99352	Sheet 3 of 3	02/04/2022

H_3 CONSULTING

BJORN HEDGES, P.E.

1237 COUNTRY RIDGE DRIVE, RICHLAND, WA 99352 | (509) 396-6505 | BJORN.HEDGES@GMAIL.COM

Submitted Version: 07/14/2021 (Revised 10/22/2021; Revised 02/04/2022)

CITY OF RICHLAND

Attn: **permittech@ci.richland.wa.us**

Please include this Engineer's report for the grading permit provided for James Sterling, for the construction of a private driveway within parcels #120983013533006, #1298301353305, 120983013387003, and #120984000006000:

Site Inspection:

07/07/2020: Met with the Property Owner and Civil Contractor to review the construction of a driveway, from an existing driveway on parcel #120983013533006.

August 2020: Discussions with the City of Richland. The City of Richland will require a geotechnical report, including slope stability analysis as this property falls within the City's Geotechnical Hazard overlay.

06/23/2021: Onsite investigation with G.N. Northern.

01/20/2022: Discussions with the City of Richland. Plan to include the grading for one home.

02/04/2022: Reduced scope for driveway and removed fence, as per Owner request.

Design:

The design includes one horizontal alignment, with a consistent cross-section. The alignment was selected to minimize cut/fill slopes, and stay clear of properly functioning critical area habitat, as no road design standards for horizontal/vertical alignment for private driveways. A roughed-in dirt road exists near the alignment. Most of this existing roadway will be used as a "key" for the new driveway fill slope. An existing roadway will be utilized between Station 1+15 and 6+07.

The driveway will have a finished gravel surface, with a width of 20'. The maximum vertical slope is 12%. Maximum cut/fill slopes are 2:1.

A Geotechnical Evaluation, dated July 9, 2021, provided the following construction requirements:

CLEARING & GRUBBING & SURFACE PREP	REMOVAL OF VEGETATION, TOPSOIL, TRASH, AND FOREIGN DEBRIS WITHIN ROADWAY PRISM. SCARIFICATION AND RECOMPACTION MINIMUM DEPTH OF 12”	
FILL – HEIGHT UP TO 5’	SLOPE: 1 ½:1 OR FLATTER (TYPICAL 2:1)	BENCHING OF SUBRADE REQUIRED IF EXISTING SLOPES EXCEED 1:5. BENCHING DIMENSIONS SHALL BE A MINIMUM OF 5’ HORIZONTAL AND MAXIMUM OF 4’ VERTICAL. MAXIMUM LIFT OF 8” COMPACTED TO 95% MAXIMUM DRY DENSITY AS PER ASTM D1557
FILL – HEIGHT FROM 5’ TO 12’	SLOPE: 2:1 OR FLATTER	
FILL – HEIGHT FROM 12’ TO 20’	SLOPE: 2 ½:1 OR FLATTER	
CUT – UP TO 10’	SLOPE: 2:1 OR FLATTER	

Drainage:
The driveway intersects several drainage areas, requiring five cross-culverts.

With a rainfall intensity (100-year 24-hour event) of I = 2.0, and runoff coefficient of 0.35 for non-cultivated land, Q (flow) is calculated at:

DRAINAGE SCHEDULE

ALIGNMENT	STATION	DRAINAGE AREA (ACRE)	CMP LENGTH (FEET)	SLOPE	I	C	CFS	CMP DIAMETER (INCHES)	PROVIDED CAPACITY (CFS)
H1	72	8.34	35.0	8%	2.0	0.35	5.8	12	5.9
H1	269.7	6.85	40.0	18%	2.0	0.35	4.8	12	8.9
H1	1109.1	8.16	60.0	30%	2.0	0.35	5.7	12	11.5

Erosion Control:

With a cross-slopes of up to 33%, to reduce erosion from cross-culverts, rip-rap with a D_{50} > 1.0 ft shall be placed at the culvert outlet, with a length of 15 feet (5’ of vertical head). Rock check dams shall be installed every 40-80’ of ditch, depending on the height of the check dam and channel slope.

Channel Slope %	Rock Check Dam Spacing (feet)		
	Dam Height, H		
	1ft	2ft	3ft
< 2	100	200	200
2 - 5	40	80	120
5 - 10	20	40	60
10 - 15	13	25	40
15 - 20	10	20	30
> 20	not recommended		

Finished cut/fill slopes shall be protected from erosion by hydroseeding using:

- Mulch” at 1,500 #/acre using a minimum of 3% tackifier.
- Grass seed: (Blue Bunch Wheatgrass and/or Sandberg Bluegrass) at 30#/acre.
- Fertilizer: Not recommended.

Finished subgrade covered with a 6” layer of crushed surfacing meeting WSDOT M41-10:

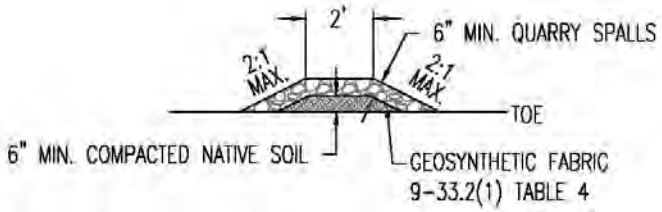
Crushed surfacing of the various classes shall meet the following requirements for grading and quality when placed in hauling vehicles for delivery to the roadway, or during manufacture and placement into a temporary stockpile. The exact point of acceptance will be determined by the Engineer.

Sieve Size	Base Course	Top Course and Keystone
	Percent Passing	
1¼"	99-100	
1"	80-100	
¾"		99-100
⅜"	50-80	
½"		80-100
No. 4	25-45	46-66
No. 40	3-18	8-24
No. 200	7.5 max.	10.0 max.
% Fracture	75 min.	75 min.
Sand Equivalent	40 min.	40 min.

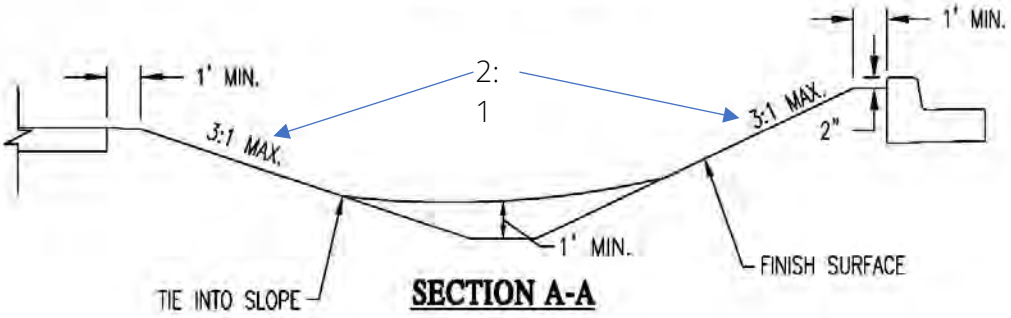
All percentages are by weight.

The fracture requirement shall be at least one fractured face and will apply to the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.

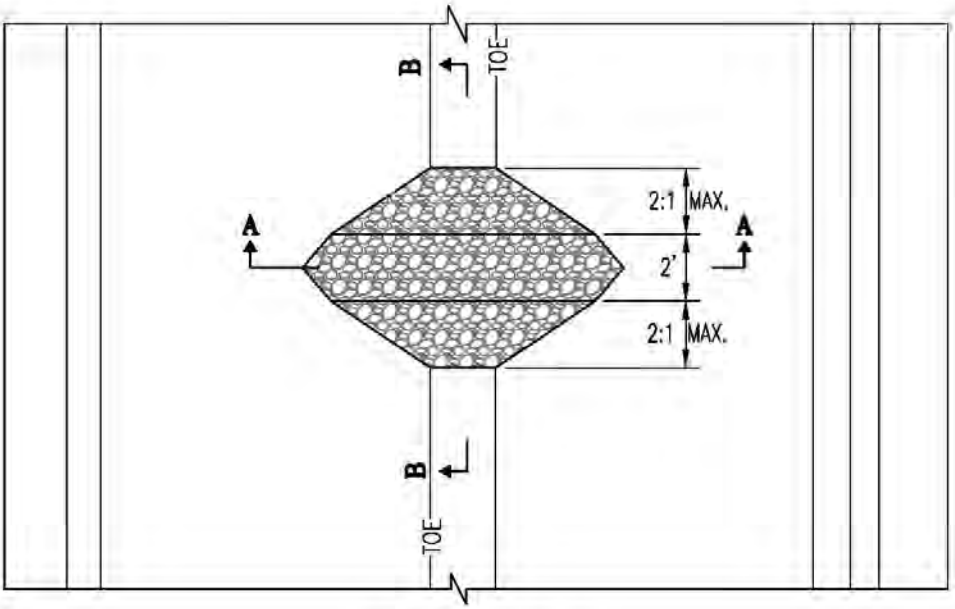
The portion of crushed surfacing retained on a No. 4 sieve shall not contain more than 0.15 percent wood waste.



SECTION B-B



SECTION A-A

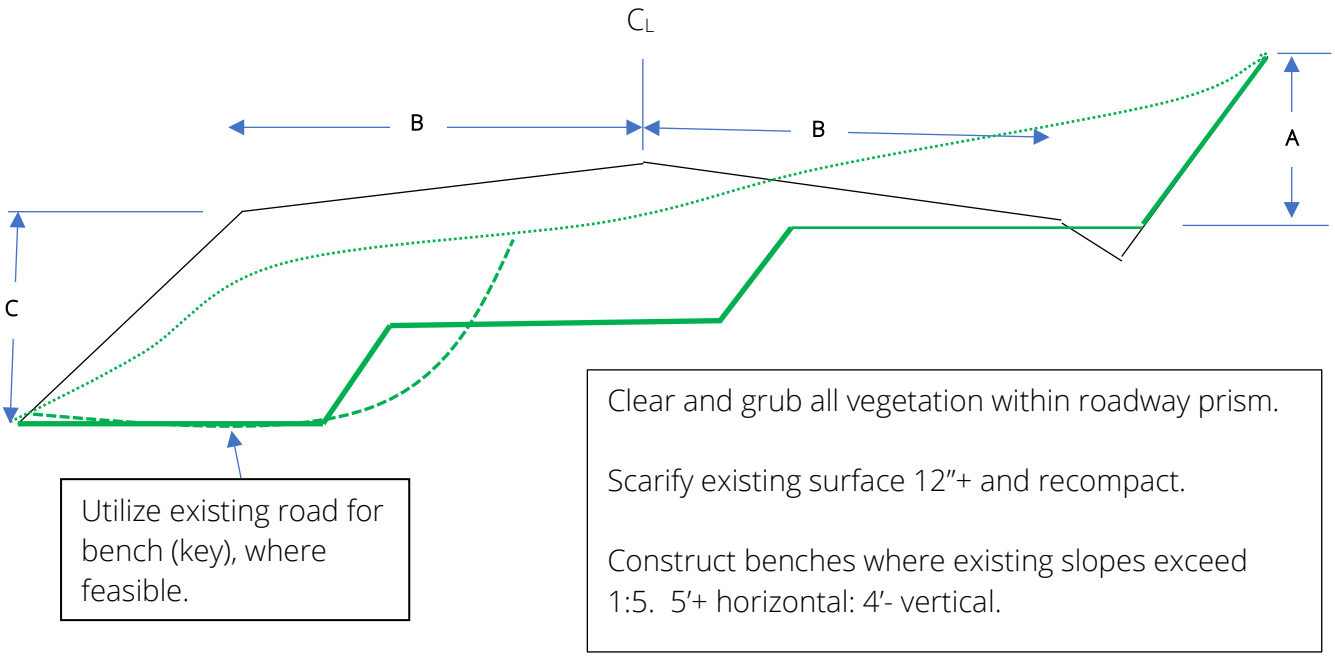


PLAN VIEW
NOT TO SCALE

ROADSIDE SWALE/ CHECK DAM DETAIL	PUBLIC WORKS ENGINEERING	
	APPR. BY: PKR	DATE: 09.13
	DRAWN BY: LD	DWG: S18
	CAD FILE: 2013_S18_09_2013	

To reduce erosion, and encourage vegetation, cut/fill slopes shall be walked with tracked equipment, perpendicular to the slope.

Standard Road Section:



SECTION	WIDTH	SLOPE	HEIGHT
A (CUT)	N/A	2:1[1]	10' MAXIMUM
B (SUBGRADE WIDTH)	11' x 2	+/- 2%	N/A
C (FILL)	N/A	2:1[1] 2 ½:1	12' MAXIMUM 20' MAXIMUM

1 - https://www.fs.fed.us/t-d/programs/forest_mgmt/projects/lowvolroads/ch11.pdf

Volume:

Total estimated volume of excavated material = 20,000 (revised to 15,065 on 02/04/2022 Plans) Cubic Yards (including clearing and grubbing)

Total estimated volume of fill = 15,000 (revised to 7,785 on 02/04/2022 Plans) Cubic Yards

Northern, Inc.

Consulting Engineers Environmental Scientists Geologists
Construction Materials Testing Geophysical Services

GEOTECHNICAL EVALUATION AND CRITICAL AREAS ASSESSMENT REPORT

STERLING PROPERTY
STERLING HEIGHTS ROAD
RICHLAND, WASHINGTON

GNN PROJECT NO. 221-1393

JULY 2021

Prepared for

JIM STERLING
890 GEORGE WASHINGTON WAY
RICHLAND, WA 99352

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 9, 2021 **GNN Project No. 221-1393**

Jim Sterling
890 George Washington Way
Richland, WA 99352

CC: Bjorn Hedges, PE, H3 Consulting

Subject: Geotechnical Evaluation and Critical Areas Assessment Report
Sterling Property
Sterling Heights Road
Richland, Washington

Dear Mr. Sterling,

As requested, GN Northern (GNN) has completed a geotechnical evaluation and critical areas assessment report for the proposed Sterling Heights Road alignment improvements on the Sterling property located in the City of Richland, Washington.

Based on the findings of our subsurface study, we conclude that the proposed development is generally considered feasible provided the recommendations presented in this report and any subsequent geotechnical engineering evaluations are followed during the design and construction phases of the project. Additional slope stability analyses may be required to confirm stability of the proposed design grades for future residential lots and provide recommendations for mitigative measurers as necessary.

This report describes in detail the results of our investigation, summarizes our findings and presents our recommendations concerning earthwork and construction for the proposed project. It is important that GN Northern provide consultation during the design phase as well as field compaction testing and geotechnical monitoring services during the construction phase to review and monitor the 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.

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

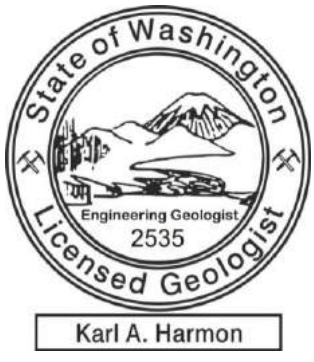


TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY

GN Northern (GNN) has prepared this executive summary to provide a general overview of the geologic hazards / critical areas assessment report for the proposed Sterling Heights Road alignment improvements on the Sterling property. The report itself should be relied upon for information about the findings, conclusions, recommendations, and other concerns. The intent of this report is to assess various geologic hazards that may impact the proposed development and provide our recommendations for mitigation. Our site assessment has been prepared in general accordance with the requirements described in the Benton County Critical Areas Regulations, Chapter 15.08, Part 5 regarding Geologically Hazardous Areas.

We understand the client intends to develop the subject property with large subdivided residential lots. The subject site currently consists of undeveloped hillside terrain with a moderate growth of native grasses and brush. In preparing this report, we reviewed plans and profiles showing topography and proposed road alignments provided by H3, PLLC.

Development on sloping ground poses an inherent risk related to global and local stability of the slopes. Surface soils are generally considered to be erodible. The majority of the subject parcel is mapped within the Benton County Geologically Hazardous Areas, with areas mapped for Steep Slopes (>15%) and Erosion Hazard.

Our site assessment was performed to identify common geologic conditions in the project region, including soil and bedrock conditions, groundwater, slopes, drainage, erosion, and geologic hazards. A review of selected information pertaining to the subject property and surrounding region was performed that included published technical literature, published geologic maps, available aerial photographs, and previous geotechnical/geologic studies prepared for other sites in the vicinity. Geologic and geotechnical data was obtained from our field exploration program consisting of nine (9) test-pits to observe the subsurface soil conditions and obtain samples for laboratory testing.

Based on our site evaluation and analyses, our findings indicate that the proposed roadway project may be constructed as planned, provided that the recommendations in this report and any subsequent geotechnical engineering evaluations are incorporated in the final design and

construction of this project. Remedial site grading will be necessary to develop stable cut/fill slopes. Additionally, the existing site slope conditions are considered generally stable. The proposed development will require appropriate design and construction for proposed reconfigured slopes as well as drainage/erosion control measures to mitigate the potential geologic site constraints.

The subject property is situated in an area where sheet flow and erosion may occur and near-surface site soils are known to exhibit a risk for erosion. Erosion concerns will require mitigation with appropriate best management practices (BMPs), including proper drainage design as well as collection and disposal (conveyance) of water to approved points of discharge in a non-erosive manner.

In our professional opinion, the proposed roadway project may be developed as planned, provided that the recommendations in this report and any subsequent geotechnical engineering evaluations are incorporated in the final design and construction. Based on our site evaluation and analysis, the existing native slope conditions are generally considered stable, however proposed cut and fill slopes for the planned roadway development will require appropriate grading measures as recommended within this report to minimize the risk of slope instability and increase safety factors of the reconfigured slopes. Additionally, based on our evaluation, near surface site soils will not be subject to a significant threat of erosion, provided that the recommendations within this report are incorporated during site grading operations along with appropriate project design, construction, and maintenance.

INTRODUCTION

Project Description

This Geologic Hazards / Critical Areas Assessment Report has been prepared for the subject site located in Richland, Benton County, Washington (see Figures 1 in Appendix I). The subject site is located east of Dalles Road, on the south side of Interstate 182. The site is located within the Benton County Geologically Hazardous Areas, with areas mapped for Steep Slopes (>15%) and Erosion Hazard. We understand that the proposed development will consist of new roadways and large residential lots.

Proposed Development

Based on the information provided, we understand that the development will be subdivided into large residential lots, along with new roadways, utilities, and associated infrastructure improvements. Access into the development will be available from Sterling Heights Road.

Although a grading plan for the proposed project was not available, we anticipate that site grading will include cuts and fills throughout the project site to create new roadways and residential lots. Grade change resulting from lot grading will likely be accommodated using slopes or retaining walls. Analysis and design of retaining walls is beyond the current scope of GNN's work.

Purpose and Scope of Services

The purpose of our services was to evaluate the surface and subsurface soil and bedrock conditions and potential geologic hazards as they relate to the proposed development, and provide professional opinions regarding the general feasibility of the proposed development and provide recommendation for mitigation of any identified geologic hazards and constraints. The scope of work included the following:

- A detailed reconnaissance of the site.
- Subsurface exploration by excavating nine (9) exploratory test-pits.
- Laboratory testing of selected soil samples obtained from exploratory test-pits.
- A review of selected published technical literature pertaining to the site and previous geotechnical/geologic reports prepared for similar projects in the vicinity.
- Review of selected available historic aerial photos and USGS topographic maps of the project site and vicinity.
- A geologic/engineering analysis and evaluation of the acquired data from the exploration and testing programs.
- Stability analyses of existing and proposed site slopes.
- A summary of our findings and recommendations in this written report.

This report contains the following:

- Discussions on subsurface soil, bedrock and groundwater conditions.
- Discussions on regional and local geologic conditions.

- Discussions on geologic and seismic hazards.
- Graphic and tabulated results of laboratory tests and field studies.
- Recommendations for grading, clearing and grubbing, excavation, suitability of onsite soils for placement as engineered fill, and compaction requirements.
- Recommendations regarding site development, including slope setbacks, cut and fill slope construction, subgrade preparation, slope maintenance and protection, and drainage.

METHODS OF EXPLORATION AND TESTING

Technical Literature and Aerial Photo Review

A review of selected information pertaining to the site and surrounding area was performed that included published technical literature, published geologic maps, aerial photographs and previous geotechnical and geologic reports prepared for other sites in the vicinity. The review was performed to identify typical geotechnical and geologic constraints that may affect the proposed development, including soil and bedrock conditions, groundwater, slopes, drainage, erosion, and geologic hazards.

Field Reconnaissance

Field reconnaissance of the subject property was performed in conjunction with our subsurface exploration on June 23rd, 2021 to observe the on-site surficial geologic and geotechnical conditions and to confirm the data obtained from our technical literature review.

Field Exploration

Field exploration was completed on June 23rd, 2021. A utility clearance was obtained prior to the field exploration. Nine (9) exploratory test-pits were completed at the site. Test-pits were excavated using a Wacker Neuson mini-excavator to depths ranging from approximately 5 to 6 feet BGS. Exploratory test-pits were logged by a GNN field engineer. Upon completion, the test-pits were loosely backfilled with the excavated soils. The exploratory test locations are shown on the *Site Exploration Map* (Figure 2, Appendix I).

Selected soil samples were sealed in containers and returned to our laboratory. 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 are presented in Appendix IV following this report. 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.

Laboratory Testing

Representative samples of the native soil obtained in the field during our subsurface exploration were selected for testing to determine the index properties of the soils in general accordance with ASTM procedures. Result of the laboratory tests are presented in graphic form in Appendix III attached to the end of the report. 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

DISCUSSION

Site Conditions

The subject site is located east of Dalles Road, on the south side of Interstate 182 in Richland, Washington (see Figures 1 & 2 in Appendix I). The site is located in the south ½ of Section 20, Township 9 North and Range 28 East, Willamette Meridian, Benton County, Washington.

The undeveloped project site is covered with a moderate growth of native grass and sagebrush. Site slopes typically exhibit approximate gradients ranging up to a maximum of ~50%.

Subsurface Soil Conditions

Based on our subsurface exploration and the results of laboratory testing, subsurface soils at the site primarily consist of native Silt (ML) and Silt with Sand (ML). The silt soils appeared ‘loose’ to ‘medium dense’ and exhibited dry to damp in-situ moisture. Test-pit logs provided in Appendix II include detailed descriptions of the soils encountered.

NRCS Soil Survey

The soil survey map of the site prepared by the Natural Resources Conservation Service (NRCS) identifies the site soil as *Shano silt loam, 30 to 65 percent slopes (ShF)* and *Warden silt loam, 0 to 5 percent slopes (WdAB)*. The landform setting for these soils is identified hillslopes and terraces, respectively. The parent material for the *Shano* soil is identified as loess. The parent material for the *Warden* soils is identified as loess over lacustrine deposits. According to the NRCS, these soils consists of *well drained* materials. Refer to the *NRCS Soil Survey Map* in Appendix VI for more details.

Groundwater

Groundwater was not encountered in the exploratory test-pits to a maximum depth of 6 feet BGS. To further assist in our evaluation, we reviewed the Washington State Department of Ecology database of nearby well logs (see Appendix VI) to estimate groundwater levels in the vicinity. Based on our review of available data, we believe groundwater levels are anticipated to be greater than 100 feet BGS at the project site. Groundwater levels will fluctuate with precipitation, irrigation, drainage, and regional pumping from wells.

Geologic Setting

The site is located on the west end of the north side of Badger Mountain in the Tri-Cities area and is part 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.

The project site is generally located near the northern portion of the Horse Heaven Hills area and in line with the Rattlesnake Hills (fault/fold structure) of the Yakima Fold Belt within the vast Columbia Basin physiographic province of southeastern Washington. The Rattlesnake and Horse Heaven Hills each consist of east-west trending anticline ridges of the Yakima Fold Belt formed by north–south compression in the regional lava flows.

Based on the *Geologic Map of the Richland 1:100,000 Quadrangle, Washington* (Reidel, 1994), the overlying sediments in the project site/vicinity generally consist of Pleistocene-age glacial

outburst flood deposits, commonly identified as the Missoula Flood Deposits [Qfs_3]. These outburst flood deposits in the project vicinity generally consist of silt and sand.

Geologic Hazards

Geologic hazards that may affect the development include seismic hazards (ground shaking, surface fault rupture, soil liquefaction, and other secondary earthquake-related hazards), slope instability, flooding, ground subsidence, and erosion. A discussion follows on the specific hazards to this site:

Seismic Conditions: The seismic hazard in the project area and vicinity results from three seismic sources: interplate events, intraslab events, and crustal events (Geomatrix, 1995, 1996). Each of these events has different causes and therefore produces earthquakes with different characteristics (*i.e.*, peak ground accelerations, response spectra, and duration of strong shaking). Each is capable of generating a peak ground acceleration (pga) on rock larger than 0.05g.

Two of the potential seismic sources, interplate and intraslab events, are related to the subduction of the Juan De Fuca plate beneath the North American plate. Interplate events occur due to movement at the interface of these two tectonic plates. Intraslab events originate within the subducting tectonic plate, away from its edges, when built-up stresses within the subducting plate are released. These source mechanisms are referred to as the Cascadia Subduction Zone (CSZ) source mechanism. The CSZ originates off the coast of Oregon and Washington and subducts beneath both states.

Earthquakes caused by movements along crustal faults, generally in the upper 10 to 15 miles, result in the third source mechanism. These movements occur on the crust of the North America tectonic plate when built-up stresses near the surface are released. There are several crustal faults in the project site region, including the Rattlesnake-Wallula Trend, Columbia Hills Anticline, and Horse Heaven Hills NW Fault (Geomatrix 1995, 1996). These faults are generally considered to be inactive or have a low probability of activity.

The most notable earthquake event in the past century occurred on July 15, 1936 near Umapine, Oregon, approximately 35 miles to the east-southeast. The Umapine quake has been set at magnitude 5.7 or 6.4 on the Richter Scale by different resources, and was felt through large

portions of Washington, Oregon, and Idaho, and caused ground cracking, small areas of soil liquefaction, structural damage, and isolated building collapses near Walla Walla, Washington and Milton-Freewater, Oregon. Damage was also reported in Waitsburg (approximately 60 east of the project site), and the quake was felt in Tri-Cities (estimated Modified Mercalli (MM) Intensity of III) but no damage was reported.

Within the past 10 years there have been a total of 28 earthquakes within a 100 kilometer radius from the site. The largest of these episodes had a magnitude of 3.7 and a hypocenter of 20 kilometers below the surface. It occurred in 2008 and the epicenter was 27 kilometers away from the site at a location of N 46.17 W -119.55. Of the 28 total earthquakes in the past 10 years, 21 had a focus of 10 kilometers or less, 6 were between 25 kilometers and 11 kilometers, and 1 was greater than 25 kilometers deep (a focus of 36 kilometers below the surface). All 28 events have an average magnitude of 2.9 on the Richter scale.

Regional Faulting: There are three main fault structures in the project site region. These three consists of the Rattlesnake Hills fault/fold structure, the Horse Heaven Hills structure, and the Wallula Fault system. These three structures are included in many of the regional lineaments in the area including the Olympic Wallowa Lineament (OWL), the Cle Elum-Wallula deformed zone (CLEW), and the Rattlesnake-Wallula trend (RAW).

The Horse Heaven Hills structure is one of the longest fold and fault systems in south-central Washington, and is part of the Yakima Fold Belt. The structures are primarily north-verging anticlines possibly underlain by south-dipping thrust and reverse faults. Tightening or growth of other Yakima Fold Belt structures, and possibly the Horse Heaven Structures, has been hypothesized; however poor exposure of Quaternary deposits and lack of detailed mapping prevent determination of this. No definitive evidence has been documented to show Quaternary movement in the Horse Heaven Hills.

The Rattlesnake Hills fault/fold structures are also anticlinal segments cut and underlain by south- to southwest-dipping thrust or reverse faults in rocks of the Miocene CRBG. These anticlinal segments characterize the southeastern part of the Rattlesnake Hills uplift and are an echelon double-plunging anticline. The faults of the Rattlesnake Hills structures are covered by loess, landslide, and glacial outburst flood deposits of Quaternary age for much of their length. Based on

published geologic maps, the concealed/buried alignment of the Rattlesnake Hills structure generally extends beneath the subject site. As with the Horse Heaven Structures, movement and tightening has been inferred, but no conclusive evidence has been presented to prove this, and no definitive evidence has been documented to show Quaternary displacement; the Rattlesnake Hills structure is therefore identified as a Class B fault.

The Wallula Fault System is a prominent northwest-striking fault zone that extends from near Milton-Freewater, OR to near Kennewick, WA. The northwest projection of the Wallula fault is generally mapped to line-up with the southeast projection of the Rattlesnake Hills fault. Unlike the two previously described structures, the Wallula Fault System is mostly mapped as linear, steeply dipping strike-slip, normal, or reverse faults in Quaternary surficial deposits and rocks of the Columbia River Basalt Group. The mapped fault pattern, and other evidence, supports a right-lateral strike-slip sense of movement on the Wallula Fault. Although poorly studied, some evidence suggests up to four surface-faulting events within the past 10,000 years along a portion of the Wallula Fault System in northeastern Oregon. Slip rate on all three faults is estimated to be less than 0.2 millimeters per year.

For the purposes of this report, an active fault is defined as a fault that has had displacement within the Holocene epoch or last 11,000 years. While the region is subject to areas of known faulting and deformation related to activity along the Yakima Fold Belts, due to the lack of any known surficial exposure of active fault traces in the immediate site vicinity, the risk of surface fault rupture considered to be relatively low at the subject property. While fault rupture would most likely occur along previously established fault traces, future fault rupture could occur at other locations.

Secondary Seismic Hazards: Secondary seismic hazards related to ground shaking include soil liquefaction, ground subsidence, tsunamis, and seiches. The site is far inland, so the hazard from tsunamis is non-existent. The potential hazard from seiches in also nil due to the lack of nearby surface water bodies and the noted low magnitudes of potential seismic shaking.

Soil Liquefaction: Liquefaction is the loss of soil strength from sudden shock (usually earthquake shaking), causing the soil to become a fluid mass. In general, for the effects of liquefaction to be manifested at the surface, groundwater levels must be within 50 feet of the ground surface and the soils within the saturated zone must also be susceptible to liquefaction. A detailed liquefaction

analysis was beyond the scope of this report. Based on the published *Liquefaction Susceptibility Map of Benton County, Washington* (dated September 2004) prepared by Washington State Department of Natural Resources, the potential for liquefaction to occur at this site is considered 'Very Low' to 'Low to Moderate'. Based on our site-specific evaluation, the risk of liquefaction at the subject site is considered very low due to the significant depth to groundwater (greater than 50 feet).

Site Slopes: Existing site slopes across the parcel descend toward the south/southwest at gradients ranging from approximately 10% to 50%. A field reconnaissance of the subject property was performed to observe site conditions and correlate the information gathered from our preliminary research. During our reconnaissance we looked for common geomorphic features of landslides as well as indications of possible signs demonstrating recent activity and instability of slide masses. No apparent indications of recent failures or significant slope instability were observed.

Flooding and Erosion: The subject property is not located in area mapped by FEMA regarding flooding concerns. Portions of the subject property are however situated in areas where sheet flow and erosion may occur. A large portion of the site is also mapped for *Erosion Hazard* due to easily-erodible soils on slopes >15%.

Erosion susceptibility from water is based on several factors, including the intensity of rainfall and runoff, soil erodibility, length and steepness of slopes, and surface condition. The erodibility factor of the soils is a measure of the soils resistance to erosion based on its physical characteristics. Typically, very fine sand, silt and clay soils are generally susceptible to erosion. Based on site specific field exploration, observations, and laboratory testing, the surficial soil exposed at the project site consists primarily of silt soils.

Soil erodibility is only one of several factors affecting the erosion susceptibility. Soil erosion by water also increases with the length and steepness of the site slopes due to the increased velocity of runoff and resulting greater degree of scour and sediment transport. Appropriate erosion and sediment control plan(s) and a drainage plan shall be prepared by the project civil engineer with the final construction drawings.

The need for and design of flood control devices and erosion protection measures is within the purview of the design Civil Engineer and/or Landscape Architect. In general, erosion should be mitigated with best management practices (BMPs) consisting of proper drainage design including collecting and disposal (conveyance) of water to approved points of discharge in a non-erosive manner, placement of vegetative covers and erosion control mats on slope surfaces. Appropriate project design, construction, and maintenance will be necessary to mitigate the site erosion hazards.

SLOPE STABILITY ANALYSIS

Slope stability analyses were conducted for various presumptive reconfigured gradients and slope heights that are anticipated to be required to develop the roadway project as planned. The analysis was conducted using generalized geologic cross-section models and data obtained from our subsurface exploration. The output of our slope stability analyses is attached in Appendix V.

The slope stability analysis was conducted by a two-dimensional limit equilibrium stability analysis of selected trial failure surfaces using the computer program *SLIDE (Version 7)*. Potential circular-arc failure surfaces were evaluated using the Spencer method. The computer program searched for critical potential failure surfaces with low computed factors of safety. The computed factor of safety (FS) against slope failure is simply the ratio of total resisting forces or moments (strength of the slope) to the total driving forces or moments for planar or circular failure surfaces respectively. A slope with a factor of safety of 1.0 is in equilibrium, indicating that the disturbing forces driving the slope down are equal to its strength to resist failure. Simply put, slope-failure results when the strength of the slope is overcome by gravity.

Although earthquakes are generally not a significant concern in the Benton County region, and anticipated seismic accelerations are expected to be relatively low, the stability of the slope has been analyzed under both static and seismic conditions. Our analysis used the pseudostatic method which modifies the limit equilibrium method by incorporating a horizontal static seismic force to simulate the potential inertial forces generated from earthquake ground accelerations. For slope stability analyses under seismic loading, a pseudostatic seismic coefficient, kh (horizontal component), expressed in terms of acceleration (units of g), is typically estimated as a percentage of the horizontal peak ground acceleration (PGA). PGA for this site was calculated with a 2,475-

year return interval (RI) using the USGS PSH Deaggregation tool for a 2% probability of exceedance in 50 years. For our analyses, we have selected a value of k_h = 0.27g, approximately half of the design PGA of 0.135g.

The selection of unit weight and shear strength parameters for the various earth materials were based on judgment and data obtained during our field investigation, laboratory testing, review of previous studies, research and previous experience with similar materials in similar geotechnical and geologic settings. Engineering and geologic judgment must be applied to the estimated shear strength parameters in order to consider lateral and vertical variations in the subsurface conditions, such as degree of cementation, fracturing, planes of weakness, and gradational characteristics. The following geotechnical strength parameters were used in our stability calculations:

Table 2: Estimated Soil Strength Parameters

Material	Shear Strength Parameters		Unit Weight (pcf)
	Friction Angle: ϕ	Cohesion: c (psf)	
Native Silt (ML)Soils	28	20	108
Engineered Fill (ML)	30	25	115

Our review and site reconnaissance indicates that the existing native (undisturbed) site slopes generally appear to be grossly stable. GN Northern recommends that any existing or reconfigured slopes should meet or be designed and constructed to meet a minimum factor of safety of 1.5 for the static condition and 1.1 under seismic loading.

Based on the findings of our slope stability analyses, all future proposed cut or fill slopes at the project site shall be engineered and constructed in accordance with the recommendations (*Graded Slope Construction* section) of this report. Engineered slopes constructed to a maximum height of 5-feet may be constructed to a maximum slope gradient of 1.5H:1V. Slopes with a maximum height of 12-feet may be constructed to a maximum slope gradient of 2H:1V. Any slopes greater than 12 feet in height must be constructed at a gradient of 2.5H:1V to a maximum of 20-feet in height. It shall be noted that all reconfigured slopes must be constructed as engineered slopes with proper keying and benching under the supervision of a representative of the GER.

FINDINGS AND CONCLUSIONS

The following is a summary of our findings, conclusions and professional opinions based on the data obtained from a review of selected technical literature and the site evaluation:

- The primary geologic hazards and site constraints for the proposed project include surface erosion and the potential for slope failures. Engineered design and careful construction as recommended within this report and any subsequent design-level geotechnical evaluations can mitigate these geologic constraints and increase safety to allow development of potentially geologically hazardous areas. Preventative measures to control runoff and reduce erosion should be incorporated into site grading plans.
- Other common geologic hazards, including fault rupture, liquefaction, and seismic shaking are considered relatively low or negligible on this site.
- Development on sloping ground can pose a risk related to global and local stability of site slopes. Site development will require appropriate design and construction of project slopes as well as drainage/erosion control measures to mitigate the observed geotechnical and geologic site constraints.
- Free groundwater was not encountered in any of the exploration test-pits to the maximum depth explored.
- The onsite soils may be suitable for use as engineered fill, provided it is free of significant organic or deleterious matter, and rocks greater than 4 inches.
- Excavation of the on-site silty soils can be accomplished with most types of conventional earth excavation equipment.
- Adherence to the preliminary grading recommendations in this report should reduce the potential risk of slope instability and erosion.
- Our review and analyses indicate that the existing undisturbed native site slopes are generally considered grossly stable. Future proposed reconfigured cut or fill slopes should be constructed in accordance with the recommendations of this report and within the maximum outlined gradients/heights specified. Once the final grading plans are prepared, additional slope stability

analyses may be warranted to confirm stability of the proposed design grades and provide recommendations for mitigative measures, as necessary.

- Site grading, excavation, placement of fill, setbacks, drainage and terracing, and erosion control shall conform to the provisions of Appendix J, *Grading*, of 2018 IBC.
- All slope faces shall be protected with appropriate erosion control measures (BMPs) to insure long-term surficial stability.
- ***In our professional opinion, the proposed roadway development at the site will not pose a threat to the health or safety of the citizens, or increase hazards to surrounding properties, provided the recommendations in this report and any subsequent geotechnical engineering evaluations are followed in the design and construction of the project.***

PRELIMINARY RECOMMENDATIONS

The following preliminary recommendations regarding site preparation and earthwork are based on our current understanding of the proposed project. A final grading plan was not available at the time of this feasibility/critical areas report and we anticipate that site grading will include cuts and fills throughout the project site to create new roadways and residential lots. The recommendations presented in this report are predicated upon appropriate monitoring and testing of the site preparation and earthwork construction by a representative of the Geotechnical-Engineer-of-Record (GER).

Site 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.

Clearing and Grubbing

At the start of site grading, the construction areas should be cleared and stripped of all vegetation, topsoil, undocumented fills, trash/debris 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.

Subgrade Preparation

Due to the relatively loose nature of the near-surface soils, we recommend scarifying and recompacting minimum 12 inches of the native subgrade below areas of proposed improvements including building lots, roadway, and hardscapes. The depth of scarification and recompaction may be increased in real-time based on the exposed conditions at the discretion of the GER. This requirement for recompaction of 12 inches applies to the native subgrades prior to placement of any fill, as well as the finished cut subgrade. Fill materials, consisting of suitable onsite materials or imported fill, shall be placed as engineered fill to the design grades. Where fill is placed on existing ground steeper than 5V:1H, the fill should be keyed and benched into firm native soil.

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 foundation excavations. 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.

The shrinkage factor for earthwork is expected to range from approximately 15% to 25% for the upper excavated or scarified silt site soils. This estimate is based on compactive effort to achieve a minimum relative compaction of 95% and may vary with contractor methods. Losses from site clearing will affect earthwork quantity calculations and should be considered.

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.

Re-Use of Onsite Soils as Engineered Fill

The onsite soils may be suitable for use as engineered fill, provided it is free of significant organic or deleterious matter. The native silt soil 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 onsite soils will require compaction to be performed within a range of ±1% of optimum moisture to achieve the proper degree of compaction. Compaction should be verified by testing.

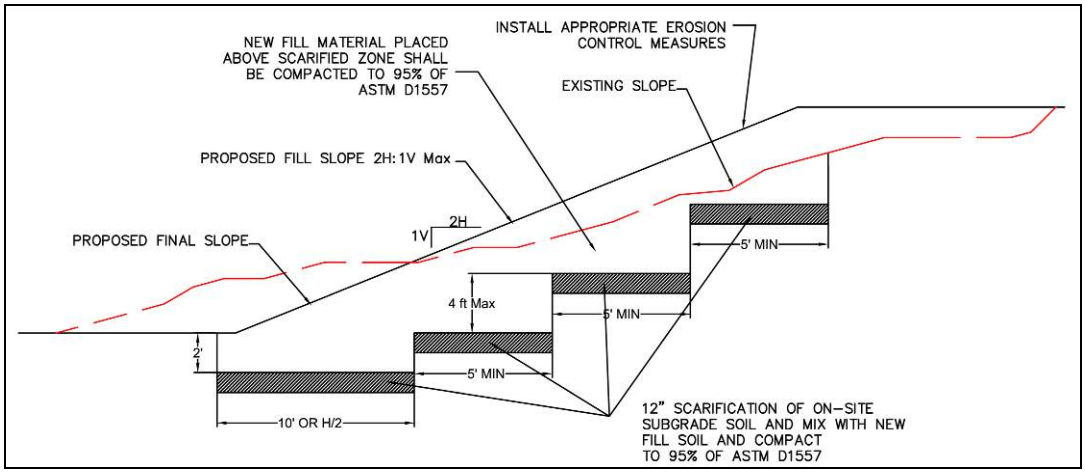
Compaction Requirements for Structural Fill

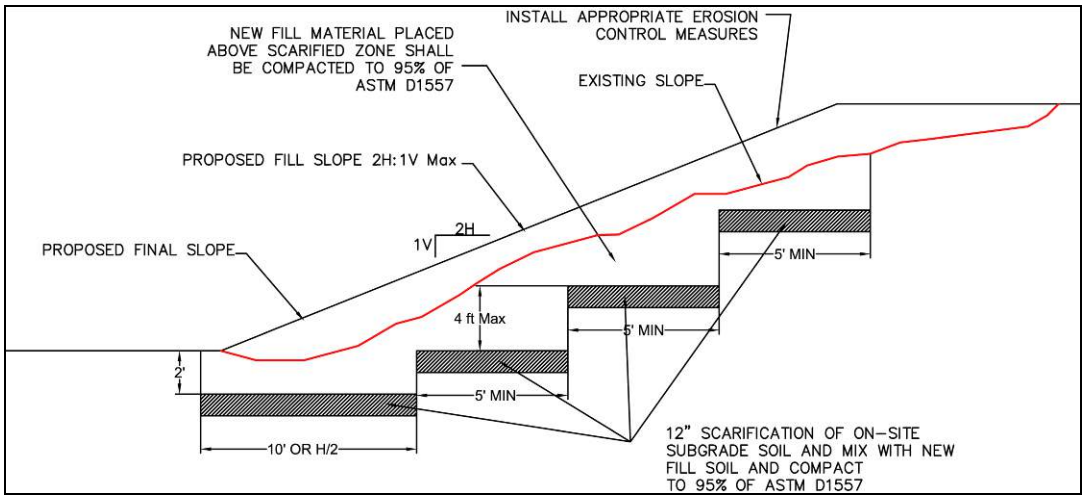
All fill or backfill shall be approved by a representative of the GER, placed in uniform lifts, and compacted to a minimum 95% of the maximum dry density as determined by ASTM D1557. The compaction effort must be verified by a representative of the GER in the field using a nuclear density gauge in accordance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

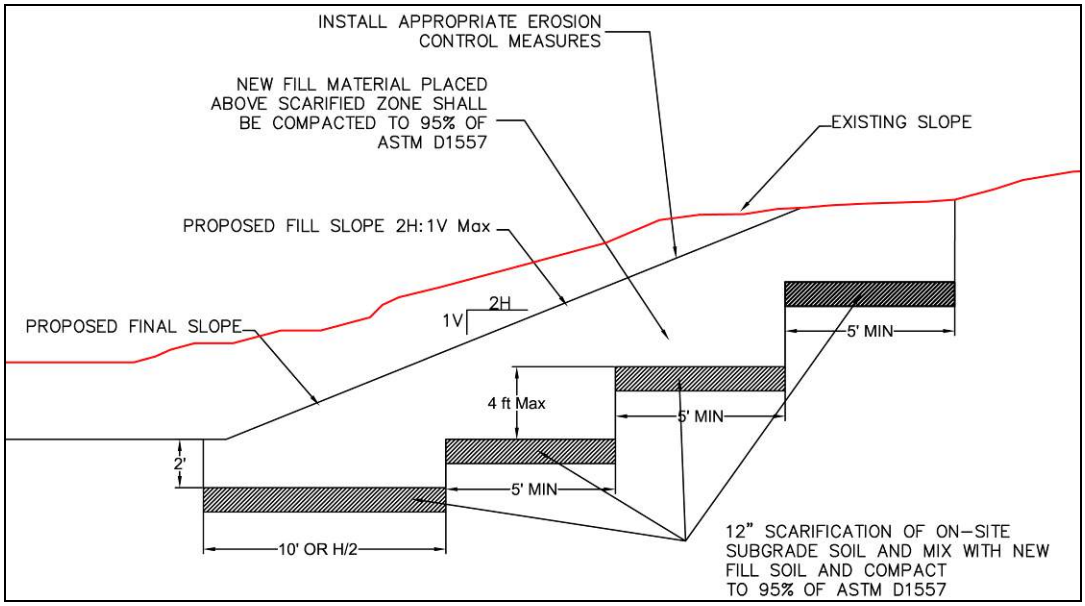
Graded Slope Construction

Development on sloping ground poses an inherent risk related to global and local stability of site slopes. In order to mitigate the potential hazards of erosion and slope instability, site development will require appropriate design and construction including drainage/erosion control measures to mitigate the noted geologic site constraints. In general, we recommend that all future proposed cut or fill slopes at the project site shall be engineered and constructed to a maximum gradient of 2H:1V and a maximum of 10 feet in height in accordance with the recommendations of this section.

All reconfigured slopes should be overfilled and trimmed back to competent material. A representative of the GER should observe all construction cuts to inspect for adverse geologic conditions and make appropriate recommendations based on the exposed conditions. Grading details for proper slope construction are shown below:







Fill Slopes (2H:1V Maximum Gradient)

Fill slopes should be overfilled and trimmed back to uniformly compacted material. The final slope surface should be track-walked or grid rolled to improve the slope's resistance to erosion. Where fill slopes or stabilization fill slopes are to be constructed on natural slopes steeper than 5V:1H, the fill should be keyed and benched into firm natural soil. Keyways for all slopes, greater than 5 feet in height, should be cut into firm natural soil. This helps ensure a good bond between the existing native soil and new fill, and to eliminate a plane of weakness at the interface. Benching dimensions into existing native slopes shall be a minimum 5 feet horizontal and maximum 4 feet vertical from the lowest adjacent soil grade. Before engineered fill is placed, the

key should be observed by a representative of the GER, to observe compliance with the above recommendations. It is recommended that the GER, or their representatives, be present during the fill construction to observe compliance with the above recommendations.

Compacted fill slopes shall be overbuilt and cut back to grade, exposing the firm, compacted fill inner core. The actual amount of overbuilding should vary as field conditions dictate. The degree of overbuilding should be increased until the desired compacted slope surface condition is achieved. Care should be taken by the contractor to provide thorough mechanical compaction to the outer edge of the overbuilt slope surface. Fill placement should proceed in thin lifts (8-10 inch loose thickness, depending upon compaction equipment). Each lift should be moisture-conditioned and thoroughly compacted. The desired moisture condition should be maintained during the period between successive lifts, and each lift should be tested to ascertain that desired compaction is being achieved.

At intervals not exceeding 4 feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly back-rolled utilizing conventional equipment. Care should be taken to maintain the desired moisture conditions as needed prior to back-rolling. Upon achieving final grade, the slopes should again be moisture conditioned and thoroughly back-rolled. The use of a side boom roller may be necessary as well as vibratory methods. Without delay, the slopes should then be grid-rolled to achieve a relatively smooth surface and uniformly compact condition. Slope construction procedures shall be monitored, and moisture and density tests shall be taken at regular intervals.

Cut Slopes (2H:1H Maximum Gradient)

We recommend reconstruction of any proposed cut-slope faces by keying and benching into native soils, along with replacement with engineered fill. A key shall be constructed at the toe of the proposed cut slope, 24-inches deep, with horizontal dimensions of 10 feet of H/2 (where H is the finished height of the slope). Benching dimensions into native cut slopes shall be a minimum 5 feet horizontal and maximum 4 feet vertical from the lowest adjacent soil grade. The exposed native surface of the overcut bench should be scarified, moisture conditioned, and recompacted to a dense and non-yielding surface prior to replacement with engineered fill. The reconstructed cut slope faces shall be overbuilt and cut back to grade, exposing the firm and compacted surface. The

GER, or their representatives, should monitor cut slopes during construction, to check for adverse geologic features exposed within the cut face.

A representative of the GER, should monitor cut slopes during construction, to check for adverse geologic features exposed within the cut face. Although not anticipated, proposed slopes may require finished at a shallower gradient or reconstruction as buttressed slopes if adverse geologic conditions are exposed during construction.

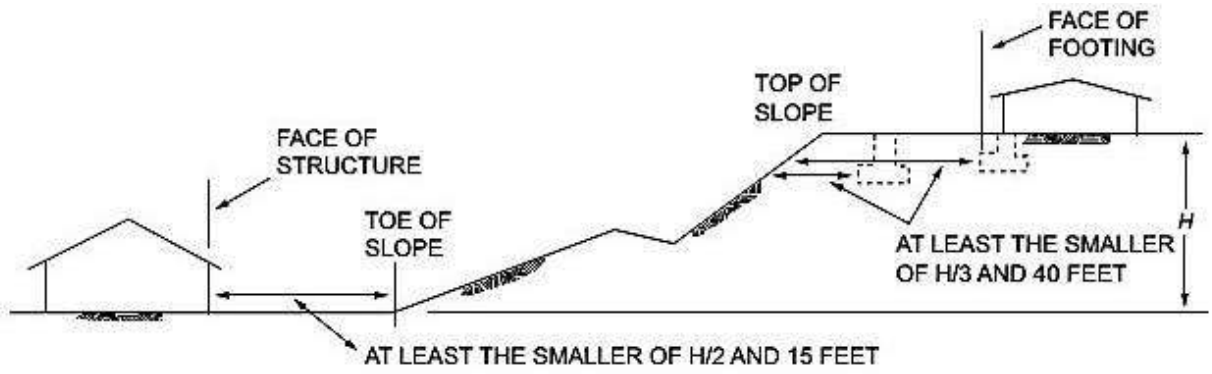
Slope Maintenance and Erosion Protection

Future proposed building sites will require appropriate setbacks from adjacent ascending or descending slopes in accordance with 2018 IBC Section 1808.7. Proper slope protection and maintenance will help minimize slope erosion and improve the stability of the project slopes. The project soils are prone to erosion and will require appropriate BMP protection and maintenance. Positive drainage should be provided at the tops of all slopes to divert runoff away from the face. Swales constructed in native soils should be lined with suitable non-erosive material. Erosion protection should be provided, especially where concentrated runoff is anticipated. A qualified Landscape Architect should provide recommendations for slope planting. As the exposed site soils are susceptible to erosion, it is required that erosion control measures, such as planting, erosion control blankets or fabrics, sprayed tackifiers, or some combination of these, be utilized on all slopes within the project. Landscaping should take into consideration the engineering characteristics of the slopes, especially with regards to the surficial stability.

The need for and design of flood control and erosion protection measures is within the purview of the design civil engineer. In general, erosion should be mitigated with best management practices (BMPs) consisting of proper drainage design including collecting and disposal (conveyance) of water to approved points of discharge in a non-erosive manner. Appropriate project design, construction, and maintenance will be necessary to mitigate the site erosion concerns. If during the course of grading, adverse or potentially adverse geologic conditions are encountered, the Geotechnical Engineer should analyze and make recommendations to treat these problems in real time.

Slope Setbacks

In accordance with IBC 2018 Section 1808.7 *Foundations on or Adjacent to Slopes*: "foundations on or adjacent to slope surfac8es shall be founded in firm material with an embedment and setback from the slope surface sufficient to provide vertical and lateral support for the foundation without detrimental settlement." IBC Figure 1808.7.1 (presented below) defines the appropriate minimum setbacks from ascending and descending slope surfaces:



The long-term performance of the structure near slopes is dependent on the protection of slopes from erosion or over steepening from subsequent slope grading. Slopes should be maintained to prevent erosion or undermining of the toe.

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.

ADDITIONAL SERVICES

GNN recommends that the Client should maintain an adequate program of geotechnical consultation, construction monitoring, and soils testing during the final design and construction phases to monitor compliance with GNN's geotechnical recommendations. Maintaining GNN as the geotechnical consultant from beginning to end of the project will provide continuity of services. If GN Northern, Inc. is not retained by the owner/developer and/or the contractor to provide the recommended geotechnical inspections/observations and testing services, the geotechnical engineering firm or testing/inspection firm providing tests and observations shall assume the role and responsibilities of Geotechnical Engineer-of-Record.

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

LIMITATIONS OF THE CRITICAL AREAS ASSESSMENT REPORT

This CRITICAL AREAS ASSESSMENT 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 at the project site. 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 one (1) year 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 for 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

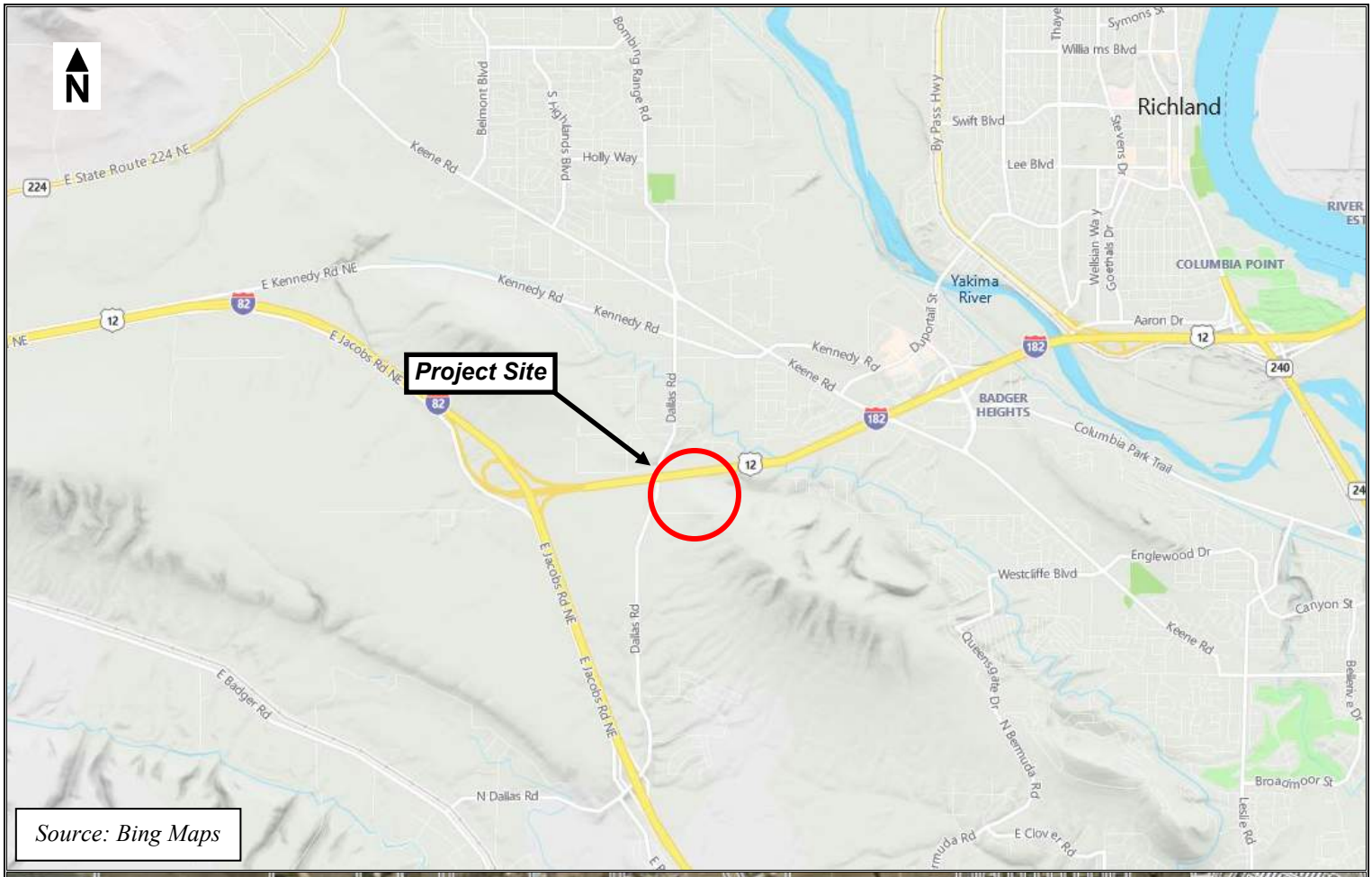
Appendix I

Vicinity Map (Figure 1)

Site Exploration Map (Figure 2)

Site Map (Figure 3)

Geological Sensitive Areas Map (Figure 4)



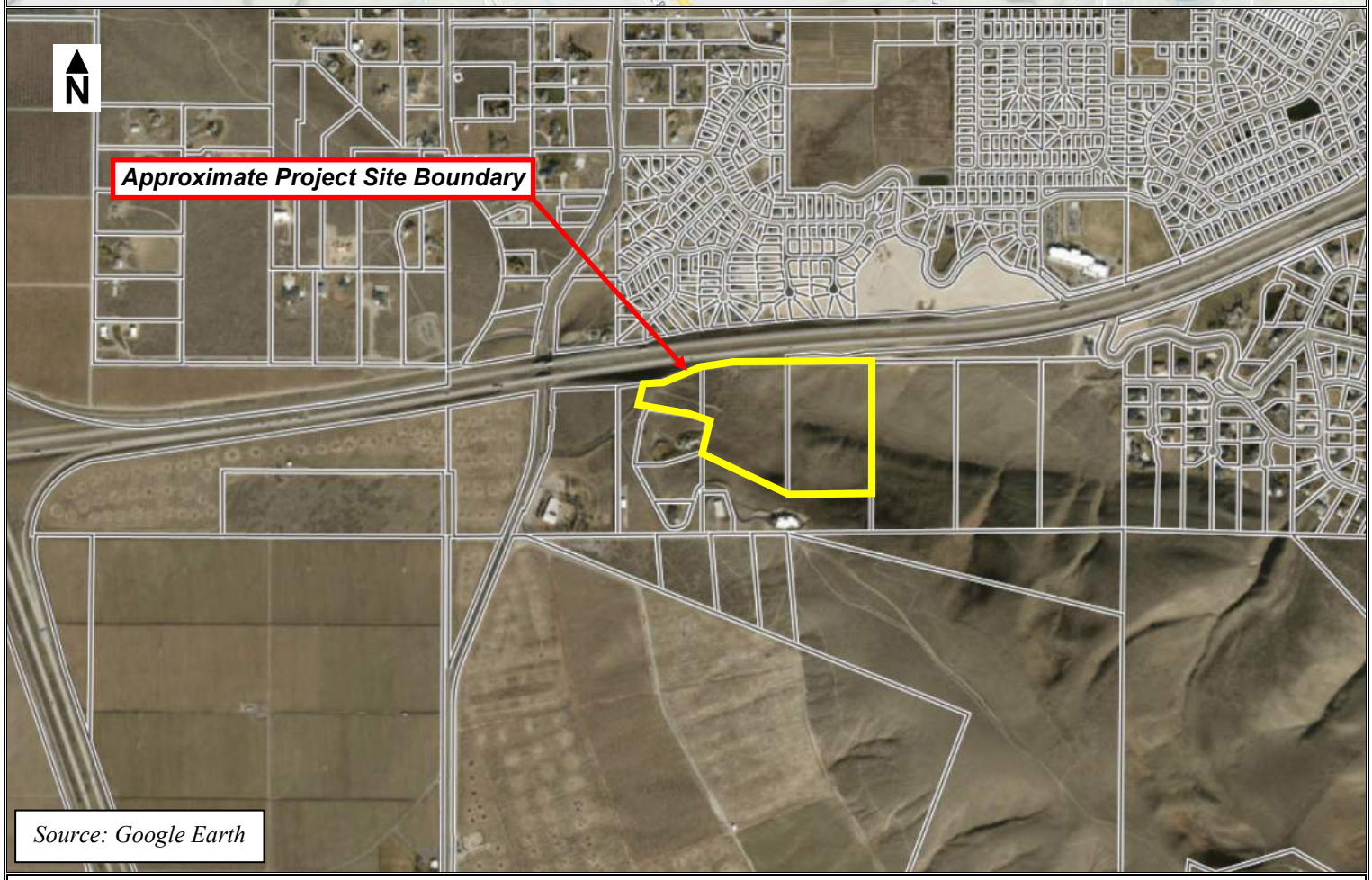


FIGURE 1: VICINITY MAP **PROJECT NO. 221-1393**

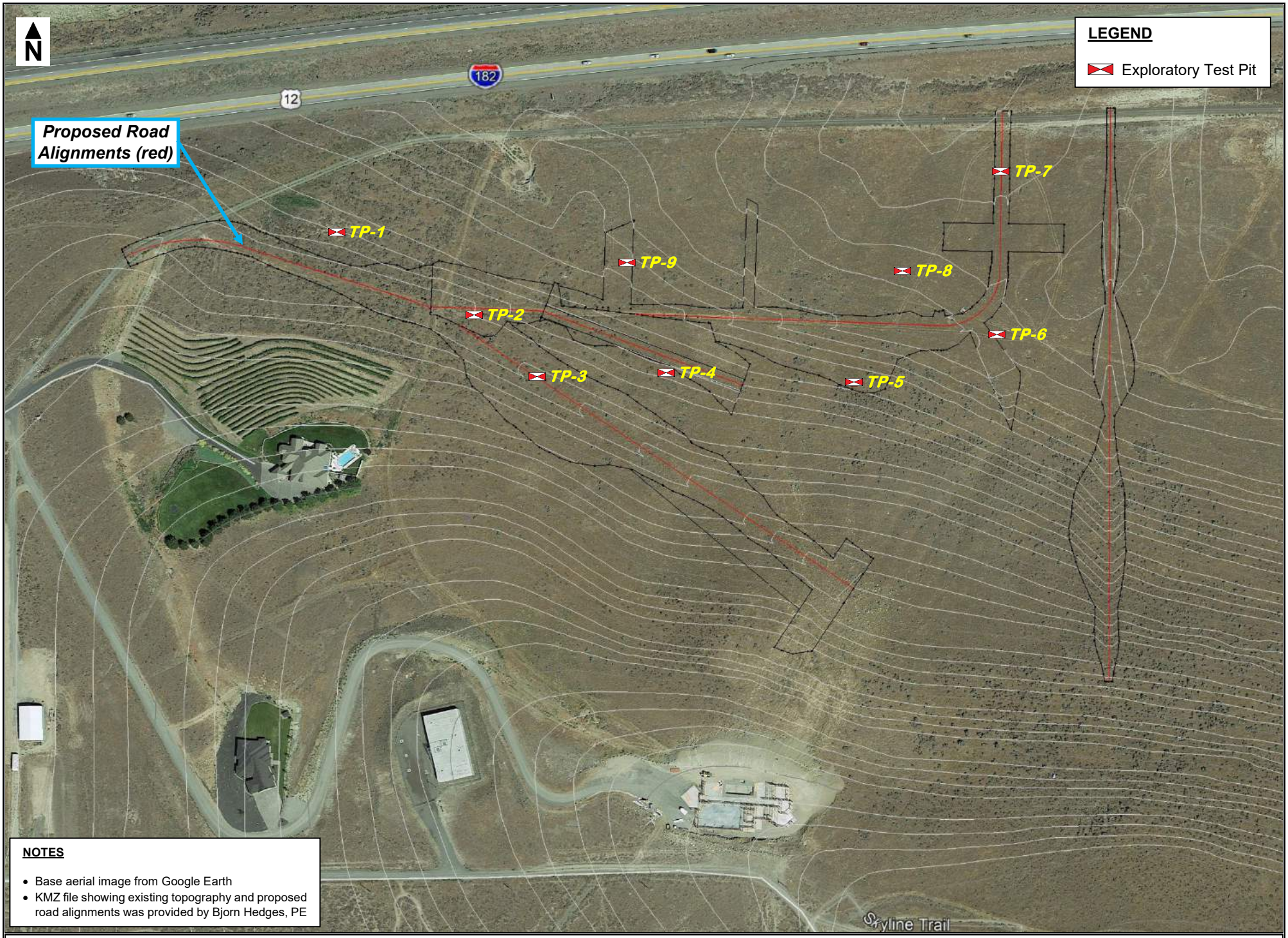


FIGURE 2: SITE EXPLORATION MAP **PROJECT NO. 221-1393**

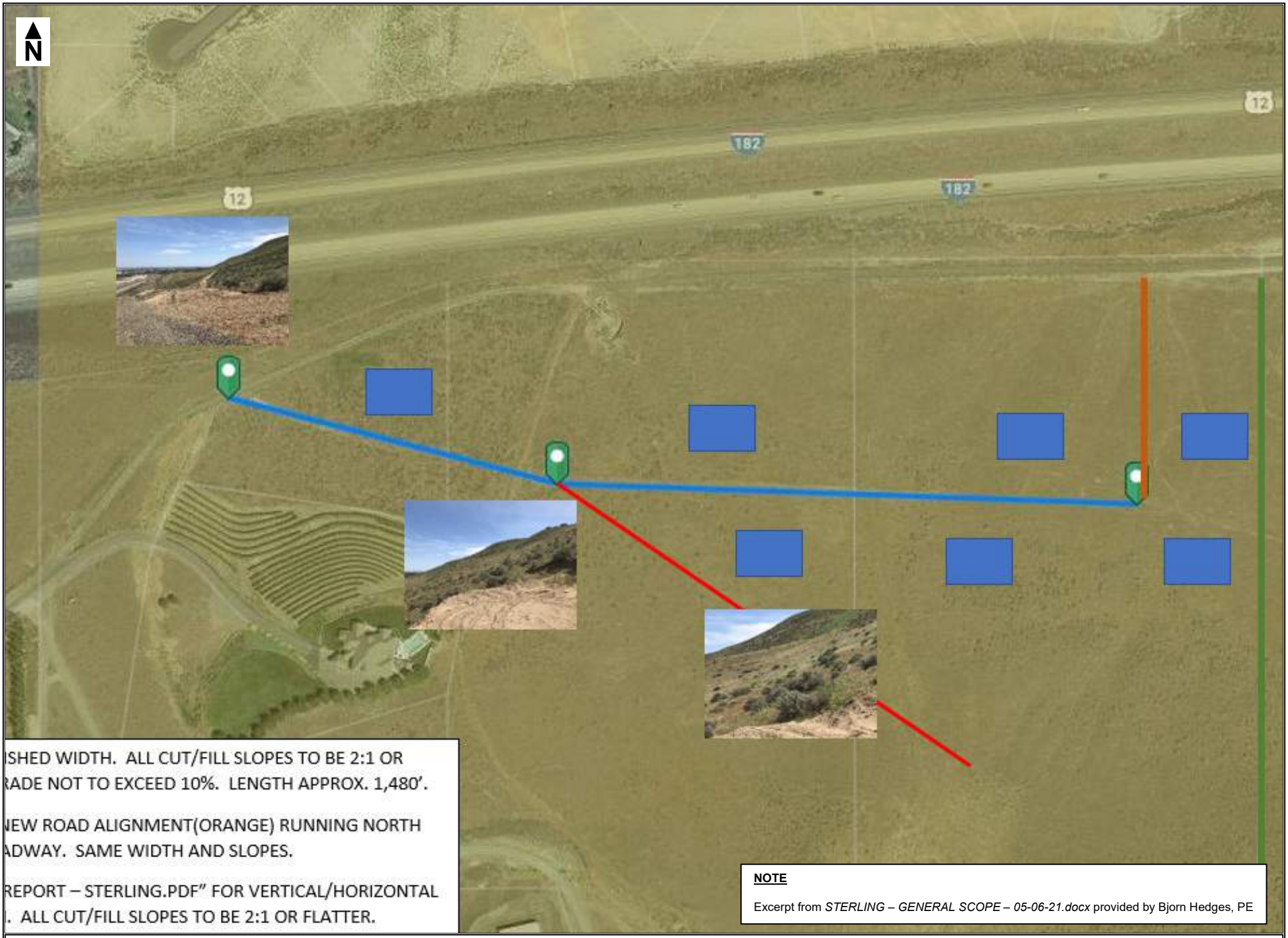
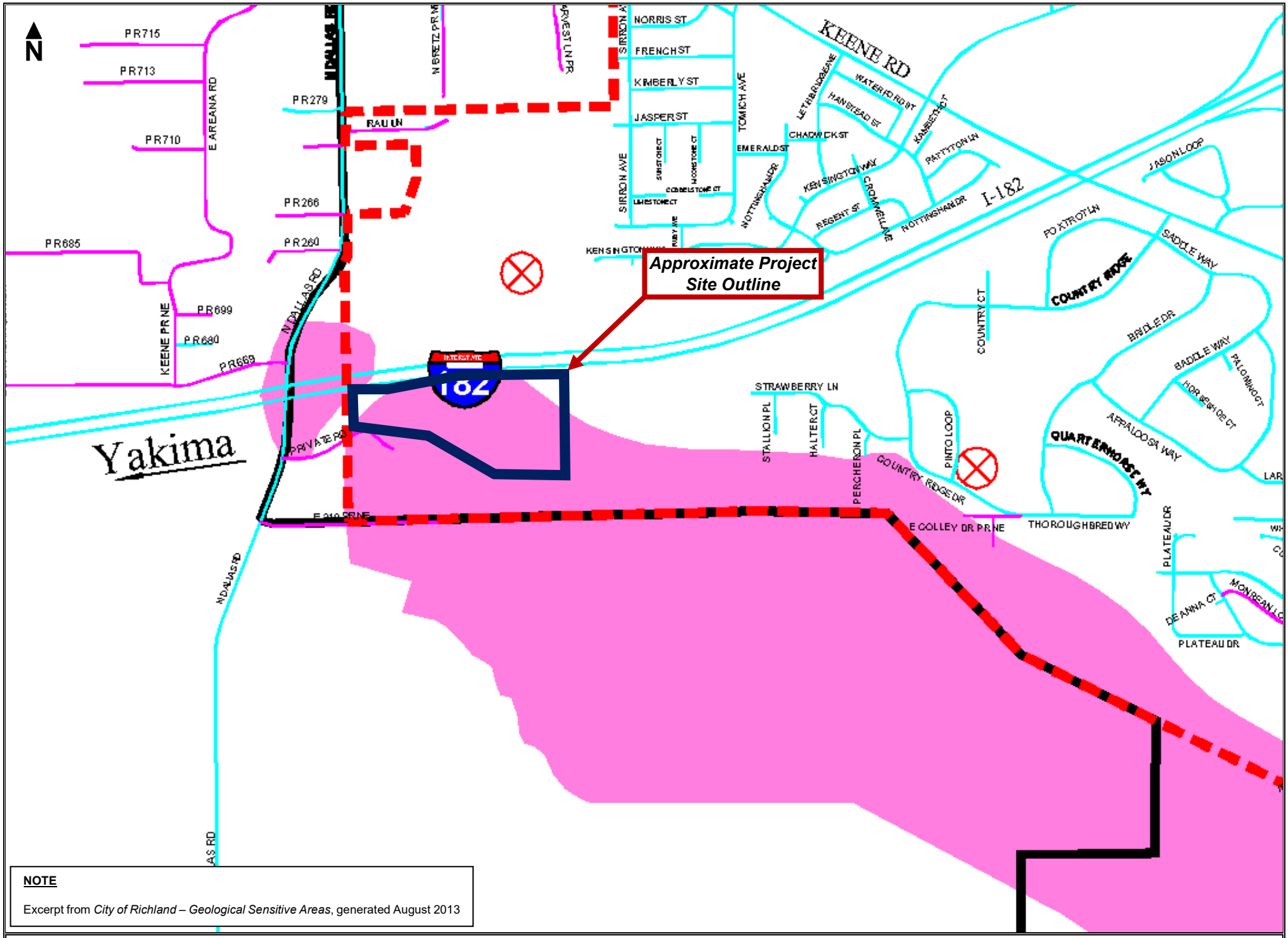


FIGURE 3: SITE MAP **PROJECT NO. 221-1393**



NOTE

Excerpt from *City of Richland – Geological Sensitive Areas*, generated August 2013

FIGURE 4: GEOLOGICAL SENSITIVE AREAS MAP **PROJECT NO. 221-1393**

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 Jim Sterling
PROJECT NAME Sterling Property
PROJECT NUMBER 221-1393
PROJECT LOCATION Richland, WA
DATE STARTED 6/23/21 **COMPLETED** 6/23/21
GROUND ELEVATION 811 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD Wacker Neusom Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.245537°, -119.340022°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SILT, (ML) tan, dry, appears loose
2.5				
5.0				
6.0				805.0

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

Bottom of test pit at 6.0 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 Jim Sterling
PROJECT NAME Sterling Property
PROJECT NUMBER 221-1393
PROJECT LOCATION Richland, WA
DATE STARTED 6/23/21 **COMPLETED** 6/23/21
GROUND ELEVATION 823 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD Wacker Neusom Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.245133°, -119.339069°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					SILT WITH SAND, (ML) light brown, dry, appears medium dense
2.5			ML		- becomes brown, moist
5.0	GB	MC = 11% Fines = 77%			5.0 818.0

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

Bottom of test pit at 5.0 feet.

GN Northern, Inc.
722 N. 16th Avenue Suite 31
Yakima, Washington 98902
Telephone: (509) 248-9798
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TEST PIT NUMBER TP-3

CLIENT Jim Sterling
PROJECT NAME Sterling Property
PROJECT NUMBER 221-1393
PROJECT LOCATION Richland, WA
DATE STARTED 6/23/21 **COMPLETED** 6/23/21
GROUND ELEVATION 842 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD Wacker Neusom Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.244835°, -119.338605°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0		ML		SILT WITH SAND, (ML) light brown, dry to damp, appears loose
2.5				
5.0				5.0 837.0

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

Bottom of test pit at 5.0 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 Jim Sterling
PROJECT NAME Sterling Property
PROJECT NUMBER 221-1393
PROJECT LOCATION Richland, WA
DATE STARTED 6/23/21 **COMPLETED** 6/23/21
GROUND ELEVATION 817 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD Wacker Neusom Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.244850°, -119.337707°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				SILT, (ML) light brown, dry to damp, appears loose
2.5		ML		- becomes medium dense
5.0				812.0

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

Bottom of test pit at 5.0 feet.

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

TEST PIT NUMBER TP-5

CLIENT Jim Sterling
PROJECT NAME Sterling Property
PROJECT NUMBER 221-1393
PROJECT LOCATION Richland, WA
DATE STARTED 6/23/21 **COMPLETED** 6/23/21
GROUND ELEVATION 781 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD Wacker Neusom Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.244803°, -119.336383°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					SILT, (ML) light brown, dry to damp, appears loose
2.5			ML		- appears medium dense
	GB	MC = 3% Fines = 85%			
5.0				5.0	776.0

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

Bottom of test pit at 5.0 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 Jim Sterling
PROJECT NAME Sterling Property
PROJECT NUMBER 221-1393
PROJECT LOCATION Richland, WA
DATE STARTED 6/23/21 **COMPLETED** 6/23/21
GROUND ELEVATION 722 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD Wacker Neusom Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.245039°, -119.335371°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				SILT WITH SAND, (ML) light brown, dry, appears loose to medium dense
2.5		ML		
5.0				5.0 717.0

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

Bottom of test pit at 5.0 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 Jim Sterling
PROJECT NAME Sterling Property
PROJECT NUMBER 221-1393
PROJECT LOCATION Richland, WA
DATE STARTED 6/23/21 **COMPLETED** 6/23/21
GROUND ELEVATION 697 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD Wacker Neusom Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.245834°, -119.335331°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					SILT, (ML) light brown, dry, appears loose to medium dense
2.5	GB	MC = 4% Fines = 85%	ML		
5.0					692.0

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

Bottom of test pit at 5.0 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 Jim Sterling
PROJECT NAME Sterling Property
PROJECT NUMBER 221-1393
PROJECT LOCATION Richland, WA
DATE STARTED 6/23/21 **COMPLETED** 6/23/21
GROUND ELEVATION 724 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD Wacker Neusom Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.245348°, -119.336032°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				SILT, (ML) light brown, dry, appears dense
2.5		ML		- appears medium dense
5.0				719.0

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

Bottom of test pit at 5.0 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 Jim Sterling
PROJECT NAME Sterling Property
PROJECT NUMBER 221-1393
PROJECT LOCATION Richland, WA
DATE STARTED 6/23/21 **COMPLETED** 6/23/21
GROUND ELEVATION 770 ft **TEST PIT SIZE** 30 x 72 inches
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD Wacker Neusom Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY BWB **CHECKED BY** KAH
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 46.245389°, -119.337979°
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				SILT, (ML) light brown, dry, appears loose
2.5		ML		
5.0				5.0 765.0

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

Bottom of test pit at 5.0 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.

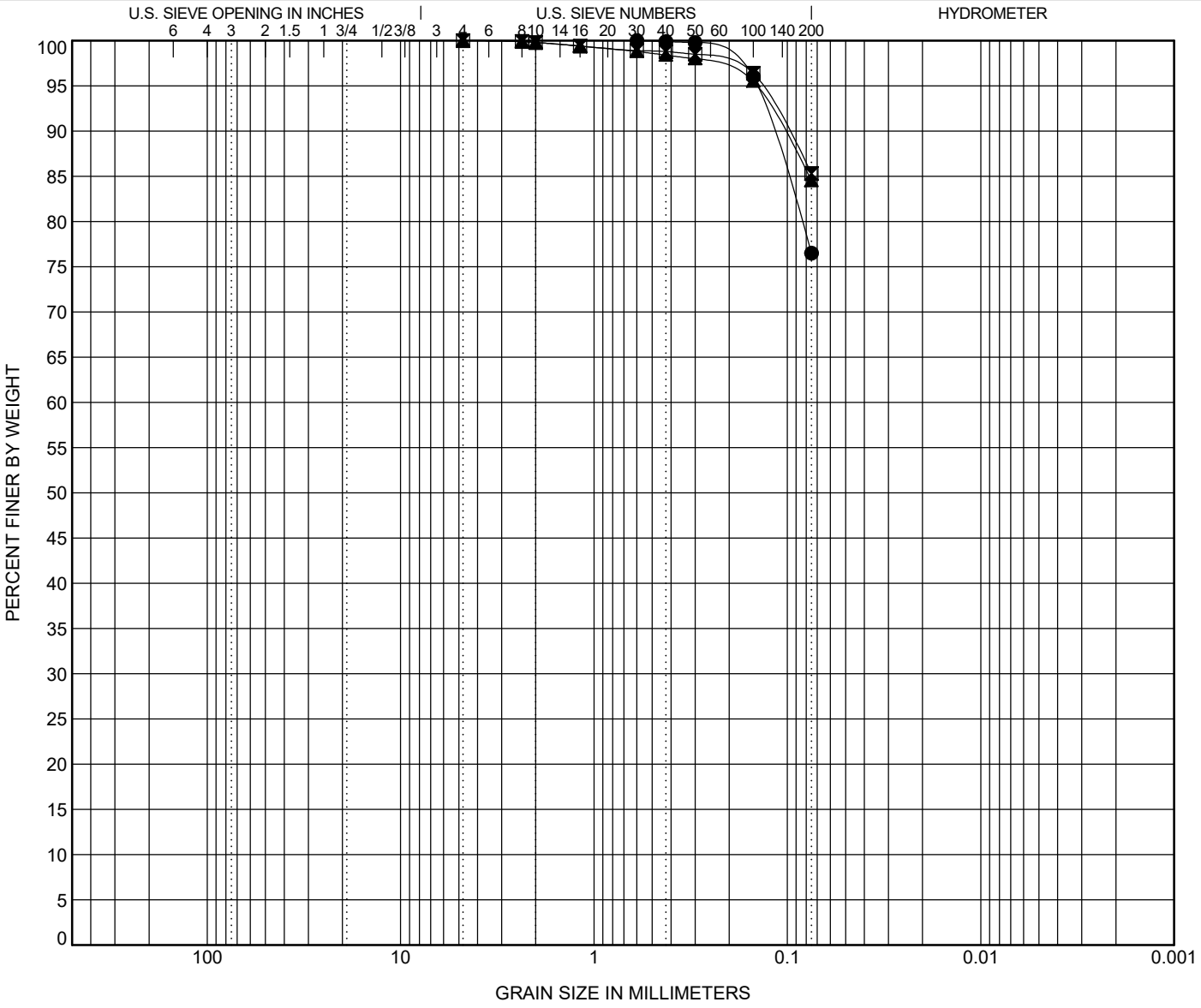
Appendix III
Laboratory Testing Results

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

GRAIN SIZE DISTRIBUTION

CLIENT Jim Sterling **PROJECT NAME** Sterling Property

PROJECT NUMBER 221-1393 **PROJECT LOCATION** Richland, WA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	TEST PIT	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**TP-2**	**5.0**	**SILT WITH SAND (ML)**					
⊠	**TP-5**	**4.0**	**SILT (ML) / SILT WITH SAND (ML)**					
▲	**TP-7**	**2.0**	**SILT WITH SAND (ML)**					

	TEST PIT	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-2**	**5.0**	**0.6**				**0.0**	**23.5**	**76.5**	
⊠	**TP-5**	**4.0**	**4.75**				**0.0**	**14.7**	**85.3**	
▲	**TP-7**	**2.0**	**4.75**				**0.0**	**15.5**	**84.5**	

Appendix IV
Site & Exploration Photographs

View of site conditions looking NW along south road alignment

View of site conditions looking SE along south road alignment

View of site conditions looking east from middle of south road

Excavation of test pit TP-3 looking NW

Excavation of test pit TP-6

Excavation of test pit TP-7 looking west

PLATE 1: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 221-1393**

Excavation of test pit TP-1

Excavation of test pit TP-2

Excavation of test pit TP-4

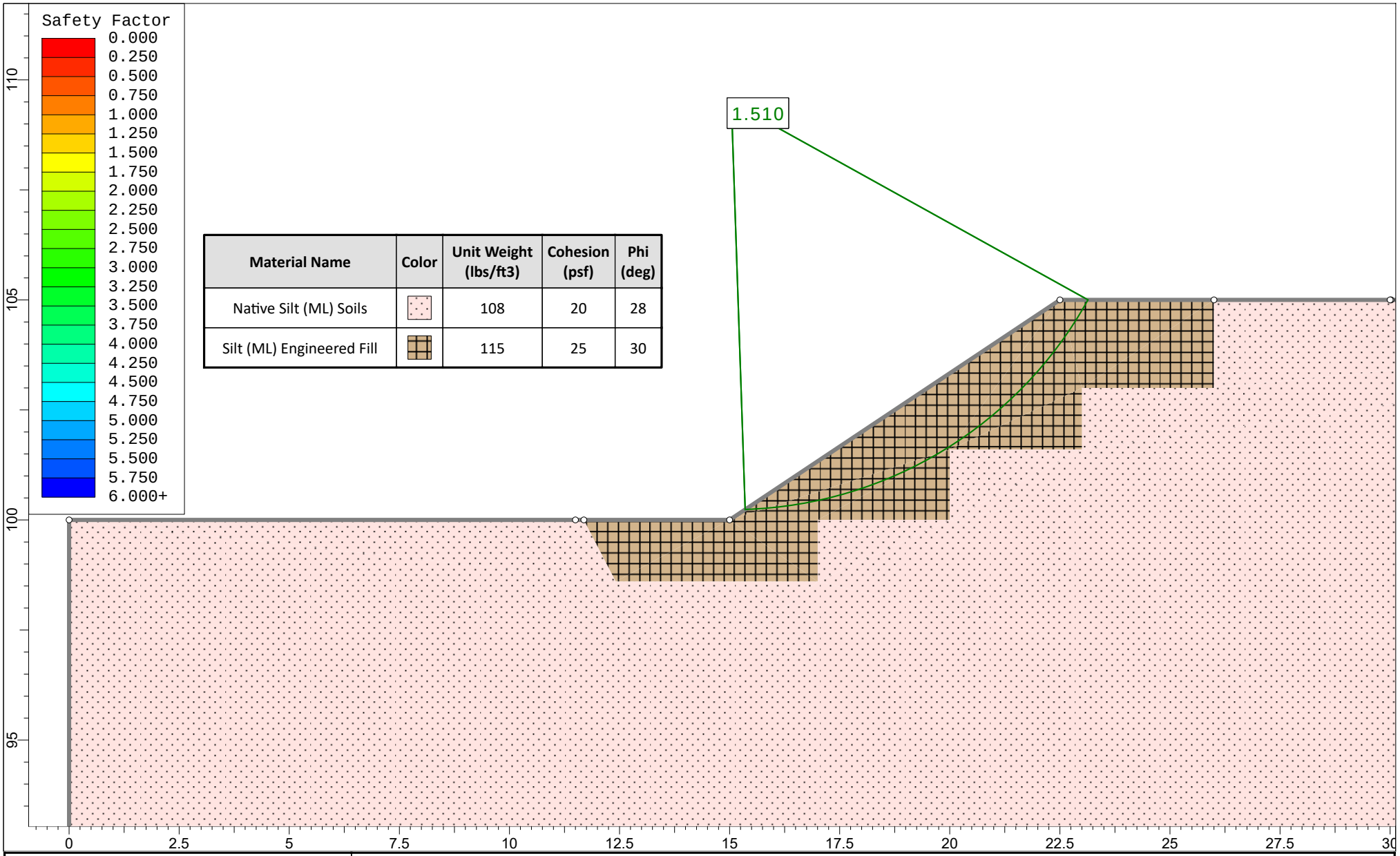
Excavation of test pit TP-5 looking west

Excavation of test pit TP-8 looking north

Excavation of test pit TP-9 looking southwest

PLATE 2: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 221-1393**

Appendix V
Slope Stability Analyses

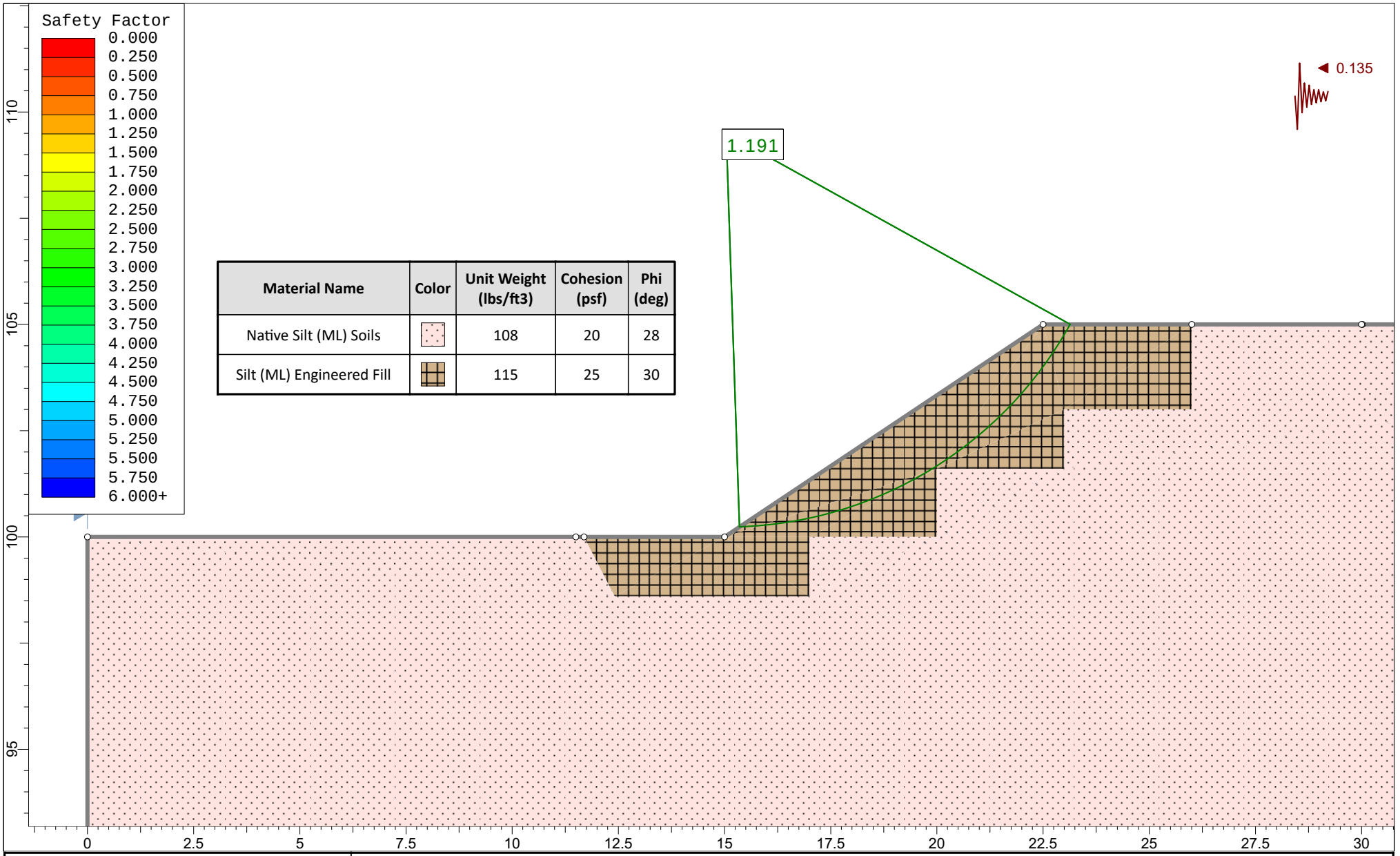


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Native Silt (ML) Soils		108	20	28
Silt (ML) Engineered Fill		115	25	30

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

SLIDEINTERPRET 7.038

Project	Sterling Richland		
Analysis Description	5' Tall Generic 1.5H:1V Engineered Slope - Static		
Drawn By	KAH	Scale 1:36	Company GN Northern
Date	7/8/2021, 4:27:46 PM		File Name 5 ft tall 1.5H to 1V Generic Engineered Slope.slim

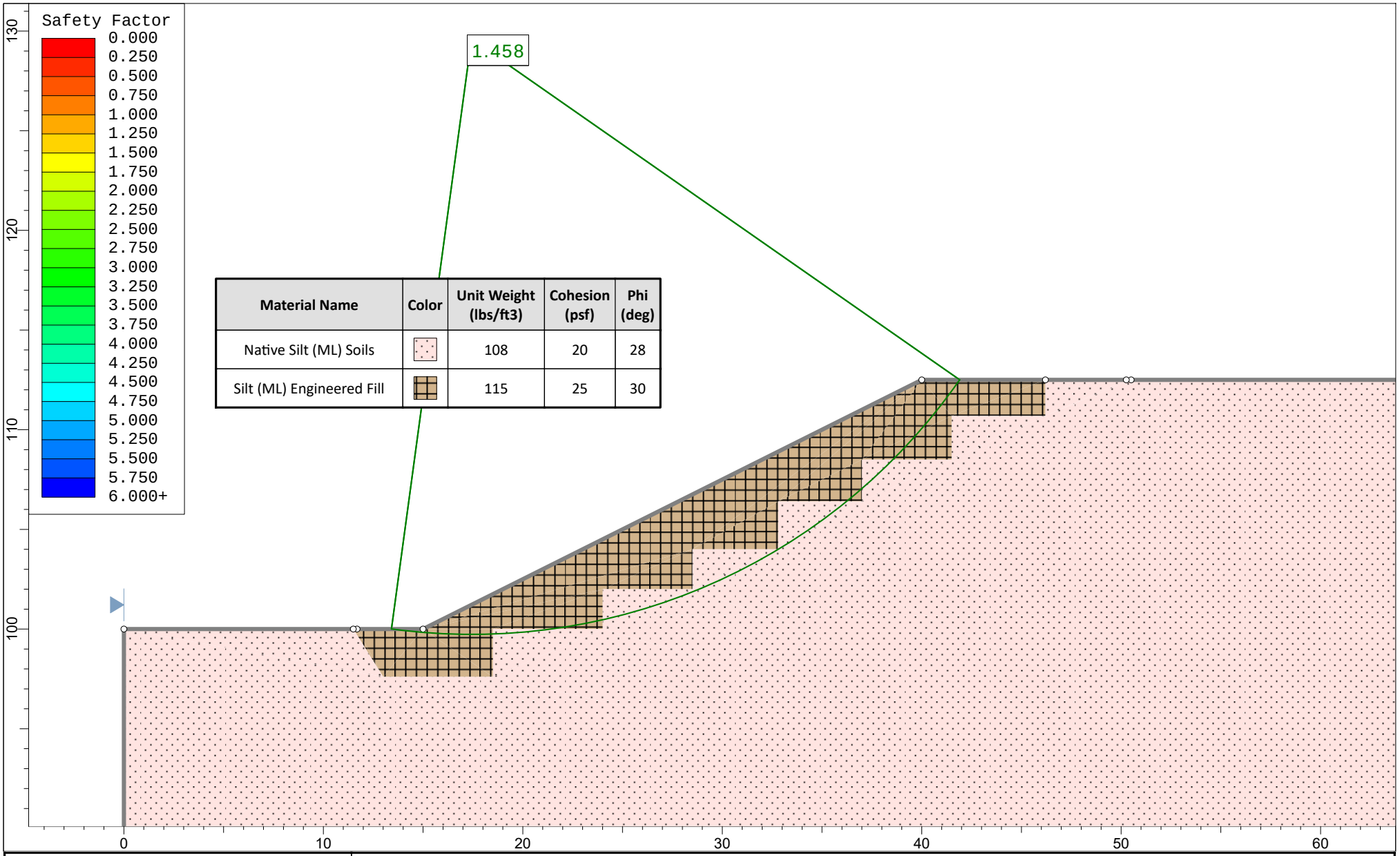


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Native Silt (ML) Soils		108	20	28
Silt (ML) Engineered Fill		115	25	30

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

SLIDEINTERPRET 7.038

Project	Sterling Richland		
Analysis Description	5' Tall Generic 1.5H:1V Engineered Slope - Seismic		
Drawn By	KAH	Scale 1:37	Company GN Northern
Date	7/8/2021, 4:27:46 PM		File Name 5 ft tall 1.5H to 1V Generic Engineered Slope.slim

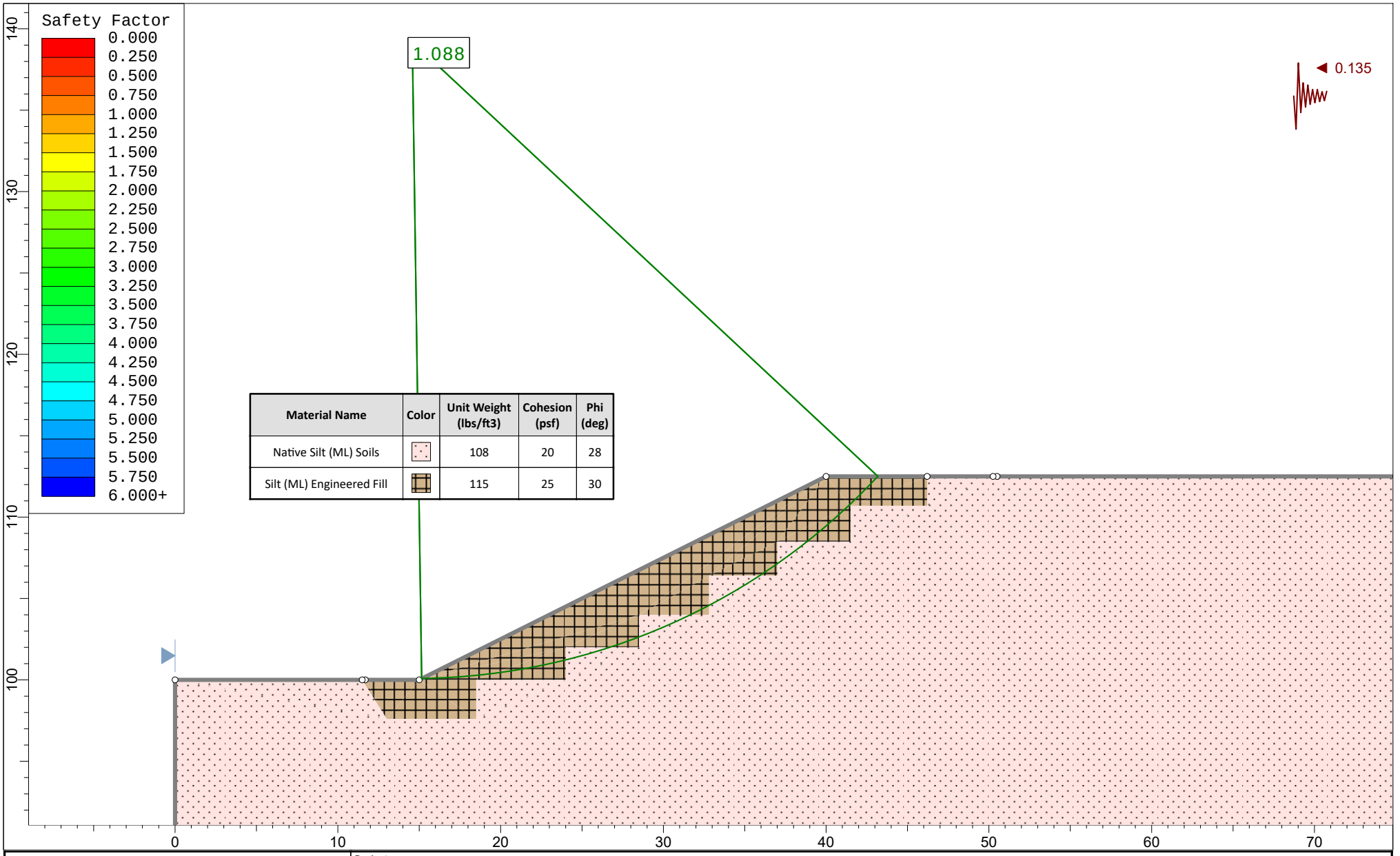


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Native Silt (ML) Soils		108	20	28
Silt (ML) Engineered Fill		115	25	30

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

SLIDEINTERPRET 7.038

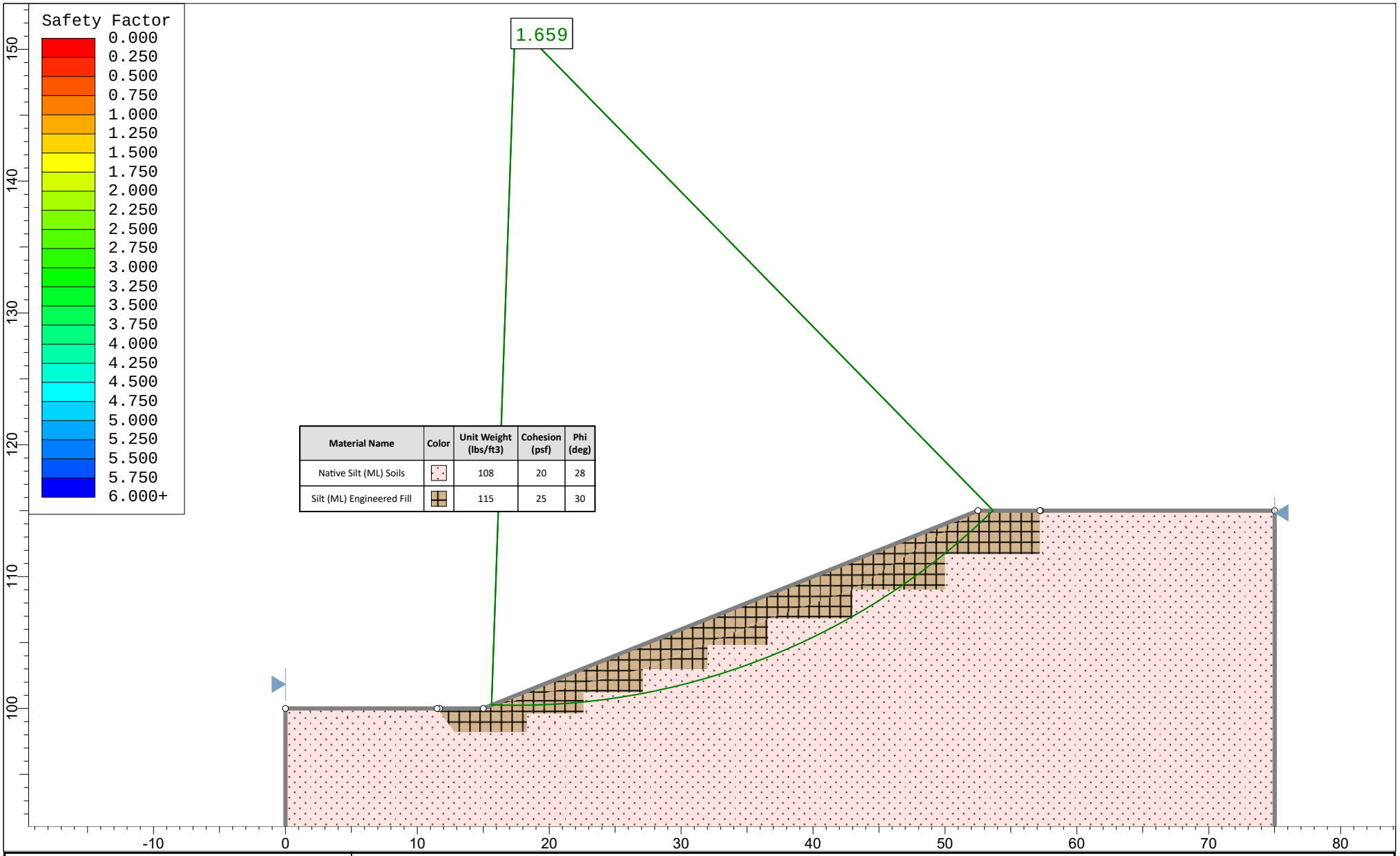
Project	Sterling Richland		
Analysis Description	12.5' Tall Generic 2H:1V Engineered Slope - Static		
Drawn By	KAH	*Scale* 1:80	*Company* GN Northern
Date	7/8/2021, 4:27:46 PM	*File Name*	12.5 ft tall 2H to 1V Generic Engineered Slope.slim



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

SLIDEINTERPRET 7.038

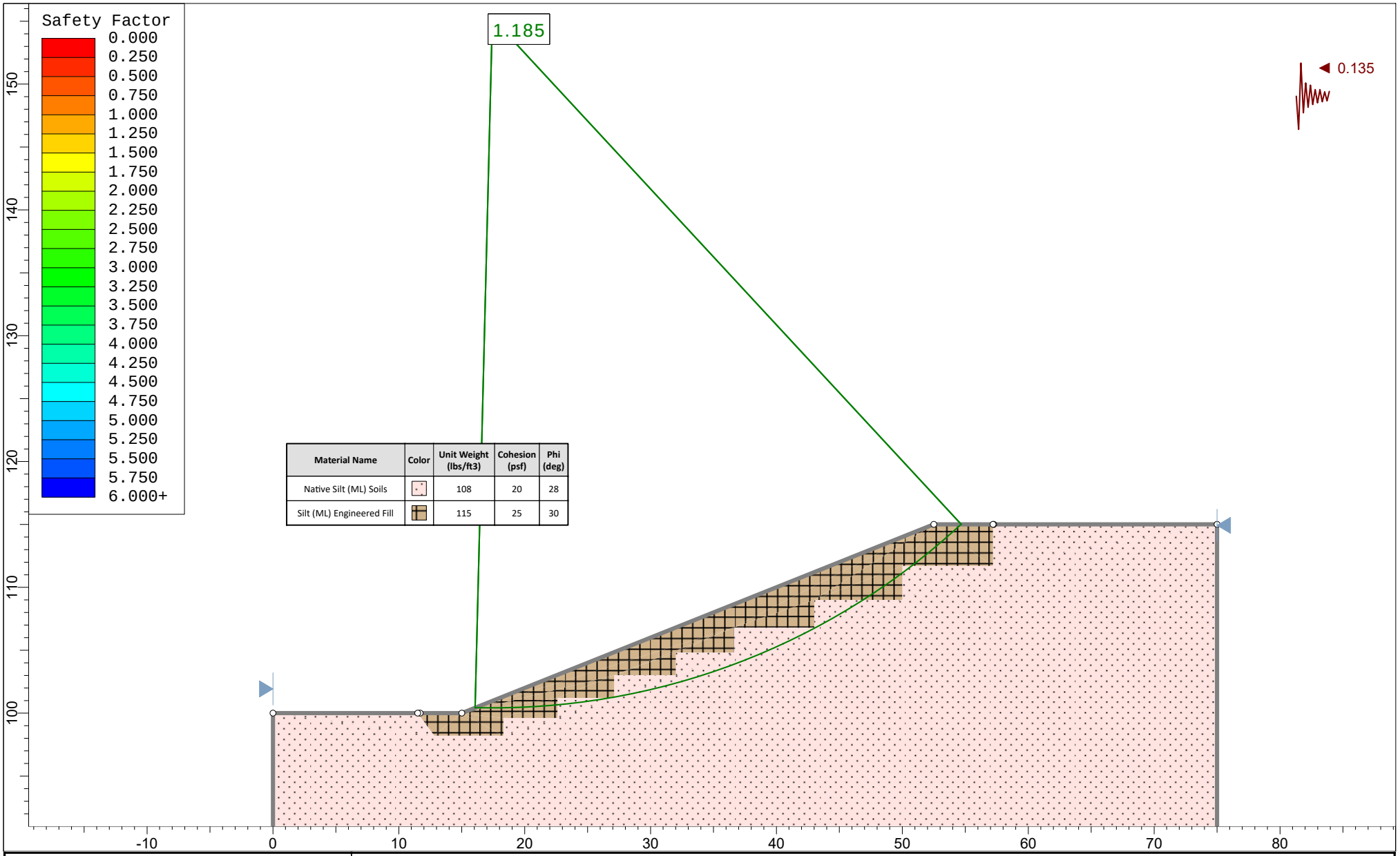
Project	Sterling Richland		
Analysis Description	12.5' Tall Generic 2H:1V Engineered Slope - Seismic		
Drawn By	KAH	*Scale* 1:98	*Company* GN Northern
Date	7/8/2021, 4:27:46 PM		*File Name* 12.5 ft tall 2H to 1V Generic Engineered Slope.slim



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

SLIDEINTERPRET 7.038

Project	Sterling Richland		
Analysis Description	15' Tall Generic 2.5H:1V Engineered Slope - Static		
Drawn By	KAH	*Scale* 1:121	*Company* GN Northern
Date	7/8/2021, 4:27:46 PM		*File Name* 15 Ft Tall 2.5 H to 1V Generic Engineered Slope.slim



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

SLIDEINTERPRET 7.038

Project	Sterling Richland		
Analysis Description	15' Tall Generic 2.5H:1V Engineered Slope - Seismic		
Drawn By	KAH	*Scale* 1:126	*Company* GN Northern
Date	7/8/2021, 4:27:46 PM		*File Name* 15 Ft Tall 2.5 H to 1V Generic Engineered Slope.slim

Appendix IV
NRCS Soil Survey

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

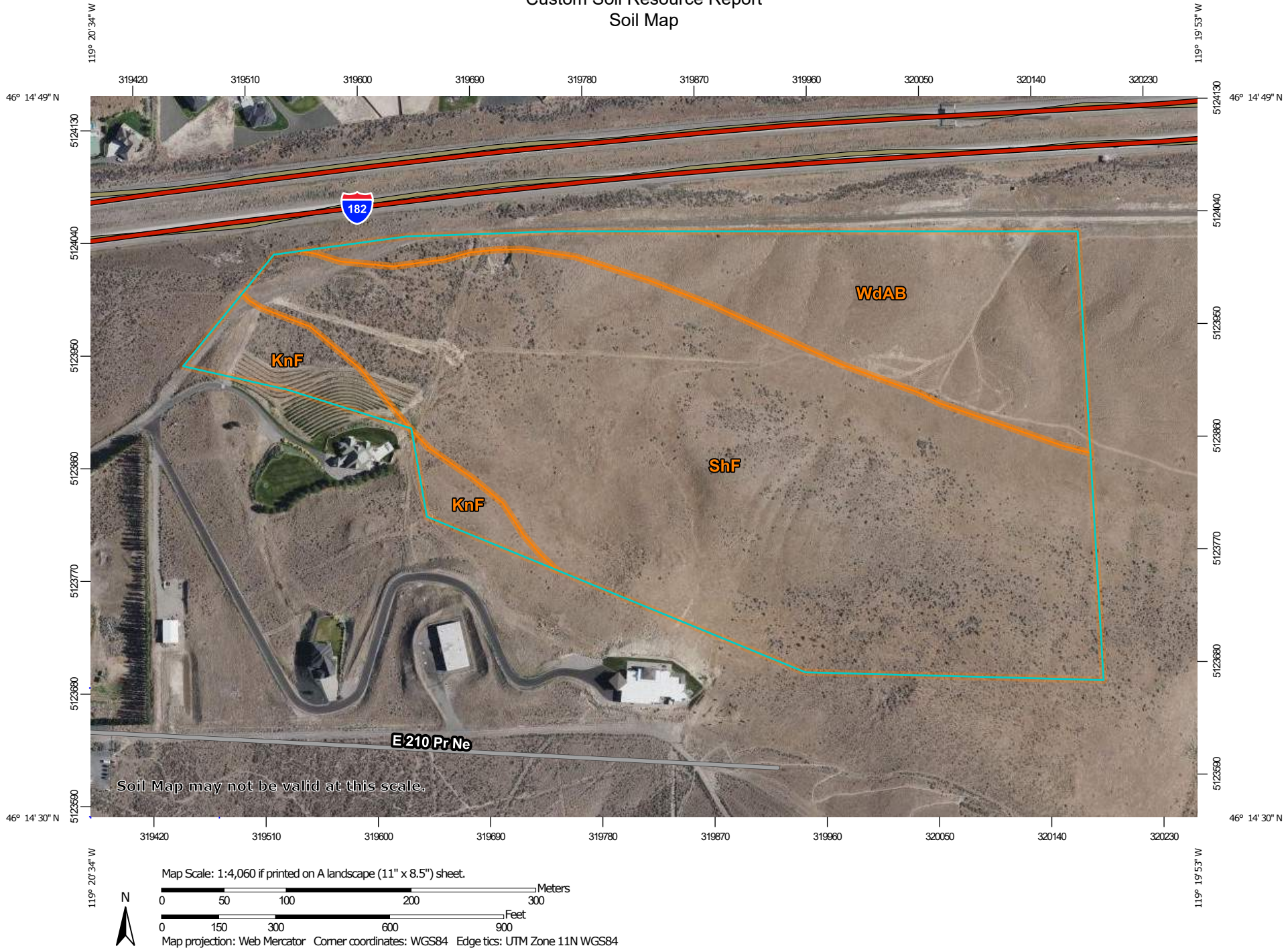
A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Benton County Area, Washington

Sterling Property, Richland, WA

July 8, 2021

Custom Soil Resource Report
Soil Map



Map Scale: 1:4,060 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

Benton County Area, Washington

KnF—Kiona very stony silt loam, 30 to 65 percent slopes

Map Unit Setting

National map unit symbol: 2bcr
Elevation: 400 to 2,500 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 140 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Kiona and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kiona

Setting

Landform: Hillslopes, plateaus, ridges
Parent material: Mixed colluvium and residuum weathered from basalt and loess

Typical profile

H1 - 0 to 4 inches: very stony silt loam
H2 - 4 to 20 inches: very stony silt loam
H3 - 20 to 60 inches: very gravelly loam

Properties and qualities

Slope: 30 to 65 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: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R007XY202WA - STONY 6-10 PZ
Hydric soil rating: No

ShF—Shano silt loam, 30 to 65 percent slopes

Map Unit Setting

National map unit symbol: 2bdx

Elevation: 500 to 2,300 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 125 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition
Shano and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Shano

Setting
Landform: Hillslopes
Parent material: Loess

Typical profile
H1 - 0 to 8 inches: silt loam
H2 - 8 to 33 inches: silt loam
H3 - 33 to 60 inches: silt loam

Properties and qualities
Slope: 30 to 65 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: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R007XY102WA - LOAMY 6-10 PZ
Hydric soil rating: No

WdAB—Warden silt loam, 0 to 5 percent slopes

Map Unit Setting
National map unit symbol: 2bfk
Elevation: 600 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 200 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Warden and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Warden

Setting

Landform: Terraces
Parent material: Loess over lacustrine deposits

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 19 inches: silt loam
H3 - 19 to 60 inches: stratified very fine sandy loam to silt loam

Properties and qualities

Slope: 0 to 5 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: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R007XY102WA - LOAMY 6-10 PZ
Hydric soil rating: No

Appendix VII
Washington Department of Ecology Well Logs

Original and First Copy with
artment of Ecology
ond Copy — Owner's Copy
ird Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. G3-010241C
Permit No.

(1) **OWNER:** Name James L Stringer Address 2334 Enterprise Richland Wa

(2) **LOCATION OF WELL:** County Benton SW ¼ SW ¼ Sec 20 T 9 N., R 28E W.M.

b. Bearing and distance from section or subdivision corner N

(3) **PROPOSED USE:** Domestic [X] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

(4) **TYPE OF WORK:** Owner's number of well (if more than one)
New well [X] Method: Dug [ ] Bored [ ]
Deepened [ ] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [X] Jetted [ ]

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 400 ft. Depth of completed well 400 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 6 " Diam. from 0 ft. to 160 ft.
Threaded [ ] " Diam. from ft. to ft.
Welded [X] " Diam. from ft. to ft.

Perforations: Yes [ ] No [X]
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes [ ] No [X] Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ] To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name Aermotor
Type: Sub H.P. 5

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 118' ft. below top of well Date 5-17-84
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [X] If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
50 gpm blown by air " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [X]

(10) **WELL LOG:**
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Topsoil	0	2
Silt	2	26
Silt + Gravel	26	56
Broken Caving Basalt	56	72
Gray Clay	72	86
Yellow Clay	86	155
Brown Basalt	155	190
Black Basalt	190	252
Blue Shale	252	283
Black Basalt	283	360
Brown Volcanic Rock	360	405

JUN - 6 1984
DEPARTMENT OF ECOLOGY
CENTRAL REGION

Work started 4-27 19 84 Completed 5-17 19 84

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Lindsay Water Systems
(Person, firm, or corporation) (Type or print)
Address 4300 North 108 Pasco
[Signed] Jim Smith (Well Driller)
License No. 552 Date 6-1 19 84

(USE ADDITIONAL SHEETS IF NECESSARY) X in well #4

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

FAX -

File Original with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

6952

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W109291
UNIQUE WELL I.D. # AEG-247
Water Right Permit No. _____

OWNER: Name KEVIN & Loci HOPE Address 1730 South Dayton Place

(2) LOCATION OF WELL: County Benton SE 1/4 SE 1/4 Sec 20 T 9 N.R. 28 WM

(2a) STREET ADDRESS OF WELL: (or nearest address) _____

TAX PARCEL NO.: _____

R

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
☒ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission
Method: ☐ Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 490 feet. Depth of completed well 460 ft.

(6) CONSTRUCTION DETAILS
Casing Installed:
☒ Welded 6 " Diam. from +1 ft. to 170 ft.
☒ Liner installed 4 " Diam. from -5 ft. to 460 ft.
☐ Threaded _____ " Diam. from _____ ft. to _____ ft.

Perforations: ☒ Yes ☐ No
Type of perforator used Saw
SIZE of perforations 6 in. by 1/8 in.
80 perforations from 290 ft. to 460 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location _____
Manufacturer's Name _____
Type _____ Model No. _____
Diam. _____ Slot Size _____ from _____ ft. to _____ ft.
Diam. _____ Slot Size _____ from _____ ft. to _____ ft.

Gravel/Filter packed: ☒ Yes ☐ No ☐ Size of gravel/sand 3/8 -
Material placed from 490 ft. to 460 ft.

Surface seal: ☒ Yes ☐ No To what depth? 40 ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

(7) PUMP: Manufacturer's Name _____
Type: _____ H.P. _____

(8) WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 285 ft. below top of well Date _____
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 70 gal./min. with 460 ft. drawdown after 4 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? ☐ Yes ☐ No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
Ash Brown Sand	0	31
Brown clay	31	160
Brown Basalt	160	180
Gray Basalt	180	230
Brown Basalt	230	245
Brown sand	245	260
Brown clay	260	273
Gray Basalt	273	431
Brown fractured Basalt Bearing Water	431	441
Gray Basalt Blue shale	441	453
Gray Basalt + Green sand	453	490

RECEIVED DEPT. OF ECOLOGY SEP 17 1999 REGIONAL OFFICE

Work Started 6/9/99 _____ Completed 6/10/99 _____

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.

Type or Print Name Peter ESKG Company License No. 0487
(Licensed Driller/Engineer)

Trainee Name _____ License No. _____
Drilling Company St. George Drilling
(Signed) Peter ESKG License No. 0487
(Licensed Driller/Engineer)
Address 701 54th Ave, west Richland
Contractor's Registration No. KU-048-715 Date 6/13/99

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

ECY 050-1-20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

MEMORANDUM

DATE:	September 9, 2021
TO:	Bjorn Hedges 1237 Country Ridge Drive Richland, WA 99352 Bjorn.hedges@gmail.com
FROM:	Brian Bieger, Sr. Scientist/ Project Manager
PROJECT:	Sterling Project, PBS Project number 71805.000
REGARDING:	Critical Areas Assessment –Fish and Wildlife Habitat Conservation Areas

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Introduction

PBS Engineering and Environmental (PBS) was contracted by Bjorn Hedges (Client) to conduct a critical areas assessment for planned development activities within the City of Richland, WA (City). The purpose of the critical areas assessment was to identify and delineate any jurisdictional fish and wildlife habitat conservation areas (FWHCA's) within or directly adjacent to the project area as defined and regulated by the City. This assessment does not address other regulated critical areas such as geologic hazard areas, frequently flooded areas, wetlands, or critical aquifer recharge areas.

Through the course of the assessment, it was determined that the project site contains habitats that meet the current Washington Department of Fish and Wildlife (WDFW) definitions of priority habitat which would be regulated as a FWHCA by the City. In addition, although the site could be utilized by priority wildlife in the form of Townsend's ground squirrel, habitat conditions for this species are poor and evidence of ground squirrel activity was not identified. The results of the critical areas assessment are detailed below.

Background Information

A review of available existing information was completed prior to completing a site visit. This included a review of WDFW Online Priority Habitat and Species (PHS) maps, US Fish and Wildlife Service national wetland inventory (NWI) maps, Natural Resource Conservation Service (NRCS) soil maps, recent aerial photographs, and historic aerial photographs.

The site is located within the Pleistocene Lake Basin level IV ecoregion within the Columbia Plateau ecoregion. This area is characterized by level to undulating lake plain that historically contained Pleistocene lakes following flooding from glacier lakes Missoula and Columbia. This area is one of the driest climates within the Columbia Plateau with annual precipitation averaging between 7 to 10 inches. The present-day landscape is characterized by sagebrush steppe grasslands in addition to irrigated agriculture lands and to a much smaller extent, developed urban lands.

The NRCS soil maps indicates four different soil units within the project area. Warden silt loam, 0-5% slopes is mapped in the northern most portion of the site, Shano silt loam, 30-65% slopes in the southern portions of the site, Kiona very stony silt loam, 30-65% slopes in the central-west portion of the site, a Hezel loamy sand, 0-30%

slopes in the extreme west end of the site. These well-draining soils are not listed as hydric in the Benton County soil survey. The USFWS NWI maps do not show any wetlands or surface waters mapped on or adjacent to the site.

The WDFW PHS maps indicate that the entire site is mapped as shrub-steppe habitat. In addition, the area has been marked as having the potential to support Townsend's ground squirrel (*Urocitellus townsendii townsendii*). The WDFW PHS report is attached to this assessment.

Following the background investigation, a site visit was completed on July 28, 2021 by PBS Senior Scientist Brian Bieger to evaluate and document the conditions of the project site. Mr. Bieger has a bachelors of science in wildlife science and over 19 years of professional experience in natural resource assessments. Surveys of the property were conducted on foot and in vehicle when appropriate. Notes on dominant vegetation, notable topographic features, potential habitat features such as burrows or cliffs, and evidence of wildlife usage or presence were investigated. A DJI Mavic Air 2 drone was utilized to capture both images and video to aid in the documentation of existing conditions and to map vegetation. The geotagged photographs were utilized to identify and map noteworthy vegetation patterns using ArcMAp software.

Existing Conditions

The approximately 50-acre project area is located west of the western terminus of Strawberry Lane and is roughly bound by Badger Mountain to the south and I-82 to the north (Figure 1). The project area comprises three separate tax lots (120983013387003,120983013533006, and 120984000006000,) and areas within 300-feet of these tax lots. It is noteworthy that the southern boundary of the development site is shared with Badger Mountain. The surrounding land uses include high-density residential areas, low density residential areas, undeveloped rangeland designated as a natural area and a high-traffic freeway.

The project area is currently undeveloped rangeland and access is gained using a gravel road that runs along the northern boundary of the properties. There is a steel gate that prevents access from the east. The topography of the site ranges from gently rolling to very steep. The southern portions of the area approach grades in excess of 1:1 (Figure 2). There is a series of undeveloped dirt roads and jeep trails that crisscross the site although these are concentrated in the central and western portions. Photographs of the site are included within the attached photo sheets. An index showing the location of each photograph and direction are provided in Figure 3.

Vegetation present on the site was classified into three separate types based on their overall degree of disturbance and potential for providing habitat value for native wildlife. The first vegetation class, which covers the largest percentage of the site was classified as heavily degraded (Figure 4). The heavily degraded areas are dominated by a dense layer of cheatgrass (*Bromus tectorum*). Other plant species in this include diffuse knapweed (*Centaurea diffusa),* and plumeless thistle *(Carduus acanthoides*). Shrub coverage within the heavily degraded areas is absent and there was no cryptogrammic crust identified anywhere within the heavily degraded areas.

The second largest vegetation class would be the marginal quality areas (Figure 4). These areas still have an understory of cheatgrass but there was higher amounts of native species and some degree of shrub coverage in the form of scattered big sagebrush (*Artemisia tridentata*) and a few, very small areas with common yarrow *(Achillea millefolium*). While almost all the areas within the marginal quality had some degree of sagebrush coverage, a small area of bunch grasses in the northern portion of the site was also included within the marginal quality vegetation overlay despite the lack of shrub coverage (Photo 11).

The last vegetation class would be the properly functioning areas. These areas still have wide swaths of invasive cheat grass but the density of sagebrush and rabbitbrush approaches what would be considered a typical density for mature shrub-steppe habitat. Other species identified within this vegetation community include cereal rye (*Secale cereale*), thick spike wheatgrass (*Elymus lanceolatus*), Russian thistle (*Kali tragus*), common yarrow, and rush skelton (*Chondrilaa juncea*). A defining feature within portions of the properly functioning overlay was the existence of an intact cryptogrammic crust (Photo 12).

Evidence of wildlife usage was extremely scarce. There was a small borrow area with vertical soils that have likely been excavated by cliff swallows (Photo 6). No ground burrows indicative of Townsend's ground squirrels usage were identified. It should be noted that observations of active Townsend's ground squirrels was unlikely as they go into estivation (hibernation) when plants dry up in the summer and do not become active again until spring. No plant species listed as threatened or endangered by the State of Washington Natural Heritage Program were identified.

WDFW Priority Wildlife Habitat and Species

Shrub-steppe Habitat
The WDFW has identified the property as containing shrub-steppe habitat. Shrub-steppe is defined as a vegetation community consisting of one or more layers of perennial grass with a discontinuous overstory layer of shrubs. In the Mid-Columbia Region, intact shrub-steppeis dominated by perennial grasses that include bluebunch wheatgrass, Sandberg's bluegrass, Idaho fescue, needle and thread grass, and Thurber's needlegrass Big sagebrush is the dominant shrub with lesser amounts of rabbitbrush, greasewood, hopsage, bitterbrush and buckwheat (WDFW 2013). One of the defining characteristics of the shrub-steppe community is the presence of a soil surface layer of cryptobiotic crust comprised of blue-green algae, bacteria, fungi, lichens and mosses. Much of the original shrub-steppe in the Tri-Cities area has been converted to agriculture or development (Azerrad,et.al, 2001). Grazing and other disturbance on the remaining shrub-steppe in the region has resulted in a dramatic reduction in perennial bunchgrasses and native forbs with a corresponding increase in the non-native annual cheatgrass. Shrub-steppe habitat is an important habitat component for a wide variety of wildlife species and is therefore a conservation priority for the WDFW.

Regardless of the fact that a large portion of the site does not contain shrubs that are indicative of shrub-steppe habitat, previous experience with the WDFW in the area dictates that the entire site would be considered shrub-steppe habitat. The absence of shrubs within swaths of habitat on the property is likely due to fires and the shrub-steppe is in a stage of recovery. Left to its own devices, shrubs would eventually become established on the site. This process can take years to decades, especially within the arid regions of SW Washington.

Townsend's Ground Squirrel (*Spermophilus townsendii)*
The WDFW priority species maps indicate the potential for Townsend's ground squirrel to occur within the general area. It is worthy to note that the ground squirrel habitat maps are on a township scale and detailed maps of known ground squirrel populations are considered sensitive information and therefore access is limited.

The Townsend's ground squirrel is a small burrowing ground squirrel found only in Washington State in the Columbia Basin west of the Columbia River in Klickitat, Benton, Yakima, and Kittitas counties. This species typically inhabits low elevation shrub-steppe, native grasslands, pastures, orchards, vineyards, highway margins, vacant lots, and banks of irrigation canals (WDFW 2013). Their diet is largely composed of green vegetation, with Sandberg's

bluegrass (*Poa secunda*), western tansy mustard (*Descurainia pinnata*), lupine (*Lupinus laxiflorus*) and woollypod milkvetch (*Astragalus purshii*) occurring most frequently in the diet. From March through May on the Arid Land Ecology Reserve in eastern Washington, the Townsend's ground squirrel diet was 49 percent Sandberg bluegrass, 11 percent western yarrow (*Achillea millefolium var. occidentalis),* 8 percent pinnate tansy mustard (*Descurania pinnata*) seed, 31 percent other plant species (mostly forbs), and 1 percent insects (Johnson, 1977).

Reasons for species decline include habitat fragmentation, past and current pest control programs (poisoning and shooting) where the squirrel may be an intended or unintended target, and reduction of food sources due to habitat conversion (Rodrick 1991). Habitat disturbance typically reduces forb diversity of arid landscapes, converting sites to shrub-steppe with cheatgrass and other non-native forb dominance. Cheatgrass tends to outcompete native forbs and is not a reliable food source for small wildlife such as ground squirrels.

There is small potential that Townsend's ground squirrel may be present within the project area although the site lacks suitable forage based on the predominance of non-native plants and a lack of native forage that Townsend's squirrels typically consume. There are known populations of Townsend's ground squirrel in the southern sections of the Badger Mountain Preserve (Ritter, 2021). While the project site is within the known range of this species, on the site is marginal at best. Food sources in the form of native grasses and forbs are extremely limited due to the dominance of non-palatable cheatgrass and other non-native grasses.

City of Richland Fish and Wildlife Habitat Conservation areas.

(FWHCAs are regulated by the City under Chapter 22.170 of the City of Richland Development Code (CRDC). FWHCA's are defined in 22.10.185 of the CRDC as:

1. Areas where state or federally designated endangered, threatened, and sensitive species have a primary association.
2. State priority habitats and areas associated with state priority habitats.
3. Habitats and species of local importance.
4. Habitats and species that are important to the City of Richland
5. National wildlife refuge, national park, or park or preserve designated under WAC 332-30-151
6. The Yakima River Delta area, including Lake Wallula wildlife habitat areas currently managed by the U.S. Army Corps of Engineers, the Chamna Natural Preserve, Bateman Island;
7. The Hanford Islands in the Columbia River managed by the U.S. Fish and Wildlife Service;
8. Amon Creek Natural Preserve;
9. Badger Mountain Natural Preserve;
10. Category I wetlands as defined in RMC 22.10.100;
11. State nature area preserves or natural resource conservation areas and state wildlife areas;
12. Documented habitat, other than accidental presence, of threatened or endangered species;
13. Documented habitat, other than accidental presence, of regional or national significance for migrating birds;
14. Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat;
15. Waters of the state;
16. Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity.

The shrub-steppe habitat on the site would be regulated as a FWHCA as it is mapped and recognized as a priority habitat by the WDFW.

Regulatory Requirements
Based on the background information search, on-site investigation, and best professional judgement, it was determined that the site contains WDFW priority habitat in the form of shrub-steppe habitat. Shrub-steppe is a priority habitat which is regulated as a FWHCA by the City. In addition, the Badger Mountain preserve directly south of the project site is regulated as a FWHCA.

There are currently no required buffers extending from the Badger Mountain area within the City of Richland Code. Additionally, there are no buffers from shrub-steppe FWHCAs within the City's code. Impacts to FWHCA should be avoided if possible and development plans should seek to leave the highest quality habitats intact. The different qualities of shrub-steppe habitat on the site are presented in Figure 4 and should serve as a general guide for future planning activities.

Management Recommendations
Preservation of natural areas must be weighed against private property rights in addition to the ever expanding populations and need for housing and other attendant developments. Given that the property contains a variety of different quality of habitats, development should be focused within those areas of marginal or degraded habitat. Mitigation for these impacts can take the form of dedicating or setting aside better quality habitats within conservation covenants running with the land which will protect these areas in perpetuity and allow them to recovery.

Summary
PBS was hired to complete a critical areas assessment for the Sterling properties located withing the City of Richland. The site was identified as having the potential for providing habitat for Townsend's ground squirrels in addition to meeting the WDFW definition of shrub-steppe habitat.

Through the course of this assessment, it was determined that the study area is not likely being utilized by priority wildlife species. The site would be regulated as a FWHCA under the City's ordinance as it meets the definition of shrub-steppe habitat. The shrub-steppe habitat on the site varies from properly functioning to heavily degraded. Future development activities on the site should be located within those areas identified as having minimal shrub-steppe habitat value. Impacts to shrub-steppe habitat could be mitigated through enhancement or preservation of remaining, higher quality habitats on the site.

If you have any questions or comments, please feel free to contact me at your convenience.

Sincerely,

Brian Bieger
PBS Senior Scientist /Project Manager

Literature cited:

Azerrad, J. M., K. A. Divens, M. F. Livingston, M. S. Teske, H. L. Ferguson, and J. L. Davis. 2011. *Management recommendations for Washington's priority habitats: managing shrub-steppe in developing landscapes*. Washington Department of Fish and Wildlife, Olympia, Washington.

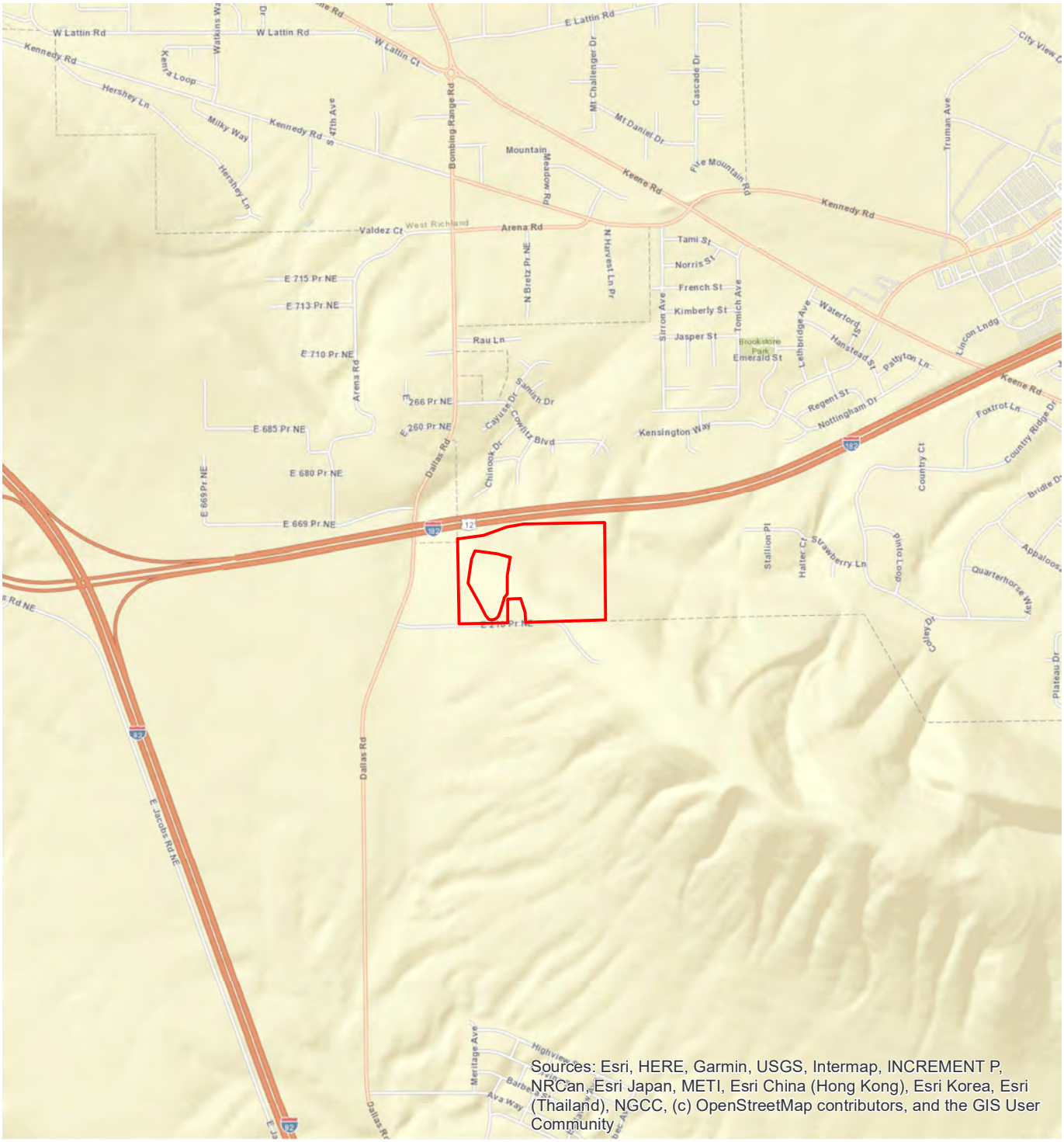
Johnson, Mark K. 1977. Food of Townsend ground squirrels on the Arid Land Ecology Reserve (Washington). The Great Basin Naturalist. 37: 128. [26157]

Ritter, Michael. 2021. Email communication between WDFW habitat Biologist Michael Ritter and Brian Bieger. July 2021.

Rodrick,E., and R. Milner, eds. . 1991. Management Recommendations for Washington's Priority Habitats and Species. Washington Department of Fish and Wildlife, Olympia. 206 pp. Available Online at: https://wdfw.wa.gov/publications/00032.

Washington Department of Fish and Wildlife. 2013. *Threatened and Endangered Wildlife in Washington: 2012 Annual Report*. Listing and Recovery Section, Wildlife Program, Washington Department of Fish and Wildlife, Olympia. 251 pp. Available Online at: https://wdfw.wa.gov/conservation/endangered/species/burrowing_owl.pdf Accessed July 20, 2019.

Attachment(s): *Figures 1, 2, 3, and 4, Photo Sheet 1, WDFW Priority Habitat Map*



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

ESRI Open Source Street Maps.

Legend

Project Area

SCALE: 1" = 2,000'

0' 1000' 2,000' 4000'

PREPARED FOR: BJORN HEDGES

LOCATION MAP

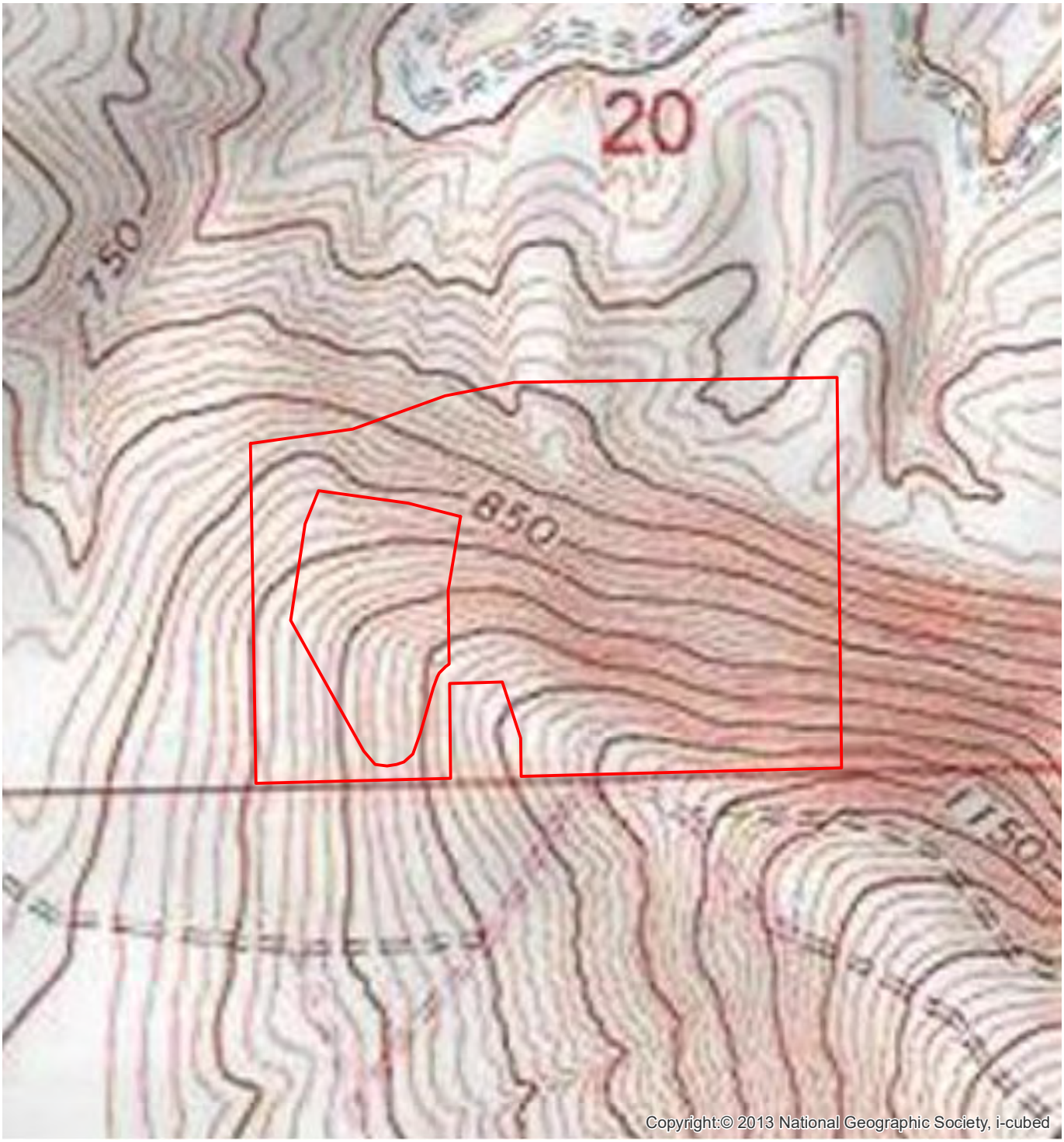
STERLING CRITICAL AREAS ASSESSMENT

CITY OF RICHLAND, WASHINGTON

SEPT 2021
71805.000

FIGURE
1

Filename: L:\Projects\71000\71805\71805-000\NR\GIS\bjorn.mxd Plot Date/Time: 9/9/2021 10:31:54 AM



USGS Topographic Map Server.

Legend

Project Area

SCALE: 1" = 500'

0' 250' 500' 1000'

PREPARED FOR: BJORN HEDGES

TOPOGRAPHIC MAP

STERLING CRITICAL AREAS ASSESSMENT

CITY OF RICHLAND, WASHINGTON

SEPT 2021
71805.000

FIGURE
2

Filename: L:\Projects\71000\71805\71805-000\NR\GIS\bjorn.mxd Plot Date/Time: 9/9/2021 10:32:25 AM

ESRI Open Source Street Maps.

Legend

- Project Area
- PHOTO POINTS

SCALE: 1" = 400'

0' 200' 400' 800'

PREPARED FOR: BJORN HEDGES

PHOTOGRAPH LOCATIONS

STERLING CRITICAL AREAS ASSESSMENT

CITY OF RICHLAND, WASHINGTON

SEPT 2021
71805.000

FIGURE
3

Filename: L:\Projects\71000\71805\71805-000\NR\GIS\bjorn.mxd Plot Date/Time: 9/9/2021 5:00:11 PM

NAID Aerial Photograph .

Legend

- Project Area
- Properly Functioning Quality
- Marginal Quality
- Heavily Degraded Quality

SCALE: 1" = 400'

0' 200' 400' 800'

PREPARED FOR: BJORN HEDGES

PBS

HABITAT CONDITIONS

STERLING CRITICAL AREAS ASSESSMENT

CITY OF RICHLAND, WASHINGTON

SEPT 2021
71805.000

FIGURE
4

Filename: L:\Projects\71000\71805\71805-000\NR\GIS\bjorn.mxd Plot Date/Time: 9/13/2021 10:42:32 AM

Photo 1. Facing East from western boundary

Photo 2. Facing east from western portion (note shrub coverage)

Photo 3. Central Portion, Facing east

Photo 4. Central Portion of Site, Facing West

Photo 5. Degraded conditions (Facing north)

Photo 6. Old borrow area with cliff swallow nests.

Photo 7. Overview of central/east portion of site

Photo 8. Western most portion of site and high shrub density.

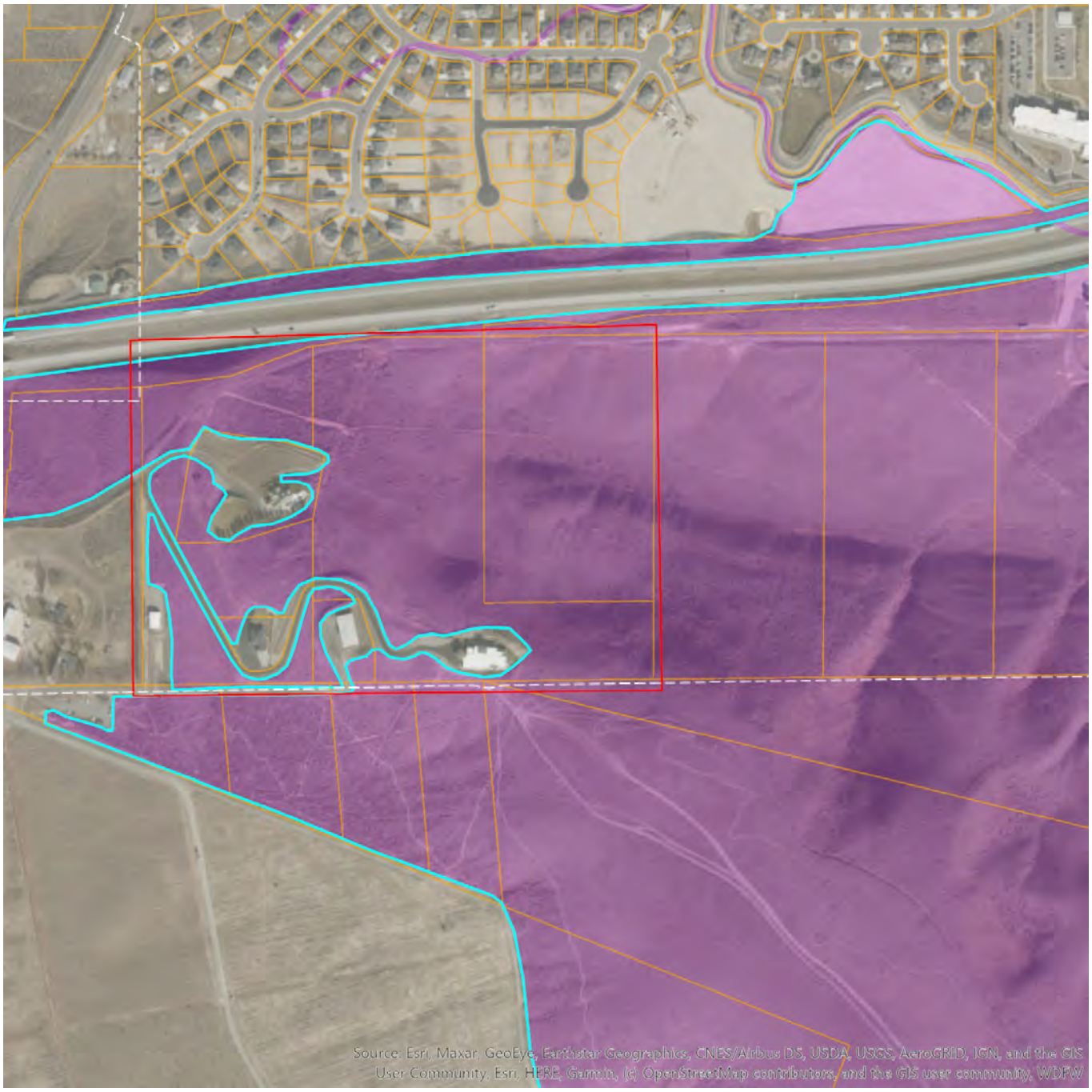
Photo 9. Central portion of site facing south/southeast

Photo 10. Central portion of site facing south

Photo 11. Bunch grasses

Photo 12. Typical vegetation in properly functioning overlay.

Priority Habitats and Species on the Web



Report Date: 08/26/2021

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Generalized Location
Shrub-steppe	N/A	N/A	No
Townsend's Ground Squirrel - townsendii	N/A	Candidate	Yes

PHS Species/Habitats Details:

Shrub-steppe	
Priority Area	Terrestrial Habitat
Site Name	BADGER MOUNTAIN-GOOSE HILLAREA
Accuracy	1/4 mile (Quarter Section)
Notes	SHRUB STEPPE HABITAT MIXED W/CLIFFS & TALUS. GOOD RANGE CONDITION-RAPTOR FEEDING AND NESTING; SAGE SPARROW; LOGGERHEAD SHRIKE
Source Record	902871
Source Dataset	PHSREGION
Source Name	FITZNER, LISA
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Polygons

Townsend's Ground Squirrel - townsendii	
Scientific Name	*Urocitellus townsendii townsendii*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	Candidate
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	Y
Display Resolution	QTR-TWP

Townsend's Ground Squirrel - townsendii	
Scientific Name	*Urocitellus townsendii townsendii*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	Candidate
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	Y
SGCN	Y
Display Resolution	QTR-TWP

surveys have not been conducted. Site specific surveys are frequently necesssary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to variation caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

MEMORANDUM

DATE:	March 31, 2022
TO:	Bjorn Hedges 1237 Country Ridge Drive Richland, WA 99352 Bjorn.hedges@gmail.com
FROM:	Brian Bieger, Sr. Scientist/ Project Manager
PROJECT:	Sterling Project, PBS Project number 71805.000
REGARDING:	Critical Areas Mitigation Plan

Introduction

PBS Engineering and Environmental (PBS) was contracted by Bjorn Hedges (Client) to complete a critical areas mitigation plan for a residential construction project. The mitigation plan addresses temporary and permanent impacts to critical areas subject to regulation by the City of Richland, WA (City). The purpose of this mitigation plan is to ensure no net loss of critical areas functions in addition to meeting the provisions of Chapter 22.10 of the City development Code (Code).

The proposed project consists of the construction of a single-family home building lot and access road. Portions of this development are within areas recognized as shrub-steppe habitat by the Washington Department of Fish and Wildlife (WDFW). Shrub-steppe habitat is listed as a priority habitat by the WDFW. The WDFW does not formally regulate development within shrub-steppe habitats, but these areas are regulated by the City as a critical area (Fish and Wildlife Habitat Conservation Area)(FWHCA). The details of the proposed project and mitigation are presented below.

Existing Conditions

The approximately 50-acre project area is located west of the western terminus of Strawberry Lane and is roughly bound by Badger Mountain to the south and I-82 to the north (Figure 1). A critical areas assessment was completed in July of 2021 by PBS Senior Scientist Brian Bieger. He found that a significant portion of the site contains shrub-steppe vegetation. The vegetation within these shrub-steppe habitats exists along a disturbance gradient from most-disturbed to least disturbed. While the WDFW does not have a formal rating system for shrub-steppe habitat, the quality of habitat is broadly recognized to decrease with higher amounts of non-native and invasive vegetation and lower amount of shrub coverage.

The vegetation present on the site was classified into three separate types based on their overall degree of disturbance and potential for providing habitat value for native wildlife. The first vegetation class, which covers the largest percentage of the site, was classified as heavily degraded. (Figure 2). The heavily degraded areas are dominated by a dense layer of cheatgrass (*Bromus tectorum*). Other plant species in this include diffuse knapweed (*Centaurea diffusa),* and plumeless thistle *(Carduus acanthoides*). Shrub coverage within the heavily degraded areas is absent and there was no cryptogrammic crust identified anywhere within the heavily degraded areas.

The second largest vegetation class would be the marginal quality areas (Figure 2). These areas still have an understory of cheatgrass but there was higher amounts of native species and some degree of shrub coverage in the form of scattered big sagebrush (*Artemisia tridentata*) and a few, very small areas with common yarrow *(Achillea millefolium*). While almost all the areas within the marginal quality had some degree of sagebrush coverage, a small area of bunch grasses in the northern portion of the site was also included within the marginal quality vegetation overlay despite the lack of shrub coverage.

The last vegetation class would be the properly functioning areas. These areas still have wide swaths of cheat grass but the density of sagebrush and rabbitbrush approaches what would be considered a typical density for mature shrub-steppe habitat. Other species identified within this vegetation community include cereal rye (*Secale cereale*), thick spike wheatgrass (*Elymus lanceolatus*), Russian thistle (*Kali tragus*), common yarrow, and rush skelton (*Chondrilaa juncea*). A defining feature within portions of the properly functioning overlay was the existence of an intact cryptogrammic crust.

City of Richland Fish and Wildlife Habitat Conservation areas.
(FWHCAs are regulated by the City under Chapter 22.170 of the City of Richland Development Code (CRDC). FWHCA's are defined in 22.10.185 of the CRDC as:

1. Areas where state or federally designated endangered, threatened, and sensitive species have a primary association.
2. State priority habitats and areas associated with state priority habitats.
3. Habitats and species of local importance.
4. Habitats and species that are important to the City of Richland
5. National wildlife refuge, national park, or park or preserve designated under WAC 332-30-151
6. The Yakima River Delta area, including Lake Wallula wildlife habitat areas currently managed by the U.S. Army Corps of Engineers, the Chamna Natural Preserve, Bateman Island;
7. The Hanford Islands in the Columbia River managed by the U.S. Fish and Wildlife Service;
8. Amon Creek Natural Preserve;
9. Badger Mountain Natural Preserve;
10. Category I wetlands as defined in RMC 22.10.100;
11. State nature area preserves or natural resource conservation areas and state wildlife areas;
12. Documented habitat, other than accidental presence, of threatened or endangered species;
13. Documented habitat, other than accidental presence, of regional or national significance for migrating birds;
14. Naturally occurring ponds under 20 acres and their submerged aquatic beds that provide fish or wildlife habitat;
15. Waters of the state;
16. Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity.

The shrub-steppe habitat on the site would be regulated as a FWHCA as it is mapped and recognized as a priority habitat by the WDFW.

Proposed Project

The proposed project involves the construction of an access road and building pad for a single family home. The access road will extend and widen an existing farm road on the site. The proposed grading plan which details the locations of the proposed work is shown in Figure 3.

Avoidance and Minimization of Impacts

The City Code requires that applicants proposing to impact critical areas impacts step through a formal process to avoid and minimize impacts to critical areas. These mitigation measures are codified in 22.10.220 of the code and are as follows:

> A. Adverse impacts to habitat functions and values shall be mitigated to the extent feasible and reasonable. Mitigation actions by an applicant or property owner shall occur in the following preferred sequence:
> 1. Avoiding the impact altogether by not taking a certain action or parts of actions;
> 2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology and engineering, or by taking affirmative steps to avoid or reduce adverse impacts;
> 3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
> 4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
> 5. Compensating for the impact by replacing, enhancing, or providing similar substitute resources or environments. Preference shall be given to measures that replace the impacted functions on site or in the immediate vicinity of the impact;
> 6. Monitoring the impact over time and taking corrective measures to minimize additional impacts.
> B. Where impacts cannot be avoided, the applicant or property owner shall seek to implement other appropriate mitigation actions in compliance with the intent, standards and criteria of this section. In an individual case, these actions may include consideration of alternative site plans and layouts, reductions in the density or scope of the proposal, and/or implementation of the performance standards listed in RMC 22.10.210. [Ord. 48-93; Ord. 23-01; Ord. 40-17 § 1; Ord. 40-17A § 1; Ord. 16-21 § 1].

Unfortunately, critical areas are located throughout most of the project site. The extent of shrub-steppe habitat is such that total avoidance is not feasible. The following steps have been taken to reduce unavoidable impacts to critical areas on the site.

1. Scaled down development plans. The initial project plans involved the construction of several access roads and buildable lots across the lower portions of the site (Figure 4). While impact amounts for this plan were not formally calculated, they represent a much greater degree of impact and habitat fragmentation than the current plans.

2. Location. Project plans were adjusted to limit the intensity of the required impacts. Portions of the new access road will be located within an existing access road which reduces the total amount of impacts. In addition, almost all the impacts will occur within those areas identified as marginal quality or heavily degraded.

Project Impacts

Temporary Impacts – Temporary impacts will occur during the grading of the proposed road and building pad. A total of 2.00 acres of critical areas will be impacted during the grading activities (Figure 5).

Permanent Impacts- Permanent impacts will result from the construction of the road surface, single-family home, and attendant parking areas. These impacts total 1.02 acres total (Figure 5).

Mitigation Measures

Mitigation to offset unavoidable impacts will consist of conservation of properly functioning shrub-steppe habitat.

Conversations with the WDFW took place to determine the appropriate conservation mitigation ratios. WDFW habitat biologist Michael Ritter informed us that the typical mitigation ratio is 1:1 for temporary impacts and 2:1 for permanent impacts. These mitigation ratios yield a conservation area of 4.04 acres.

The 4.04 acre conservation area consists of high quality, properly functioning shrub-steppe habitat (Figure 5). This area will be protected in perpetuity through the recording of a conservation covenant running with the land. The area is located directly adjacent to the Badger Mountain Preserve and is currently vegetated with heavy amounts of native shrubs and bunch grasses.

These mitigation measures meet the requirement of 22.10.220(a)(5). *Compensating for the impact by replacing, enhancing, or providing similar substitute resources or environments. Preference shall be given to measures that replace the impacted functions on site or in the immediate vicinity of the impact;*

The conservation covenant and legal description will be recorded with the City prior to commencement of construction activities on the site.

Summary

PBS was hired to complete a critical area mitigation plan for the proposed development of a single-family home and access road. The construction of these features would result in both temporary and permanent impacts to fish and wildlife habitat conservation areas regulated as critical areas by the City,

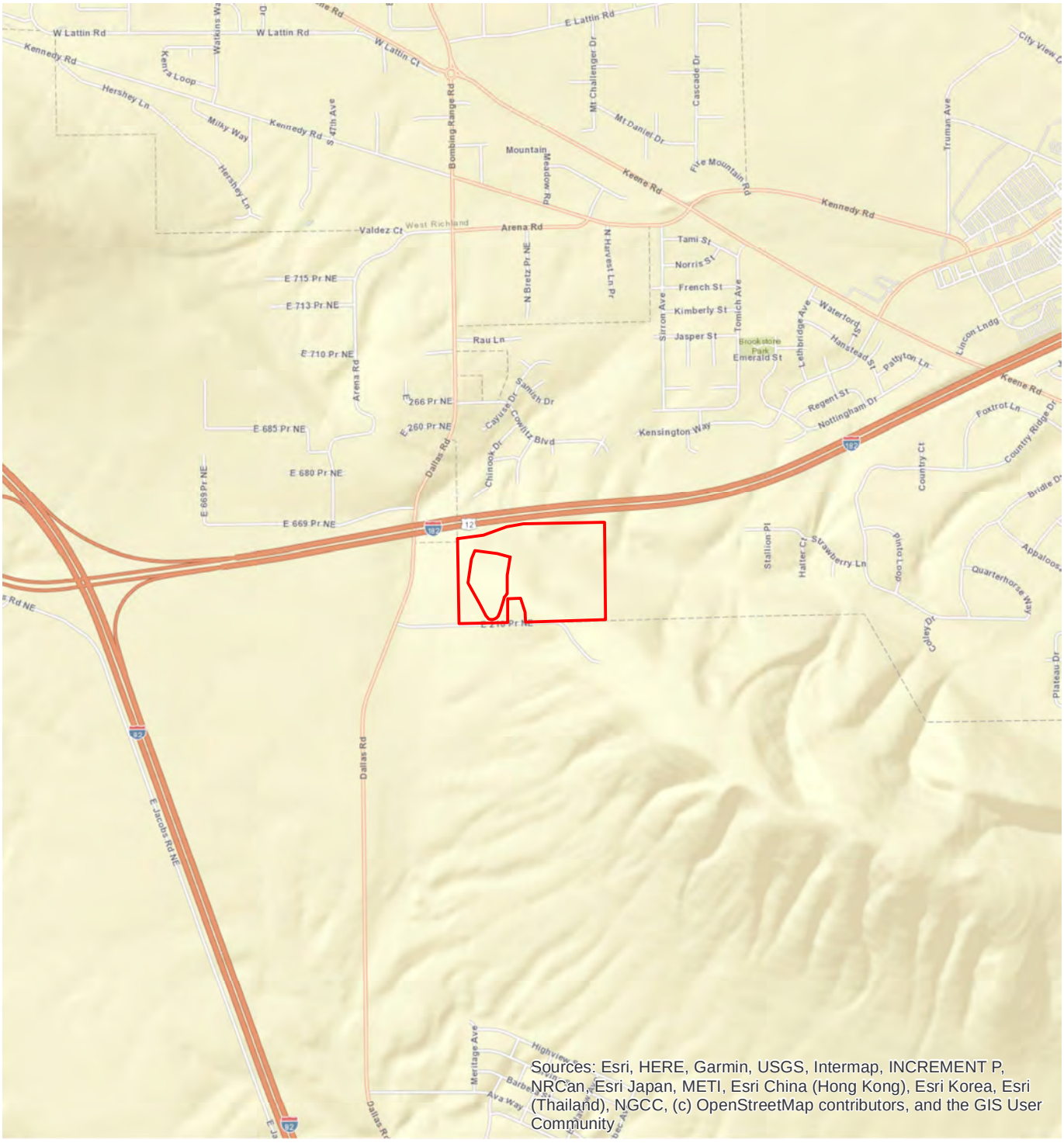
Through consultation with WDFW, it was determined that the proposed unavoidable impacts could be mitigated through the conservation of quality shrub-steppe habitat on the site at a ratio of 1:1 for temporary impacts and 2:1 for permanent impacts. The applicant has agreed to set aside 4.04 acres of shrub-steppe habitat into a conservation covenant that will protect these areas in perpetuity.

If you have any questions or comments, please feel free to contact me at your convenience.

Sincerely,

Brian Bieger
PBS Senior Scientist /Project Manager

Attachment(s): *Figures 1-5*



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

ESRI Open Source Street Maps.

Legend

Project Area

SCALE: 1" = 2,000'

0' 1000' 2,000' 4000'

PREPARED FOR: BJORN HEDGES

LOCATION MAP

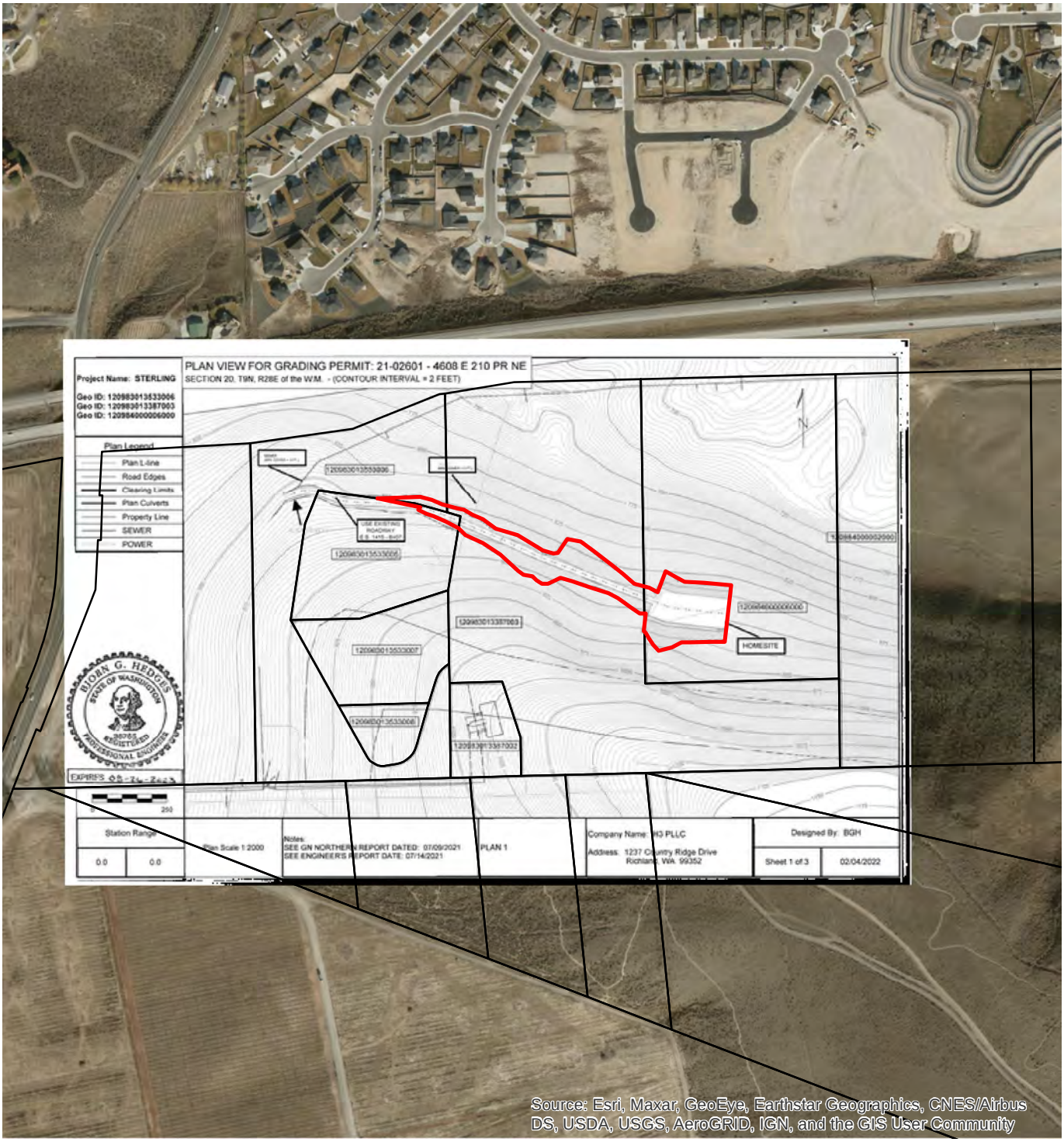
STERLING CRITICAL AREA MITIGATION PLAN

CITY OF RICHLAND, WASHINGTON

MAR 2022
71805.000

FIGURE
1

Filename: L:\Projects\71000\71805\71805-000\NR\GIS\bjorn.mxd Plot Date/Time: 3/25/2022 11:36:18 AM



USGS Topographic Map Server.

Legend

- Grading Limits
- taxlots

SCALE: 1" = 500'

0' 250' 500' 1000'

PREPARED FOR: BJORN HEDGES

PROJECT PLANS

STERLING CRITICAL AREA MITIGATION PLAN

CITY OF RICHLAND, WASHINGTON

MAR 2022
71805.000

FIGURE
2

Filename: L:\Projects\71000\71805\71805-000\NR\GIS\bjorn.mxd Plot Date/Time: 3/25/2022 9:45:22 AM

Legend

- taxlots
- Project Area
- Properly Functioning Quality
- Marginal Quality
- Heavily Degraded Quality

SCALE: 1" = 400'

0' 200' 400' 800'

PREPARED FOR: BJORN HEDGES

PBS

HABITAT CONDITIONS

STERLING CRITICAL AREA MITIGATION PLAN

CITY OF RICHLAND, WASHINGTON

MAR 2022
71805.000

FIGURE
2

Filename: L:\Projects\71000\71805\71805-000\NR\GIS\bjorn.mxd Plot Date/Time: 3/25/2022 11:35:26 AM

ESRI Open Source Street Maps.

Legend

- centerline
- grading_limits
- project_area
- taxlots

SCALE: 1" = 400'

0' 200' 400' 800'

INITIALLY PROPOSED DEVELOPMENT

CRITICAL AREA MITIGATION PLAN

CITY OF RICHLAND, WASHINGTON

MAR 2022
71682.000

FIGURE
4

Filename: L:\Projects\71000\71805\71805-000\NR\GIS\bjorn.mxd Plot Date/Time: 8/23/2021 12:10:02 PM

ESRI Open Source Street Maps.

Legend

- Project Area
- Temporary Impacts -2.00 acres
- Permanent Impacts - 1.02 acres
- Conservation Area - 4.04 acres

SCALE: 1" = 400'

0' 200' 400' 800'

PREPARED FOR: BJORN HEDGES

PBS

MITIGATION MAP

STERLING CRITICAL AREA MITIGATION PLAN

CITY OF RICHLAND, WASHINGTON

MAR 2022
71805.000

FIGURE
4

Filename: L:\Projects\71000\71805\71805-000\NR\GIS\bjorn.mxd Plot Date/Time: 4/1/2022 12:55:21 PM