Tracking Number: SHOR2020-01

SHORELINES PERMIT APPLICATION

Substantial Development, Timber Cutting, Conditional Uses, Variances

STEVENSON, WA

PO Box 371 Stevenson, Washington 98648

Phone: (509)427-5970 Fax: (509)427-8202

Request:

☒ Substantial Development ☐ Timber Cutting ☐ Conditional Use ☐ Variance

Applicant/Contact: Zachary Pyle

Mailing Address: 5101 NE 82nd Avenue, Suite 200, Vancouver, WA 98662

Phone: 360-529-0987 Fax: N/A

E-Mail Address (Optional): zpyle@fdmdevelopment.com

Property Owner: ERWIN L & K, LLC & OPH DBD, LLC &, RAWLINGS FAMILY INVESTMENTS, LLC

Mailing Address: 5101 NE 82nd Avenue, Suite 200, Vancouver, WA 98662

Phone: 360-529-0987 Fax: N/A

If There are Additional Property Owners, Please Attach Additional Pages and Signatures as Necessary

Subject Property Address (Or Nearest Intersection): Rock Creek Dr

Tax Parcel Number: 02070100130200, 300, 400 **Zoning:** CR

Name of Affected Waterbody: Rock Creek Cove **Shoreline Designation:**

Current Use: Vacant **Proposed Use:** Hospitality

Brief Project Summary: This project seeks to develop a mixed-use hospitality center. The project will be developed in phases, consisting multi-room units (Phase 1), event space (Phase 2),and single-room/ studio units (Phase 3). All units will be managed by a single operator and available for rent on nightly basis. The proposed hospitality orientation of the project takes full advantage of the water views and access by providing views of Rock Creek Cove and non-motorized boating access to the water utilizing an existing boat ramp.

Water Supply Source: City **Sewage Disposal Method:** City

As the property owners of the real property described in this proposal, our signatures indicate our approval of this proposal, with the understanding that the proposal is subject to review, approval, and/or denial under SMC 18.04.

I/we hereby provide written authorization for the City to reasonably access to the subject property to examine the proposal and carry out the administrative duties of the Stevenson Municipal Code.

I/we hereby certify my/our awareness that application fees are non-refundable, there is no guarantee that a permit will be issued

Incomplete applications will not be accepted. • Please ensure that all submittals are included

Signature of Applicant: **Date:** 02/05/2020

Signature of Property Owner: **Date:** 02/05/2020

For Official Use Only:

Date Application Received 2/7/2020 • Date Application Complete

SUBMIT TO:
City Hall
7121 NE Loop Road

Shorelines Permit

Submittal Requirements

The following information is required for all Shoreline Permit Applications. Applications without the required information will not be accepted. Site plans are to be submitted on 8½"x11" or 11"x17" paper, and drawn to a standard engineering scale (e.g. 1"=10', 1"=20', ⅛"=1', etc.).

☑ **Application Fee** (Amount: $1,000.00 Date: 2/7/2020 Receipt #: 2282)

☑ **Completed and Signed Shorelines Permit Application**

☑ **Any Associated Land Use and Building Permit Applications**

☑ **Two (2) Complete Site Plan Proposals—Drawn to scale, showing the proposal site and all adjoining areas within 100 feet, and including the following:**
- ☑ A Vicinity Map
- ☑ A North Arrow
- ☑ All property boundary lines **and** dimensions
- ☑ The location and width of all public and private roads
- ☑ The location and size of all existing structures, utility lines, easements, septic tanks and drainfields, wells, and other improvements
- ☑ The location and extent of all proposed structures and/or uses
- ☑ The location, species, and diameter of all significant trees
- ☑ The location and description of all critical areas and buffers

The following information is required for <u>Timber Cutting Permits</u>. Timber cutting permits are related to selective commercial timber cutting where no more than thirty (30) percent of the merchantable timber is harvested, or clear-cutting necessary for the preparation of land for another use.

☐ **Timber Cutting Permits**
- ☐ A Report Prepared by a Professional Forester Documenting the Full Amount of Merchantable Timber Existing at the Time of Application, and the Amount of Timber Proposed for Cutting
- ☐ A Description of Any Topography, Soil Conditions, or Silviculture Practices Necessary for Regeneration that May Render Selective Logging Ecologically Detrimental

The following information is required for <u>Shoreline Conditional Use Permits</u>. Conditional uses are those uses which either do not need a shoreline location or are considered unsuitable for siting within a particular shoreline environment. Such uses must:
- Cause no unreasonable adverse effects on the environment or other uses within the area;
- Not interfere with the public use of public shorelines;
- Have a design that is compatible with the shorelines environment in which it will be located; and
- Not be contrary to the goals, policy statements or general intent of the shoreline environments.

☐ **Shoreline Conditional Use Permits**
- ☐ A Narrative Explaining How the Proposal Meets the Four Criteria Above

Shorelines Permit

Submittal Requirements, Continued

The following information is required for Shoreline Variances. Variances deal with specific requirements of the Shoreline Management Master Program and their objective is to grant relief when there are practical difficulties or unnecessary hardship in the way of carrying out the strict letter of the Shoreline Management Master Program. The property owner must show that if forced to comply with the provisions then no reasonable use of the property can be made. The fact that the property owner might make a greater profit by using the property in a manner contrary to the intent of the Shoreline Management Master Program is not a sufficient reason for variance. A variance will be granted only after the applicant can demonstrate the following:

- The hardship which serves as a basis for granting of variance is specifically related to the property of the applicant;
- The hardship results from the application of the requirements of the Act and the Shoreline Management Master Program and not from for example, deed restrictions or the applicant's own actions;
- The variance granted will be in harmony with the general purpose and intent of the Shoreline Management Master Program.
- Public welfare and interest will be preserved. If more harm will be done to the area by granting the variance that would be done to the applicant by denying it, the variance will be denied.

☐ **Shoreline Variances**

☐ A Narrative Explaining How the Proposal Meets the Four Criteria Above
☐ A Financial Analysis Showing that No Reasonable Use of the Property Can be Made

May 14, 2020

Project Name: Rock Creek Cove Hospitality

Re: Land Use Application Narrative

Dear Mr. Shumaker:

PROJECT APPLICATION SUMMARY

FDM Development (the Applicant) is proud to present the Rock Creek Cove Hospitality project: a mixed-use hospitality development adjacent to Rock Creek Cove on the former Hegewald Lumber Mill Site in Stevenson, WA. The project seeks to complement the existing tourism industry in Stevenson by offering condo- and studio-sized units available for nightly and weekly rental, totaling 48 available bedrooms. A 15,000 square-foot commercial venue space will anchor the development and provide wide views of Rock Creek Cove and the Columbia River Gorge. The conceptual space planning of the commercial building consists of 5,000 open venue space, supported by 10,000 square feet of service, food preparation, and guest lounging area. The development seeks to attract both local and regional visitors, with venue space available for weddings, company parties, family reunions, and corporate retreats.

The Applicant proposes a three-phased development, beginning with the condo-style units, operated by a single ownership group, similar to a hotel. Phase 2 will add the commercial venue space and restore water-side portions of the property for enhanced, publicly-accessible observation and enjoyment. Phase 3 completes the development with the studio-sized units, operated under the same ownership group as the remainder of the property.

The project encompasses parcels 02070100130200, 02070100130300, and 02070100130400. The parcels make up 6.40 acres, all within the Commercial Recreation (CR) zoning designation. The following narrative addresses the proposed development within the context of the applicable City of Stevenson Municipal Code (SMC).

In addition to the Application Narrative, the Applicant has provided a preliminary site plan and several existing conditions studies to support the application.

COMPLIANCE WITH SMC 17.25

Commercial Recreation District Purpose

> 17.25.010: "Trade districts support development of a healthy, diversified economy and facilitate Stevenson to become the year-round recreation and tourist destination of the county and Central Gorge. The standards in this chapter are intended to enhance the vitality of the downtown core, improve our status as a tourist destination, and ensure that the local business community remains a healthy component of Stevenson's economy."
>
> 17.25.020: "The commercial recreation district (CR) provides for the siting of facilities within Stevenson for the express purpose of expanding the tourism industry while adding to local citizens' opportunities for economic development. The establishment of the CR commercial recreation district is intended to enhance and diversify the business and tourism opportunities in Stevenson through development of commercial and other facilities that complement the natural and cultural attractions of the area without significant adverse effect to environmental features or to natural, cultural and historic resources and their settings."

As noted in the project summary, this project fits squarely within the stated purpose of the Commercial Recreation Zone. The proposed development is a tourism-oriented destination that also provides added local benefits to the community in terms of water access, enjoyment, and venue operations. The project is located approximately 1 mile from the downtown core, which will allow for and encourage visitors to experience both downtown and the natural environment of Rock Creek Cove.

Uses

Utilizing Table 17.25.040-1, the following uses have been reviewed for compliance with the CR zone:

> Overnight Lodging (Hotel): **Permitted**
> Food Service: **Permitted**
> Arts, Entertainment, and Recreation Uses (Public Assembly): **Permitted**

The project proposes to provide overnight lodging, operated as a hotel via condo- and studio-sized units. Food service and public assembly will support and anchor the overnight lodging. As stated within the code, those uses are permitted outright.

> Multi-family Dwelling: **Conditional** and subject to review according to the density and parking requirements of the R3 multi-family residential district (see below)
> Overnight Lodging (Vacation Rental Home): **Conditional**

Additionally, the Applicant will also demonstrate compliance with the zoning should the ownership group decide, at a later date, to convert any of the units to vacation rental units or multi-family residential (see the Compliance with 17.23 below). The Applicant understands that at the time of land use change, an additional Application for Improvement will be required.

Density and Dimensional Standards

> Minimum Lot Area: 10,000 square feet

Maximum Lot Coverage: 35%

The project proposes a boundary line adjustment that will reduce the number of lots from three to two. The proposed lots are 99,400 square feet and 179,050 square feet, individually. Total coverage by building footprints is approximately 22,700 square feet in total, approximately 8% of total lot area. These requirements are met.

Maximum Building Height: 35 feet
Front Setback: 25 feet
Side, Street Setback: 20 feet
Side, Interior: 0 feet
Rear, Interior: 0 feet
Rear, Through Lot: 20 feet

The maximum height of Phase 1 buildings is 35 feet. Since the commercial building is only conceptual at this time, the Applicant accepts this as a continued condition of approval. Minimum setback from the public roadway is approximately 100 feet. The minimum distance between adjacent buildings (or clusters, in the case of the multiroom units) is 30 feet. These requirements are met.

Commercial Recreation Trade District Design

1. Buildings shall be appropriately scaled and compatible with their locations and surrounding environment, including adjacent buildings, landscaping, water bodies and other natural features.

2. Exterior building materials and finishes shall be compatible with the unique setting of the Columbia River Gorge. Preference should be given to nonglossy finishes and earthtone colors.

The proposed Phase 1 buildings are designed in the heavy timber craftsman style that complements existing design aesthetics in Stevenson. Phase 2 and 3 buildings will complement Phase 1 buildings, while moving to a slightly more modern aesthetic representative of the more commercial-specific use. Color tones and building materials will remain natural and nonglossy.

3. Outdoor storage shall be visually screened by landscaping, fences, walls or enclosures.

4. Refuse containers shall be fully enclosed and covered. Enclosures shall be constructed of materials compatible with the main structure.

Outdoor storage is not proposed for the site. A central garbage collection location will be screened with a masonry wall and a landscaped buffer around it.

5. Screening and buffering shall be provided between dissimilar uses to minimize negative impacts, such as those from noise, traffic, lighting and glare.

6. Screening and buffering shall be located along the perimeter of a lot or parcel.

The property's unique geography ensures that the development will not negatively impact adjacent parcels. Additionally, the minimum setback from road frontage is approximately 100 feet. Existing trees, a proposed berm around a stormwater pond, and ground covers will provide robust screening from the public roadway.

> 7. The location and number of access points to the site, their relationship to existing streets and traffic, the interior circulation patterns, and the separation between pedestrians and vehicles shall be designed to maximize safety and convenience.
>
> 8. Pedestrian sidewalks, pathways and access ways shall be located and constructed to minimize conflicts with vehicular traffic and natural hazards.
>
> 9. Safety crossings and adequate sight lines shall be provided at pathway intersections with roads.

The property's unique geometry minimizes options for public roadway access. However, within the parcel, pedestrian and vehicle circulation is clear and provides sufficient turnaround for emergency vehicles. Pedestrian pathways in the developed portion of the site will meet ADA requirements. Pedestrian crossings of driveways will be highlighted with painted striping. Lighting will be provided at both the pedestrian- and building-scale. Entryways, street lighting, and recreation areas will be lit to provide safe access throughout the development.

> 10. Roads, buildings and other structural improvements shall be located and designed to minimize grading and modification of existing landforms and natural characteristics.
>
> 11. Developments shall not contribute to the instability of a parcel or to adjoining lands.

The existing property is fairly flat and will be maintained as such. Additionally, setbacks required by the shoreline management plan and the geotechnical investigation report ensure that buildings will be located at a distance adequate to retain structural stability of the natural slopes.

> 12. Surface drainage systems shall be designed so as not to adversely affect neighboring properties, roads or water bodies.

Surface drainage is designed to capture and convey runoff from impervious surfaces to on-site stormwater facilities. These facilities will treat, detain, and discharge the runoff in accordance with the western Washington stormwater control regulations.

> 13. Developments within the designated shoreline areas of the CR district shall provide ample public visual and physical access to the water.

The development proposes restoring access to the shoreline area via sidewalks, viewing platforms, and a non-motorized boat launch.

COMPLIANCE WITH 17.23 - R3 DESIGN STANDARDS

As stated above, the ownership group would like to maintain the option to convert any of the hotel units to vacation rental units or multi-family residential at a later date, dependent upon market conditions. The Applicant understands that at the time of land use change, an additional Application for Improvement will be required. However, the Applicant would like to demonstrate alignment with the R3 design standards at this time in order to avoid concerns with residential design standards down the road.

R3 District Purpose

> "To provide a corridor along Rock Creek Drive that would be aesthetically pleasing to residents and to visitors. To encourage attractive development along Rock Creek Drive that blends well with the existing topographic features and those structures of high quality in the area, such as the Rock Creek Center, Skamania Lodge and Columbia Gorge Interpretive Center."

The project is located along the southern portion of Rock Creek Drive and provides patrons staying or living in the units to enjoy the nearby attractions. The units are designed in the heavy timber craftsman style that complements existing design aesthetics in Stevenson.

Natural Site Features, Site Grading, and Drainage

The proposed development fully utilizes the extensive shoreline along the property, giving each cluster of units a unique view of Rock Creek Cove and the gorge. Site design prioritized saving large evergreen trees on-site where feasible. Mass grading is minimized, and shoreline features will be left intact.

Building Design, Finish, and Roofline Variation

As mentioned above, the units are designed to reflect a heavy timber craftsman style, appropriate for the Rock Creek Cove subarea and Stevenson as a whole. The minimum distance between each cluster of units is 30 feet, approximately 45% of the combined building height and within 5% of building design guidelines. Site constraints from required shoreline and slope setbacks limit further separation of the closest clusters.

Proposed roofline variations conform to code design guidelines by inserting non-structural decorative heavy-timber frames and regular intervals along the building roofline.

On-Site Open Space and Landscape Requirements

Each unit contains a second-floor balcony space. Additionally, open space and walking paths, although within shoreline buffer locations, provide well over 4,000 square feet of open space required for 16 units. The minimum setback from road frontage is approximately 100 feet. Existing trees, a proposed berm around a stormwater pond, and ground covers will provide robust screening from the public roadway.

Parking and Loading Requirements

> Residential structures: two spaces per dwelling unit plus one space for each room rented, except that one-bedroom dwelling units only require one space.

Each unit is provided two parking spaces, compliant with both residential structure standards, should the use be changed from hotel-operated use to privately-owned condos or vacation rentals.

Pedestrian Pathway, Outdoor Storage, and Lighting

Pedestrian pathways in the developed portion of the site will meet ADA requirements. Pedestrian crossings of driveways will be highlighted with painted striping.

Garbage collection is located within the development and will be screened from both the public roadway and the on-site points of interest by a masonry wall and landscaping.

Lighting will be provided at both the pedestrian- and building-scale. Entryways, street lighting, and recreation areas will be lit to provide safe access throughout the development.

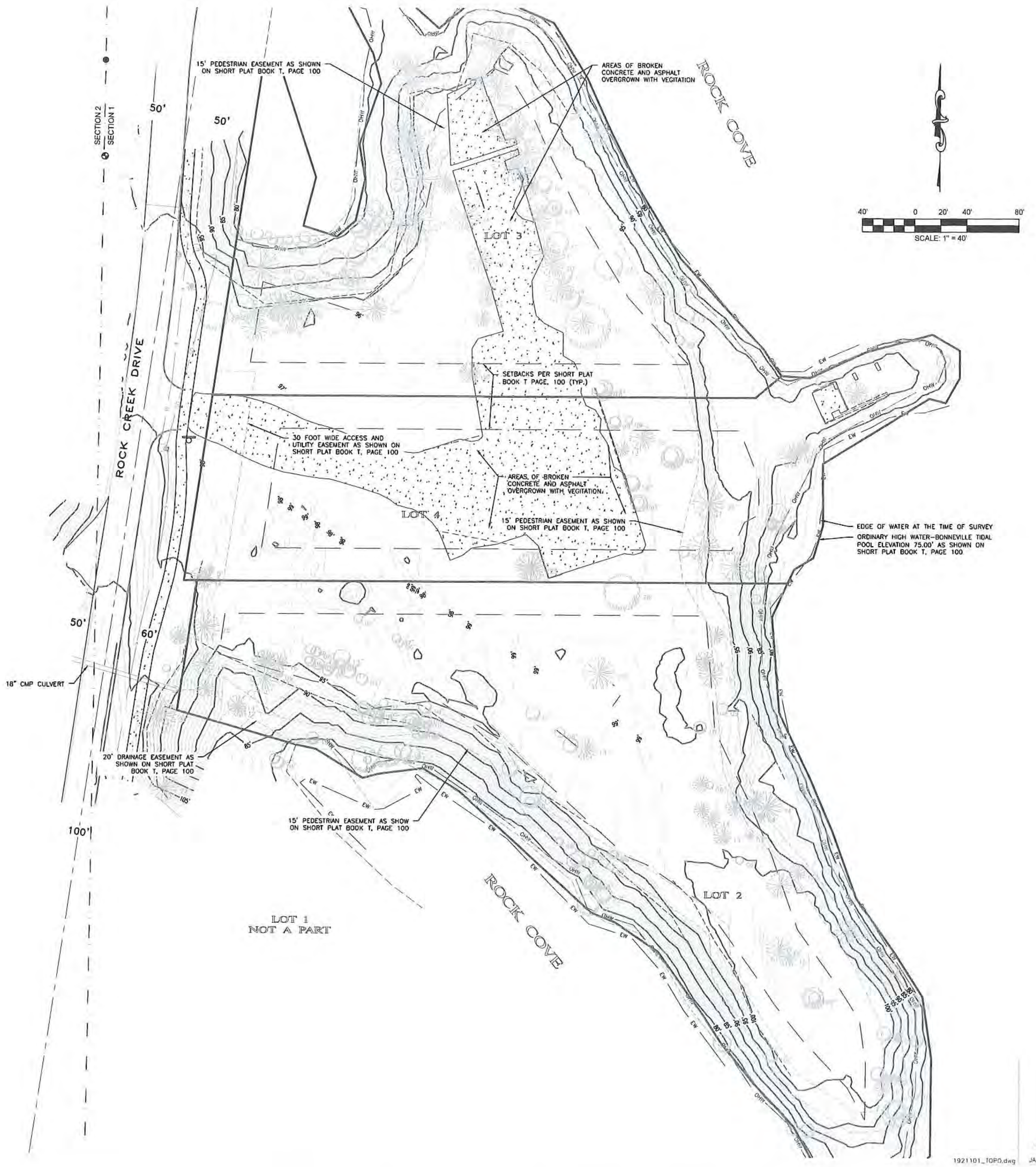
Sincerely,
FDM Development, Inc.

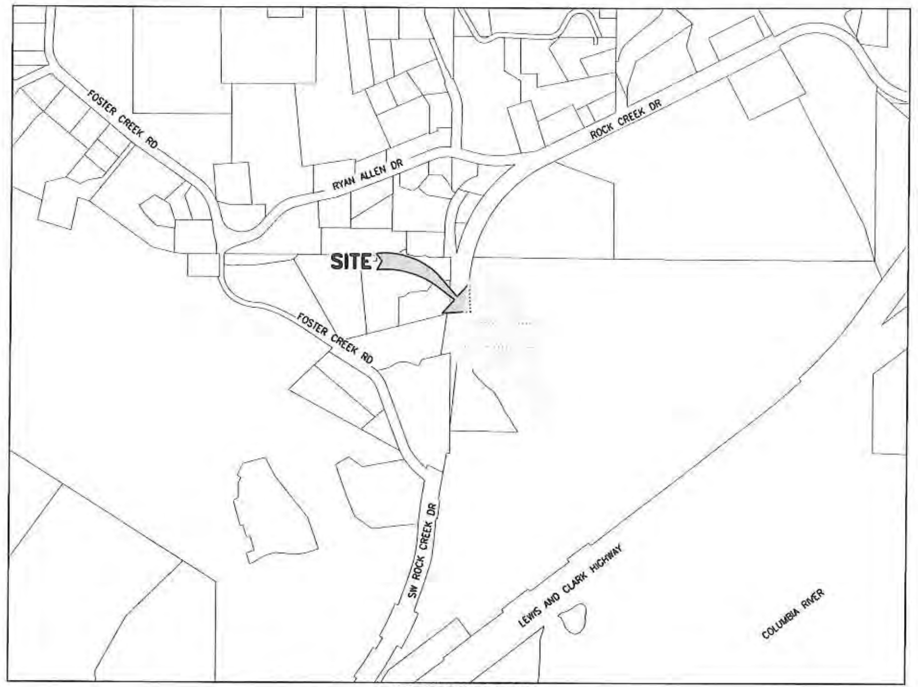
Zachary Pyle, PE
Project Engineer, Development Manager

Attachments:

1. Existing Conditions Plan
2. Preliminary Site Plan
3. Conceptual Phase 1 Building Elevations
4. Geotechnical Investigation
5. Cultural Resources Study
6. Preliminary Critical Areas Assessment

P:\2019-211-01 Rock Creek Cove\Survey\Drawings\1921101_TOPO.dwg Plotted: Jan 03, 2020 - 4:04pm By: andrew.plett





VICINITY MAP

SCALE: 1" = 1000'

LEGEND:

ROAD STRIPING
FLOW LINE CURB
STANDARD CURB
EDGE OF PAVEMENT
EDGE OF CONCRETE
WALL-TOP
WALL-TOE
WATER
DITCH FLOW LINE
STORM SEWER
GAS
SANITARY SEWER
EW — EW — EDGE OF WATER
OHW — OHW — ORDINARY HIGH WATER LINE
CENTERLINE
RIGHT OF WAY
BOUNDARY LINE
LOT/PARCEL LINE
EASEMENT
SETBACK
SECTION LINE
CONCRETE HATCH
MAJOR CONTOUR
MINOR CONTOUR
FOUND MONUMENT-ALUMINUM CAP
FOUND MONUMENT-BRASS CAP
FOUND MONUMENT - 5/8" IRON ROD
SIGN
SCHRUB/BUSH
TREE - DECIDUOUS
TREE - CONIFER
SANITARY SEWER MANHOLE
STORM CATCH BASIN
STORM CULVERT
FIRE HYDRANT
WATER METER

HORIZONTAL DATUM (BASIS OF BEARINGS):

PROJECT IS WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, SCALED TO GROUND AROUND CONTROL POINT #1 WITH A COMBINED SCALE FACTOR OF 1.00003427467. THE HORIZONTAL DATUM IS NAD83(2011) EPOCH 2010.00 BASED ON STATIC GPS OBSERVATIONS ON CONTROL POINT #1, PROCESSED THROUGH OPUS. UNITS ARE IN US SURVEY FEET.

VERTICAL DATUM:

NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) BASED ON STATIC GPS OBSERVATIONS ON POINT #1 PROCESSED THROUGH OPUS, USING GEOID 18.

SURVEY NOTES

THIS MAP DOES NOT CONSTITUTE A PROPERTY BOUNDARY SURVEY. PARCEL LINEWORK SHOWN IS FOR INFORMATIONAL PURPOSES ONLY.

OHW LINE WAS FIELD DETERMINED THROUGH A JOINT EFFORT BY ECOLOGICAL LAND SERVICES AND WASHINGTON DEPARTMENT OF ECOLOGY ON DECEMBER 30, 2019. FIELD SURVEY OF OHW FLAGS TOOK PLACE DEC. 30-31, 2019.

S&F Land Services

1725 N ROOSEVELT DR,
STE B, SEASIDE, OR 97138
(503) 738-3425
WWW.SFLANDS.COM
EMAIL: INFO@SFLANDS.COM

1921101_TOPO.dwg

DATE	JOB NO.	FIELD	DRAWN	CHECKED
JAN 3, 2020	19-211-01	AS	DJT	CCS

A PORTION OF TAX LOT 02-07-01-1300

SECTION 1, TOWNSHIP 4 NORTH,
RANGE 7 EAST, WILLAMETTE MERIDIAN.
SKAMANIA COUNTY, WASHINGTON

PROJECT SUMMARY

PHASE 1
16 3-BEDROOM CONDO UNITS OPERATED AS HOTEL
TOTAL 48 BEDROOMS
TOTAL 32,950 SF
PEDESTRIAN ACCESS TO NORTHERN PENINSULA
COVERED FIRE PIT
LANDSCAPE IMPROVEMENTS
STORMWATER FACILITIES CONSTRUCTION
MASS GRADING
TYPE S BUFFER OFF-SITE MITIGATION
BOUNDARY LINE ADJUSTMENT

PHASE 2
15,000 SQ FT COMMERCIAL VENUE SPACE
LANDSCAPE IMPROVEMENTS
OBSERVATION AREA AND BOAT RAMP RESTORATION AND
SAFETY IMPROVEMENTS

PHASE 3
5 STUDIO RENTALS
LANDSCAPE IMPROVEMENTS

FDM DEVELOPMENT INC.

ROCK CREEK COVE HOSPITALITY
MASTER PLAN
FDM DEVELOPMENT, INC.
STEVENSON, WA

ISSUE	DATE	DESCRIPTION
A	01/30/2020	PRELIMINARY

DESIGNED: Z. PYLE

SCALE
0' 40' 80'

SHEET TITLE
SITE PLAN

SHEET
C2.0

PLOTTED ON: 2020-01-31 12:45 PM PLOTTED BY: Zachary Pyle FILENAME: C:_CAD Drive\09_Rock Creek Cove\PLANS\C2.0 SITE PLAN.dwg

Receipt: 2282 02/07/2020
Acct #: 1175 COPY
City Of Stevenson
7121 E. Loop Rd.
PO Box 371
Stevenson, WA 98648-0371
(509) 427-5970

Receipting Vendor

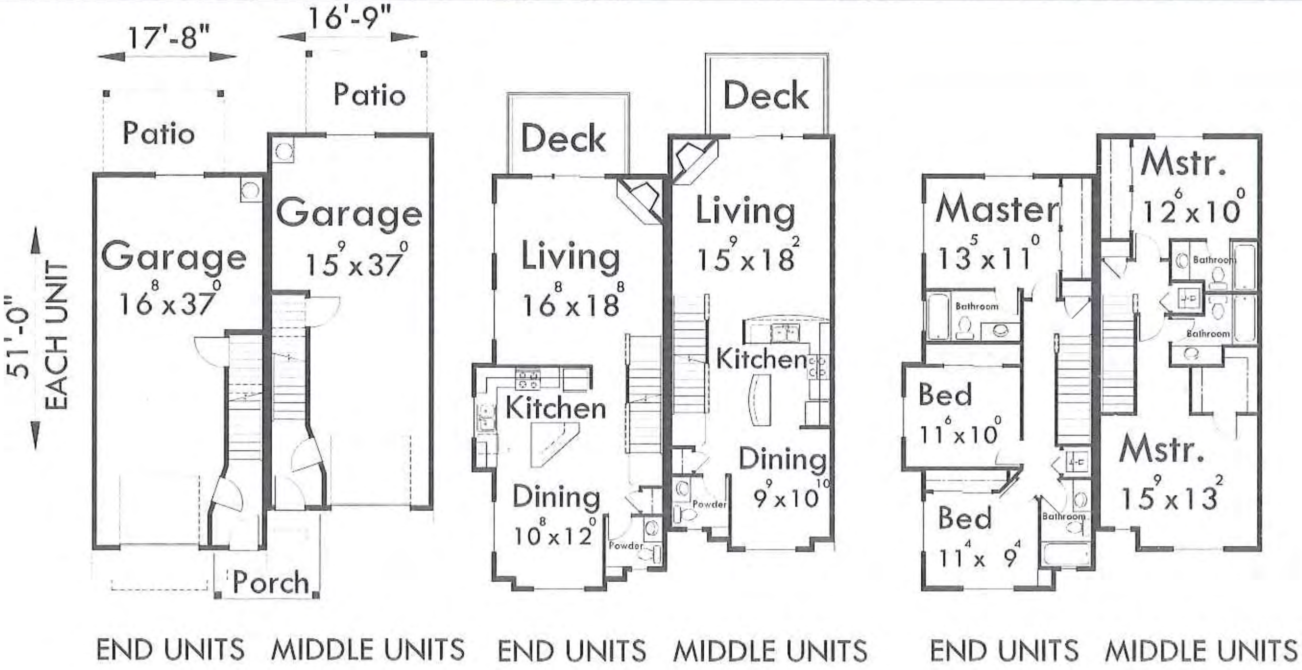
Planning Fees

SEPA2020-01 Pyle	200.00
SHOR2020-01 Pyle	1,000.00
CAP2020-01 Pyle	200.00
Non Taxed Amt:	1,400.00
Total:	1,400.00
Chk: 10005	1,400.00
Ttl Tendered:	1,400.00
Change:	0.00

Issued By: Mary C.
02/07/2020 09:06:03

Plan #F-540

END UNITS		MIDDLE UNITS	
FIRST FLR.	54 sq. ft.	FIRST FLR.	54 sq. ft.
SECOND FLR.	752 sq. ft.	SECOND FLR.	692 sq. ft.
THIRD FLR.	715 sq. ft.	THIRD FLR.	651 sq. ft.
TOTAL	1521 sq. ft.	TOTAL	1397 sq. ft.
GARAGE	618 sq. ft.	GARAGE	583 sq. ft.



First floor

Second floor

Third floor

www.houseplans.pro by Bruinier & associates, inc. building designers®
1304 SW Bertha Blvd. Portland, Oregon 97219 (503-246-3022)

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

GEOTECHNICAL SITE INVESTIGATION REPORT

PROPOSED ROCK CREEK COVE DEVELOPMENT
PARCEL # 02070100130200, 02070100130300 & 02070100130400
ROCK CREEK DRIVE, STEVENSON, WASHINGTON

GNN PROJECT NO. 219-1183

JANUARY 2020

Prepared for

FDM DEVELOPMENT INC.
5101 NE 82ND AVENUE, SUITE 200
VANCOUVER, WA 98662

FDM DEVELOPMENT INC.

Prepared by

GN NORTHERN, INC.
CONSULTING GEOTECHNICAL ENGINEERS
YAKIMA, WASHINGTON
(509) 248-9798 / (541) 387-3387

Common Sense Approach to Earth and Engineering
Since 1995

Yakima • Kennewick • Spokane Valley • Hermiston, OR • Hood River, OR

(509) 248-9798
www.gnnorthern.com
gnnorthern@gnnorthern.com

GN 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.

GN Northern, Inc.

January 13, 2020

FDM Development Inc.
5101 NE 82nd Ave, Suite 200
Vancouver, WA 98662

Attn: Zachary Pyle, PE, Development Manager

CC: F. Dean Maldonado, Principal

Subject: **Geotechnical Site Investigation Report**
Proposed Rock Creek Cove Development
Parcel # 02070100130200, 02070100130300 & 02070100130400
Rock Creek Drive, Stevenson, Washington

GNN Project No. 219-1183

Gentlemen,

As requested, GN Northern (GNN) has completed a geotechnical site investigation for the proposed Rock Creek Cove vacation homes project to be constructed at the vacant site located on Rock Creek Drive, east of the intersection with Attwell Road, in the City of Stevenson, Washington.

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

This report describes in detail the results of our investigation, summarizes our findings and presents our recommendations concerning earthwork and the design and construction of foundation 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 earthwork phase to ensure implementation of the geotechnical recommendations.

If you have any questions regarding this report, please contact us at 509-248-9798 or 541-387-3387.

Respectfully submitted,

GN Northern, Inc.

Karl A. Harmon

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

State of Washington Licensed Geologist
Engineering Geologist
2535
Karl A. Harmon

M. Yousuf Memon, PE
Geotechnical Engineer

M. Yousuf Memon
55606

TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE OF SERVICES

This report has been prepared for the proposed Rock Creek Cove vacation homes project to be constructed at the vacant site located on Rock Creek Drive, east of the intersection with Attwell Road, in the City of Stevenson, Washington; site location is shown on the *Vicinity Map* (Figure 1, Appendix I). Our investigation was conducted to collect information regarding subsurface conditions and present recommendations for suitability of the subsurface materials to support the proposed building structures and allowable bearing capacity for the proposed construction.

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

Our study was conducted in general accordance with our *Proposal for Geotechnical Engineering Services* dated October 29, 2019. Notice to proceed was provided in the form of a signed/authorized copy of our proposal via email on November 19, 2019.

A conceptual site plan (*Concept D*, prepared by FDM Development, dated 10/28/2019), along with a topographic survey of the project site (Lots 2, 3, and 4 of Rock Creek Cove, prepared by S&F Land Services, dated 12/11/2019), were provided by Mr. Pyle via email on December 17, 2019. Field exploration, consisting of twelve (12) test-pits and one (1) infiltration test, was completed on December 23, 2019. Locations of the exploratory test-pits and infiltration test are shown on the *Site Exploration Map* (Figure 2, Appendix I), and detailed test-pit logs are presented in Appendix II.

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

2.0 PROPOSED CONSTRUCTION

Based on the preliminary information presented on the conceptual site plan and communication with your office, we understand that the proposed development will likely include approximately 15 to 25 structures. The various vacation rental structures are anticipated to consist of 6 to 8 single-room studio units along with 8 to 16 multi-story 3-bedroom units. Based on the current site layout, the studio units are planned across the southern finger, while the multi-story units are planned across the northern and western portions of the site. Proposed development will also include a 3-story central building with upstairs suite, central floor reception area, and lower floor kitchen and bar. Site development will also include associated infrastructure elements consisting of underground utilities, stormwater facilities, parking areas, and drive lanes. While the current site plan calls for a proposed wedding chapel/shelter on the eastern finger, we understand that development across this portion of the site may not be permitted.

Structural loading information was not available at the time of this report. Based on our experience with similar projects, we expect maximum wall loads to be on the order of 2,500 plf and maximum column loads to be less than 80 kips. It shall be noted that assumed loading is based on limited preliminary information provided at the time of this report. If loading conditions differ from those described herein, GNN should be given an opportunity to perform re-analysis. Settlement tolerances for structures are assumed to be limited to 1 inch, with differential settlement limited to ½ inch.

3.0 FIELD EXPLORATION & LABORATORY TESTING

The field exploration was completed on December 23, 2019. A local public utility clearance was obtained prior to the field exploration. Twelve (12) exploratory test-pits were completed at various locations within the footprint of the proposed development. Test-pits were excavated by Riley Materials using a Link-Belt 145x4 excavator to depths of approximately 8 to 14.5 feet below existing ground surface (BGS) and logged by a GNN field geologist/engineer. Additionally, an infiltration test was performed on the north side of the entrance driveway. Upon completion, all excavations were loosely backfilled with excavation spoils. Test-hole locations are shown on *Site Exploration Map* (Figure 2)

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

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

Table 1: Laboratory Tests Performed

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

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

4.0 SITE CONDITIONS

The project site is located east of the intersection of Rock Creek Drive and Attwell Road, approximately ½-mile north of State Highway 14, in the City of Stevenson, Washington. The 6.4-acre project site is currently comprised of three separate parcels identified by the Skamania County Assessor as Parcel Numbers: 020701001302000 (Lot 2), 020701001303000 (Lot 3), and 020701001304000 (Lot 4) located within the SW ¼ of the NW ¼ of Section 1, Township 2 North and Range 7 East, Willamette Meridian.

The subject site is generally characterized as an irregular shaped peninsula with several fingers extending east from Rock Creek Drive into Rock Cove. The majority of the upper surface of the site is relatively flat, while the irregular shaped peninsula fingers typically include steep slopes along the perimeter down to the shoreline. Surface conditions across the site include a variety of gravel covered and paved areas (asphalt and concrete), as well as areas with a dense growth of mature trees and vegetation, with selected areas across slope faces that include a veneer of angular rock (apparent rip-rap). Recently placed stockpiles of apparent landscape clippings are present across an area located south of the existing entrance driveway.

Surface topography across the subject site has been historically altered by previous grading activity related to the preexisting use. The upper historically graded portions of the site are relatively flat at elevations ranging from approximately 95' to 101' across a majority of the site. Site grades step down towards that eastern finger with surface elevations ranging from approximately 87' to 90'. The surrounding edges of the various peninsula fingers typically include relatively steep slopes, with gradients as steep as 1H:1V, from the upper flat portions descending down to the shoreline.

The history of past use and development of the property was not investigated as part of our scope of services for this geotechnical site investigation. Based on our cursory review of available historic aerial photos (Appendix V) and topographic maps, along with a previously completed phase II environmental site assessment (Maul Foster Alongi, 2017), the site is known to have been historically developed with an industrial lumber mill facility. Scattered buried remnants related to the noted previous development and operations at the site including concrete foundation and slabs, miscellaneous utilities, trash and debris should be anticipated. Additionally, the eastern finger extending into Rock Cove appears to have been created by historic filling of the area between the main portion of the site and a preexisting island toward the eastern tip. The 1935 aerial photograph taken prior to historic site development of the site shows the site vicinity at the time when the Rock Cove had not been flooded by construction of the Bonneville Dam.

5.0 SITE & REGIONAL GEOLOGY

The City of Stevenson and Skamania County are located in the South Cascades physiographic province that extends from the Columbia River to the south to Interstate 90 to the north, and is dominated by three massive stratovolcanoes. The current day volcanoes are the most recent installments of a 40-million-year-old volcanic complex called the Cascades Volcanic Arc. The bedrock geology of the western Columbia Gorge is dominated by Oligocene to early Miocene volcaniclastic rocks and minor interbedded lava flows of the ancestral Cascade Volcanic Arc. At many locations, the ancestral arc rocks are unconformably overlain by lava flows of the middle Miocene Columbia River Basalt Group, late Miocene to Pliocene fluvial deposits, or Quaternary olivine-phyric mafic lavas (Pierson et al., 2016).

The western part of the Columbia River Gorge is characterized by massive landslides on the Washington side, and the instability of these land masses is associated with abundant rainfall, high relief, composition and structure of the underlying rocks, tectonic uplift associated with the structural evolution of the Cascade Range and Yakima Fold Belt, and valley-side erosion by the incising Columbia River, which flows across the uplifting terrains (Pierson et al., 2016). The Cascade landslide complex is one such landslide feature that spans from the town of North Bonneville to the western portion of Stevenson. The Cascade landslide complex is subdivided into four individual landslides: the Carpenters Lake, Bonneville, and Red Bluffs landslides, as well as a reactivated part of the Red Bluffs landslide body known as the Crescent Lake landslide. Immediately east of the Cascade landslide complex is the newly recognized Stevenson landslide which is occupied by the City of Stevenson.

The project site is located near the eastern toe of the Red Bluffs landslide, approximately 1-mile east of the reactivated Crescent Lake landslide. The head scarp of the Red Bluffs landslide is located approximately 3½ miles northwest of the site. Surface geology at the site is mapped as Quaternary landslide deposits [Qls] of the Red Bluffs landslide (mass wasting deposits), consisting of poorly sorted blocks, boulders, gravels, and fines sediments produced by the gravitational failure and rotational-translational slide of bedrock and/or unconsolidated sediments above the bedrock (Korosec, 1987).

6.0 SUBSURFACE CONDITIONS

Based on the findings of our field exploration, subsurface soils at the project site include a variably-thick layer of artificial fill soils likely associated with historic site development, atop the native silty gravel with sand stratum (mass wasting deposits). The undocumented artificial fill soils were noted to depths of approximately 3 to 8 feet across the upper portion of the site. Test-pit TP-9 excavated on the lower eastern finger encountered fill to the full depth of exploration (~8 feet) that is believed to represent historic fill placed to create new land. Fill soils were generally classified as silty gravel with sand and variable amounts of cobbles and boulders, and with some areas also including organics, wood debris and miscellaneous trash. The fill soils at the site are likely to be related to the previous historic development at the site. The apparent native underlying soils were classified as Silty Gravel with Sand (GM) and included varying amounts of cobbles and boulders. The native soil stratum typically appeared medium dense. Due to similar soil condition between the upper fills and the underlaying native stratum, the fill/native transition was typically ambiguous and therefore not clearly discernable within the test-pits. Test-pit logs in Appendix II show detailed descriptions and stratification of the soils encountered.

6.1 NRCS Soil Survey

Although altered at the surface, the soil survey map of the site prepared by the Natural Resources Conservation Service (NRCS) identifies the site soils as *Arents* with typical profile described as *gravelly sandy loam* grading to *extremely gravelly sandy loam*. Based on the NRCS map (Appendix VII), these units generally consist of *well drained* materials.

6.2 Groundwater

Groundwater was encountered within two of the exploratory test-pits at depths ranging from approximately 12 to 14 feet BGS at the time of our exploration in late December. Approximate correlating groundwater elevations ranged from approximately 83' in TP-3 in the western portion, down to 78' in TP-8 near the eastern portion. A review of the Washington Department of Ecology's online water well log database revealed a lack of nearby water wells in the site vicinity. Water levels within the adjacent Rock Cove portion of the Columbia River, controlled by the down-river Bonneville Dam, are typically noted at an elevation approximately 20 to 25 feet below the upper leveled-off site elevation. Therefore, we believe groundwater at the site is not directly affected by pool elevations in the Columbia River, and is likely controlled by the complex hydrogeological conditions of the up-gradient mass-wasting landslide deposits, as well as regional precipitation and snowmelt. Groundwater levels will fluctuate with irrigation, precipitation, drainage, and regional pumping from wells.

7.0 SOIL INFILTRATION TESTING

A single infiltration test was performed on the north side of the existing entrance drive at a depth of approximately 5.5 feet BGS using a small-scale Pilot Infiltration Test (PIT). To the degree possible, care was exercised during excavation to attempt to maintain relatively uniform side walls, and the resulting size and geometry of the finished test-pit was carefully recorded in the field. Water was introduced into the test-pit using a garden hose connected to a nearby fire hydrant. The water flow into the test-pit was continued until the soils with the test-pit were saturated and a constant flow rate was established. The stabilized inflow rate was measured and recorded, and the resulting un-factored infiltration rates are presented in the table below:

Table 2: Infiltration Test Results

Test ID	Approximate Location (GPS Coordinates)	Soil Tested	Field Infiltration Rate
P-1	45°41'20.69"N, 121°53'56.06"W	Silty Gravel	**4 inches/hour**

The infiltration rate presented herein represents the un-factored field soil infiltration rate. An appropriate factor of safety should be applied to the field infiltration rate to determine long-term design infiltration rate. Determination of safety factors for long-term design infiltration should consider the following: pretreatment, potential for bio-fouling, system maintainability, horizontal and vertical variability of soils, and type of infiltration testing. Typical factors of safety for these soils generally range from 2 to 3. If stormwater management facilities are selected at other locations, additional site-specific infiltration testing shall be performed.

8.0 GEOLOGIC HAZARDS

Potential geologic hazards that may affect the proposed development include: [i] landslides & slope instability, [ii] seismic hazards (ground shaking, surface fault rupture, soil liquefaction, and other secondary earthquake-related hazards), and [iii] flooding & erosion. The perimeter/shoreline edges of the subject property are generally all mapped by the City of Stevenson’s Critical Areas & Geologic Hazards Map as ‘Potentially Unstable Slope’ which refers to an area with slopes of 25% or greater per Stevenson Municipal Code (SMC), Chapter 18.13, Section 18.13.090, Critical Area - Geologically Hazardous Areas. A discussion follows on the specific hazards to this site:

8.1 Landslides

As discussed above in Section 5.0, the project site lies within the Cascade landslide complex that is subdivided into four individual landslides (Carpenters Lake, Bonneville, Red Bluffs, & Crescent Lake landslide). The Bonneville landslide has been dated to have occurred from 1416-1452 A.D. by a combination of dating methods. The Red Bluffs landslide has crosscutting morphologic features suggesting a younger age than that of the Bonneville landslide, with an age range of 1760-1770 A.D. The Crescent Lake landslide has reactivated within the last few decades and currently is moving downslope at an average rate of 11–18 cm/year and possibly as fast as 25 cm/year (Pierson et al., 2016). Results of another recent study (Hu et al., 2015) showed that the central upper part of the Crescent Lake landslide moved a total of 700 mm downslope during a 4-year observation period from 2007 to 2011, and that the movement was seasonal and showed a strong correlation with winter precipitation. In contrast to the Crescent Lake landslide, coherent parts of Red Bluffs, Bonneville and Stevenson landslides were observed to remain stable during the observation period.

Although considered a recent landslide (< 1,000 years old), the Red Bluffs landslide is not considered an active landslide (movement in last 20 years). Based on Table 18.13.090-1, Landslide Hazard Classification, of the Stevenson Municipal Code (SMC), the landslide hazard for the site classifies as 'Moderate Hazard'.

8.2 Regional Faulting & Surface Fault Rupture

The nearest regional faulting with Quaternary displacement (< 130,000 years) consists of the Faults near The Dalles located approximately 12 miles east of the project site (Czajkowski, 2014). Published slip rates for these faults are listed at less than 0.2 mm/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 11,700 years. Due to the lack of any known active fault traces in the immediate site vicinity, surface fault rupture is unlikely to occur at the subject property. While future fault rupture could occur at other locations, rupture would most likely occur along previously established fault traces.

8.3 Earthquakes & Seismic Conditions

Earthquakes caused by movements along crustal faults, generally in the upper 10 to 15 miles, occur on the crust of the North America tectonic plate when built-up stresses near the surface are released. The two largest crustal earthquakes felt in the state of Washington included the 1872, M 6.8 quake near Lake Chelan and the 1936, M 6.0 Walla Walla earthquake. Noteworthy to the City of Stevenson, the Mount Saint Helens Seismic Zone is located approximately 30 miles towards the north-northwest. The following list provides information gathered from the online USGS database regarding historic earthquakes ($\geq$4.0 M) within the past 50 years for epicenters within 100 kilometers of project site, sorted by magnitude (largest to smallest):

Table 3: Earthquakes within 100-kilometers of project site

Date(s) of Event	Magnitude(s)	Nearby Faults / Seismic Zone	Approx. Distance from Site (miles)
March to May, 1980	4.0 - 5.7	Mt. Saint Helens Seismic Zone	33 – 47
March 25, 1993	5.6	Mt. Angel Fault Zone	57
February 14, 1981	5.2	Mt. Saint Helens Seismic Zone	48

May 13, 1981	4.5	Mt. Saint Helens Seismic Zone	50
June 29, 2002	4.5	Faults near The Dalles	26
March 1, 1982	4.4	Mt. Saint Helens Seismic Zone	48
February 14, 2011	4.3	Mt. Saint Helens Seismic Zone	44
July 14, 2008	4.2	*Unknown*	60
December 13, 1974	4.1	Faults near The Dalles	33
February 2, 1981	4.0	Toppenish Ridge Fault Zone	59

Based on seismic scenarios published by the Washington State Department of Natural Resources (DNR), M 7.0 Mount Saint Helens and M 7.1 Mill Creek earthquake events would result in a shaking intensity of ‘V’ (moderate shaking) on the Modified Mercalli Intensity (MMI) scale. We further used the USGS deaggregation tool which provides the relative contributions of hazard for each seismic source based on Probabilistic Seismic Hazard Analysis (PSHA). Based on the deaggregation, it appears that about 23% of the contribution to the probabilistic hazard at the site comes from the Cascadia Subduction Zone, with the remaining contribution primarily from the shallower sources.

8.4 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. Based on the published Liquefaction Susceptibility Map of of Skamania County, Washington (Palmer et al., 2004a), the site is mapped with a ‘low to moderate’ relative suceptibility for seismically-induced liquefaction to occur. A detailed assessment of the liquefaction potential at the site, including liquefaction-induced settlement and the effects of lateral spreading, is beyond the scope of this investigation.

8.5 Secondary Seismic Hazards

Additional secondary seismic hazards related to ground shaking include ground subsidence, tsunamis, and seiches. The site is far inland, so the hazard from tsunamis is non-existent. The potential hazard of seiches from a significant seismic event is relatively low for development on the upper portion of the project site that is elevated approximately 20 to 25 feet above Rock Cove.

8.6 Site Slopes

Surface topography across the subject site has been historically altered by previous grading activity related to the preexisting lumber mill facility. The upper historically graded portions of the site are relatively flat at elevations ranging from approximately 95' to 101'. The surrounding edges of the various peninsula fingers typically include relatively steep slopes, with gradients as great as 1H:1V, from the upper flat portions descending down to the shoreline. A field reconnaissance of the subject property was performed to observe site conditions and look for common geomorphic features of landslides as well as indications of possible signs demonstrating recent activity and instability of slide masses. While several areas across the site include a relatively dense cover of vegetation, no apparent indications of recent failures or significant slope instability were observed. Section 9.0 presents results of a preliminary slope stability analysis completed at the site and Section 12.0 provides recommendations for appropriate structure setbacks.

8.7 Flooding and Erosion

The subject property is mapped by Federal Emergency Management Agency (FEMA) as Zone 'C' which translates to areas of minimal flooding. Portions of the subject property are however situated in areas where sheet flow and erosion may occur. 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. The need for and design of erosion protection measures is within the purview of the design Civil Engineer. Appropriate erosion and sediment control plan(s) and a drainage plan shall be prepared by the project civil engineer with the final construction drawings. Erosion should be mitigated with appropriate 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 hazards.

9.0 SLOPE STABILITY ANALYSIS

A preliminary slope stability analysis was conducted for a critical slope section across the southern finger as shown on Figure 2. The analysis was conducted using a generalized geologic cross-section model developed from the existing site topography and data obtained from our subsurface exploration. An output of our slope stability analysis is attached in Appendix VI.

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 under static conditions. 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 result when the strength of the slope is overcome by gravity.

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 4: Estimated Strength Parameters

Material	**Shear Strength Parameters**		**Unit Weight (pcf)**
	Friction Angle: ϕ	**Cohesion: c (psf)**	
Fill/Disturbed Soil	33	25	120
Native Silty Gravel w/ Sand	35	50	130 (moist) 138 (saturated)

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 results of our slope stability analysis, we conclude that the steep perimeter slopes do not meet minimum recommended safety factors. Consequently, the currently proposed layout with future structures sited at/over the edge of slopes is generally considered unfeasible, and remedial grading and/or other appropriate mitigation measures will be required to increase slope safety factors and provide adequate subgrade support for the proposed structures.

In lieu of appropriate remediation of the slope stability concerns, in order to provide sufficient vertical and lateral support for the proposed foundations without significant risk of detrimental settlement, appropriate increased setbacks/embedment for the new building foundations should be maintained. It should be understood however that while the proposed structures may not be at significant risk from slope instability, the existing slopes will remain at risk for some future failure if not appropriately remediated.

10.0 SEISMIC DESIGN PARAMETERS

Based on subsurface data obtained during or field exploration, along with our review of the published NEHRP Site Class Map of Skamania County, Washington (Palmer et al., 2004b), a site class ‘D’ as defined by 2015 International Building Code (IBC) is applicable. According to Mapped Spectral Acceleration obtained from the USGS Seismic Design Maps using the 2015 IBC, the following site-specific design values may be used:

Table 5: IBC Design Response Spectra Parameters

Seismic Design Parameter	Value (unit)
S_s	0.657 (g)
S_1	0.292 (g)
F_a	1.274 (unitless)
F_v	1.816 (unitless)
SM_s	0.837 (g)
SM_1	0.530 (g)
SD_s	0.558 (g)
SD_1	0.354 (g)

S_S = MCE spectral response acceleration at short periods
S_1 = MCE spectral response acceleration at 1-second period
F_a = Site coefficient for short periods
F_v = Site coefficient for 1-second period
SM_S = MCE spectral response acceleration at short periods as adjusted for site effects
SM_1 = MCE spectral response acceleration at 1-second period as adjusted for site effects
SD_S = Design spectral response acceleration at short periods
SD_1 = Design spectral response acceleration at 1-second period

It shall be noted that determination of an appropriate site class requires shear wave velocity, soil undrained shear strength, or standard penetration resistance (N-value) data in the upper 100 feet of the subsurface profile, which was beyond the scope of this investigation.

11.0 SUMMARY OF FINDINGS & CONCLUSIONS

Conditions imposed by the proposed development have been evaluated on the basis of assumed elevations and engineering characteristics of the subsurface materials encountered in the exploratory test-pits, and their anticipated behavior both during and after construction. 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.

- Based on the findings of this geotechnical evaluation and our understanding of the proposed development, from a geotechnical perspective, it is our opinion that the site is suitable for the proposed development, provided the soil design parameters and site-specific recommendations in this report are followed in the design and construction of the project.
- Final design plans for the proposed development, including grading, drainage and finished elevations, were not provided at the time of this report**.** Once the plans are finalized, GNN **must** be provided an opportunity to review final design plans to provide revised recommendations if/as necessary.
- Site soils include a variably-thick layer of artificial fill soils believed to be related to historic site development, atop the native silty gravels with sand. The undocumented artificial fill soils, largely made-up of similar soils that were apparently derived from onsite and/or near sources, extend to depths ranging from 3 to 8 feet and include some areas with miscellaneous trash and debris. Our estimation of the depth of fill materials is based on selected, localized points of exploration, and cannot quantify the full extent of the onsite fill. Additional undocumented fill soils with trash/debris, buried within the subsurface profile, may extend to greater depths at isolated locations across the site.
- Groundwater was encountered within the two of our test-pits at depths ranging from approximately 12 to 14 feet BGS at the time of our exploration in late December. Approximate correlating groundwater elevations ranged from approximately 83' in TP-3 in the western portion, down to 78' in TP-8 near the eastern portion. We believe groundwater at the site is not directly affected by pool elevations in the Columbia River, and is likely controlled by the complex hydrogeological conditions of the up-gradient mass-wasting landslide deposits, as well as regional precipitation and snowmelt.

- The onsite silty gravel soils, screened and processed to be free of oversize rocks (>5 inches) and any deleterious materials including trash and debris, are generally suitable for reuse as engineered fill and utility trench backfill.
- The proposed building structures may be supported on conventional shallow foundations bearing on a layer of crushed rock atop the recompacted native subgrade in accordance with the recommendations of this report. However, due to presence of artificial fill soils across future building footprints, over-excavation of the existing fill soils to a competent native stratum and replacement with engineered fill will be required.
- Due to ecological constraints, it appears that remedial grading of the onsite slopes to improve long-term stability is not considered feasible. Therefore, deeper embedment of the building foundations will be required in order to meet the minimum setback requirements while ignoring the stability of the onsite slopes.
- Appropriate slope setbacks for future structures should be incorporated in the final planning and design of the project. Slopes setbacks shall adhere to IBC 2015 Section 1808.7 *Foundations on or Adjacent to Slopes*, as well as the recommendations of this report.
- Site grading shall incorporate the requirements of IBC 2015, Appendix J *Grading*.
- Upon completion, all test-pit excavations were loosely backfilled with excavation spoils. The contractor is responsible to locate the test-pits to re-excavate the loose soils and re-place as compacted engineered fill.
- The underlying geologic condition for seismic design is site class ‘D’. The *minimum* seismic design should comply with the 2015 International Building Code (IBC) and ASCE 07-10, Minimum Design Loads for Buildings and Other Structures.
- The near-surface site soils are susceptible to wind and water erosion when exposed during grading operations. Preventative measures and appropriate BMPs to control runoff and reduce erosion should be incorporated into site grading plans.
- Based on our evaluation, the risk for liquefaction at the project site is considered low to moderate. A site-specific liquefaction analysis to assess the risk of soil liquefaction and liquefaction-induced settlement was beyond the scope of this geotechnical evaluation and would require additional exploration including a 50-foot deep boring with continuous penetration testing.

12.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical recommendations are based on our current understanding of the proposed project as shown on the conceptual site plan (Concept D, prepared by FDM Development, dated 10/28/2019), and as described in Section 2.0 of this report. The report is prepared to comply with the 2015 International Building Code Section 1803, Geotechnical Investigations, and as required by Subsection 1803.2, Investigations Required. Please note that Soil Design Parameters and Recommendations presented in this report are predicated upon appropriate geotechnical monitoring and testing of the site preparation and foundation and building pad construction by a representative of GNN's Geotechnical-Engineer-of-Record (GER). Any deviation and nonconformity from this requirement may invalidate, partially or in whole, the following recommendations. We recommend that we be engaged to review grading and foundation plans in order to provide revised, augmented, and/or additional geotechnical recommendations as required.

12.1 Site Development – Grading

Site grading shall incorporate the requirements of IBC 2015 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.

12.2 Clearing and Grubbing

At the start of site grading, any vegetation, large roots, non-engineered/artificial fill, including trash and debris, and any abandoned underground utilities shall be removed from the proposed building and structural areas. The surface shall be stripped of all topsoil and/or organic growth (vegetation) that may exist within the proposed structural areas. The topsoil and organic rich soils shall either be stockpiled on-site separately for future use or be removed from the construction area. Depth of stripping can be minimized with real-time onsite observation of sufficient removals. Areas disturbed during clearing shall be properly backfilled and compacted as described below.

12.3 Suitability of the Onsite Soils as Engineered Fill

The onsite silty gravel with sand soils, screened and processed to be free of oversize rocks (>5 inches) and deleterious materials including trash and debris, are generally suitable for reuse as engineered fill and utility trench backfill. Suitable onsite soils shall be placed in maximum 8-inch lifts (loose) and compacted to at least 95% relative compaction (ASTM D1557) near its optimum moisture content. Compaction of these soils shall be performed within a range of ±2% of optimum moisture to achieve the proper degree of compaction.

12.4 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 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. Final (permanent) fill slopes should be graded to an angle of 2H:1V or flatter. Where unstable soils are encountered, flatter slopes may be required.

12.5 Utility Excavation, Pipe Bedding and Trench Backfill

To provide suitable support and bedding for the pipe, we recommend the utilities be founded on suitable bedding material consisting of clean sand and/or sand & gravel mixture. To minimize trench subgrade disturbance during excavation, the excavator should use a smooth-edged bucket rather than a toothed bucket.

Pipe bedding and pipe zone materials shall conform to Section 9-03.12(3) of the *WSDOT Standard Specifications.* Pipe bedding should provide a firm uniform cradle for support of the pipes. A minimum 4-inch thickness of bedding material beneath the pipe should be provided. Prior to installation of the pipe, the pipe bedding should be shaped to fit the lower part of the pipe exterior with reasonable closeness to provide uniform support along the pipe. Pipe bedding material should be used as pipe zone backfill and placed in layers and tamped around the pipes to obtain complete contact. To protect the pipe, bedding material should extend at least 6 inches above the top of the pipe.

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

Onsite soils are considered suitable for utility trench backfill provided they are free of oversize material and trash/debris and can be adequately compacted. All excavations should be wide enough to allow for compaction around the haunches of pipes and underground tanks. We recommend that utility trenching, installation, and backfilling conform to all applicable federal, state, and local regulations such as OSHA and WISHA for open excavations.

Compaction of backfill material should be accomplished with soils within ±2% of their optimum moisture content in order to achieve the minimum specified compaction levels recommended in this report. However, initial lift thickness could be increased to levels recommended by the

12.6 Imported Crushed Rock Structural Fill

Imported structural fill shall consist of well-graded, crushed aggregate material meeting the grading requirements of Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9(3) (1-1/4 inch minus Base Course Material) presented here:

Table 6: WSDOT Standard Spec. 9-03.9(3)

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

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

12.7 Compaction Requirements for Engineered Fill

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

12.8 Building Pad & Foundation Subgrade Preparation

Building structures may be supported on conventional shallow foundations bearing on subgrade prepared in accordance with the recommendations of this report. We recommend that all building foundations, including all exterior footings, interior footings and isolated column footings for any over-hang patio roof/decks, be supported on uniform improved native subgrade support conditions. The minimum footing depth shall be 24 inches below adjacent grades for frost protection and bearing capacity considerations. Interior footings may be supported at nominal depths below the floor. All footings shall be protected against weather and water damage during/after construction.

Following completion of site clearing and grubbing operations, all foundation areas shall be over-excavated to expose the native silty gravels. We anticipate the native soils in the vicinity of the currently proposed building footprints will range from depths of approximately 3 to 8 feet BGS. In order to reduce the risk of differential settlement, we recommend the differential in depth of foundation over-excavation (thickness of fill) be limited to 50%; i.e. if the deepest required foundation over-ex is 6 feet, then no portion of the foundation excavation shall be less than 3 feet below footing elevation. The exposed native gravelly stratum shall be moisture-conditioned (as necessary) and proof-compacted to a dense and non-yielding surface. Any soft spots encountered during compaction shall be over-excavated an additional 12 inches and replaced as compacted fill. Although not anticipated, deeper foundation over-excavations may extend into groundwater; consequently, employment of appropriate means of dewatering by the contractor may be required.

Foundation backfill shall consist of suitable screened/processed onsite soils (see *Suitability of Onsite Soils as Engineered Fill*) and/or imported 2-inch minus Gravel Borrow material (meeting the grading and quality requirements of WSDOT Standard Spec. Sec. 9-03.14(1)). The upper 12 inches of backfill directly below the foundations shall consist of imported 1¼”-minus crushed rock structural fill placed as engineered fill, moisture-conditioned and compacted to at least 95% of the maximum dry density as determined by the ASTM D1557. Crushed rock structural fill shall extend minimum 12 inches beyond the edges of the footings.

Where future buildings are proposed near or on the existing slopes, building foundations will be required to be constructed with appropriate setbacks in accordance with IBC 2015 Section 1808.7 (see *Slope Setbacks* section below). In general, if buildings are constructed with the current proposed layout, deeper embedment of the foundations will be required in order to meet the minimum setback, such that a minimum distance of 10 feet from the exterior face of the footings to a projected 2H:1V slope face from the toe of the existing slope is maintained. These recommendations may require the need for stepped foundations across the building structure, or deeper foundations such as taller stem-walls or columns.

Footings constructed in accordance with the above recommendations may be designed for an allowable bearing capacity of **2,500 pounds per square foot (psf)**. The allowable bearing pressure may be increased by 1/3 for short-term transient loading conditions. The estimated total settlement for footings is approximately 1-inch with differential settlement less than half that magnitude. The weight of the foundation concrete below grade may be neglected in dead load computations.

Lateral forces on foundations from short term wind and seismic loading would be resisted by friction at the base of foundations and passive earth pressure against the buried portions. We recommend an allowable passive earth pressure for the compacted onsite soil of **220 pcf**. This lateral foundation resistance value includes a factor of safety of 1.5. We recommend a coefficient of friction of **0.45** be used between cast-in-place concrete and imported crushed rock fill. An appropriate factor of safety should be used to calculate sliding resistance at the base of footings.

12.9 Slab-on-Grade Floors

We recommend placing a minimum 6-inch layer of crushed aggregate fill beneath all slabs. The material shall meet the WSDOT Specification 9-03.9 (3), “Crushed Surfacing Top Course”. The crushed rock material shall be compacted to at least 95% of the maximum dry density as determined by the ASTM D1557 method. Prior to placement of crushed aggregate fill, the building pad shall be prepared as described above in the *Building Pad & Foundation Subgrade Preparation* section. We recommend a modulus of subgrade reaction equal to 120 pounds per cubic inch (pci) based on a value for gravel presented in the Portland Cement Association publication No. EB075.01D. Slab thickness, reinforcement and joint spacing shall be determined by a licensed engineer based on the intended use and loading.

An appropriate vapor retarder (15-mil polyethylene liner) shall be used (ASTM E1745/E1643) beneath areas receiving moisture sensitive resilient flooring/VCT where prevention of moisture migration through slab is essential. The slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder. The architect shall determine the need and use of a vapor retarder.

12.10 Retaining Walls

The following table presents recommendations for lateral earth pressures for use in retaining wall design. The values are given in terms of equivalent fluid pressures without surcharge loads and are based on the assumption that proper drainage is provided behind the wall, the backfill is horizontal and that no-buildup of hydrostatic pressure occurs.

Table 7: Lateral Earth Pressures

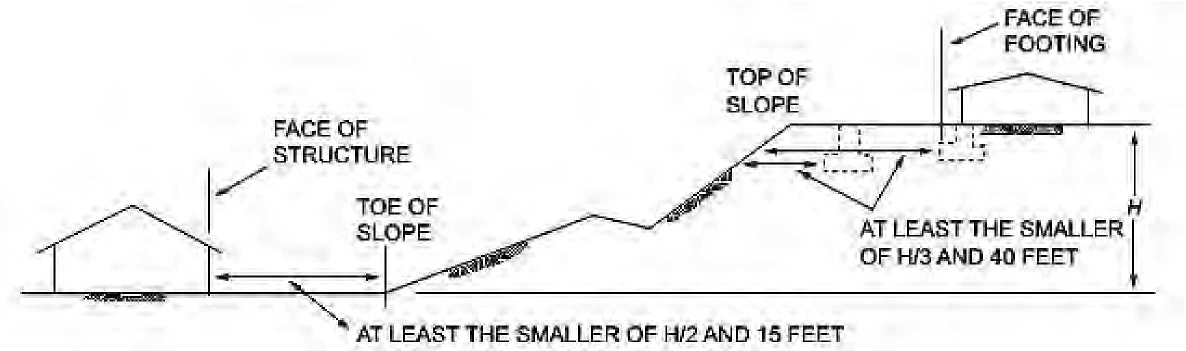
Lateral Pressures	Suitable Onsite Soils
Active Pressure Use when wall is permitted to rotate 0.1 to 0.2% of wall height for granular backfill	38 pcf - level ground
At-Rest Pressure	56 pcf - level ground

Drainage: Retaining structures should include adequate back drainage to avoid build-up of hydrostatic pressures. Positive drainage for retaining walls should consist of a vertical layer of permeable material (chimney drain), such as a pea gravel or crushed rock (typically ¼- to ¾-inch crushed), at least 18 inches thick, positioned between the retaining wall and the backfill. We recommend installing a non-woven filter fabric such as Mirafi 140N between the drainage material and the general backfill to prevent fines from migrating into the drainage material. A 4-inch diameter perforated or slotted drain-pipe, wrapped or socked in filter fabric, shall be installed at the bottom of the chimney drain.

Backfill and Subgrade Compaction: Compaction on the retained side of the wall within a horizontal distance equal to one wall height should be performed by hand-operated or other lightweight compaction equipment. This is intended to reduce potential locked-in lateral pressures caused by compaction with heavy grading equipment. Retaining wall foundations and subgrade improvements shall be constructed in accordance with the recommendations of this report.

12.11 Slope Setbacks

In accordance with IBC 2015 Section 1808.7 *Foundations on or Adjacent to Slopes*: "foundations on or adjacent to slope surfaces 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:



Appropriate setbacks can be accommodated by lateral offset and/or increased embedment. 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.

12.12 Flexible Pavement

Due to the presence of undocumented fills throughout the project site, remedial grading will be required to minimize the risk of pavement distress. We recommend that the new pavement section be constructed on an improved subgrade. Due to the presence of artificial fills soils that include some miscellaneous trash and debris, the pavement subgrade over-excavation be completed in accordance with one of the following two options:

(1) Pavement areas shall be fully over-excavated to remove the artificial fill soils. Based on our site exploration, we anticipate that the maximum depth of excavation could be as great as approximately 8 feet.

(2) Excavate the proposed pavement areas to a minimum depth of 12 inches BGS. We recommend installing a Mirafi 600X geotextile fabric at the bottom of the over-ex. It must be understood that if this option is selected, the owner must accept some risks related to future distresses to the pavements including the potential for settlement and cracking.

After appropriate over-excavation is complete and confirmed by a representative of the GER, the exposed native subgrade shall be moisture-conditioned and compacted to a dense and non-yielding surface. After a suitable subgrade is confirmed by a representative of the GER, the over-excavation shall be backfilled with engineered structural fill soil consisting of suitable/screened onsite soil (see Section 12.3) and/or imported 2-inch minus Gravel Borrow material (meeting the grading and quality requirements of WSDOT Standard Spec. Sec. 9-03.14(1)). Engineered structural fill soils shall be placed in max. 8-inch thick loose lifts and each lift compacted to 95% of ASTM D1557. The following table presents recommended light duty and heavy-duty asphalt pavement sections for proposed project to constructed atop the prepared subgrade:

Table 8: Recommended Asphalt Concrete Paving Sections

Traffic	Asphalt Thickness (inches)	Crushed Aggregate Base Course (inches)
Heavy Duty†	4.0	10*
Standard Duty ††	3.0	6

†Heavy duty applies to pavements subjected to truck traffic and drive lanes
††Standard duty applies to general parking areas
*The upper 2" of crushed rock should be top course rock placed over the base course layer

Pavement section recommendations assume proper drainage and construction monitoring. Pavement shall be constructed on a dense and non-yielding surface. All fills used to raise low areas must be compacted structural fills and shall be placed under engineering control conditions.

Soils containing roots or organic materials shall be completely removed from the proposed paved areas prior to subgrade construction. The upper 12 inches of subgrade soils beneath the pavement section shall be moisture conditioned and proof-compacted to a dense and non-yielding condition. All fills used to raise low areas must be compacted onsite soils or structural gravel fill and shall be placed under engineering control conditions. The finished surface shall be smooth, uniform and free of localized weak/soft spots. All subgrade deficiency corrections and drainage provisions shall be made prior to placing the aggregate base course. All underground utilities shall be protected prior to grading.

The HMAC utilized for the project should be designed and produced in accordance with Section 5-04 Hot Mix Asphalt of the *Washington Department of Transportation 2014 Standard Specifications for Road and Bridge Construction* (WSDOT Specifications). Aggregate Base material shall comply with Section 9-03.9(3) Crushed Surfacing of the *WSDOT Specifications*. Aggregate base or pavement materials should not be placed when the surface is wet.

12.13 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 fine-grained soils currently present on site are considered to 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 should be covered with a layer of gravel or quarry spalls course. The soils are also susceptible to erosion in the presence of moving water. The soils shall be stabilized to minimize the potential of erosion into the foundation excavation. The site shall be graded to prevent water from ponding within construction areas and/or flowing into excavations. Accumulated water must be removed immediately along with any unstable soil. Foundation concrete shall be placed and excavations backfilled as soon as possible to protect the bearing grade. We further recommend that soils that become unstable are to be either:

- Removed and replaced with structural compacted gravel fill, or
- Mechanically stabilized with a coarse crushed aggregate (possibly underlain with a geotextile) and compacted into the subgrade.

12.14 Surface Drainage

With respect to surface water drainage, we recommend that the ground surface be sloped to drain away from the structure. 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.

12.15 Wet Weather Conditions

The project site soils are fine-grained and sensitive to moisture during handling and compaction. Proceeding with site earthwork operations using these soils during wet weather could add project costs and/or delays. The stability of exposed soils may rapidly deteriorate due to a change in moisture content. Therefore, if possible, complete site clearing, preparation, and earthwork during periods of warm, dry weather when soil moisture can be controlled by aeration. During/subsequent to wet weather, drying or compacting the on-site soils will be difficult. It may be necessary to amend the on-site soils or import granular materials for use as structural fill. If earthwork takes place in wet weather/conditions, the following recommendations should be followed:

- Fill material should consist of clean, granular soil, and not more than 3% fines (by weight) should pass the No. 200 sieve. Fines should be non-plastic. These soils would have to be imported to the site.
- Earthwork should be accomplished in small sections and carried through to completion to reduce exposure to wet weather. Soils that becomes too wet for compaction should be removed and replaced with clean, granular material.
- The construction area ground surface should be sloped and sealed to reduce water infiltration, to promote rapid runoff, and to prevent water ponding.
- To prevent soil disturbance, the size or type of equipment may have to be limited.
- Work areas and stockpiles should be covered with plastic. Straw bales, straw wattles, geotextile silt fences, and other measures should be used as appropriate to control soil erosion.
- Excavation and fill placement should be observed on a full-time basis by a representative of GER to determine that unsuitable materials are removed and that suitable compaction and site drainage is achieved.

13.0 REFERENCES

Czajkowski, J.L., and Bowman, J.D., 2014. Faults and Earthquakes in Washington State. Washington State Department of Natural Resources (DNR), Washington Division of Geology and Earth Resources, Open-File Report 2014-05.

City of Stevenson, Critical Areas & Geologic Hazards Map.

International Code Council, Inc., 2015 International Building Code (IBC).

Hu, X., Wang, T., Pierson, T.C., Lu, Z., Kim, J., and Cecere, T.H., (2016). Detecting seasonal landslide movement within the Cascade landslide complex (Washington) using time-series SAR imagery. Remote Sensing of Environment, Vol. 187, pp 49-61.

Korosec, M.A., (1987). Geologic Map of the Hood River Quadrangle, Washington and Oregon. Washington Division of Geology and Earth Resources, Washington State Department of Natural Resources (DNR), Open File Report 87-6.

Maul Foster Alongi, 2017. Phase II environmental site assessment–former Hegewalg Timber Mill.

Palmer, S.P., Magsino, S.L., Bilderback, E.L., Poelstra, J.L., Folger, D.S., and Niggemann, R.A., (2004a). Liquefaction Susceptibility Map of Skamania County, Washington. Washington State Department of Natural Resources (DNR), Washington Division of Geology and Earth Resources, Open File Report 2004-20, Map 30A.

Palmer, S.P., Magsino, S.L., Bilderback, E.L., Poelstra, J.L., Folger, D.S., and Niggemann, R.A., (2004b). Site Class Map of Skamania County, Washington. Washington State Department of Natural Resources (DNR), Washington Division of Geology and Earth Resources, Open File Report 2004-20, Map 30B.

Pierson, T.C., Evarts, R.C., and Bard, J.A., (2016). Landslides in the Western Columbia Gorge, Skamania County, Washington. U.S. Department of the Interior, U.S. Geological Survey (USGS), Scientific Investigations Map 3358.

U.S. Department of the Interior, U.S. Geological Survey (USGS), (1979). Bonneville Dam Quadrangle, Washington-Oregon, 7.5 Minute Series (Topographic). DMA 1675 III NW-Series V891.

U.S. Geologic Survey (USGS), Earthquake Hazards Program, U.S. Seismic Design Maps, online tool, website: earthquake.usgs.gov/designmaps/us/application.php

Washington State Department of Natural Resources (DNR), Washington Division of Geology and Earth Resources, on-line mapping tool, https://fortress.wa.gov/dnr/protectiongis/geology/

14.0 CONTINUING GEOTECHNICAL 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. <u>Maintaining GNN as the geotechnical consultant from beginning to end of the project will provide continuity of services.</u> 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

15.0 LIMITATIONS OF THE GEOTECHNICAL SITE INVESTIGATION REPORT

This GEOTECHNICAL SITE INVESTIGATION REPORT ("Report") was prepared for the exclusive use of the Client. GN Northern, Inc.'s (GNN) findings, conclusions and recommendations in this Report are based on selected points of field exploration, 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 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.

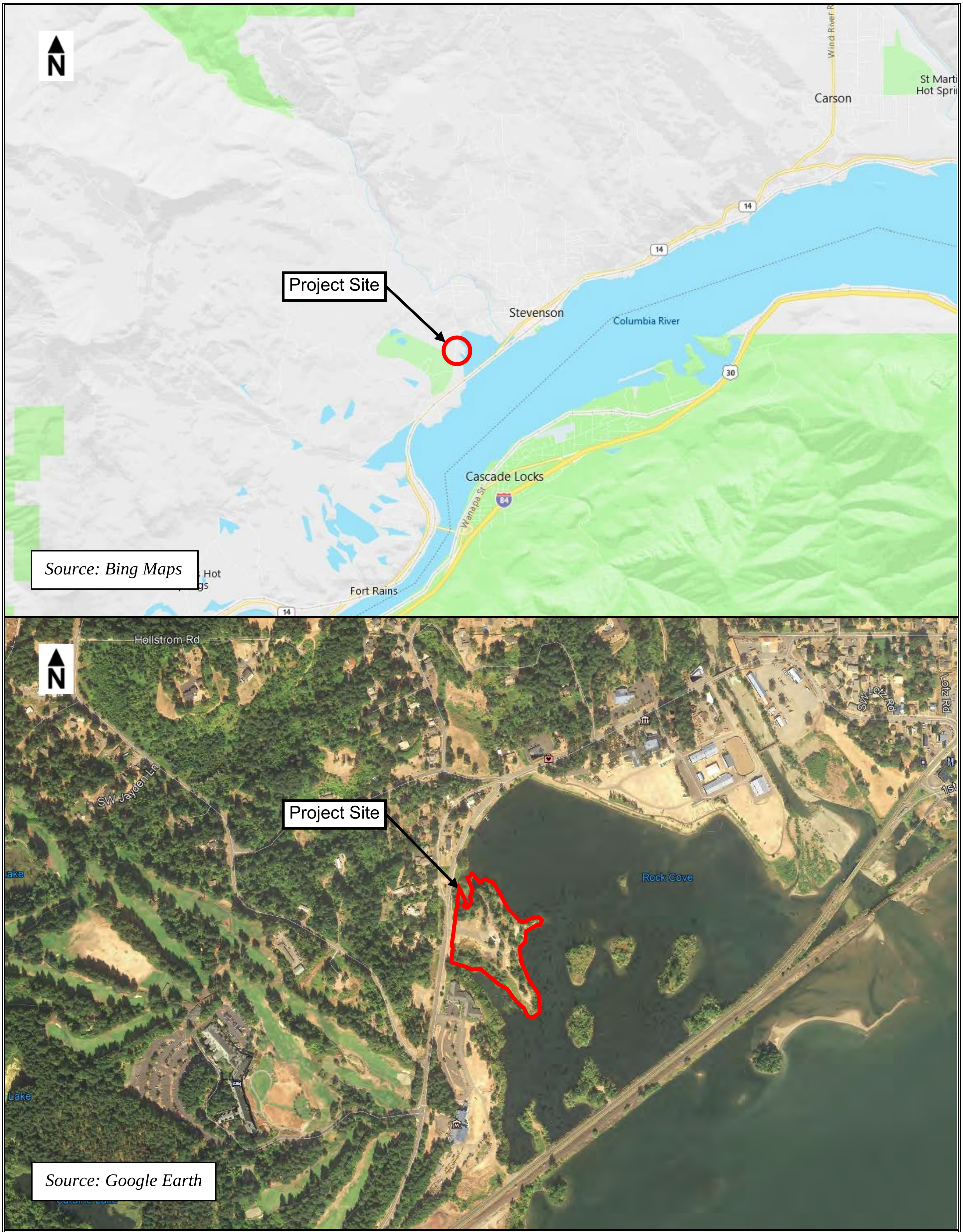
APPENDICES

Appendix I

Vicinity Map (Figure 1)

Site Exploration Map (Figure 2)

Critical Areas Map (Figure 3)



Source: Bing Maps

Source: Google Earth

FIGURE 1: VICINITY MAP **PROJECT NO. 219-1183**

LEGEND

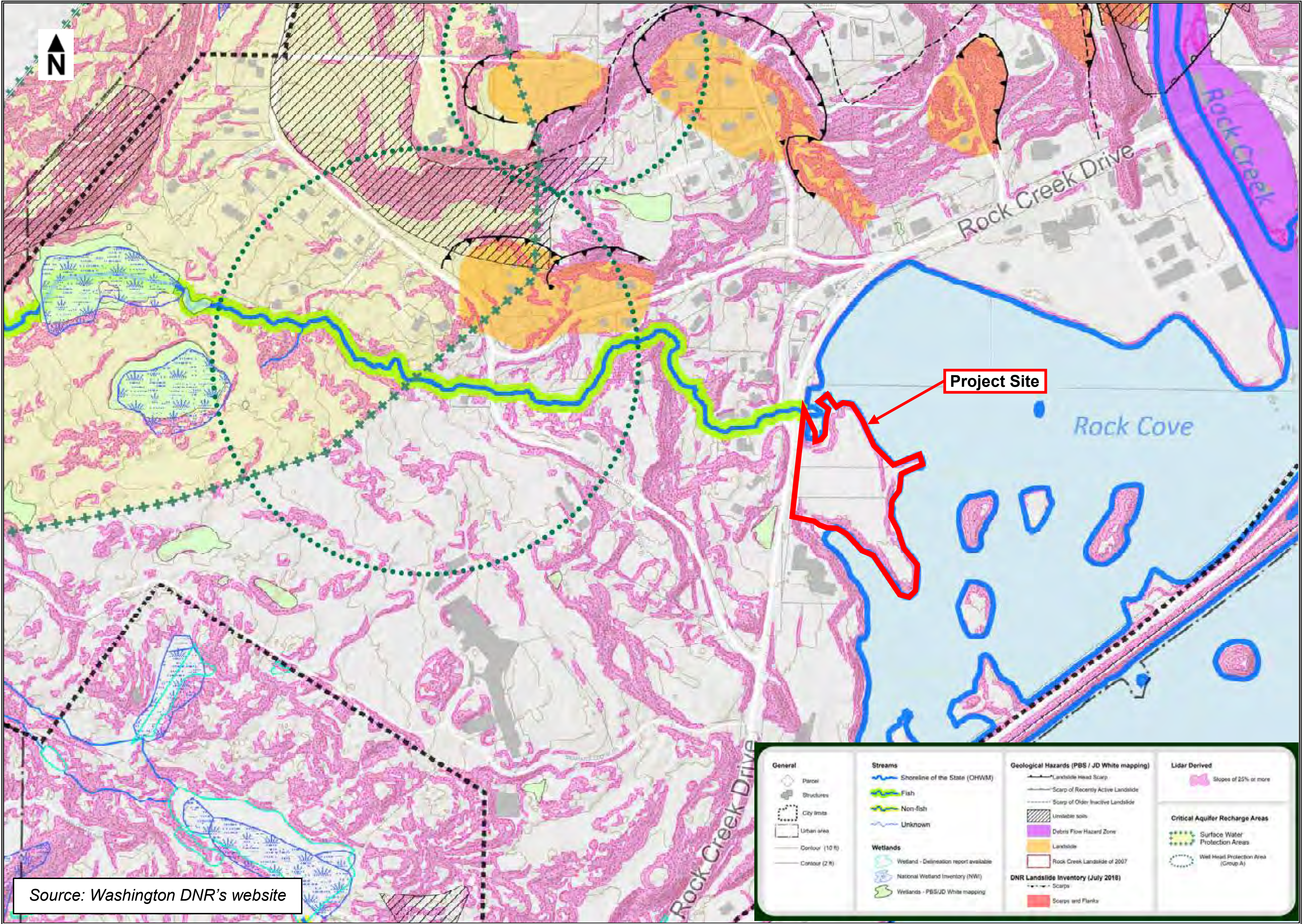
🟥 = Exploratory test pit

🟦 = Infiltration test

NOTE

Base aerial image from *Google Earth*; overlayed *Concept D* dated October 28, 2019 prepared by FDM Development, Inc.

FIGURE 2: SITE EXPLORATION MAP **PROJECT NO. 219-1183**



Source: Washington DNR's website

FIGURE 3: CRITICAL AREAS MAP **PROJECT NO. 219-1183**

Appendix II

Exploratory Test-Pit Logs

Key Chart (for Soil Classification)

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-1

PAGE 1 OF 1

CLIENT FDM Development

PROJECT NAME Proposed Rock Creek Cove Development

PROJECT NUMBER 219-1183

PROJECT LOCATION Rock Creek Drive, Stevenson, WA

DATE STARTED 12/23/19 **COMPLETED** 12/23/19

GROUND ELEVATION 98 ft **TEST PIT SIZE** 36 x 96 inches

EXCAVATION CONTRACTOR Riley Materials

GROUND WATER LEVELS:

EXCAVATION METHOD Link-Belt 145x4 Excavator

AT TIME OF EXCAVATION ---

LOGGED BY KAH **CHECKED BY** MYM

AT END OF EXCAVATION ---

NOTES Approx. GPS Coords.: 45°41'19.59"N, 121°53'55.44"W

AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0					~6" to 18" LANDSCAPE CUTTINGS / ORGANIC DEBRIS	
				1.5		96.5
2.5			GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray, moist to wet, appears loose to medium dense, with cobbles, with wood and organic debris	
					- pipe at ~3' BGS	
				4.5		93.5
5.0	✋ GB	MC = 22% Fines = 18%	GC		CLAYEY GRAVEL WITH SAND, (GC) brown, wet, appears loose to medium dense, with organics and roots (APPARENT NATIVE)	
7.5					- becomes blueish gray, moist, appears medium dense (NATIVE)	
10.0					- with boulders from 10' to 11'	
12.5						
				14.5		83.5

- Significant amount of surface water flowing into test-pit excavation
- Referenced elevations are approximate and based on Survey Topography for Lots 2, 3, and 4 of Rock Creek Cove dated December 11, 2019 prepared by S&F Land Services

Bottom of test pit at 14.5 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-2

PAGE 1 OF 1

CLIENT FDM Development
PROJECT NAME Proposed Rock Creek Cove Development
PROJECT NUMBER 219-1183
PROJECT LOCATION Rock Creek Drive, Stevenson, WA
DATE STARTED 12/23/19 **COMPLETED** 12/23/19
GROUND ELEVATION 98 ft **TEST PIT SIZE** 36 x 96 inches
EXCAVATION CONTRACTOR Riley Materials
GROUND WATER LEVELS:
EXCAVATION METHOD Link-Belt 145x4 Excavator
AT TIME OF EXCAVATION ---
LOGGED BY KAH **CHECKED BY** MYM
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 45°41'18.75"N, 121°53'55.09"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0			GM	▨	FILL: SILTY GRAVEL WITH SAND, (GM) brown, angular, moist, appears loose, with cobbles, with roots	
				▨	- becomes orange brown, appears loose to medium dense, some cobbles	
	GB	MC = 28% Fines = 47%		▨		
				▨	- with a significant amount of woody debris, organics, roots	
8.0			GM	○	SILTY GRAVEL WITH SAND, (GM) brown, subrounded, moist, appears medium dense to dense, with cobbles and boulders (APPARENT NATIVE)	90.0
14.0						84.0

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

Bottom of test pit at 14.0 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-3

CLIENT FDM Development
PROJECT NAME Proposed Rock Creek Cove Development
PROJECT NUMBER 219-1183
PROJECT LOCATION Rock Creek Drive, Stevenson, WA
DATE STARTED 12/23/19 **COMPLETED** 12/23/19
GROUND ELEVATION 97 ft **TEST PIT SIZE** 36 x 96 inches
EXCAVATION CONTRACTOR Riley Materials
GROUND WATER LEVELS:
EXCAVATION METHOD Link-Belt 145x4 Excavator
∇ **AT TIME OF EXCAVATION** 14.00 ft / Elev 83.00 ft
LOGGED BY KAH **CHECKED BY** MYM
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 45°41'20.75"N, 121°53'55.36"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0			GP-GM		FILL: POORLY GRADED GRAVEL WITH SILT AND SAND, (GP-GM) gray brown, angular, wet, appears loose to medium dense, with cobbles	
2.5						
				3.0		94.0
			GM		SILTY GRAVEL WITH SAND, (GM) brown, subrounded, moist, appears medium dense, trace cobbles (APPARENT NATIVE)	
5.0						
7.5						
					- becomes blueish gray	
10.0						
	GB	MC = 29% Fines = 28%				
12.5						
					∇	
				14.5		82.5

- Groundwater encountered at ~14' BGS at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 14.5 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-4

PAGE 1 OF 1

CLIENT FDM Development

PROJECT NAME Proposed Rock Creek Cove Development

PROJECT NUMBER 219-1183

PROJECT LOCATION Rock Creek Drive, Stevenson, WA

DATE STARTED 12/23/19 **COMPLETED** 12/23/19

GROUND ELEVATION 94.9 ft **TEST PIT SIZE** 36 x 96 inches

EXCAVATION CONTRACTOR Riley Materials

GROUND WATER LEVELS:

EXCAVATION METHOD Link-Belt 145x4 Excavator

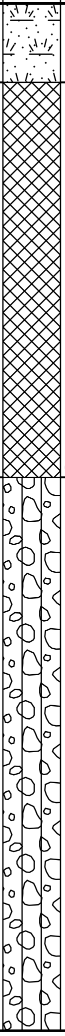
AT TIME OF EXCAVATION ---

LOGGED BY KAH **CHECKED BY** MYM

AT END OF EXCAVATION ---

NOTES Approx. GPS Coords.: 45°41'23.09"N, 121°53'53.97"W

AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0				TOPSOIL/DUFF	
1.0		GM		FILL: SILTY GRAVEL WITH SAND, (GM) brown, moist, appears loose to medium dense, some cobbles, trace boulders	93.9
2.5					
5.0					
6.0		GM		- chainsaw blade SILTY GRAVEL WITH SAND, (GM) light brown, damp, appears medium dense, some cobbles (APPARENT NATIVE)	88.9
7.5					
10.0					
12.5					
13.0					81.9

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

Bottom of test pit at 13.0 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-5

PAGE 1 OF 1

CLIENT FDM Development

PROJECT NAME Proposed Rock Creek Cove Development

PROJECT NUMBER 219-1183

PROJECT LOCATION Rock Creek Drive, Stevenson, WA

DATE STARTED 12/23/19 **COMPLETED** 12/23/19

GROUND ELEVATION 96.9 ft **TEST PIT SIZE** 36 x 96 inches

EXCAVATION CONTRACTOR Riley Materials

GROUND WATER LEVELS:

EXCAVATION METHOD Link-Belt 145x4 Excavator

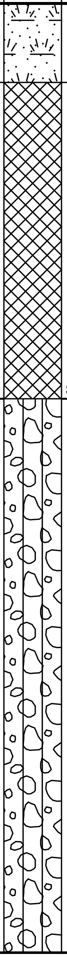
AT TIME OF EXCAVATION ---

LOGGED BY KAH **CHECKED BY** MYM

AT END OF EXCAVATION ---

NOTES Approx. GPS Coords.: 45°41'22.14"N, 121°53'53.51"W

AFTER EXCAVATION ---



DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0			1.0	TOPSOIL/SLASH/DUFF	95.9
2.5		GM	5.0	APPARENT FILL: SILTY GRAVEL WITH SAND, (GM) brown, moist, appears loose to medium dense, some cobbles, trace boulders	91.9
5.0 7.5 10.0		GM	12.0	SILTY GRAVEL WITH SAND, (GM) light brown, damp to moist, appears medium dense, some cobbles (APPARENT NATIVE)	84.9

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

Bottom of test pit at 12.0 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-6

CLIENT FDM Development

PROJECT NAME Proposed Rock Creek Cove Development

PROJECT NUMBER 219-1183

PROJECT LOCATION Rock Creek Drive, Stevenson, WA

DATE STARTED 12/23/19 **COMPLETED** 12/23/19

GROUND ELEVATION 98 ft **TEST PIT SIZE** 36 x 96 inches

EXCAVATION CONTRACTOR Riley Materials

GROUND WATER LEVELS:

EXCAVATION METHOD Link-Belt 145x4 Excavator

AT TIME OF EXCAVATION ---

LOGGED BY KAH **CHECKED BY** MYM

AT END OF EXCAVATION ---

NOTES Approx. GPS Coords.: 45°41'21.16"N, 121°53'53.95"W

AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0			1.0	~12" CONCRETE SLAB	97.0
			2.0	FILL: BASALTIC GRAVEL/COBBLES, angular, some silty/sandy soil matrix	96.0
2.5		SM	3.0	FILL: SILTY SAND, (SM) gray, fine grained, damp to moist, appears medium dense	95.0
5.0 7.5 10.0		GM	12.0	SILTY GRAVEL WITH SAND, (GM) brown, rounded to subrounded, damp to moist, appears medium dense to dense, with cobbles and boulders (APPARENT NATIVE)	86.0

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

Bottom of test pit at 12.0 feet.

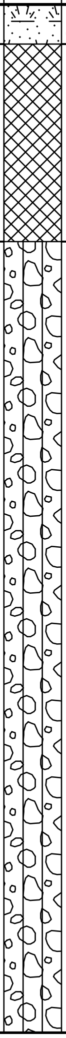
GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-7

PAGE 1 OF 1

CLIENT FDM Development
PROJECT NAME Proposed Rock Creek Cove Development
PROJECT NUMBER 219-1183
PROJECT LOCATION Rock Creek Drive, Stevenson, WA
DATE STARTED 12/23/19 **COMPLETED** 12/23/19
GROUND ELEVATION 97.6 ft **TEST PIT SIZE** 36 x 96 inches
EXCAVATION CONTRACTOR Riley Materials
GROUND WATER LEVELS:
EXCAVATION METHOD Link-Belt 145x4 Excavator
AT TIME OF EXCAVATION ---
LOGGED BY KAH **CHECKED BY** MYM
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 45°41'19.86"N, 121°53'52.14"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0					
0.5				~6" TOPSOIL	97.1
3.0		GM		FILL: SILTY GRAVEL WITH SAND, (GM) brown, moist, appears loose to medium dense, some cobbles, trace boulders	94.6
13.0		GM		SILTY GRAVEL WITH SAND, (GM) light brown, damp to moist, appears medium dense, some cobbles (APPARENT NATIVE)	84.6



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

Bottom of test pit at 13.0 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-8

PAGE 1 OF 1

CLIENT FDM Development

PROJECT NAME Proposed Rock Creek Cove Development

PROJECT NUMBER 219-1183

PROJECT LOCATION Rock Creek Drive, Stevenson, WA

DATE STARTED 12/23/19 **COMPLETED** 12/23/19

GROUND ELEVATION 89.5 ft **TEST PIT SIZE** 36 x 96 inches

EXCAVATION CONTRACTOR Riley Materials

GROUND WATER LEVELS:

EXCAVATION METHOD Link-Belt 145x4 Excavator

▽ **AT TIME OF EXCAVATION** 12.00 ft / Elev 77.50 ft

LOGGED BY KAH **CHECKED BY** MYM

AT END OF EXCAVATION ---

NOTES Approx. GPS Coords.: 45°41'20.44"N, 121°53'51.63"W

AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0		GM		FILL: SILTY GRAVEL WITH SAND, (GM) brown, moist, appears loose, some cobbles	
2.0					87.5
2.0		GM		SILTY GRAVEL WITH SAND, (GM) brown, damp to moist, appears medium dense, some cobbles (APPARENT NATIVE)	
10.0				- becomes moist to wet	
12.0				▽	
14.5					75.0

- Groundwater encountered at ~12' BGS at time of excavation
- Referenced elevations are approximate and based on Google Earth topography

Bottom of test pit at 14.5 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-9

PAGE 1 OF 1

CLIENT FDM Development

PROJECT NAME Proposed Rock Creek Cove Development

PROJECT NUMBER 219-1183

PROJECT LOCATION Rock Creek Drive, Stevenson, WA

DATE STARTED 12/23/19 **COMPLETED** 12/23/19

GROUND ELEVATION 87 ft **TEST PIT SIZE** 36 x 96 inches

EXCAVATION CONTRACTOR Riley Materials

GROUND WATER LEVELS:

EXCAVATION METHOD Link-Belt 145x4 Excavator

AT TIME OF EXCAVATION ---

LOGGED BY KAH **CHECKED BY** MYM

AT END OF EXCAVATION ---

NOTES Approx. GPS Coords.: 45°41'20.74"N, 121°53'49.97"W

AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0				~6" to 12" TOPSOIL/ORGANICS	
			1.0		86.0
				FILL: SILTY GRAVEL WITH SAND, (GM) brown, moist, appears loose to medium dense, some cobbles, trace boulders (APPARENT FILL)	
2.5					
5.0		GM			
7.5					
			8.0		79.0

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

Bottom of test pit at 8.0 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-10

PAGE 1 OF 1

CLIENT FDM Development

PROJECT NAME Proposed Rock Creek Cove Development

PROJECT NUMBER 219-1183

PROJECT LOCATION Rock Creek Drive, Stevenson, WA

DATE STARTED 12/23/19 **COMPLETED** 12/23/19

GROUND ELEVATION 100.3 ft **TEST PIT SIZE** 36 x 96 inches

EXCAVATION CONTRACTOR Riley Materials

GROUND WATER LEVELS:

EXCAVATION METHOD Link-Belt 145x4 Excavator

AT TIME OF EXCAVATION ---

LOGGED BY KAH **CHECKED BY** MYM

AT END OF EXCAVATION ---

NOTES Approx. GPS Coords.: 45°41'15.46"N, 121°53'49.93"W

AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0		GM	▩	APPARENT FILL: SILTY GRAVEL WITH SAND, (GM) brown, moist, appears loose to medium dense, some cobbles	
2.5			▩		
				4.0	96.3
5.0		GM	⚬	SILTY GRAVEL WITH SAND, (GM) light brown, damp to moist, appears medium dense, some roots in upper ~6", some cobbles (APPARENT NATIVE)	
7.5			⚬		
10.0			⚬	- becomes orange brown, damp to moist (NATIVE)	
12.5			⚬		
				13.0	87.3

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

Bottom of test pit at 13.0 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-11

PAGE 1 OF 1

CLIENT FDM Development

PROJECT NAME Proposed Rock Creek Cove Development

PROJECT NUMBER 219-1183

PROJECT LOCATION Rock Creek Drive, Stevenson, WA

DATE STARTED 12/23/19 **COMPLETED** 12/23/19

GROUND ELEVATION 104 ft **TEST PIT SIZE** 36 x 96 inches

EXCAVATION CONTRACTOR Riley Materials

GROUND WATER LEVELS:

EXCAVATION METHOD Link-Belt 145x4 Excavator

AT TIME OF EXCAVATION ---

LOGGED BY KAH **CHECKED BY** MYM

AT END OF EXCAVATION ---

NOTES Approx. GPS Coords.: 45°41'16.39"N, 121°53'50.59"W

AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0			SM	▨	FILL: SILTY SAND WITH GRAVEL, (SM) dark gray brown, fine grained, damp to moist, appears loose to medium dense, with misc. trash/metal debris	
2.5				▨	- becomes cemented, very dense	
3.5						100.5
	GB	MC = 17% Fines = 12%	SM	▨	APPARENT FILL: SILTY SAND, (SM) reddish brown, fine grained, damp, appears medium dense, some gravel	
5.0				▨		
6.0						98.0
7.5			GM	○	SILTY GRAVEL WITH SAND, (GM) light brown, damp to moist, appears medium dense, with cobbles, with boulders (APPARENT NATIVE)	
10.0						94.0

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

Bottom of test pit at 10.0 feet.

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

TEST PIT NUMBER TP-12

PAGE 1 OF 1

CLIENT FDM Development
PROJECT NAME Proposed Rock Creek Cove Development
PROJECT NUMBER 219-1183
PROJECT LOCATION Rock Creek Drive, Stevenson, WA
DATE STARTED 12/23/19 **COMPLETED** 12/23/19
GROUND ELEVATION 99.5 ft **TEST PIT SIZE** 36 x 96 inches
EXCAVATION CONTRACTOR Riley Materials
GROUND WATER LEVELS:
EXCAVATION METHOD Link-Belt 145x4 Excavator
AT TIME OF EXCAVATION ---
LOGGED BY KAH **CHECKED BY** MYM
AT END OF EXCAVATION ---
NOTES Approx. GPS Coords.: 45°41'17.30"N, 121°53'51.73"W
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0				~12" TOPSOIL/DUFF	
1.0		GM		APPARENT FILL: SILTY GRAVEL WITH SAND, (GM) brown, damp, appears medium dense, some roots	98.5
2.5					
5.0					
6.0		GM		SILTY GRAVEL WITH SAND, (GM) light brown, damp, appears medium dense, some cobbles (APPARENT NATIVE)	93.5
7.5					
10.0					
11.0					88.5

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

Bottom of test pit at 11.0 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 **Clay** (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.

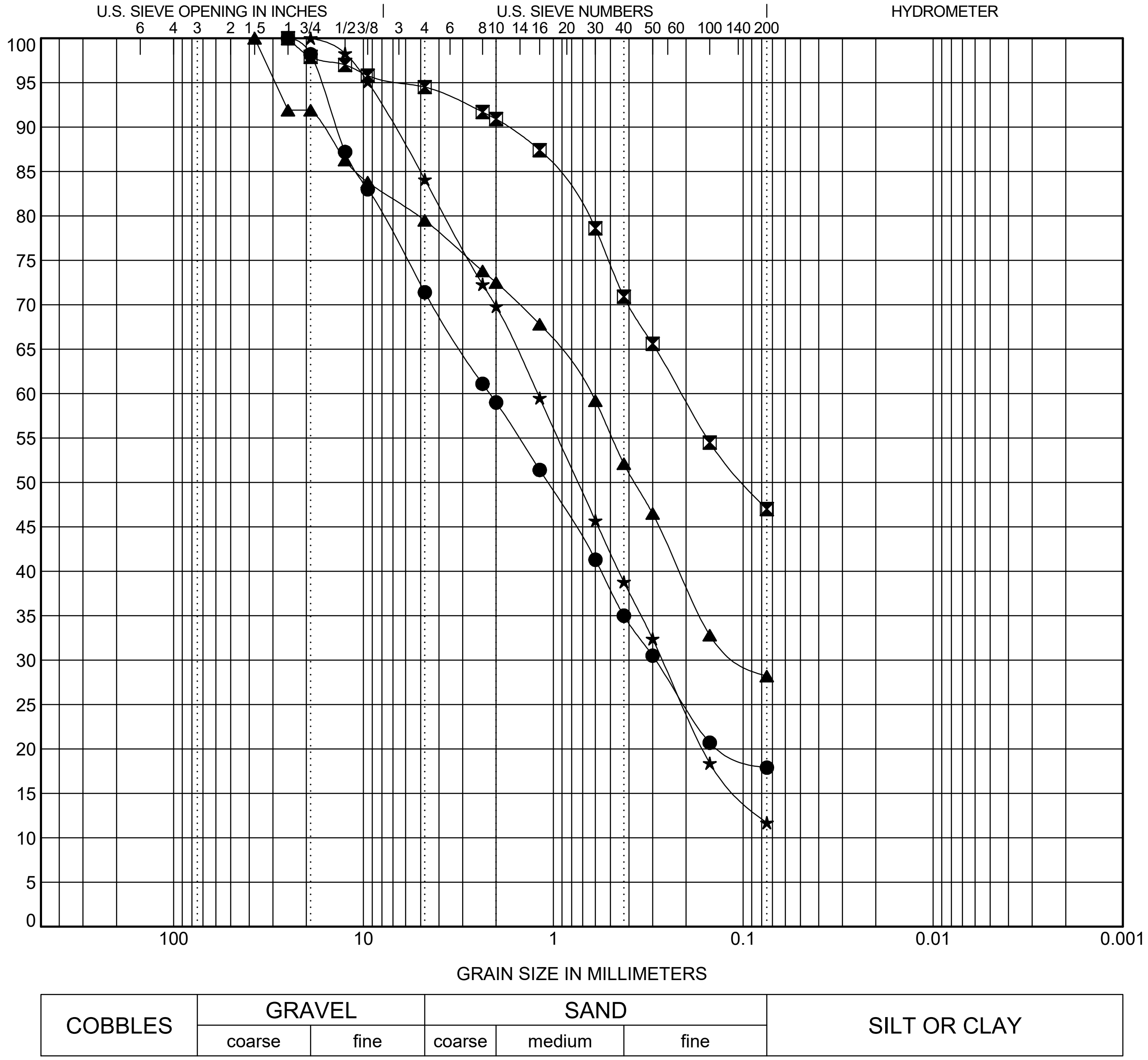
Appendix III

Laboratory Testing Results

GN Northern Inc.
11115 E. Montgomery, Suite C
Spokane Valley, WA, 99206
Telephone: (509) 248-9798
Fax: (509) 248-4220

GRAIN SIZE DISTRIBUTION

CLIENT FDM Development
PROJECT NAME Proposed Rock Creek Cove Development
PROJECT NUMBER 219-1183
PROJECT LOCATION Rock Creek Drive, Stevenson, WA



BOREHOLE		DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**TP-1**	**5.0**	**SILTY SAND WITH GRAVEL (SM)**					
☒	**TP-2**	**3.5**	**SILTY SAND (SM)**					
▲	**TP-3**	**11.0**	**SILTY SAND WITH GRAVEL (SM)**					
★	**TP-11**	**4.0**	**SILTY SAND WITH GRAVEL (SM)**				**0.93**	**19.25**

BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-1**	**5.0**	**25**	**2.164**	**0.29**		**28.6**	**53.5**	**17.9**	
☒	**TP-2**	**3.5**	**25**	**0.211**			**5.5**	**47.5**	**47.0**	
▲	**TP-3**	**11.0**	**37.5**	**0.639**	**0.098**		**20.5**	**51.3**	**28.2**	
★	**TP-11**	**4.0**	**19**	**1.211**	**0.266**		**15.9**	**72.4**	**11.7**	

GRAIN SIZE - TEMPLATE_JESSE.GDT - 1/13/20 14:06 - C:\USERS\GN NORTHERN\DROPBOX\5-ACTIVE PROJECTS\219-1183 ROCK CREEK COVE, STEVENSON\219-1183 LOGS.GPJ

Appendix IV

Site & Exploration Photographs

Excavation of test-pit TP-1, looking west

Exposed subsurface soil profile within test-pit TP-1

Excavation of test-pit TP-2, looking southwest

Exposed subsurface soil profile within test-pit TP-2

Excavation of test-pit TP-3, looking west

Exposed subsurface soil profile within test-pit TP-3

PLATE 1: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 219-1183**

View of site conditions near test-pit TP-4

Exposed subsurface soil profile within test-pit TP-4

Excavation of test-pit TP-5, looking east

Exposed subsurface soil profile within test-pit TP-5

Excavation of test-pit TP-6, looking north

Exposed subsurface soil profile within test-pit TP-6

PLATE 2: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 219-1183**

View of site conditions near test-pit TP-7, looking north

View of site conditions

View of site conditions near test-pit TP-8, looking west

Exposed subsurface soil profile within test-pit TP-8

Exposed subsurface soil profile within test-pit TP-9

Exposed subsurface soil profile within test-pit TP-10

PLATE 3: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 219-1183**

Exposed subsurface soil profile within test-pit TP-11

Exposed subsurface soil profile within test-pit TP-11

Excavation of test-pit TP-12, looking southwest

Exposed subsurface soil profile within test-pit TP-12

View of site conditions near test-pit TP-12, looking northwest

Infiltration test setup at test-pit P-1

PLATE 4: SITE & EXPLORATION PHOTOGRAPHS **PROJECT NO. 219-1183**

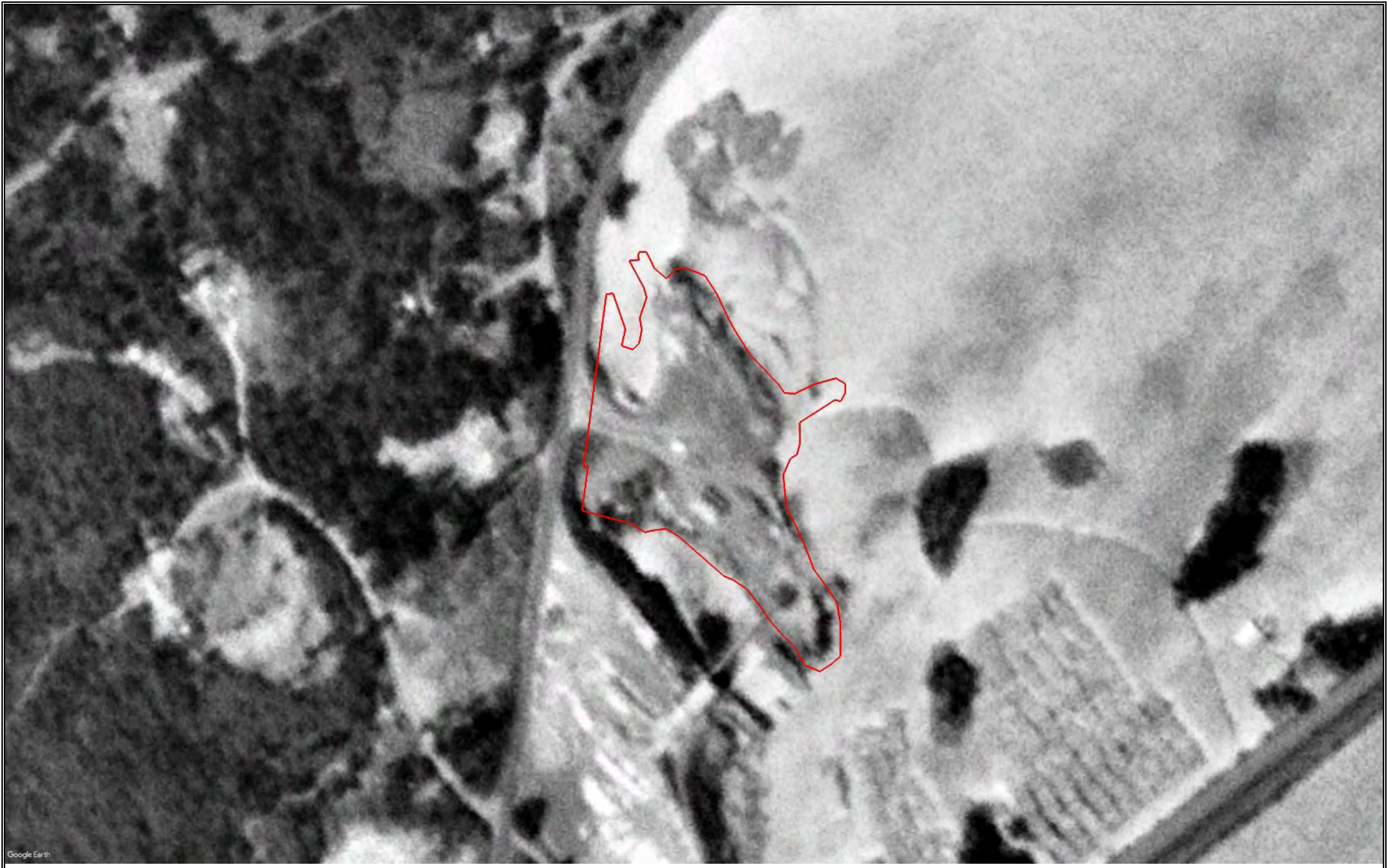
Appendix V

Historic Aerial Photographs

1935 Historic USGS Aerial

1952 Historic USGS Aerial

PLATE 1: HISTORIC AERIAL PHOTOGRAPHS **PROJECT NO. 119-1183**



1955 Historic USGS Aerial

1973 Historic USGS Aerial

PLATE 2: HISTORIC AERIAL PHOTOGRAPHS **PROJECT NO. 119-1183**

1975 Historic USGS Aerial

1979 Historic USGS Aerial

PLATE 3: HISTORIC AERIAL PHOTOGRAPHS **PROJECT NO. 119-1183**

1981 Historic USGS Aerial

1984 Historic USGS Aerial

PLATE 4: HISTORIC AERIAL PHOTOGRAPHS **PROJECT NO. 119-1183**

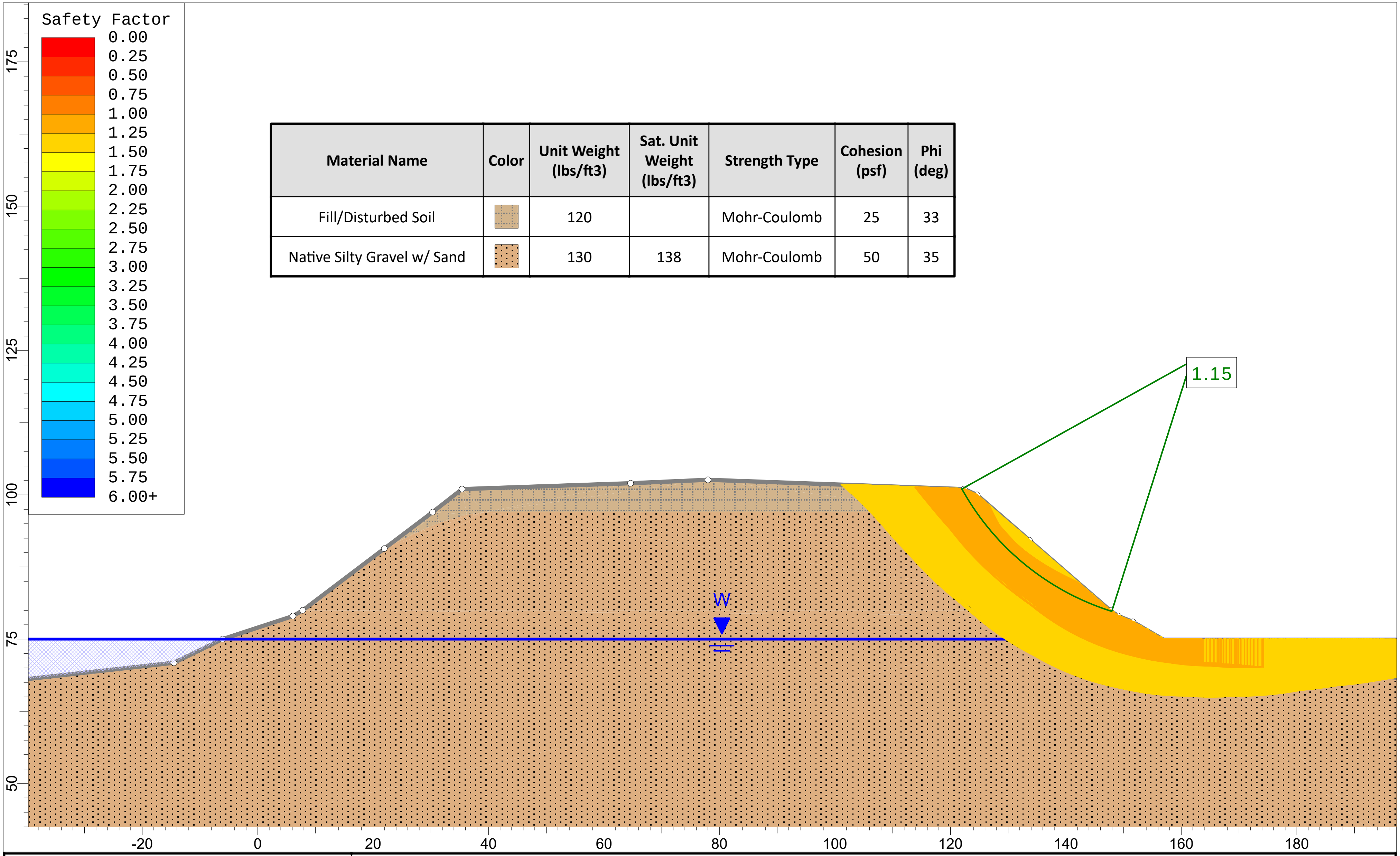
1993 Historic USGS Aerial

2007 Historic USGS Aerial

PLATE 5: HISTORIC AERIAL PHOTOGRAPHS **PROJECT NO. 119-1183**

Appendix VI

Slope Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Fill/Disturbed Soil	▨	120		Mohr-Coulomb	25	33
Native Silty Gravel w/ Sand	▨	130	138	Mohr-Coulomb	50	35

Northern, Inc.

Consulting Engineers Environmental Scientists Geologists
Construction Materials Testing Geophysical Services

SLIDEINTERPRET 7.037

Project	Rock Creek Cove Vacation Homes Project
Analysis Description	Existing Slopes Across Southern Peninsula - Spencer Method - Static
Drawn By	MYM
Scale	1:276
Company	GN Northern, Inc,
Date	
File Name	Slide1.slim

Appendix VII

NRCS Soil Survey

United States
Department of
Agriculture

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
Skamania County Area, Washington

Rock Creek Cove Vacation Homes Project

January 9, 2020

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,710 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Skamania County Area, Washington

2—Arents, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1hhrw
Elevation: 0 to 200 feet
Mean annual precipitation: 40 to 80 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 90 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Arents

Setting

Landform: Terraces

Typical profile

H1 - 0 to 24 inches: gravelly sandy loam
H2 - 24 to 60 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

177—Water

Map Unit Composition

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

CULTURAL RESOURCES REPORT COVER SHEET

DAHP Project Number: ______ (Please contact the lead agency for the project number. If associated to SEPA, please contact SEPA@dahp.wa.gov to obtain the project number before creating a new project.)

Author: Donald D. Pattee and Bill R.Roulette

Title of Report: Results of a Cultural Resources Study of the Proposed Rock Creek Cove Resort Property, Stevenson, Washington

Date of Report: February 4, 2020

County(ies): Skamania Section: 1 Township: 2N Range: 7E

Quad: Bonneville Dam, OR-WA; Carson, WA-OR 2017 Acres: 6.4

PDF of report submitted (REQUIRED) ☐ Yes

Historic Property Inventory Forms to be Approved Online? ☐ Yes ☐ No

Archaeological Site(s)/Isolate(s) Found or Amended? ☐ Yes ☐ No

TCP(s) found? ☐ Yes ☐ No

Replace a draft? ☐ Yes ☐ No

Satisfy a DAHP Archaeological Excavation Permit requirement? ☐ Yes # ______ ☐ No

Were Human Remains Found? ☐ Yes DAHP Case # ______ ☐ No

DAHP Archaeological Site #:

______
______
______
______
______
______
______
______
______

- Submission of PDFs is required.
- Please be sure that any PDF submitted to DAHP has its cover sheet, figures, graphics, appendices, attachments, correspondence, etc., compiled into one single PDF file.
- Please check that the PDF displays correctly when opened.

RESULTS OF A CULTURAL RESOURCES STUDY OF THE PROPOSED ROCK CREEK COVE RESORT PROPERTY, STEVENSON, WASHINGTON

By
Donald D. Pattee, M.A., RPA 32246885,
and
Bill R. Roulette, M.A., RPA 11132,

Report submitted to

FDM Development, Inc.
Kennewick, Washington

February 4, 2020

APPLIED ARCHAEOLOGICAL RESEARCH, INC., REPORT NO. 2292

APPLIED
ARCHAEOLOGICAL
RESEARCH, INC.
Cultural Resource Management and Historic Preservation

4001 NE Halsey Street, Suite 3
Portland, OR 97232
Phone (503) 281-9451

RESULTS OF A CULTURAL RESOURCES STUDY OF THE PROPOSED ROCK CREEK COVE RESORT PROPERTY, STEVENSON, WASHINGTON

By:

Donald D. Pattee, M.A., RPA 32246885
Bill R. Roulette, M.A., RPA 11132

Report submitted to

FDM Development, Inc.
Kennewick, Washington

February 4, 2020

APPLIED ARCHAEOLOGICAL RESEARCH, INC., REPORT NO. 2292

ABSTRACT

FDM Development, Inc. (FDM) proposes to develop the Rock Creek Cove resort on an industrial property, formerly occupied by the Hegewald Veneer Mill (HVM), located in the western part of the town of Stevenson in Skamania County, Washington. Developments will include the construction of 14 vacation rental homes, a property management building, and paved parking areas around each structure.

The development site is within an urban exempt area of the Columbia River Gorge National Scenic Area. Therefore, the proposed project is not required to follow the guidelines for cultural resource surveys described in the Columbia River Gorge National Scenic Area Management Plan. However, the project is required to comply with the State Environmental Policy Act as implemented by Skamania County Code (16.04). The State Environmental Policy Act requires all developers to consider the impacts a project may have on the environment and to cultural resources before making permitting decisions. FDM contracted with Applied Archaeological Research, Inc. (AAR) to assist it in determining the effects of its proposed project on cultural resources.

AAR's study was designed to locate cultural resources that may be affected by the development and included background research and a field study. The latter included an intensive pedestrian survey and the excavation of four shovel test pits.

As a result, AAR determined that the entire project area had been impacted by the construction and operation of the HVM. Two concrete pads are all that remain of the mill operations. They mark the locations of the main sawmill building and another mill building. In AAR's opinion, the pads are not archaeological and they were not recorded as an archaeological resource.

In terms of Line 13 of the State Environmental Policy Act checklist, it is AAR finding that the project area does not contain any buildings, structures, or sites, that are listed in or eligible for listing in national, state, or local preservation registers. AAR recommends no further archaeological work is warranted in the current project area.

Although considered unlikely, there is always a possibility that an archaeological resource may be discovered during future development activity on the property. For that reason, the applicant and any contractors that may work on the property need to be aware that under the Revised Code of Washington at 27.53.060, it is unlawful to knowingly damage, deface, or destroy an archaeological site on public or private land in Washington. The Revised Code of Washington at 27.44.040 makes it a class C felony to knowingly remove, mutilate, deface, injure, or destroy any cairn or grave of any native Indian. Thus, in the event that archaeological materials, Indian cairns, or human remains are encountered during the development of the property, all construction activities must stop in the vicinity of the finds and the Department of Archaeology and Historic Preservation should immediately be notified and work halted in the vicinity of the finds until they can be inspected and assessed. Procedures outlined under Washington Administrative Code 25-48 will be followed and work will not resume until mitigation measures have been agreed upon.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Project Description and Staffing

FDM Development, Inc. (FDM) proposes to develop the former site of the Hegewald Veneer Mill (HVM) located at Rock Creek Cove resort into a resort that would include 14 vacation rental homes, a property management building, associated infrastructure, and paved parking areas. The development site is within an urban exempt area of the Columbia River Gorge National Scenic Area (CRGNSA). Therefore, the proposed project is not required to follow the guidelines for cultural resource surveys described in the CRGNSA Management Plan. However, the project is required to comply with the State Environmental Policy Act (SEPA) as implemented by Skamania County Code (16.04). SEPA requires all developers to consider the impacts a project may have on the environment and to cultural resources before making permitting decisions. To assist FDM in its compliance with SEPA requirements, Applied Archaeological Research, Inc. (AAR) conducted a cultural resource survey of the proposed development site.

Archaeological fieldwork for the project was supervised by Donald D. Pattee, M.A., RPA 32246885 who was assisted by Michelle R. Lynch, M.A., RPA 429967347. The project was under the technical supervision of Bill R. Roulette, M.A., RPA 11132, AAR's Principle Investigator. Mr. Pattee, Ms. Lynch, and Mr. Roulette meet the Secretary of the Interior's professional qualification standards.

Conventions

In this report, measurements for common distances, elevations, and areas are in United States customary units (e.g., feet, miles, and acres). Measurements related to archaeological techniques and artifact analyses are in metric units (e.g., meters, centimeters, and millimeters). Numbers in the thousands used to express ages and distances feature commas to denote thousands. Calendar dates and dates used to express years before present (B.P.) do not use commas to denote the thousands place but do use commas to denote the ten thousands place.

Description of the Project Area

The proposed resort development site is in the western part of the town of Stevenson in Skamania County, Washington, in Section 1, Township 2 North, Range 7 East, Willamette Meridian (Figure 1). It is privately owned and encompasses 6.4 acres. It is composed of three contiguous tax parcels numbered 02070100130300, 02070100130400, and 02070100130200, that together form an irregularly-shaped tract that is maximally 1,022 feet (ft) measured north-to-south and 580 ft measured east-to-west. The property is located on a peninsula that projects into Rock Creek Cove on the northern bank of the Columbia River. The cove was created in 1937 as a result of flooding that occurred along the banks of the river east of Cascade Locks soon after the Bonneville Dam began operation. Its west side is bordered by Rock Creek Drive. Its other sides are defined by the boundaries of the proposed development footprint and the cove (Figure 2).

The project area is at an elevation of about 102 ft above mean sea level (amsl). Its surface has been artificially flattened and built up. The modifications are most likely related to the development of the property by the HVM in the early 1950s (see below). Its central part contains two concrete pads that mark the former locations of mill buildings. The largest pad is 337 ft long and 86 ft wide. It marks the former location of the main sawmill (Figure 3). The other pad is 59 ft long and 45 ft wide and most likely marks the location of a second mill building, possibly a machine shop.

Prior to AAR's fieldwork parts of the property had been disturbed by heavy equipment that was used to clear brush and remove trees. Cleared vegetation and soil were pushed into low piles that

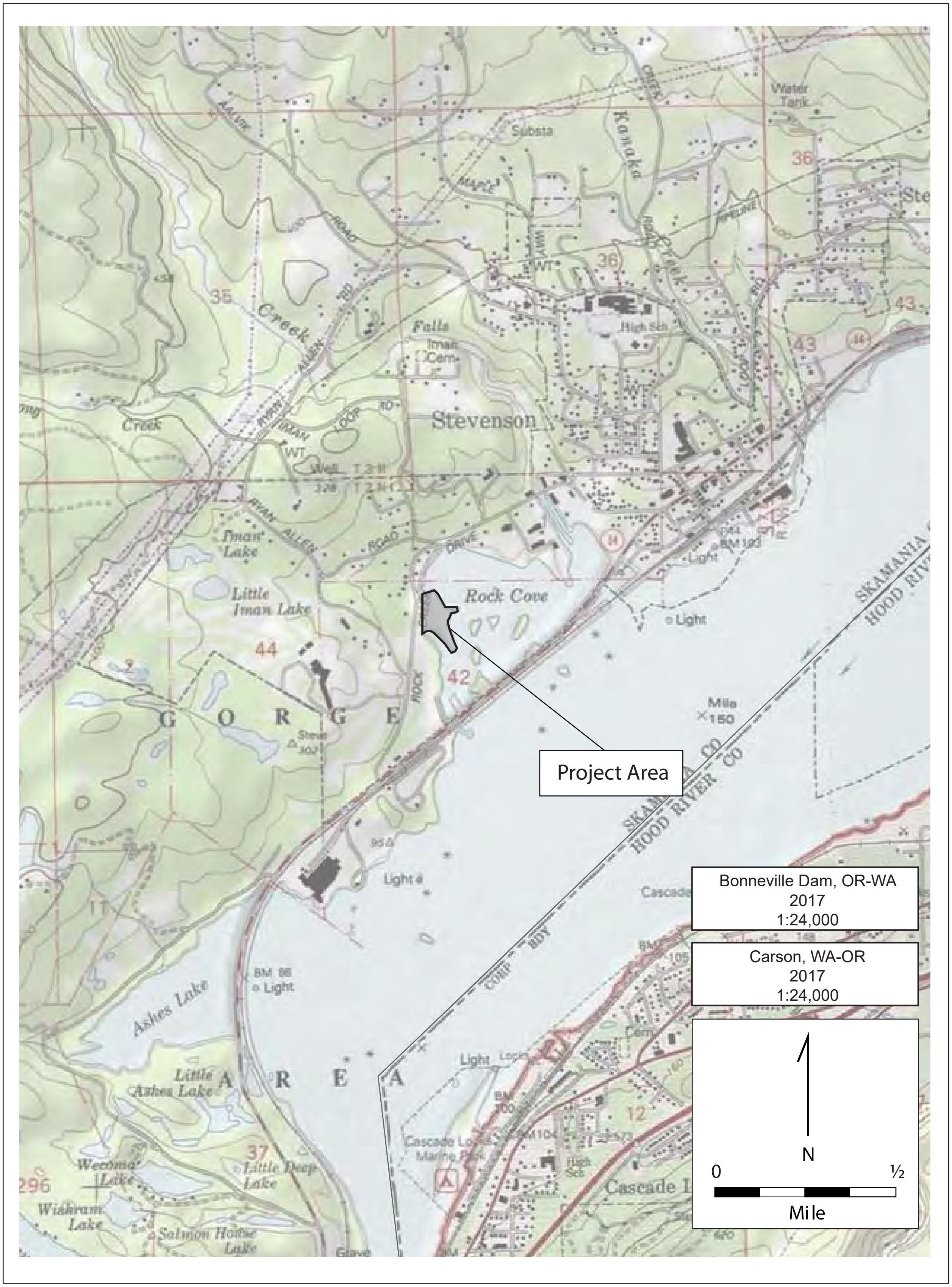


Figure 1. Location of the project area.

Figure 2. Aerial photomap of the project area.

Figure 3. Photographic overview looking east at the concrete foundation of the main sawmill building of the HVM.

remain in place (Figure 4). At least two trenches had been excavated in the eastern part of the property and partly backfilled (Figure 5). The ground surface in the parts of the property that were not disturbed or otherwise obscured by gravel or building foundations were covered in grasses, blackberry brambles, and a scattering of Douglas-fir, alder, and maple trees (Figure 6).

Project Background

In 2016, Skamania County initiated an inventory of all brownfield sites (i.e. abandoned properties where there may be environmental contamination) located in the county to better understand their impacts on surrounding communities and to study their potential for commercial development. As part of the inventory, the county conducted a Phase II environmental site assessment (ESA) of the project area to evaluate the potential environmental impacts associated with the historical operation of the HVM. No cultural resource investigations were conducted on the property in advance of or as part of the assessment. The ESA included the use of ground penetrating radar across the site to check for buried infrastructure (e.g. tanks, tank pits, pipes, or septic systems). In addition, ten test pits were excavated in select areas to extract soil samples to be analyzed for metals, petroleum, and dioxins. The GPR results showed that there were no buried infrastructure and no petroleum was detected in the soil. Some metals and dioxins were detected, but did not exceed contamination levels considered by the Model Toxics Control Act to be harmful to humans. The ESA recommended that no further environmental remediation of the site was warranted.

Figure 4. Photographic overview looking north of an area cleared of brush. The vegetation and displaced soil have been pushed into low piles.

Figure 5. Photographic overview looking northeast of an area that had been trenched prior to fieldwork.

Figure 6. Photographic overview looking west showing typical vegetation throughout the project area at the time of fieldwork.

ENVIRONMENTAL, CULTURAL, AND HISTORICAL CONTEXTS

Environmental Setting

The project area is located in the southernmost part of the Southern Washington Cascade physiographic province where the mountains have been incised by the Columbia River Gorge. The province is characterized by deeply dissected and weathered mountains set on a generally western sloping terrace. It contains rugged mountainous areas, river floodplains, and low terraces.

The modern topography of the Gorge reflects the down cutting of the Columbia River through basalt bedrock. The basalt was laid down during the Miocene in a number of individual flows that collectively are known as the Columbia River Basalts. The lava from these flows originated in central and eastern Washington and Oregon and streamed westward down the Columbia River valley to the sea (Allen et al. 1986). Exposures of these flows can be seen in the steep walls framing the Gorge.

Following the deposition of the basalts, the Cascades were up-arched. As the mountains were rising, the Columbia River was cutting down through the range, creating its deep canyon. Later, toward the end of the Pliocene and into the Pleistocene, volcanic activity resumed in the Cascades, producing lava flows which filled the tributaries of the Columbia and which displaced the river to the north, near its present position. The strato volcano peaks of Mt. Hood, Mt. St. Helens, and Mt. Adams began to rise some 700,000 years ago, a process which continues into the present. The up-arching of the Cascades created a barrier to easterly flowing moist marine air and resulted in the climatic division of the region into the moist western and dry eastern portions (Allen et al. 1986). In the Columbia River Gorge, this climatic change occurs around White Salmon and Hood River, a short distance upriver, or east, of the project area.

Although the basalt flows of the Miocene laid the foundation for the physiography of the Gorge, the geological events of the Pleistocene shaped it into its present configuration. The most important of these events were the Missoula Floods (known variously as the Bretz or Spokane floods) that occurred between about 17,000 and 12,700 years ago (Clague et al. 2003; Waitt 1994). The floodwaters originated in Glacial Lake Missoula, a body of water formed when the Purcell Trench Lobe of the Cordilleran ice sheet blocked the Clark Fork River in Montana. When the waters of Lake Missoula breached the ice dam, a wall of water estimated to have been ca. 2,000 ft high was released. In a single flood, somewhere near 500 cubic miles of water rushed across the Columbia Plateau and entered the Columbia River system (Alt and Hyndman 1993:172). The tremendous force and volume of the floods scoured away the soils of the Gorge and altered the river valley from its previous V shape to its present U-shaped cross-sectional profile (Allen et al. 1986:159).

The floods led to the oversteepening of the Gorge walls, particularly in areas where the Columbia River basalts are underlain by the easily erodible Eagle Creek Formation. These conditions have made a nearly 50-square-mile area toward the west end of the Gorge prone to landslides. The project area is situated near the leading edge of a debris deposit from the quaternary-aged Red Bluff landslide, which is part of the greater Cascade Landslide Complex. The deposits extend further southward and are submerged in Rock Creek Cove (Pierson et al. 2016; Randall 2012).

The project area is in the *Tsuga heterophylla* zone, a classification of plant associations that is found throughout western Washington and Oregon in wet maritime climates between sea level and about 2,300 ft amsl (Franklin and Dyrness 1988). Throughout the zone, Douglas-fir, western hemlock, and western redcedar with few hardwoods dominate typical overstory vegetation in forested areas. Common forest understory plants throughout the zone include vine maple, hawthorn, wild rose, blackberry, thimbleberry, and snowberry.

The primary soil mapped within the project area is Arents, 0 to 5 percent slopes (Haggen 1990). It is an anthropogenic soil that developed as the result of disturbance and redeposition through various human activities such as mining, dredging of water bodies, road building, and construction (Sencindiver and Ammons 2000). It does not represent a native soil body, but rather formed in spoils that have been removed from their original context and redeposited. No single profile of Arents is typical. One commonly observed includes a 24-inch-thick “A horizon” of dark brown, gravelly sandy loam. The underlying material extends to a depth of 5 ft below surface and consists of stratified gravelly to very gravelly loamy sand (Haagen 1990).

Ethnographic Overview

The project area is located at the eastern periphery of the traditional territory of the Cascade people that spoke an Upper Chinook dialect and were closely aligned with other Upper Chinook peoples that occupied both sides of the Columbia River between from roughly the mouth of the Washougal River to a point above Dallesport including the Hood River, White Salmon, Wasco, and Wishram (French and French 1998:360-363*)*. The territory of the Cascades Chinook included lands on each side of the Columbia River in the vicinity of the Cascades of the Columbia, a section of river narrowed and obstructed with landslide debris where the river dropped about 40 ft in elevation through a series of rapids over a distance of several miles. The Cascades controlled the portages around the rapids and the important salmon fishery centered there.

The Cascade people and other Upper Chinookan groups lived in autonomous villages without overarching political organization or centralized government (French and French 1998:369). Villages were presided over by chiefs who held office based primarily on a system of hereditary leadership rights (Silverstein 1990:541). Chiefs were usually persons of the highest rank within the hierarchically organized Chinook society, and chiefly status was conferred on members of wealthy and politically influential families. Status, class, and rank were used as organizational principles in Chinook society. Chiefs, along with shamans, warriors, and traders, formed a small upper class with slaves forming the bottom of the social hierarchy. Commoners ranged between these hierarchical poles and were probably ranked along numerous socially recognized gradations. High rank and high class was strongly linked to wealth.

Winters were spent in permanent settlements consisting of one or more rectangular, gabled-roofed, upright-cedar-plank houses (Hajda 1994; Silverstein 1990) that featured raised sleeping and storage platforms that lined the house walls. In 1805, Lewis and Clark encountered the Chinook village of Wishram on the north side of the Columbia River (near what is now Columbia Hills State Park) and described some 20 homes constructed of wood, the first wooden houses the expedition had seen since leaving Illinois (Wilke et al. 1983:75-76). Chinook subsistence was oriented toward fishing and root-and-berry gathering. Most subsistence activities were organized around small groups that dispersed to smaller camps focused on task-specific subsistence activities.

Native peoples that lived along the Columbia River came into contact with European and American sea-borne fur traders in the late-eighteenth century. Diseases introduced by the traders, especially small pox, influenza, and malaria, spread rapidly upriver and throughout the region with catastrophic results. The first historical reports of a malarial epidemic are from 1830. Within four years 75 to 90 percent of the regional native population was dead (Boyd 1985). Displaced groups and individuals formed *ad hoc* communities or joined those still existing, and either attempted to follow traditional patterns or adopted the life ways of the Euroamericans (Hajda and Boyd 1988:45-46).

Historical Overview

The first Euroamericans to pass through the Columbia River Gorge were explorers and fur traders in the early decades of the nineteenth century. Among the explorers were Lewis and Clark who led their Corps of Discovery expedition down the Columbia River in 1805, and David Thompson, who traversed the length of the Columbia River in 1811. After the establishment of a land-based fur trade around 1811, a greater number of Euroamericans traveled throughout the region in search of furs. Travel logs left by early traders in the region document the spread of disease among the native populations of the Columbia River as early as the 1830s, resulting in a catastrophic population loss (Minor et al. 1986:54-55). By 1834, missionaries began trickling into the region, followed several years later by the initial waves of pioneers heading to the Willamette Valley along the Oregon Trail. Between 1841 and 1851 all travelers and settlers heading west had to pass through the Columbia River Gorge, where, just east of the city of Stevenson, they were forced to portage along the north bank of the river around the rapids known as the Upper, Middle, and Lower Cascades.

The passing of the Oregon Donation Land Act of 1850 resulted in a steady influx of Euroamerican settlers that initially used the area for grazing livestock and logging (Mack and McClure 1999). As more settlers arrived to the region, small communities were established along the banks of the Columbia River, which provided needed services for travelers passing through the gorge. These included lodging, supplies, and improved portage routes. One such community was Stevenson, which shared the name of its founder, George Stevenson. The town was founded in 1893 and quickly became an important way-stop for travelers passing through the gorge. River transportation improved with the construction of the Cascade Locks in 1896 allowing boats to by-pass the cascades. Incoming travelers to the region could now navigate the Columbia River from Portland as far as The Dalles. Easier river travel spurred economic development in Stevenson and by 1900 the town featured two hotels, two saloons, two restaurants, as well as a general store, drug store, post-office, jail, print shop, and court house (Skamania County Chamber of Commerce 2020; Wilma 2006). The town was officially incorporated in 1908. That same year, the Spokane, Portland, and Seattle rail line arrived and connected the town to the major cities of the Pacific Northwest (Wilma 2006).

The rail line and the more navigable river resulted in logging and milling becoming one of the more important economic pursuits in the region as timber products could be transported with relative ease to Portland or Seattle and then shipped overseas where demand was high. In the following decades, the logging industry became vital to the economy of Stevenson. Trees logged in the hills backing the town were transported by flumes down to sawmills that lined the shoreline including the HVM.

The HVM operated between 1952 and 1973. It was primarily used for the production of wood veneer, which was peeled from tree logs and then pressed into 8-foot-long sheets (Hunt 1964). The sheets were used to line doors, table tops, and cabinetry panels. At the height of its operation, the mill produced 60,000,000 square feet of veneer annually (Hunt 1964). Waste produced from the process (e.g. wood chips or parts of the log not suitable for milling) was burned in two conical structures referred to at the time as “wigwam burners” (Hunt 1964). Tree logs were stored in Rock Creek Cove, which was enclosed by wooden booms that prevented the logs from floating downriver. In 1973, the mill was sold to Louisiana Pacific, which operated it until its closure in 1975. Around that same time, other sawmills in the Stevenson area closed resulting in the loss of hundreds of jobs and severely impacting the economy of the town. It did not fully recover until the early 1990s (Wilma 2006).

Historical Maps Research

As part of the background research, historical maps were reviewed to determine the likelihood that the project area contains undocumented historic-era features and to trace land ownership. Maps reviewed include those produced by the General Land Office (GLO) as part of the cadastral survey and those prepared by the United States Geologic Survey (USGS). Historic aerial photographs were also reviewed.

The earliest maps that depict the project area are cadastral survey maps produced by the General Land Office (GLO) in 1860, 1876, 1903, and 1906. The project area is shown as devoid of developments on the maps (GLO 1860, 1876, 1903, 1906). An 1864 GLO map shows lands taken out of federal ownership through land claims. The project area is shown as within a 319.91-acre land claim filed by D. Baughman (GLO 1864).

A 30-minute (1:125,000) map published by the United States Geological Survey (USGS) in 1929 shows the project area before inundation of the Bonneville Pool (also known as Bonneville Lake) the reservoir behind Bonneville Dam (USGS 1929). No buildings or other developments are depicted in it (Figure 7). A 15-minute map published by the USGS in 1957 shows the project area after completion of the Bonneville Dam and formation of the reservoir behind it (USGS 1957). A large rectangular structure is shown on the map to be in the project area representing the main HVM sawmill building (Figure 8).

An aerial photograph taken of the mill sometime between 1952 and 1973 on display in the Columbia Gorge Interpretive Center Museum, shows that HVM in full development (Figure 9). The mill complex can be seen to cover the entire project area with much of it covered by buildings, what appear to be graveled surfaces, stockpiled wood products, and general debris. The photograph shows the main sawmill and the second mill building in locations corresponding to where concrete pads remain. It also shows two wigwam burners that were located in the southern part of the property (Western Ways, Inc., n.d.).

Previous Archaeology in the Project Area and Vicinity

A review of records on file at the Washington State Department of Archaeology and Historic Preservation (DAHP) accessed online using its Washington Information System for Architectural and Archaeological Records Data (WISAARD) database showed that the project area has not previously been surveyed for cultural resources. Thirty-three cultural resource investigations have been conducted within

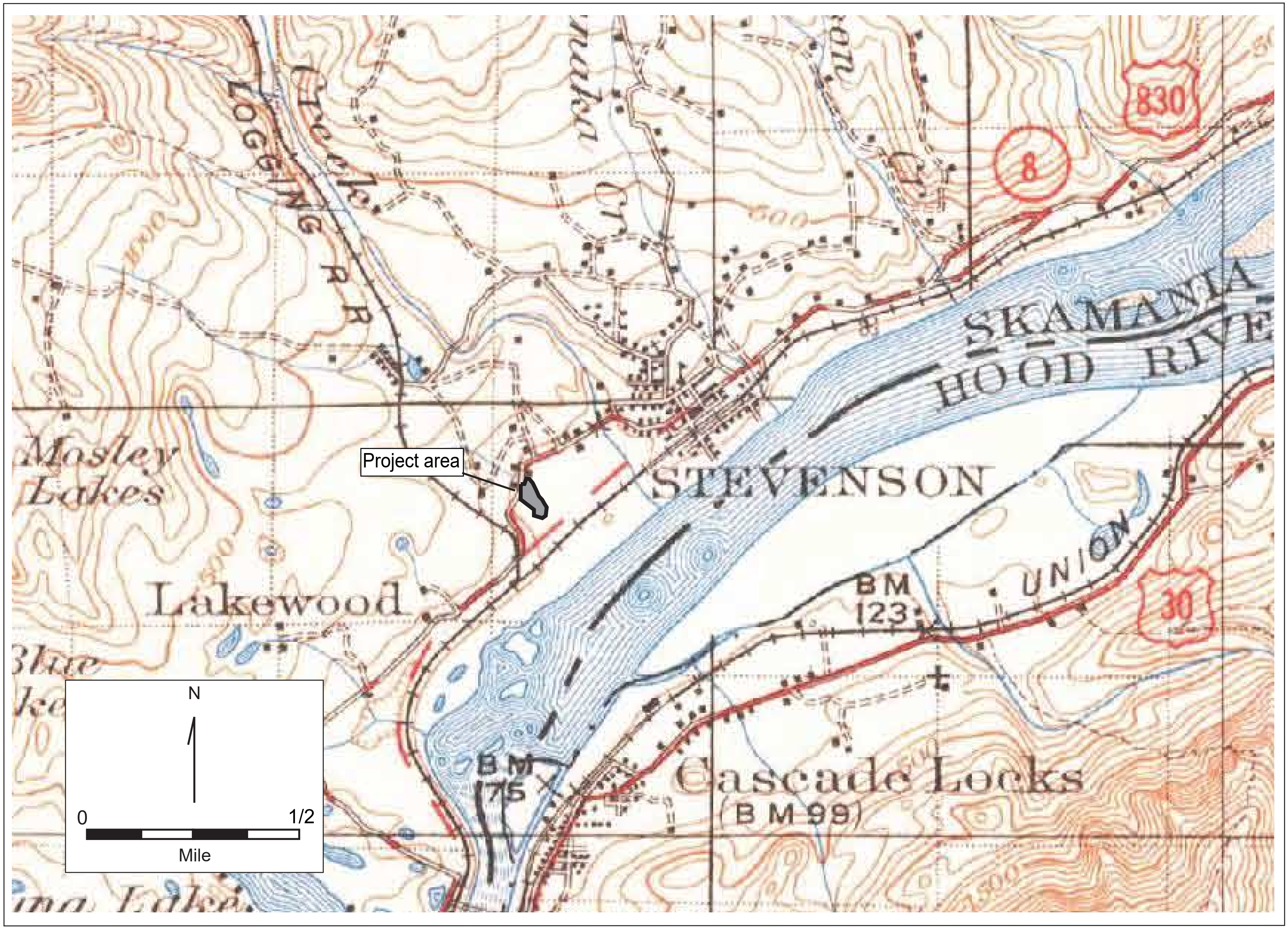


Figure 7. Location of the project area as depicted on the Hood River, Wash.-Oreg., 30-minute topographic quadrangle published in 1929.

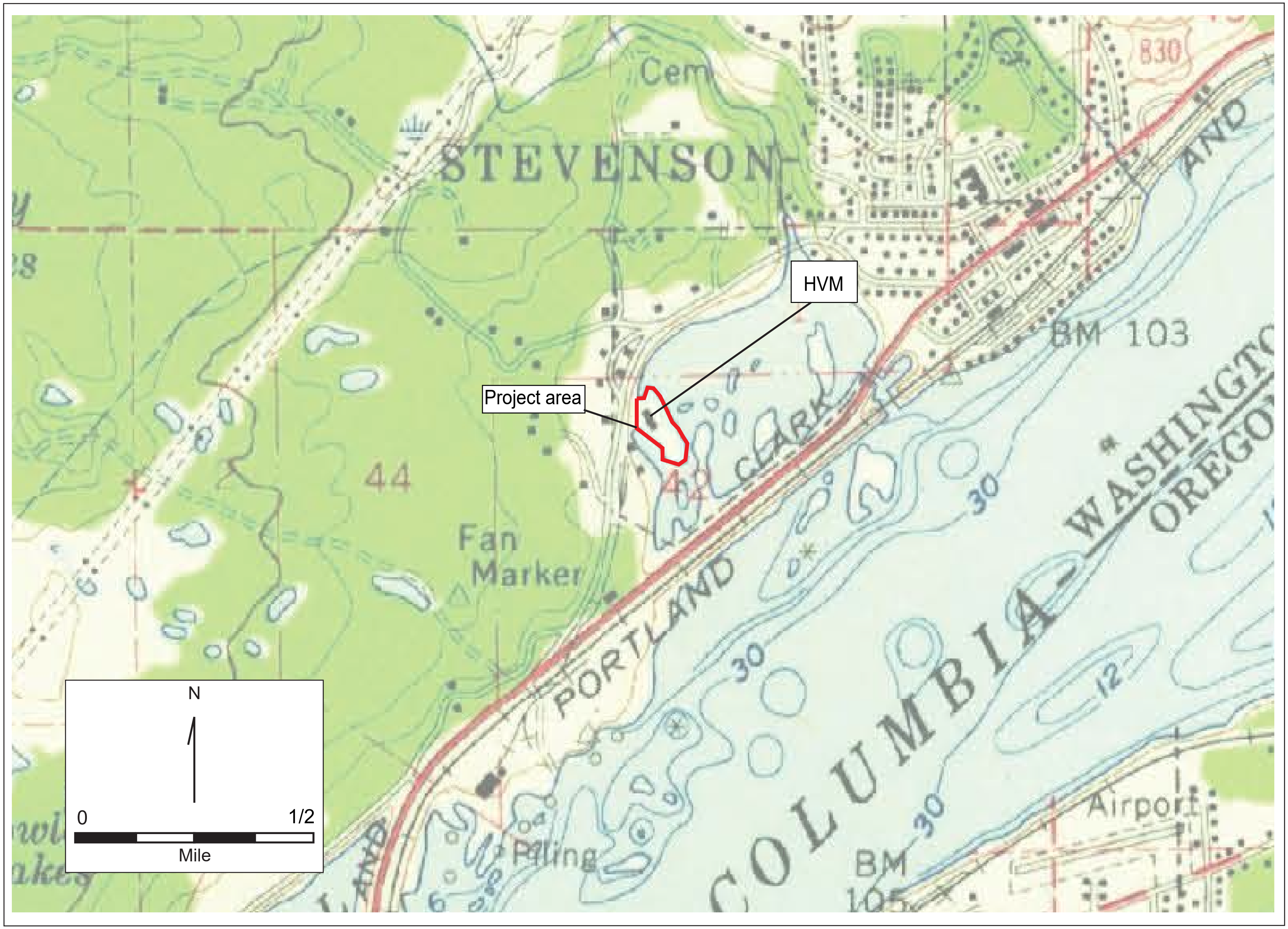


Figure 8. Location of the project area and the HVM as depicted on the Bonneville Dam, Oreg.-Wash., 15-minute topographic quadrangle published in 1957.

Figure 9. Aerial photomap taken of the HVM sometime between 1952 and 1973. Photomap is currently on display in the Columbia Gorge Interpretive Center Museum.

two miles of it (Table 1). The studies have generally consisted of reconnaissance and formal surveys that have resulted in the identification of multiple component sites 45SA20 and45SA541, pre-contact sites 45SA210, 45SA600, 45SA633, 45SA650, pre-contact isolate 45SA585, and historic-era sites 45SA8, 45SA121, 45SA501, and 45SA502.

Of the previously recorded sites, 45SA20, the Ice House Lake site, has been the most intensively studied. The site was recorded during a cultural resources survey conducted by the University of Washington in advance of the construction of a powerhouse at Bonneville Dam (Mesrobian and Sunstrom 1976). It is located about 1.4 miles to the southwest of the project area on terraces overlooking the northern shore of the Columbia River. Evaluative test excavations were conducted at the site in 1988. They included a surface inspection as well as the excavation of six 1-x-1 meter (m) test units (TUs) and six auger test probes. The investigation resulted in the recovery of a variety of pre-contact and historic-era artifacts as well as floral and faunal remains.

Pre-contact artifacts recovered from the site included 11,243 pieces of cryptocrystalline silicate (CCS), obsidian, basalt, and petrified wood debitage and 99 stone tools. Tools included projectile points, preforms, knife fragments, bifaces, flake knives, perforators, used flakes, hammerstones, pounders, anvils, choppers, cobble flake knifes, spall tools, abraders, and cores (Minor 1988). Most of the projectile points identified were small, narrow necked forms consistent with Types 7, 8, 10, and 12 described in Pettigrew's (1981) projectile point chronology of the Portland Basin. Broad-necked projectile points of the Type 2 variety were also observed (Pettigrew 1981).

The 439 historic-era artifacts recovered during the investigations included fragments of earthenware, porcelain, stoneware, and Chinese ware, clay pipes, vessel glass, machine cut nails, spikes, brace plates, iron bolts, staples, wire, bullets, metal scraps, and gunflint. A few pieces of charred nut shell and 148 animal bones were also recovered. Most of the bones were small fragments. Most were from sturgeon but they also included horse, elk, deer, cow, salmonids, and cyprinid bones (Minor 1988).

Minor (1988) determined that the site represented the village *Wahlala* (Curtis 1911) or *Walala* (Spier and Sapir 1930) occupied by the Cascade Chinook. It is described in the journal of Lewis and Clark as consisting of eight plank slab houses that were inhabited part of the year during the fishing season. Based on the results of the investigation, the site was interpreted to have been continually used by Chinook as a seasonal fishing village during the pre-contact period and into historic times. Initial occupation of the site was thought to have occurred 830 years ago. The site was likely abandoned around 1850 when the United States established a strong military presence throughout the Columbia River Gorge (see below). The site was recommended as eligible for listing on the National Register of Historic Places (NRHP).

The other multicomponent site within two miles of the project area is 45SA541. The site was recorded based on the inadvertent discovery of human remains in the side wall of a utility trench during the installation of buried telecommunications equipment. The discovery triggered emergency archaeological excavations and the screening of a sample of the spoils created during the trenching. Recovered were 86 human or potentially human bones and mixed historical; and prehistoric artifacts all of which were contained in a thick layer of imported fill (Paraso and Ellis 2010).

Of the previously recorded pre-contact resources, three of them (45SA210, 45SA585, and 45SA650) consist of low density, lithic scatters that have not been documented past the initial survey phase. Site 45SA210 was identified 1.5 miles to the southwest of the project area on the north shore of Ashes Lake. As documented, the site contains one desert side-notched projectile point, a piece of human bone, and pieces of lithic debitage (Cole and Southard 1971). Only lithic debitage was identified at the other resources with site 45SA585 containing 10 pieces of CCS and basalt debitage and isolated find 45SA650 containing a single piece of CCS debitage (Becker and Roulette 2017; Olander et al. 2011).

Table 1. Cultural Resource Surveys Conducted within 2 Miles of the Project Area

Author(s) of Report/Year	Type of Investigation	Size of Study Area	Findings
Cole and Southard 1971	Formal survey	Not listed	45SA210 identified and documented
Dunnell and Lewarch 1974	Formal survey	Not listed	45SA8 identified and documented
Mesrobian and Sundstrom 1976	Formal survey	Not listed	45SA20 identified and recorded
Minor 1988	Evaluative testing	Not listed	Additional study at 45SA20 that refined its boundaries and expanded its artifact assemblage.
Minor and Beckham 1988	Evaluative testing	Not listed	45SA121 identified and documented
Freed 1989	Damage Assessment	Not listed	Additional study at 45SA20 that expanded its artifact assemblage.
Boynton 1995	Formal survey	82 acres	Archaeological resources identified and documented at distances greater than 2 miles from the project area
Musil 1999	Formal survey	120 acres	No archaeological resources identified
Easton and Roulette 2002	Formal survey	Not listed	No archaeological resources identified
Stilson 2002	Formal survey	4.4 acres	Archaeological resources identified and documented at distances greater than 2 miles from the project area
Scott 2003	Cultural resource monitoring	47 mile linear cooridor	Archaeological resources identified and documented at distances greater than 2 miles from the project area
White and Ozbun 2003	Reconnaissance survey	Not listed	No archaeological resources identified
Boynton and Fagan 2006	Formal survey	4.2 acres	45SA501 and 45SA502 identified and documented
Gall 2006	Formal survey	25.4 acres	No archaeological resources identified
Dryden 2007	Reconnaissance survey	0.90 acre	No archaeological resources identified
Dryden 2009	Reconnaissance survey	0.01 acre	No archaeological resources identified
Lloyd-Jones and Ozbun 2009	Formal survey	5 acres	No archaeological resources identified
Dryden 2010a	Reconnaissance survey/cultural resource monitoring	2 acres	No archaeological resources identified
Dryden 2010b	Reconnaissance survey	0.15 acre	No archaeological resources identified
Paraso and Ellis 2010	Emergency archaeological excavations	Not listed	45SA541 identified and documented
Olander et al. 2011	Formal survey	Not listed	45SA585 identified and documented
Kiers 2012	Formal survey	<0.1 acre	No archaeological resources identified
Knutson et al. 2012	Formal survey	8.6 acres	45SA600 identified and documented. Numerous other resources identified at distances greater than 2 miles from the project area.
Harris et al. 2013	Formal survey	3.5 acres	No archaeological resources identified
O'Donnchadha 2013	Formal survey	1 acre	No archaeological resources identified
Bard et al. 2014	Formal survey	123.5 acres	Archaeological resources identified and documented at distances greater than 2 miles from the project area

Table 1. Cultural Resource Surveys Conducted within 2 Miles of the Project Area, continued

Author(s) of Report/Year	Type of Investigation	Size of Study Area	Findings
Jenkins and Reese 2014	Formal survey	2.6 acres	No archaeological resources identified
Pattee and Roulette 2014	Formal survey	8.26 acres	No archaeological resources identified
Smith and Gall 2014	Formal survey	30 acres	Additional study at 45SA600 that refined its boundaries. 45SA633 identified and documented.
Holschuh 2015	Formal survey	1 acre	No archaeological resources identified
Becker and Roulette 2017	Formal survey	1 acre	45SA650 identified and documented
Homan and O'Donnchadha 2017	Formal survey	52.51 acres	No archaeological resources identified
Gall and Smith 2019	Formal survey	41.5 acres	Additional study at 45SA8 that refined its boundaries and expanded its artifact assemblage. Archaeological resources identified and documented at distances greater than 2 miles of the project area.

Pre-contact sites 45SA600 and 45SA633 were observed to contain shallow pit features that had been excavated into a talus slope. The sites are located about two miles to the southwest of the project area. The date, origin, and function of the pits could not be determined. They are similar to those identified on the summit of Wind Mountain located approximately seven miles to the northeast of the project area, which are considered sacred to past and contemporary Native American groups. Because of this, the features were recorded as archaeological sites (Knutson et al. 2012; Smith and Gall 2014).

Historic-era site 45SA121 is located about 1.2 miles to the southwest and consists of the remnants of the U.S. Army's Fort Lugenbeel and the civilian town site of Upper Cascades. The town was established in 1851 and became one of the first frontier communities in the Columbia River Gorge. It contained hotels, homes, storage buildings, a portage tramway, and a sawmill. By 1855 the U.S. Army had established Fort Cascades at the Lower Cascades and Fort Rains at the Middle Cascades to the west to ensure the safe passage of troops and supplies from Fort Vancouver. Both forts were attacked and destroyed by Native Americans in 1856. Following the attack, the U.S. Army regained control of the area and constructed Fort Lugenbeel on a ridge above the community at Upper Cascades to deter future attacks (Minor and Beckham 1988). Evaluative testing at the site in 1988 resulted in the identification of multiple building foundations associated with the fort and town site as well as the recovery of 4,630 artifacts. These included ceramic and glass fragments, nails, spikes, bricks, various items related to firearms, clay pipe fragments, buttons, and faunal remains (Minor and Beckham 1988). The fort and town site were used between 1850 and 1880. The site has been listed on the NRHP under Criterion D.

Historic-era site 45SA8 was initially identified in 1974 as an historical homestead based on anecdotal information (Dunnell and Lewarch 1974). At the time of its recording, the location of the site was not field verified. In 2019, the site was the subject of a formal cultural resources survey that resulted in the discovery of a sparse, subsurface historic-era debris scatter. Observed artifacts included amber, aqua, amethyst, and colorless vessel glass, cut nails, several bottle bases, fragments of whiteware ceramics, and metal fragments (Gall and Smith 2019). Based on the identification of temporally sensitive artifacts during the investigation, the site deposit was determined to have formed between 1880 and 1920 (Gall and Smith 2019).

Historic-era sites 45SA501 and 45SA502 are located approximately 1 mile to the northeast of the project area. They were identified during a cultural resources survey conducted in advance of the construction of a residential subdivision. Site 45SA501 consists of a small dump of household debris, which includes oval Postum tins, a Hazel-Atlas bottle base, zinc caps, rusted cans, canning jars, and fragments of machine molded glass. The dump has been interpreted to have formed in the early 20th century (Boynton and Fagan 2006). Site 45SA502 consists of the ruins of an historic-period residential structure that was constructed in 1895 (Boynton and Fagan 2006).

Two historic-era cemeteries, which were recorded as cultural resources, are located within two miles of the project area. They are sites 45SA555, the Iman Cemetery, and 45SA651, the Gropper Cemetery. The first is located on land that was owned by Feliz Grundy Iman and was established in 1889 (Anonymous n.d.a). The second is located on the northern end of Stevenson and was established in 1905 (Anonymous n.d.b).

METHODS AND RESULTS

Fieldwork Methods

Fieldwork was conducted on January 8 and 15, 2020. The approach to the fieldwork was informed by the results of the background research that showed that the entire development site had been significantly impacted by past development that appears to have included grading and leveling the ground surface. Subsequent to that soil and gravel were dumped across the landform and compacted. With that history of land use in mind, the potential for buried archaeological deposits to be present was assessed as very low. Consequently, the fieldwork consisted of an intensive surface survey and the excavation of four shovel-test-pits (STPs) to verify the suspected level of disturbance and to examine the character of subsurface conditions (Figure 10).

The STPs were 30 centimeters (cm) in diameter and were excavated in 20-cm or thinner levels to depths that ranged between 20 and 50 cm below surface (cmbs). All sediments removed from the probes were screened through one-eighth-inch-mesh hardware cloth. Afterward, the STPs were completely backfilled and their locations were recorded using a handheld Trimble Geo7X global positioning system (GPS) device. GPS data were then corrected and exported to a graphics program for final editing and formatting.

Results of the Field Investigations

The ground surface was inspected by walking transects spaced no more than 10 m apart. Ground surface visibility was variable. In the parts of the property that were obscured by building foundations, gravel, or trampled blackberry brambles, surface visibility was zero percent. Areas that had been trenched and then backfilled prior to fieldwork had 100 percent visibility. Other areas of the property were covered in a thin layer of grass and duff. Surface visibility in these areas was about 25 percent. No artifacts were found on the ground surface. The two concrete pads, mentioned above, were observed. They appear to be all that remains of the HVM. All other mill facilities have been completely removed. The slabs are overgrown and covered with a thin layer of moss and grass.

No artifacts were found in the STPs. Soil profiles encountered during the excavations consisted entirely of fill material, which matched the description of Arents, 0 to 5 percent slopes mapped on the property. Profiles generally included a 5- to 20-cm-thick organic layer of very dark brown (7.5YR 2/2) sandy loam, which capped a 10- to 45-cm-thick layer of brown (10YR 4/3), sandy loam (Figure 11). At least three quarters of the soil matrix in the latter layer contained angular gravel intermixed with small to medium angular cobbles (Figure 12). STP 3 and 4 terminated at 20 cmbs due to an impenetrable layer of angular cobbles (Table 2).

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 10. Aerial photomap of the project area showing the locations of the concrete slabs representing mill structures, STPs, and pedestrian transects walked.

Figure 11. Representative view of the gravelly fill encountered in the STPs.

Figure 12. Representative view showing the amount of rock found in the STPs.

Table 2. Summary Results of STPs Excavated

STP #	Depth (cmbs)	Sediments (Moist)	Results
1	0-5	Organic layer of very dark brown (10YR2/2) sandy loam	No artifacts
	45-50	Brown (10YR4/3) sandy loam. Numerous angular gravels and cobbles.	
2	0-20	Organic layer of very dark brown (10YR2/2,) sandy loam	No artifacts
	20-50	Brown (10YR4/3) sandy loam. Numerous angular gravels and cobbles.	
3	0-5	Organic layer of very dark brown (10YR2/2) sandy loam	No artifacts
	5-20	Brown (10YR4/3) sandy loam. Numerous angular gravels and cobbles. Terminated at impenetrable layer of angular cobbles.	
4	0-5	Organic layer of very dark brown (10YR2/2) sandy loam	No artifacts
	5-20	Brown (10YR4/3) sandy loam. Numerous angular gravels and cobbles. Terminated at impenetrable layer of angular cobbles.	

SUMMARY AND RECOMMENDATIONS

Summary

This report has described the results of a cultural resources study conducted by AAR of a 6.4-acre property that FDM proposes to develop into the Rock Creek Cove resort. The study included background research and field investigations. The results of the background research indicate that the property has been significantly altered such that it has low potential to contain archaeological resources. AAR's fieldwork included an intensive surface survey and excavation of four STPs. No artifacts were found. Profiles exposed in the probes showed that a thick layer of imported gravelly fill covers the entire development site.

The only trace of the HVM consists of two concrete pads that mark the location of two of the mill buildings. In AAR's view, the pads are not archaeological and they were not were not recorded as an archaeological resource.

Recommendations

AAR's study was done to assist FDM in complying with SEPA as implemented by Skamania County Code (16.04). In terms of Line 13 of the SEPA checklist, it is AAR finding that the project area does not contain any buildings, structures, or sites, that are listed in or eligible for listing in national, state, or local preservation registers. AAR recommends no further archaeological work is warranted in the current project area.

Although considered unlikely, there is always a possibility that an archaeological resource may be discovered during future development activity on the property. For that reason, the applicant and any contractors that may work on the property need to be aware that under the Revised Code of Washington at 27.53.060, it is unlawful to knowingly damage, deface, or destroy an archaeological site on public or private land in Washington. Under the Revised Code of Washington at 27.44.040 it a class C felony to knowingly remove, mutilate, deface, injure, or destroy any cairn or grave of any native Indian. Thus, in the event that archaeological materials, Indian cairns, or human remains are encountered during the development of the property, all construction activities must stop in the vicinity of the finds and the DAHP should immediately be notified and work halted in the vicinity of the finds until they can be inspected and assessed. Procedures outlined under Washington Administrative Code at 25-48 will be followed and work will not resume until mitigation measures have been agreed upon.

REFERENCES CITED

Allen, John Elliot, Marjorie Burns, and Sam C. Sargent
1986 *Cataclysms on the Columbia.* Timber Press, Portland, Oregon.

Alt, D. D., and D. W. Hyndman
1993 *Roadside Geology of Washington*. Mountain Press Publishing Company, Missoula, Montana.

Anonymous
n.d.a *Cemetery Report for the Iman Cemetery (45SA555).* On file, Washington Department of Archaeology and Historic Preservation, Olympia.
n.d.b *Cemetery Report for the Gropper Cemetery (45SA651).* On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Bard, James C., Celia Moret-Ferguson, Jennifer Flathman, and David W. Harvey
2014 *A Cultural Resources Survey of the Ross-John Day Fiber Replacement Project, Skamania and Klickitat Counties, Washington.* On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Becker, Thomas E., and Bill R. Roulette
2017 *Results of a Cultural Resource Survey of the Paradise Rock Development Project, Skamania County, Washington*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Boyd, Robert T.
1985 *The Introduction of Infectious Diseases among the Indians of the Pacific Northwest, 1774-1874.* Ph.D. Dissertation, Department of Anthropology, University of Washington, Seattle.

Boynton, Michael
1995 *High Cascade Verneer/Lizotte/Exchange*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Boynton, Michael J., and John L. Fagan
2006 *An Archaeological Survey of the Proposed Snowberry Woods Subdivision, Stevenson*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Clague, J.J., R. Barendregt, R.J. Enkin, and F.F. Foit, Jr.
2003 Paleomagnetic and Tephra Evidence for Tens of Missoula Floods in Southern Washington: *Geology* 31:247-250.

Cole, D.L., and M.D. Southard
1971 *Archaeological Survey of the Bonneville Dam Reservoir*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Curtis, Edward S.
1911 The North American Indian. Volume 8. Cambridge University Press, Cambridge, Massachusetts.

Dryden, Margaret L.
2007 *Heritage Resource Inventory Report of Clubb Demolition and New Construction Project.* On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Dryden, Margaret L., continued

2009 *Heritage Resource Inventory Report for Embarq New Construction Project, North End of Bridge of the Gods*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

2010a *Heritage Resource Inventory Report for Burlington Northern-Santa Fe Powerpole Project*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

2010b *Heritage Resource Inventory Report for Kitlow New Construction Project.* On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Dunnell, R.C., and D.E. Lewarch

1974 *Archaeological Remains in Home Valley Park*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Easton, Krey, and Bill R. Roulette

2002 *Letter to Phil Smith Regarding Results of an archaeological survey for the Stevenson Substation Fiber Optic Connection Project*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Franklin, J. F., and C. T. Dyrness

1988 *Natural Vegetation of Oregon and Washington*. Second edition. Oregon State University Press, Corvallis, Oregon.

Freed, Robert A.

1989 *Damage Assessment of Looting Incident at Ice House Lake Archaeological Site (45SA20) Skamania County, Bonneville Project*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

French, D., and K. French

1998 Wasco, Wishram, and Cascades. In *Plateau*, edited by Deward E. Walker, pp. 360-377. Handbook of North American Indians, vol. 12, W. G. Sturtevant, general editor. Smithsonian Institution, Washington, D. C.

Gall, Alexander

2006 *A Cultural Resources Survey of the Chinidere Mountain Estates Subdivision Project Area, Stevenson*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Gall, Alexander, and Mike Smith

2019 *Cultural Resources Survey of the North Bonneville Substation and Powerline Upgrade Project Area, Skamania County, Washington*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

General Land Office (GLO)

1860 *Township 2 North Range 7 East, Willamette Meridian.* Electronic document, http://www.blm.gov/or/landrecords/survey/ySrvy1.php, accessed January 20, 2020.

1864 *Township 2 North Range 7 East, Willamette Meridian.* Electronic document, http://www.blm.gov/or/landrecords/survey/ySrvy1.php, accessed January 20, 2020.

1876 *Township 2 North Range 7 East, Willamette Meridian.* Electronic document, http://www.blm.gov/or/landrecords/survey/ySrvy1.php, accessed January 20, 2020.

1903 *Township 2 North Range 7 East, Willamette Meridian.* Electronic document, http://www.blm.gov/or/landrecords/survey/ySrvy1.php, accessed January 20, 2020.

1906 *Township 2 North Range 7 East, Willamette Meridian.* Electronic document, http://www.blm.gov/or/landrecords/survey/ySrvy1.php, accessed January 20, 2020.

Haagen, Edward
1990 *Soil Survey of Skamania County Area, Washington.* U. S. Dept. of Agriculture, Soil Conservation Service, Washington, D. C.

Hajda, Yvonne P.
1994 Notes on Indian Houses of the Wappato Valley. *Northwest Anthropological Research Notes* 28(2):177-188.

Hajda, Yvonne P., and Robert T. Boyd
1988 Ethnohistory of the Wappato Valley. In *An Inventory of Cultural Resources and an Evaluation of the Effects of the Proposed North Coast Feeder Gas Pipeline, Located Between Deer Island and Sauvie Island, Lower Columbia River Valley, in Oregon*, by Charles Hibbs, Jr., and David V. Ellis, Section D. On file, Oregon State Historic Preservation Office, Salem.

Harris, Lucille E., Bill R. Roulette, and Aimee A. Finley
2013 *Cultural Resource Study of the Stevenson Trail Extension, Phase 1, Project Area*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Holschuh, Dana L.
2015 *Cultural Resources Survey of the SR-14 Heritage Marker Project Area*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Homan, Amy, and Brian O Donnchadha
2017 *Cultural Resources Survey for the North Bonneville-Midway No. 1 Transmission Line Impairments Project (Miles 1-80).* On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Hunt, W.J.
1964 The Northwest and Its Resources. *The Northwest* 38:3-5.

Jenkins, Sarah L., and Jo Reese
2014 *Archaeological Survey of the Cascade Avenue Improvements Project, Stevenson*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Kiers, Roger
2012 *Section 106 Review, SR 14 Ice House Lake Culvert Replacement*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Knutson, Chris, Todd M. Ahlman, and Michael Falkner
2012 *Literature Review, Archaeological Survey, and Subsurface Testing for the Wautoma-Ostrander No. 1 Upgrade Project*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Lloyd-Jones, Jeff, and Terry Ozbun
2009 *Archaeological Survey for the Skamania Pipe Replacement Project*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Mack, Cheryl A., and Richard H. McClure
1999 *Significance Evaluation, Wind River Administrative Site Historic District*. Heritage Program, USDA Forest Service Gifford Pinchot National Forest. Vancouver, Washington.

Mesrobian, A., and L.J. Sundstrom
1976 *University of Washington Archaeological Site Survey Form for 45SA20*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Minor, Rick
1988 *Archaeological Testing at Ice House Lake, Skamania County, Washington*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Minor, Rick, and Stephen Dow Beckham
1988 *Archaeological Testing at Fort Lugenbeel and the Upper Cascade Townsite, Skamania County, Washington*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Minor, Rick, Kathryn Anne Toepel, and Stephen Dow Beckham
1986 *An Overview of Investigations at 45SA11: Archaeology in the Columbia River Gorge*. Heritage Research Assoicates, Report No. 39. Prepared for the Portland District U.S. Army Corps of Engineers.

Musil, Robert R.
1999 *Letter to Craig Rundell RE: Cultural Resources Survey of the Blue Lake Rock Quarry*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

O'Donnchadha, Brian
2013 *Underwood Tap Emergency Restoration Program*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Olander, Jennifer, Jennifer Gilpin, Fred Anderson, Jennifer Hushour, Barbara Montgomery
2011 *Updated and Revised Historic Properties Treatment Plan for Route SC-2 of BTOP Round 1 of the Washington Rural Access Project (WRAP), Skamania County*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Paraso, Kanani, and David V. Ellis
2010 *Emergency Archaeological Excavation at Site 45SA541, Bridge of the Gods Discovery Location, Skamania County, Washington*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Pattee, Donald D., and Bill R. Roulette
2014 *Cultural Resource Study for the Monitoring of Land Movement Near Tower 128/1 on the Wautoma-Ostrander No. 1 Transmission Line*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Pettigrew, Richard M.
1981 *A Prehistoric Culture Sequence in the Portland Basin of the Lower Columbia Valley.* University of Oregon Anthropological Papers 22.

Pierson, Thomas C., Russell C. Evarts, and Joseph A. Bard
2016 *Landslides in the Western Columbia Gorge, Skamania County, Washington*. U.S. Geological Survey Scientific Investigations, Map 3358.

Randall, James Robert
2012 *Characterization of the Red Bluff Landslide, Great Cascade Landslide Complex, Columbia River Gorge, Washington*. Portland State University, Portland Oregon, M.S. Thesis.

Scott, Shane J.

2003 *Cultural Resource Monitoring on the Washington Shore of the Bonneville Pool*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Sencindiver, J.C., and J.T. Ammons

2000 Minesoil Genesis and Classification. *Reclamation of Drastically Disturbed Lands* 41:595-613.

Silverstein, Michael

1990 Chinookans of the Lower Columbia. In *Northwest Coast*, edited by Wayne Suttles, pp. 533-546. Handbook of North American Indians, vol. 7, W. G. Sturtevant, general editor. Smithsonian Institution, Washington, D. C.

Skamania County Chamber of Commerce

2020 *Stevenson History*. Electronic document, https://skamania.org/history/#1496983641788-67c6bfc3-e78f, accessed January 17, 2020.

Smith, Michael, and Alexander Gall

2014 *Cultural Resources Survey of the Blue Lake Rock Quarry Project Area*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Spier, Leslie, and Edward Sapir

1930 Wishram Ethnography. University of Washington Publications in Anthropology 3(3).

Stilson, M. Leland

2002 *Nootka Variable Thinning Timber Sale, Agreement #30-071263, Cultural Resource Survey*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

United States Geological Survey (USGS)

1929 Hood River, Wash.-Oreg. 30-minute topographic quadrangle (reported without correction 1950). Copy on file Applied Archaeological Research, Inc., Portland, Oregon.

1957 Bonneville Dam, Oreg.-Wash., 15-Minute Topographic Quadrangle. Electronic document accessed at http://nationalmap.gov/historical/, accessed January 20, 2020.

Waitt, Richard B. Jr.

1994 Numerous Colossal Missoula Floods Through Columbia Gorge and Portland-Vancouver Basin: *Geological Society of America* 28(5):120-121.

Western Ways, Inc.

n.d. Aerial photograph of the Hegewald Timber Co. Inc. Photograph on Display at the Columbia Gorge Interpretive Center Museum, Stevenson, Washington

White, Susan Lynn, and Terry Lee Ozbun

2003 *Cultural Resource Reconnaissance Survey for Blue Lake Stress Relief Project 26" Ignacio to Sumas Line*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Wilke, S., R. Dalan, J. Wild, K. Fames, R. Weaver, and D. Harvey

1983 *Cultural Resource Overview and Survey of Select Parcels in The Dalles Reservoir, Oregon and Washington*. On file, Washington Department of Archaeology and Historic Preservation, Olympia.

Wilma, David
2006 *Skamania County-Thumbnail History*. Electronic document, https://historylink.org/File/7811, accessed January 17, 2020.

Ecological
Land Services

January 21, 2020

Zachary Pyle, PE
Development Manager
FDM Development, Inc.
5453 Ridgeline Dr #160
Kennewick, WA 99338
zpyle@fdmdevelopment.com
(210) 849-5592

Re: Rock Cove Preliminary Critical Areas Assessment

Zach,

Ecological Land Services (ELS) completed a field assessment for FDM Development to determine whether wetlands or fish and wildlife habitat conservation areas (hereafter collectively termed critical areas) are located on or adjacent to parcels 02070100130300, 02070100130400, and 02070100130200 (hereafter referred to as the study area) in the City of Stevenson, Skamania County, Washington. The study area is in the SW ¼ of the NW ¼ of Section 1, Township 2 N, and Range 7 East of the Willamette Meridian, coordinates 45.6890, -121.8992, and accessed from Rock Cove Drive (Figure 1). City of Stevenson zoning is “Commercial Recreation” (CR).

ELS completed fieldwork for a critical areas determination on December 30, 2019 in collaboration with Washington Department of Ecology (Ecology) staff. This letter provides a description of the study area’s existing conditions as observed on December 30th and a summary of critical areas findings in accordance with Stevenson Municipal Code (SMC), Title 18 “Environmental Protection”, Chapters 18.08 “Shoreline Management” and 18.13 “Critical Areas and Natural Resource Lands”, and Stevenson’s Shoreline Master Programs (SMP) dated 1977 (approved) and 2018 (in review).

Site Description

The study area consists of three parcels that form a peninsula in Rock Cove; Rock Cove is a side channel of the Columbia River formed by the berm for Lewis and Clark Hwy (WA 14) and an adjacent railroad. An unnamed tributary enters Rock Cove north of the study area and Rock Creek enters Rock Cove to the east (Figure 3). An open connection between Rock Cove and the Columbia River is present at its confluence with Rock Creek, southeast of the study area. The study area is currently undeveloped (there are no buildings) but it retains improvements from prior industrial land uses that include concrete and gravel surfaces, gravel roads accessing various points within the study area, a graveled boat launch, and riprap embankments that span the majority of shoreline. A line of abandoned wooden pilings is located just offshore northeast.

Dominant vegetation in the study area included Douglas fir (*Pseudotsuga menziesii*) and red alder (*Alnus rubra*) with Himalayan blackberry (*Rubus armeniacus*) in the understory and rooted in riprap along the shoreline, and clusters of reed canarygrass (*Phalaris arundinacea*) and soft rush (*Juncus effuses*) rooted in places along the water's edge, at the head of sediment bars and mudflats, and along the river's ordinary high water mark (OHWM).

Methods

ELS followed the U.S. Army Corps of Engineers (Corps) Routine Determination Method described in the "Wetland Delineation Manual" (Environmental Laboratory 1987) and the "Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)" (Corps 2010). To make determinations about the presence of wetland in the study area. For regulatory purposes under the Clean Water Act (Section 404) the Environmental Protection Agency (EPA) defines wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (EPA 2014). Wetlands are regulated as "Waters of the United States" by the Corps, as "Waters of the State" by Ecology, and locally by the City of Stevenson.

The Revised Code of Washington (RCW) 90.58.030(2)(b) and Washington Administrative Code (WAC) 173-22-030(11), defines ordinary high water mark as the action of water "so common and usual and so long continued in all ordinary years as to mark upon the soil a character distinct from that of the abutting upland." In collaboration with Ecology staff, ELS used principles in this guidance to identify transitions in vegetation, wrack lines, scouring under trees and exposed roots, and breaks in topography to distinguish the OHWM of the Columbia River along the study area boundary. Ecology and ELS flagged the OHWM with consecutively numbered orange tape flagging. The flag locations were professionally surveyed by S&F Land Services.

Critical areas findings

ELS and Ecology identified one unnamed tributary north of the study area (Figures 2 and 3). The tributary is identified as a Type F (fish-bearing) water by Washington Department of Natural Resources (DNR) (Figure 4). Rock Creek is east of the study area and is designated as Type S, a shoreline of the state. Rock Cove surrounds the study area on three sides. The Columbia River is designated Type S and is a shoreline of statewide significance. There were no wetlands or other surface waters in the study area, and no priority habitat for terrestrial wildlife. According to SMC 18.13.095(D), the area designated as a fish and wildlife habitat conservation area (FWHCA) for Type F waters is 100 feet and for Type S waters, 150 feet.[1] SMC 18.13.095(D)(3) addresses functionally isolated buffers, indicating areas that "do not protect the FWHCA from adverse impacts due to features such as "lawns, pre-existing roads, structures, or vertical separation" are exempt from buffer criteria. Accordingly, portions of the study area are exempt from the FWHCA for Rock Cove due to areas of maintained vegetation and the presence of riprap which is both structural and vertical separation from Rock Cove (Figure 2).

SMC 18.13.095(D)(6) outlines provisions for buffer averaging or riparian habitat buffer reduction with mitigation to allow reasonable use of a parcel.

---

[1] Table 18.13.095-1 - Fish & Wildlife Habitat Conservation Area Protective Buffer Widths

Averaged buffers must meet the following conditions:

a. There are no feasible alternatives to the site design
b. The averaged buffer will not result in degradation of the FWHCA's functions and values.
c. The total buffer area after averaging is equal to the area required without averaging.
d. The buffer at its narrowest point is never less than 75% of the required base buffer width.

Reduced buffers must meet the following conditions:

a. mitigation involves restoration or enhancement of all remaining buffers.
b. Conservation covenants shall--and performance bonds may--be required.
c. Reduced buffers do not result in a net loss of existing buffer functions.

December 2018 SMP requirements

The standard shoreline management area (or shoreline setback) for all designated shorelines is 200 feet, measured landward from the OHWM. The study area is zoned “active waterfront”; according to the 2018 SMP, setbacks for development proposed in active waterfront is typically 50 feet.[2]

Regarding improvements from prior industrial land uses including concrete and gravel surfaces, gravel roads, the graveled boat launch, and riprap embankments, the following condition applies:

> A shoreline use that was lawfully constructed prior to the effective date of the SMA or the December 2018 SMP and that does not conform to the current SMP standards is considered a nonconforming use. For the purposes of the December 2018 SMP, existing roads (whether asphalt, gravel, or dirt) are considered nonconforming uses and do not need a Shoreline Conditional Use Permit to be retained or improved (SMP 2018).

Thank you for the opportunity to provide this information. The findings in this letter are intended for FDM Development’s planning strategy and should be considered preliminary until they’re reviewed and approved in writing by the City of Stevenson and Washington Department of Ecology. If you have any questions, please contact me by phone (360) 578-1371 or email andrew@eco-land.com.

Sincerely,

Andrew R Allison

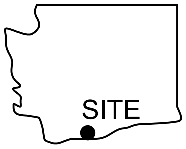
Andrew R. Allison
Wetland Scientist, Principal

Attachments:
Figures 1-4
Photoplates 1-4
City of Stevenson 2018 SMP “Table 5.1 Shoreline Use & Setback Standards”

---

[2] Tables identifying setback distances per development type are attached to this letter for reference.

WASHINGTON

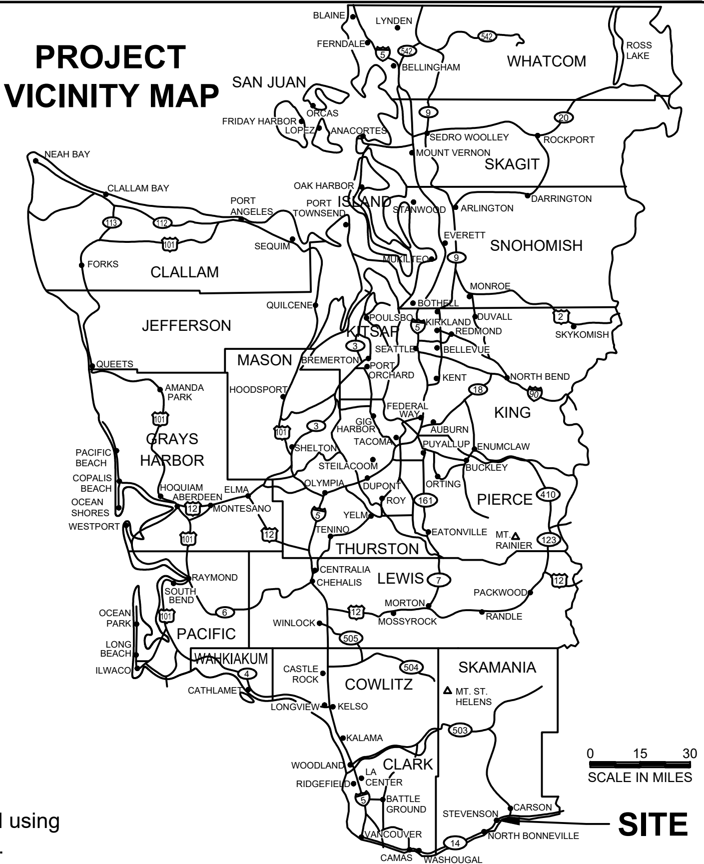


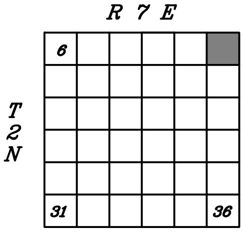
Latitude: 45.6886°

Longitude: -121.8981°

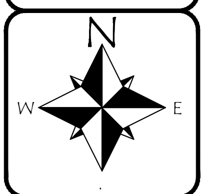
LOCATION MAP

PROJECT VICINITY MAP





NOTE:
USGS topographic quadrangle map reproduced using MAPTECH Inc., Terrain Navigator Pro software.



0
2000
4000
SCALE IN FEET

Figure 1
VICINITY MAP
Rock Cove CAR
FDM Development
City of Stevenson, Skamania County, Washington
Section 1, Township 2N, Range 3E, W.M.

DATE: 1/17/20
DWN: EF
REQ. BY: AA
PRJ. MGR: AA
CHK: AA
PROJECT NO: 2682.02

Ecological Land Services
1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com

1/17/2020 3:00 PM 2686.02 DL.dwg Emilio

1/17/2020 3:00 PM 2686.02_DL.dwg Emilio

LEGEND:

- Site Boundary
- OHWM
- Stream with Flow Direction
- FWHCA Buffer for Type F
- FWHCA Buffer for Type S
- Shoreline Management Plan Setback
- Culvert
- Existing Graveled or Concrete Surfacing
- Existing Rip Rap

NOTE(S):

1. Aerial from Google Earth™.
2. OHWM line was determined through a joint effort by Ecological Land Services and Washington Department of Ecology on December 30, 2019. OHWM flags were professionally surveyed by S&F Land Services December 30-31, 2019.
3. FWHCA buffer is functionally isolated along existing riprap and existing graveled or concrete surfacing.

N
W
E
S

0 100 200
SCALE IN FEET

Ecological Land Services
1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com

DATE: 1/17/20
DWN: EF
REQ. BY: AA
PRJ. MGR: AA
CHK: AA
PROJECT NO:
2682.02

Figure 2
SITE MAP
Rock Cove CAR
FDM Development
City of Stevenson, Skamania County, Washington
Section 1, Township 2N, Range 3E, W.M.

LEGEND:

▬ Site Boundary

-·· OHWM

→··· Stream with Flow Direction

NOTE(S):

1. Aerial from Google Earth™.

N
W E
S

0 400 800
SCALE IN FEET

Ecological Land Services
1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com

DATE: 1/17/20
DWN: EF
REQ. BY: AA
PRJ. MGR: AA
CHK: AA
PROJECT NO:
2682.02

Figure 3
SITE OVERVIEW MAP
Rock Cove CAR
FDM Development
City of Stevenson, Skamania County, Washington
Section 1, Township 2N, Range 3E, W.M.

No mapped streams indicated onsite by the Washington State Department of Natural Resources (DNR).

LEGEND:

Streams

Streams

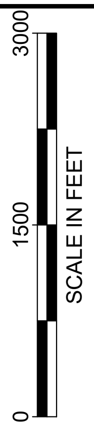
- 🟦 Type S
- 🟥 Type F
- 🟩 Type N, Np, Ns
- — U, unknown
- ··· X, non-typed per WAC 222-16

NOTE: Map provided online by Washington State Department of Natural Resources at web address: *https://fortress.wa.gov/dnr/protectiongis/fpamt/index.html*

Figure 4
DNR STREAM TYPE MAP
Rock Cove CAR
FDM Development
City of Stevenson, Skamania County, Washington
Section 1, Township 2N, Range 3E, W.M.

DATE: 1/17/20
DWN: EF
REQ. BY: AA
PRJ. MGR: AA
CHK: AA
PROJECT NO: 2682.02

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com
Ecological Land Services



1/17/2020 3:00 PM 2686.02 DL.dwg Emilio

Photo 1. Inflow point of the unnamed tributary via concrete culvert.

Photo 2. Unnamed tributary flowing toward Rock Cove.

Photo 3. Overview of unnamed tributary's confluence with Rock Cove.

Photo 4. Mud flat adjoining Rock Cove.

Ecological Land Services

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305

DATE: 1/17/20
DWN: ARBA
MGR: ARBA
PR#: 2682.02

Photoplate 1
Site Photos
Rock Cove Preliminary Critical Areas Assessment
FDM Development, Inc.
City of Stevenson, Washington

Photo 1. Vegetated shoreline on the north end of the study area.

Photo 2. Vegetated shoreline extending toward the unnamed tributary.

Photo 3. Riprap on the eastern shoreline, facing north.

Photo 4. Riprap on the eastern shoreline, facing south.

Ecological
Land Services

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305

DATE: 1/17/20
DWN: ARBA
MGR: ARBA
PR#: 2682.02

Photoplate 2
Site Photos
Rock Cove Preliminary Critical Areas Assessment
FDM Development, Inc.
City of Stevenson, Washington

Photo 1. Graveled boat launch on the east side of the study area.

Photo 2. Vegetated shoreline on the west side, facing south.

Photo 3. Vegetated shoreline and mud flat in the southwest portion of the study area, facing south.

Photo 4. Groomed vegetation in the center of the study area.

Ecological Land Services

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305

DATE: 1/17/20
DWN: ARBA
MGR: ARBA
PR#: 2682.02

Photoplate 3
Site Photos
Rock Cove Preliminary Critical Areas Assessment
FDM Development, Inc.
City of Stevenson, Washington

Photo 1. Existing concrete and gravel surfacing.

Photo 2. Existing concrete and gravel surfacing.

Photo 3. Groomed vegetation in the center of the study area.

Photo 4. Existing gravel road.

Ecological
Land Services

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305

DATE: 1/17/20
DWN: ARBA
MGR: ARBA
PR#: 2682.02

Photoplate 4
Site Photos
Rock Cove Preliminary Critical Areas Assessment
FDM Development, Inc.
City of Stevenson, Washington

TABLE 5.1 – SHORELINE USE & SETBACK STANDARDS

	Shoreline Environment Designation									
	Most Restrictive				to			Least Restrictive		
	AQUATIC		NATURAL		SHORELINE RESIDENTIAL		URBAN CONSERVANCY		ACTIVE WATERFRONT	
	Allowance	Setbacks (ft)	Allowance	Setbacks (ft)	Allowance	Setbacks (ft)	Allowance	Setbacks (ft)	Allowance	Setbacks (ft)
P= Permitted, C=Conditional Use, X= Not Permitted, n/a= Not Applicable										
Agriculture & Mining										
Agriculture	X	n/a	X	n/a	X	n/a	X	n/a	X	n/a
Mining	X	n/a	X	n/a	X	n/a	X	n/a	X	n/a
Aquaculture										
Water-Oriented	C	n/a	X	n/a	X	n/a	C	0	C	0
Non-Water Oriented	X						X	n/a	C	150
Boating Facilities & Overwater Structures										
Non-motorized Boat Launch	See Adjacent Upland Environment		C	n/a	P	n/a	P	n/a	P	n/a
Motorized Boat Launch			X		C		C		P	
Mooring Buoy			C		C		P		P	
Float			X		C		C		P	
Private Leisure Deck			X		C		C		P	
Public Leisure Pier			X		C		P		P	
Single-User Residential Dock			X		C		C		P	
Joint-Use Moorage			X		P		P		P	
Marina			X		X		C		P	
Commercial & Industrial										
Water-Dependent	P	n/a	X	n/a	X[1]	0	P	0	P	0
Water-Related, Water Enjoyment	C				X[1]	75	P	50	P	33
Non-Water-Oriented	X				X	-	C[2]	150	C[2]	100
Forest Practices										
All	X	n/a	C	50	P	50	P	50	P	25
Institutional										
Water-Dependent	C	n/a	C	0	C	0	P	0	P	0
Water-Related	X		X	n/a	C	100	P	75	P	50
Non-Water-Oriented	X		X	n/a	C	100	C	100	P	100
Cemetery	X		X	n/a	C	50	P	50	C	50
Instream Structures										
All	C	n/a	C	0	C	0	C	0	C	0

TABLE 5.1 – SHORELINE USE & SETBACK STANDARDS, CONT.

	Shoreline Environment Designation									
	Most Restrictive				to				Least Restrictive	
	AQUATIC		NATURAL		SHORELINE RESIDENTIAL		URBAN CONSERVANCY		ACTIVE WATERFRONT	
	Allowance	Setbacks (ft)	Allowance	Setbacks (ft)	Allowance	Setbacks (ft)	Allowance	Setbacks (ft)	Allowance	Setbacks (ft)
P= Permitted, C=Conditional Use, X= Not Permitted, n/a= Not Applicable										
Land Division										
All	C	n/a	C	n/a	P	n/a	P	n/a	P	n/a
Recreational										
Water-Dependent	P	n/a	P	0	P	0	P	0	P	0
Water-Related/Water-Enjoyment	X		C	100	P	50	P	50	P	50
Trail Parallel to the Shoreline, View Platform	C		P	50	P	50	P	33	P	25
Dirt or Gravel Public Access Trail to the Water	X		P	0	P	0	P	0	P	0
Non-Water-Oriented (golf course, sports field)	X		X	n/a	X	n/a	C	150	C	100
Residential										
Single-Family	X	n/a	X	n/a	P	50	C	50	X	N/A
Multi-Family	X		X		P	50	P	50	P	50
Over-Water Residence	X		X		X	n/a	X	n/a	X	n/a
Transportation & Parking Facilities										
Highway/Arterial Road	C	n/a	X	n/a	C	100	P	50	P	50
Access & Collector Road	X		C	100	P	100	P	50	P	50
Private Road	X		C	100	P	50	C	50	C	50
Bridge	C		C	0	C	0	P	0	P	0
Railroad	C		C	100	C	100	P	50	P	50
Airport	X		X	n/a	X	n/a	C	150	C	150
Primary Parking Facility	X		X	n/a	X	n/a	X	n/a	X	n/a
Accessory Parking (On-Site Parking Serving another Use, Including Recreation/Vista Uses)	X		P	100	P	100	P	50	P	33

Exhibit D

TABLE 5.1 – SHORELINE USE & SETBACK STANDARDS, CONT.

	Shoreline Environment Designation									
	Most Restrictive to Least Restrictive									
	AQUATIC		**NATURAL**		**SHORELINE RESIDENTIAL**		**URBAN CONSERVANCY**		**ACTIVE WATERFRONT**	
	Allowance	**Setbacks (ft)**	**Allowance**	**Setbacks (ft)**	**Allowance**	**Setbacks (ft)**	**Allowance**	**Setbacks (ft)**	**Allowance**	**Setbacks (ft)**
P= Permitted, C=Conditional Use, X= Not Permitted, n/a= Not Applicable										
Utilities										
Water-Oriented	P	n/a	C	0	C	0	P	0	P	0
Non-Water-Oriented (Parallel)	X	n/a	C	100	C	50	P	50	P	33
Non-water-Oriented (Perpendicular)	C	n/a	C	0	C	0	C	0	P	0

1 – All Industrial uses are prohibited, however, a Water-Oriented Commercial use may be allowed as a conditional use in the Shoreline Residential SED.

2 – Conditionally allowed only when a) the project provides a significant public benefit with respect to SMA objectives (e.g., providing public access and ecological restoration) and i) is part of a mixed-use project that includes water-dependent uses or ii) navigability is severely limited or b) the site is physically separated from the shoreline by another property or public right-of-way.