DIVISION 06

Stormwater Management/Grading Permit

National Flood Hazard Layer FIRMette

FEMA

116°56'17"W 48°31'39"N

116°55'40"W 48°31'15"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/28/2022 at 12:43 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Bonner County Planning Department

"Protecting property rights and enhancing property value"
1500 Highway 2, Suite 208, Sandpoint, Idaho 83864
Phone (208) 265-1458 - Fax (866) 537-4935
Email: planning@bonnercountyid.gov - Web site: www.bonnercountyid.gov

Grading, Erosion Control and Stormwater Plan Decision Letter

June 14, 2022

L.T. Partnership, LTD
2450 Fondren, Suite 210,
Houston, TX 77063

Subject: **ST0005-22 - Stand-alone Erosion Control, Stormwater Management Plan and Geotechnical Report for a potential Planned Unit Development at RP60N05W252802A**

Enclosed: (1) Bonner County Engineering Department - Review Memo

Dear L.T. Partnership, LTD,

The above referenced application is hereby administratively **approved with conditions** as of the date of this letter. The application was found to be in compliance with the Bonner County Revised Code Title 12, Subchapter 7.2 Grading, Stormwater Management and Erosion Control standards.

Conditions of Approval:

1. The parcel contains PSS1C wetlands as determined from the U.S. Fish and Wildlife Service national wetland inventory maps. As per the submitted plans, no disturbance has been proposed to the existing wetlands. Any future land disturbing activities within these mapped wetland would require a professional wetland reconnaissance and delineation as per BCRC 12-731 and BCRC 12-732.

2. Only an erosion control plan was submitted for the northwestern portion of the site where 10 single family homes are proposed as shown in the PUD site plan submitted with the application. The applicant would be required to submit a storm water management plan for this portion of the site with or before the PUD application.

3. The applicant may be required to update the erosion control, stormwater management plans and/or geotechnical report approved with this application, if required, based on the Planned Unit Development proposal when submitted to the Planning Department.

NOTE: Any determination made by the Planning Director in the administration of the provisions of this title may be appealed to the Board by paying the required fee and notifying the Planning Director in writing of the intent to appeal within ten (10) working days from the date of the determination. (BCRC 12-261.A).

Please contact this department if you have any questions.

Sincerely,

Jacob Gabell, Interim Planning Director — June 14, 2022 Date

CC: James A. Sewell & Associates/ Jennifer Owens (Project Representative)

Bonner County Engineering Department
1500 Highway 2, Suite 101
Sandpoint, ID 83864
(208) 255-5681

MEMORANDUM

DATE: June 3, 2022

TO: Swati Rastogi, Bonner County Planning Department

FROM: Brandon Staglund, P.E., Bonner County Staff Engineer

SUBJ: ST0005-22 (Eagle Terrace & Eagle Ridge)
Stormwater Plan Review

Swati,

I have reviewed the following documents related to the project:

- Stormwater Plan for Eagle Terrace & Eagle Ridge, prepared by Kevin Koesel, P.E., dated 5/12/2022, for conformance with Bonner County Code §12-7.2
- Erosion Control Plan for the Luby Bay Cluster Development, prepared by Kevin Koesel, P.E., dated 12/21/2021, for conformance with §12-7.2
- Geotechnical Engineering Report, prepared by Benjamin Vance, P.E., dated 12/3/2021, for conformance with §12-7.6

The scope of the submitted stormwater plan includes private roads and driveways for a Planned Unit Development. The PUD application will be submitted at a later date. A total of 157,375 square feet of impervious surfaces are proposed, all of which represent paved roadways. The application has indicated that no building construction is included, therefore additional grading/stormwater plans may be required for future building construction as part of a building location permit.

My understanding is that private road plans will be submitted with the future PUD permit. The application indicates that this stormwater permit only seeks approval to begin earthwork associated with the proposed roads, driveways, and building pads for the future PUD. Therefore, this memo should not be interpreted as an approval to construct the private roads. If changes to the design occur between now and submittal of the private road plans, this stormwater plan may need to be updated and resubmitted for review.

After review, the stormwater plan, erosion control plan, and geotechnical report are **approved as submitted.**

BUILDING LOCATION PERMIT #_____

FOR: ☐ Grading/Erosion Control ☐ Grading/Stormwater Plan

BONNER COUNTY PLANNING DEPARTMENT

1500 HIGHWAY 2, SUITE 208, SANDPOINT, ID 83864 (208) 265-1458 (208) 265-1463 (FAX)
planning@co.bonner.id.us (e-mail) http://www.co.bonner.id.us/planning/index.html (web page)

GRADING/STORMWATER/EROSION CONTROL APPLICATION

Landowner's name: **L.T. Partnership, LTD**			
Landowner's address: **2450 Fondren, Suite 210, Houston, TX 77063**			
Phone:**208-661-8332**	Cell: **208-661-8332**		
E-mail (optional): **toddbburke@gmail.com**			
Construction company: **Goins Roads and Excavation LLC**			
Contractor's name: **Brandon Goins**			
Use: ☒ Residential	☐ Commercial	☐ Industrial	☐ Other

Is the construction or land disturbing activity:		
Located within a subdivision requiring a plan?	☐ Yes	☐ No
Within 300 feet of any surface water?	☒ Yes	☐ No
On a slope of 15% or greater incline?	☒ Yes	☐ No
Does site work result in the excavation of 50 cubic yards or more of rock, soil or fill?	☒ Yes	☐ No

SQUARE FOOTAGE OF PROPOSED LAND DISTURBING AREA:

ROOF (S)	DRIVEWAY	DECKS	WALKS	OTHER	TOTALS
				975,000	975,000

•If the total disturbed area is *less* than 4000 square feet, please complete the application for a grading/erosion control plan. (BCRC 12-722.3(b))

EROSION CONTROL PLAN
(BCRC 12-724.2)

√ Submit a drawing of an appropriate scale, showing where land will be disturbed by proposed building activity, all surface water bodies (creeks, lake, etc.), utilities, easements and areas subject to clearing, grading or stockpiling of soils. Indicate direction of water runoff from impervious surfaces.

√ On the site plan: include the location of temporary and permanent erosion and sedimentation control measures. Include the dimensions of all grassy swales, buffer strips, etc. (Check on back of application all erosion control features to be used.)

√ Complete the Following:

- When will temporary erosion controls be installed and ready for inspection? _____
- When will site preparation and construction begin? _____
- When will re-vegetation of the site occur? _____

•If the total disturbed area is *greater* than 4000 square feet, please complete the application for a grading/stormwater management plan. (BCRC 12-722.3(a))

GRADING/STORMWATER MANAGEMENT PLAN
(BCRC 12-724.1 and BCRC 12-724.2)

√ A stormwater management plan shall be completed, signed and/or stamped by a design professional who is a qualified person with the requisite education and experience to design a stormwater management system. Design professionals may include, but are not limited to, engineers, landscape architects and soil scientists for various components of a grading/stormwater management plan. **The plan shall include:**

√ A project summary or site plan.

√ Construction quality drawings of all physical features of the stormwater system.

√ Calculations of the impervious areas, capacity of stormwater systems (how much it can hold) and the design storm yield expected at the site.

√ A proposed construction schedule for the stormwater system.

√ A maintenance and operation plan for the stormwater system

√ An erosion control plan as out lined at left

√ A grading plan

Who will be in charge of the maintenance and repair of the erosion control features?	
Name: **Brandon Goins**	Phone/Cell #: **208-610-9677**

PLANNED EROSION CONTROL FEATURES
Temporary erosion control:
☒ Straw barriers: #**2**
☒ Silt fences: # **5,575 linear feet of silt fencing**
☒ Mulch type: # **Straw on disturbed slopes**
☐ Silting ponds: #'s & size
☐ Sediment traps: #'s & materials
☐ Matting: Type
Permanent erosion control:
☒ Reseeding: Mixture **Native Grasses per USDA NRCS recommendation**
☒ Swales: #'s & dimensions **See proposed construction plans attached**
☐ Other: Explain

The stormwater/erosion control requirements are imposed to protect the ground water of Bonner County from the effects of stormwater runoff by requiring pre-treatment prior to infiltration and to protect surface waters from the effects of contaminants and sediments carried by stormwater runoff.

When preparing your stormwater and/or erosion control plan, keep in mind that:

√ The objective of the stormwater control plan is to hold and treat the first ½ inch of stormwater from impervious surfaces. All stormwater from impervious areas shall be directed to **grassed infiltration areas (grassy swales)** or their functional equivalents. A handout to assist you in designing grassed infiltration areas is attached. Note: Grassy swales may not be appropriate for all sites, particularly on steep slopes or on rocky soils.

√ Streams, lakes and other surface water shall be protected from disturbance and erosion during site development. Drawings of **erosion control measures** and installation suggestions are attached.

√ All **disturbed soils** shall be protected from erosion during the course of construction.

√ No stormwater shall be collected or concentrated except within a **channel or artificial water course** protected against erosion and providing for dissipation measures to prevent erosion on adjoining lands.

As a guide for designing and reviewing stormwater/erosion control plans, Bonner County uses **"The handbook of Best Management Practices for stormwater Management and Erosion and Sedimentation Control"** and **"The stormwater Management Plan Criteria and Engineering Standards,"** prepared by Kennedy Engineers, Spokane, WA., April 1992. Copies of the books are available for review at the Bonner County Planning Department and public library. **"A Landowner & Contractor's Best Management for the Control and Treatment of stormwater, Erosion and Sedimentation,"** produced by the Idaho Division of Environmental Quality and the U.S. Environmental Protection Agency, is also available at the Bonner County Planning Department.

If you have any question about stormwater/erosion control, contact the Planning Department at 1500 Hwy 2 Ste. 208, Sandpoint, ID 83864. Phone (208) 265-1458 Fax (208) 265-1463.

Signature: Kris Koehl	**Date:** 5-12-22

Construction Stormwater Pollution Prevention Plan Template

To be covered under the U.S. Environmental Protection Agency's (EPA) Construction General Permit (CGP), all construction operators are required to develop a "Stormwater Pollution Prevention Plan" (or "SWPPP") prior to submitting a Notice of Intent (NOI) for permit coverage. EPA created this SWPPP Template to help you develop a SWPPP that is compliant with the minimum requirements of Part 7 of EPA's 2022 Construction General Permit ("2022 CGP"), and is customizable to your specific project and site.

Instructions for Using the SWPPP Template

Each section of the SWPPP Template includes instructions and space for your project and site information. Read the instructions for each section before you complete that section. Specific instructions on what information to include is indicated in each text field in blue text. Click on the blue text and the instructions will disappear once you start typing. The SWPPP Template is an editable document file so that you can easily add tables and additional text and delete unneeded or non-applicable fields. Note that some sections may require only a brief description while others may require several pages of explanation.

The following tips for using this template will help ensure that you meet the minimum permit requirements:

- Read the 2022 CGP thoroughly before you begin preparation of your SWPPP to ensure that you have a working understanding of the permit's underlying requirements. You will also need to consult Part 9 of the permit to determine if your State or Tribe has included additional requirements that affect you.
- Complete the SWPPP prior to submitting your NOI for permit coverage. This is required in Parts 1.4 and 7.1.
- If you prepared a SWPPP under a previous version of EPA's CGP, you must update your SWPPP to ensure that the 2022 CGP requirements are addressed prior to submitting your NOI.
- If there is more than one construction operator for your project, consider coordinating development of your SWPPP with the other operators.
- Once EPA has provided your site with coverage under the CGP, include your NOI, your authorization email, and a copy of the CGP as attachments to the SWPPP. See Appendices B and C of the SWPPP Template.

While EPA has made every effort to ensure the accuracy of all instructions contained in the SWPPP Template, it is the permit, not the template, that determines the actual obligations of regulated construction stormwater discharges. In the event of a conflict between the SWPPP Template and any corresponding provision of the 2022 CGP, you must abide by the requirements in the permit. EPA welcomes comments on the SWPPP Template at any time and will consider those comments in any future revision of this document. You may contact EPA for CGP-related inquiries at cgp@epa.gov.

Stormwater Pollution Prevention Plan (SWPPP)

For Construction Activities At:

Eagle Subdivision & Millie's Development
28441 HWY 57
Priest Lake, ID, 83856
Insert Project/Site Telephone Number

SWPPP Prepared For:

Goins Roads & Excavation, LLC
Brandon Goins
P.O. Box 1295
Priest River, ID, 83856
208-610-9677
goinsroads@yahoo.com

SWPPP Prepared By:

James A. Sewell and Associates
Kevin Koesel
600 4th Street West
Newport, WA 99156
509-447-3626
kkoesel@jasewell.com

SWPPP Preparation Date:

07/20/2022

Estimated Project Dates:

Project Start Date: 08/01/2022

Project Completion Date: 11/30/2024

Contents

SECTION 1: CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 Operator(s) / Subcontractor(s)

Instructions (see definition of "operator" at CGP Part 1.1.1):

- Identify all site operators who will be engaged in construction activities at the site and the areas of the site over which each operator has control (Part 7.2.1). Indicate respective responsibilities, where appropriate. Also include the 24-hour emergency contact.
- List subcontractors expected to work on-site. Notify subcontractors of stormwater requirements applicable to their work.
- Consider using Subcontractor Agreements such as the type included as a sample in Appendix G of this Template.

Operator(s):

Goins Roads and Excavation, LLC
Brandon Goins
P.O. Box 1295
Priest River, ID 83856
208-610-9677
goinsroads@yahoo.com
Excavation and earthwork construction

[Repeat as necessary.]

Subcontractor(s):

Insert Company or Organization Name
Insert Name
Insert Address
Insert City, State, Zip Code
Insert Telephone Number
Insert Fax/Email
Insert area of control (if more than one operator at site)

[Repeat as necessary.]

Emergency 24-Hour Contact:

Goins Roads and Excavation, LLC
Brandon Goins or Seth Madsen
208-610-9677

1.2 Stormwater Team

Instructions (see CGP Parts 6 and 7.2.2):

- Identify the individuals (by name and position) that you have made part of the project's stormwater team pursuant to CGP Part 6.1, their individual responsibilities, and which members are responsible for inspections. At a minimum the stormwater team is comprised of individuals who are responsible for the design, installation, maintenance, and/or repair of stormwater controls; the application and storage of treatment chemicals (if applicable); conducting inspections as required in CGP Part 4.1; and taking corrective actions as required in Part 5.
- Each member of the stormwater team must have ready access to either an electronic or paper copy of applicable portions of the 2022 CGP and the SWPPP.
- Each member of the stormwater team must understand the requirements of the 2022 CGP and their specific responsibilities with respect to those requirements, including the information in Part 6.2.
- For projects that receive coverage under the 2022 CGP on or after February 17, 2023, to be considered a qualified person under Part 4.1 to conduct inspections under Part 4, you must, at a minimum, either:
  - ✓ Have completed the EPA construction inspection course developed for this permit and have passed the exam; or
  - ✓ Hold a current valid construction inspection certification or license from a program that, at a minimum, covers the following:
    - o Principles and practices of erosion and sediment control and pollution prevention practices at construction sites;
    - o Proper installation, and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites; and
    - o Performance of inspections, including the proper completion of required reports and documentation, consistent with the requirements of Part 4.

    Note that if one of the following topics (e.g., installation and maintenance of pollution prevention practices) is not covered by the non-EPA training program, you may consider supplementing the training with the analogous module of the EPA course (e.g., Module 4) that covers the missing topic.
- Include documentation showing completion of trainings in Appendix I of this SWPPP template.
- For projects that receive coverage under the 2022 CGP prior to February 17, 2023, any personnel conducting site inspections pursuant to Part 4 on your site must, at a minimum:
  - ✓ Be knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention,
  - ✓ Possess the appropriate skills and training in conditions at the construction site that could impact stormwater quality, and
  - ✓ Possess the appropriate skills and training in the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

Stormwater Team

Name and/or Position, and Contact	Responsibilities	I Have Completed Training Required by CGP Part 6.2	I Have Read the CGP and Understand the Applicable Requirements
Seth Madsen SWPPP Inspector 208-610-9677 goinsroads@yahool.com	SWPPP Inspector Provide Reporting Update SWPPP	☒ Yes ☐ No	☐ Yes Date: Click here to enter a date.
Insert Name of Responsible Person Insert Position Insert Telephone Number Insert Email	Insert Responsibility	☐ Yes ☐ No	☐ Yes Date: Click here to enter a date.
Insert Name of Responsible Person Insert Position Insert Telephone Number Insert Email	Insert Responsibility	☐ Yes ☐ No	☐ Yes Date: Click here to enter a date.

[Insert or delete rows as necessary.]

Stormwater Team Members Who Conduct Inspections Pursuant to CGP Part 4

Name and/or Position and Contact	Training(s) Received	Date Training(s) Completed	If Training is a Non-EPA Training, Confirm that it Satisfies the Minimum Elements of CGP Part 6.3.b
Seth Madsen Insert Position Insert Telephone Number Insert Email	Insert Title of Training Received	Date: Click here to enter a date.	☐ Principles and practices of erosion and sediment control and pollution prevention practices at construction sites ☐ Proper installation and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites ☐ Performance of inspections, including the proper completion of required reports and documentation, consistent with the requirements of Part 4
Insert Name of Responsible Person Insert Position Insert Telephone Number Insert Email	Insert Title of Training Received	Date: Click here to enter a date.	☐ Principles and practices of erosion and sediment control and pollution prevention practices at construction sites ☐ Proper installation and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites ☐ Performance of inspections, including the proper completion of required reports and documentation, consistent with the requirements of Part 4
Insert Name of Responsible Person Insert Position Insert Telephone Number Insert Email	Insert Title of Training Received	Date: Click here to enter a date.	☐ Principles and practices of erosion and sediment control and pollution prevention practices at construction sites ☐ Proper installation and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites ☐ Performance of inspections, including the proper completion of required reports and documentation, consistent with the requirements of Part 4

[Insert or delete rows as necessary.]

SECTION 2: SITE EVALUATION, ASSESSMENT, AND PLANNING

2.1 Project/Site Information

Instructions (see "Project/Site Information," Section IV of Appendix H – NOI Form and Instructions):

- In this section, compile basic site information that will be helpful when you file your NOI.

Project Name and Address

Project/Site Name: Eagle Subdivision and Millie's Development
Street/Location: 28441 Highway 57-ID
City: Priest Lake
State: Idaho
ZIP Code: 83856
County or Similar Government Division: Bonner County

Project Latitude/Longitude

Latitude: 48.522928° N
(decimal degrees)

Longitude: - -116.932633 ° W
(decimal degrees)

Latitude/longitude data source: ☒ Map ☐ GPS ☐ Other (please specify): Google Maps

Horizontal Reference Datum: ☐ NAD 27 ☐ NAD 83 ☒ WGS 84

Additional Site Information

Is your site located on Indian country lands, or on a property of religious or cultural significance to an Indian Tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian Tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian Tribe associated with the property: Insert Text Here

2.2 Discharge Information

Instructions (see "Discharge Information," Section V of Appendix H – NOI Form and Instructions):

- In this section, include information relating to your site's discharge. This information corresponds to the "Discharge Information" section of the NOI form.
- List all of the stormwater points of discharge from your site. Identify each point of discharge with a unique 3-digit ID (e.g., 001, 002).
- For each unique point of discharge you list, specify the name of the first receiving water that receives stormwater directly from the point of discharge and/or from the MS4 that the point of discharge discharges to. You may have multiple points of discharge that discharge to the same receiving water.
- Next, specify whether any waters of the U.S. that you discharge to are listed as "impaired" as defined in Appendix A, and the pollutants causing the impairment. Identify any Total Maximum Daily Loads (TMDL) that have been completed for any of the waters of the U.S. that you discharge to and the pollutants for which there is a TMDL. For more information on impaired waters and TMDLs, including a list of TMDL contacts and links by State, visit https://www.epa.gov/tmdl.
- Finally, indicate whether any receiving water that you discharge to is designated as a Tier 2, Tier 2.5, or Tier 3 water and if so, what the designation is (2, 2.5, or 3). A list of Tier 2, 2.5, and 3 waters located in the areas eligible for coverage under this permit can be found at https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates.

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☐ Yes ☒ No

Are there any waters of the U.S. within 50 feet of your project's earth disturbances? ☒ Yes ☐ No

For each point of discharge, provide a point of discharge ID (a unique 3-digit ID, e.g., 001, 002), the name of the first receiving water that receives stormwater directly from the point of discharge and/or from the MS4 that the point of discharge discharges to, and the following receiving water information, if applicable:

Point of Discharge ID	Name of receiving water that receives stormwater discharge:	Is the receiving water impaired (on the CWA 303(d) list)?	If yes, list the pollutants that are causing the impairment:	Has a TMDL been completed for this receiving waterbody?	If yes, list TMDL Name and ID:	Pollutant(s) for which there is a TMDL:	Is this receiving water designated as a Tier 2, Tier 2.5, or Tier 3 water?	If yes, specify which Tier (2, 2.5, or 3)?
[001]	Unnamed Wetland	☐ Yes ☒ No		☐ Yes ☒ No			☐ Yes ☒ No	[INSERT "Tier 2", "Tier 2.5", or "Tier 3"]

2.3 Nature of the Construction Activities

Instructions (see CGP Parts 1.2.1.c and 7.2.3):

- Provide a general description of the nature of the construction activities at your site.
- Describe the size of the property (in acres or length in miles if a linear construction site), the total area expected to be disturbed by the construction activities (to the nearest quarter acre or quarter mile if a linear construction site), and the maximum area expected to be disturbed at any one time.
- A description of any on-site and off-site construction support activity areas covered by this permit;
- Indicate the type of construction site, whether there will be certain demolition activities, and whether the predevelopment land use was for agriculture.
- Provide a list and description of all pollutant-generating activities (e.g., paving operations; concrete, paint, and stucco washout and waste disposal; solid waste storage and disposal; and dewatering operations) and indicate for each activity the associated pollutants or pollutant constituents (e.g., sediment, fertilizers, pesticides, paints, caulks, sealants, fluorescent light ballasts, contaminated substrates, solvents, fuels) which could be discharged in stormwater from your construction site.
- Describe the construction support activities covered by this permit (see Part 1.2.1.c of

General Description of Project

Provide a general description of the nature of your construction activities, including the age or dates of past renovations for structures that are undergoing demolition:

Infrastructure for a future 150 home subdivision including water mainlines, sewer main lines, dry utilities, road construction with permanent stormwater catch basins, piping and swales. Construction runoff is proposed to be prevented through use of silt fencing in strategic areas essentially encompassing the property and wetlands. Permanent stormwater treatment areas will be grassy swales with percolation to the native soils.

If you are conducting earth-disturbing activities in response to a public emergency, document the cause of the public emergency *(e.g., mud slides, earthquake, extreme flooding conditions, widespread disruption in essential public services)*, information substantiating its occurrence *(e.g., State disaster declaration or similar State or local declaration)*, and a description of the construction necessary to reestablish affected public services:

Insert Text Here

Business days and hours for the project: Insert Text Here

Size of Construction Site

Size of Property	45.0 acres
Total Area Expected to be Disturbed by Construction Activities	~20 acres
Maximum Area Expected to be Disturbed at Any One Time, Including On-site and Off-site Construction Support Areas	~20 acres

Size of Construction Site

[Repeat as necessary for individual project phases.]

Type of Construction Site *(check all that apply):*

☒ Single-Family Residential ☒ Multi-Family Residential ☒ Commercial ☐ Industrial

☐ Institutional ☒ Highway or Road ☒ Utility ☐ Other _____

Will you be discharging dewatering water from your site? ☐ Yes ☒ No

If yes, will you be discharging dewatering water from a current or former Federal or State remediation site? ☐ Yes ☐ No

Pollutant-Generating Activities

List and describe all pollutant-generating activities and indicate for each activity the associated pollutants or pollutant constituents that could be discharged in stormwater from your construction site. Take into account where potential spills and leaks could occur that contribute pollutants to stormwater discharges, and any known hazardous or toxic substances, such as PCBs and asbestos, that will be disturbed during construction.

Pollutant-Generating Activity (e.g., paving operations; concrete, paint, and stucco washout and waste disposal; solid waste storage and disposal; and dewatering operations)	**Pollutants or Pollutant Constituents** (e.g., sediment, fertilizers, pesticides, paints, caulks, sealants, fluorescent light ballasts, contaminated substrates, solvents, fuels)
Excavation	Sediment
Asphalt Paving	Fuels/oils, Solvents, Asphalt
Concrete Washout	Concrete and associated wash water
Piping Construction Materials	Paints, Caulks, Misc. construction materials
Portable Toilet	Toilet Chemicals

[Include additional rows or delete as necessary.]

Construction Support Activities *(only provide if applicable)*

Describe any construction support activities for the project (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas):

Excavated material storage piles, topsoil stockpile, contractor's storage yard for materials and equipment.

Construction Support Activities *(only provide if applicable)*

Contact information for construction support activity:
Insert Name
Insert Telephone No.
Insert Email
Insert Address And/Or Latitude/Longitude

[Repeat as necessary.]

2.4 Sequence and Estimated Dates of Construction Activities

Instructions (see CGP Part 7.2.3):

- Describe the intended construction sequence and duration of major activities.
- For each portion or phase of the construction site, include the following:
  - ✓ Commencement and duration of construction activities, including clearing and grubbing, mass grading, demolition activities, site preparation (i.e., excavating, cutting and filling), final grading, and creation of soil and vegetation stockpiles requiring stabilization;
  - ✓ Temporary or permanent cessation of construction activities in each portion of the site;
  - ✓ Temporary or final stabilization of exposed areas for each portion of the site. The dates for stabilization must reflect the applicable deadlines to which you are subject to in Part 2.2.14; and
  - ✓ Removal of temporary stormwater controls and construction equipment or vehicles, and cessation of any construction-related pollutant-generating activities.
- The construction sequence must reflect the following requirements:
  - ✓ Part 2.1.3 (installation of stormwater controls); and
  - ✓ Parts 2.2.14 (stabilization deadlines).

Phase I

Site Clearing and Grubbing	
Estimated Start Date of Construction Activities for this Phase	Summer 2022
Estimated End Date of Construction Activities for this Phase	Fall 2022
Estimated Date(s) of Application of Stabilization Measures for Areas of the Site Required to be Stabilized	Fall 2022 *[Add additional dates as necessary]*
Estimated Date(s) when Stormwater Controls will be Removed	Summer 2025 *[Add additional dates as necessary]*

Phase II

Utility installation and Site Grading	
Estimated Start Date of Construction Activities for this Phase	Spring 2023

Estimated End Date of Construction Activities for this Phase	End of Summer 2024
Estimated Date(s) of Application of Stabilization Measures for Areas of the Site Required to be Stabilized	End of Summer 2024 *[Add additional dates as necessary]*
Estimated Date(s) when Stormwater Controls will be Removed	Summer 2025 *[Add additional dates as necessary]*

[Repeat as needed.]

2.5 Authorized Non-Stormwater Discharges

Instructions (see CGP Parts 1.2.2 and 7.2.5):

- Identify all authorized non-stormwater discharges. The authorized non-stormwater discharges identified in Part 1.2.2 of the 2022 CGP include:
  - ✓ Discharges from emergency fire-fighting activities;
  - ✓ Fire hydrant flushings;
  - ✓ Landscape irrigation;
  - ✓ Waters used to wash vehicles and equipment, provided that there is no discharge of soaps, solvents, or detergents used for such purposes;
  - ✓ Water used to control dust;
  - ✓ Potable water including uncontaminated water line flushings;
  - ✓ External building washdown, provided soaps, solvents and detergents are not used, and external surfaces do not contain hazardous substances as defined in CGP Appendix A (e.g., paint or caulk containing polychlorinated biphenyls (PCBs));
  - ✓ Pavement wash waters provided spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and detergents are not used. You are prohibited from directing pavement wash waters directly into any receiving water, storm drain inlet, or constructed or natural site drainage features, unless the conveyance is connected to a sediment basin, sediment trap, or similarly effective control;
  - ✓ Uncontaminated air conditioning or compressor condensate;
  - ✓ Uncontaminated, non-turbid discharges of ground water or spring water;
  - ✓ Foundation or footing drains where flows are not contaminated with process materials such as solvents or contaminated ground water; and
  - ✓ Uncontaminated construction dewatering water discharged in accordance with Part 2.4.

List of Authorized Non-Stormwater Discharges Present at the Site

Authorized Non-Stormwater Discharge	Will or May Occur at Your Site?
Discharges from emergency fire-fighting activities	☐ Yes ☒ No
Fire hydrant flushings	☒ Yes ☐ No
Landscape irrigation	☐ Yes ☒ No
Water used to wash vehicles and equipment	☒ Yes ☐ No
Water used to control dust	☒ Yes ☐ No
Potable water including uncontaminated water line flushings	☒ Yes ☐ No
External building washdown (soaps/solvents are not used and external surfaces do not contain hazardous substances)	☐ Yes ☒ No
Pavement wash waters	☐ Yes ☒ No
Uncontaminated air conditioning or compressor condensate	☐ Yes ☒ No
Uncontaminated, non-turbid discharges of ground water or spring water	☐ Yes ☒ No
Foundation or footing drains	☐ Yes ☒ No
Uncontaminated construction dewatering water	☒ Yes ☐ No

(Note: You are required to identify the likely locations of these authorized non-stormwater discharges on your site map. See Section 2.6, below, of this SWPPP Template.)

2.6 Site Maps

Instructions (see CGP Part 7.2.4):

- Attach site maps in Appendix A of the Template. For most projects, a series of site maps is necessary and recommended. The first should show the undeveloped site and its current features. An additional map or maps should be created to show the developed site or, for more complicated sites, show the major phases of development.

These maps must include the following features:

- Boundaries of the property and of the locations where construction will occur, including:
  - ✓ Locations where earth-disturbing activities will occur, noting any phasing of construction activities and any demolition activities;
  - ✓ Approximate slopes before and after major grading activities. Note any areas of steep slopes, as defined in CGP Appendix A;
  - ✓ Locations where sediment, soil, or other construction materials will be stockpiled;
  - ✓ Locations of any crossings of receiving waters;
  - ✓ Designated points where vehicles will exit onto paved roads;
  - ✓ Locations of structures and other impervious surfaces upon completion of construction; and
  - ✓ Locations of on-site and off-site construction support activity areas covered by the permit (see CGP Part 1.2.1.c).
- Locations of any receiving waters, including wetlands, within your site and all receiving waters within one mile downstream of the site's discharge point(s). Indicate which receiving waters are listed as impaired, and which are identified by your State, Tribe, or EPA as Tier 2, Tier 2.5, or Tier 3 waters.
- Any areas of Federally-listed critical habitat for endangered or threatened species within the action area of the site as defined in CGP Appendix A (Helpful resources: CGP Appendix D and www.epa.gov/npdes/construction-general-permit-cgp-threatened-and-endangered-species-eligibility).
- Type and extent of pre-construction cover on the site (e.g., vegetative cover, forest, pasture, pavement, structures).
- Drainage pattern(s) of stormwater and authorized non-stormwater before and after major grading activities.
- Stormwater and authorized non-stormwater discharge locations, including:
  - ✓ Locations where stormwater and/or authorized non-stormwater will be discharged to storm drain inlets, including a notation of whether the inlet conveys stormwater to a sediment basin, sediment trap, or similarly effective control; and
  - ✓ Locations where stormwater or allowable non-stormwater will be discharged directly to receiving waters, including wetlands (i.e., not via a storm drain inlet).
  - ✓ Locations where turbidity benchmark monitoring will take place to comply with Part 3.3, if applicable to your site.
- Locations of all potential pollutant-generating activities identified in Part 7.2.3g (note: you should have those identified in Section 2.3 (Nature of the Construction Activities) in this SWPPP Template).
- Designated areas where construction wastes that are covered by the exception in Part 2.3.3e.ii (i.e., they are not pollutant-generating) will be stored.

- Locations of stormwater controls, including natural buffer areas and any shared controls utilized to comply with the permit.
- Locations where polymers, flocculants, or other treatment chemicals will be used and stored.

SECTION 3: DOCUMENTATION OF COMPLIANCE WITH OTHER FEDERAL REQUIREMENTS

3.1 Endangered Species Protection

Instructions (see CGP Parts 1.1.5, 7.2.9.a, Appendix D, and the "Endangered Species Protection" section of the Appendix H – NOI Form and Instructions as well as resources available at www.epa.gov/npdes/construction-general-permit-cgp-threatened-and-endangered-species-eligibility):

Using the instructions in Appendix D of the permit, determine which criterion listed below (A-F) applies with respect to the protection of endangered species. To make this determination, you must use information from **BOTH** the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). Both the NMFS and USFWS maintain lists of Endangered Species Act-listed (ESA-listed) species and designated critical habitat. Operators must consult both when determining their eligibility.

- Check only 1 box, include the required information, and provide a sound basis for supporting the criterion selected. Select the most conservative criterion that applies.
- Include documentation supporting your determination of eligibility required in the Endangered Species Protection section of the NOI in NeT or the ESA worksheet in CGP Appendix D.

Eligibility Criterion

Following the process outlined in Appendix D, under which criterion are you eligible for coverage under this permit?

Eligibility Criterion

Following the process outlined in Appendix D, under which criterion are you eligible for coverage under this permit?

☒ **Criterion C:** Discharges not likely to result in any short- or long-term adverse effects to ESA-listed species and/or designated critical habitat. ESA-listed species and/or designated critical habitat(s) under the jurisdiction of the USFWS and/or NMFS are likely to occur in or near your site's "action area," and you certify to EPA that your site's discharges and discharge-related activities are not likely to result in any short- or long-term adverse effects to ESA-listed threatened or endangered species and/or designated critical habitat. This certification may include consideration of any stormwater controls and/or management practices you will adopt to ensure that your discharges and discharge-related activities are not likely to result in any short- or long-term adverse effects to ESA-listed species and/or designated critical habitat. To certify your eligibility under this criterion, indicate 1) the ESA-listed species and/or designated habitat located in your "action area" using the process outlined in Appendix D of this permit; 2) the distance between the site and the listed species and/or designated critical habitat in the action area (in miles); and 3) a rationale describing specifically how short- or long-term adverse effects to ESA-listed species will be avoided from the discharges and discharge-related activities. (Note: You must include a copy of your site map from your SWPPP showing the upland and in-water extent of your "action area" with your NOI.)

☒ Check to confirm you have provided documentation in your SWPPP as required by CGP Appendix D.

Documentation: Please see the Biological Assessment completed through IPaC in Appendix D.

3.2 Historic Property Screening Process

Instructions (see CGP Part 1.1.6, 7.2.9.b, Appendix E, and the "Historic Preservation" section of the Appendix H – NOI Form and Instructions):

Follow the screening process in Appendix E of the permit to determine whether your installation of subsurface earth-disturbing stormwater controls will have an effect on historic properties.

- Include documentation supporting your determination of eligibility.
- To contact your applicable State historic preservation office, information is available at *https://ncshpo.org/directory/*
- To contact your applicable Tribal historic preservation office, information is available at *https://grantsdev.cr.nps.gov/THPO_Review/index.cfm*

Appendix E, Step 1

Do you plan on installing any stormwater controls that require subsurface earth disturbance, including, but not limited to, any of the following stormwater controls at your site? Check all that apply below, and proceed to Appendix E, Step 2.

- ☐ Dike
- ☐ Berm
- ☒ Catch Basin
- ☐ Pond
- ☒ Constructed Site Drainage Feature (e.g., ditch, trench, perimeter drain, swale, etc.)
- ☐ Culvert
- ☐ Channel
- ☐ Other type of ground-disturbing stormwater control: Insert Specific Type of Stormwater Control

(Note: If you will not be installing any subsurface earth-disturbing stormwater controls, no further documentation is required for Section 3.2 of the Template.)

Appendix E, Step 2

If you answered yes in Step 1, have prior professional cultural resource surveys or other evaluations determined that historic properties do not exist, or have prior disturbances at the site have precluded the existence of historic properties? ☐ YES ☒ NO

- If yes, no further documentation is required for Section 3.2 of the Template and you may provide the prior documentation in your SWPPP.
  - Insert references and information sources relied upon to determine that prior to your project, no historic properties exist at your site based on available information, including information that may be provided by your applicable SHPO, THPO, or other Tribal representative or references and information sources relied upon to determine that prior earth disturbances may have eliminated he possibility that historic properties exist on your site.
- If no, proceed to Appendix E, Step 3.

Appendix E, Step 3

If you answered no in Step 2, have you determined that your installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties? ☒ YES ☐ NO

- If yes, provide documentation of the basis for your determination. Parcels surrounding the site are developed with no evidence of historic properties associated with them. Consultation of the National Register of Historic Places in Idaho show historic properties in the Priest Lake area but no historic site is shown near or on the project site.
- If no, proceed to Appendix E, Step 4.

Appendix E, Steps 4 and 5

If you answered no in Step 3, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other Tribal representative (whichever applies) respond to you within 15 calendar days to indicate their views as to the likelihood that historic properties are potentially present on your site and may be impacted by the installation of stormwater controls that require subsurface earth disturbance? ☐ YES ☐ NO

- If yes, describe the nature of their response:
  - ☐ Written indication that no historic properties will be affected by the installation of stormwater controls. Insert copies of letters, emails, or other communication between you and the applicable SHPO, THPO, or other Tribal representative
  - ☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions. Insert copies of letters, emails, or other communication between you and the applicable SHPO, THPO, or other Tribal representative
  - ☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls. Provide a description of any significant remaining disagreements regarding mitigation measures and insert copies of letters, emails, or other communication between you and the applicable SHPO, THPO, or other Tribal representative
  - ☐ Other: Insert copies of letters, emails, or other communication between you and the applicable SHPO, THPO, or other Tribal representative
- If no, no further documentation is required for Section 3.2 of the Template.

3.3 Safe Drinking Water Act Underground Injection Control Requirements

Instructions (see CGP Part 7.2.9.c):

- If you will use any of the identified controls in this section, document any contact you have had with the applicable State agency or EPA Regional Office responsible for implementing the requirements for underground injection wells in the Safe Drinking Water Act and EPA's implementing regulations at 40 CFR Parts 144-147.
- For State UIC program contacts, refer to the following EPA website: https://www.epa.gov/uic.

Do you plan to install any of the following controls? Check all that apply below.

- ☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)
- ☐ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow
- ☒ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, insert copies of letters, emails, or other communication between you and the State agency or EPA regional office.

SECTION 4: EROSION AND SEDIMENT CONTROLS AND DEWATERING PRACTICES

General Instructions (See CGP Parts 2.2 and 7.2.6):

- Describe the erosion and sediment controls that will be implemented at your site to meet the requirements of CGP Part 2.2.
- Describe any applicable stormwater control design specifications (including references to any manufacturer specifications and/or erosion and sediment control manuals/ordinances relied upon).
- Describe any routine stormwater control maintenance specifications.
- Describe the projected schedule for stormwater control installation/implementation.

4.1 Natural Buffers or Equivalent Sediment Controls

Instructions (see CGP Parts 2.2.1 and 7.2.6.b.i, and Appendix F):

This section only applies to you if discharge to a receiving water is located within 50 feet of your site's earth disturbances. If this is the case, consult CGP Part 2.2.1 and Appendix F for information on how to comply with the buffer requirements.

- Describe the compliance alternative (CGP Part 2.2.1.a.i, ii, or iii) that you will implement to meet the buffer requirements, and include any required documentation supporting the alternative selected. For alternative 3, also include why it is infeasible for you to provide and maintain an undisturbed natural buffer of any size. For "linear construction sites" where it is infeasible to implement alternative 1, 2, or 3, also include a description of any buffer width retained and/or supplemental erosion and sediment controls installed. The compliance alternative selected must be maintained throughout the duration of permit coverage. However, if you select a different compliance alternative during your period of permit coverage, you must modify your SWPPP to reflect this change.
- If you qualify for one of the exceptions in CGP Part 2.2.1.b, include documentation related to your qualification for such exceptions.

Buffer Compliance Alternatives

Are there any receiving waters within 50 feet of your project's earth disturbances? ☒ YES ☐ NO

(Note: If no, no further documentation is required for Section 4.1 in the SWPPP Template. Continue to Section 4.2.)

Check the compliance alternative that you have chosen:

☐ (i) I will provide and maintain a 50-foot undisturbed natural buffer.

(Note 1: You must show the 50-foot boundary line of the natural buffer on your site map.)

(Note 2: You must show on your site map how all discharges from your construction disturbances through the natural buffer area will first be treated by the site's erosion and sediment controls. Also, show on the site map any velocity dissipation devices used to prevent erosion within the natural buffer area.)

☐ (ii) I will provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by additional erosion and sediment controls that achieve, in

combination, the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

(Note 1: You must show the boundary line of the natural buffer on your site map.)

(Note 2: You must show on your site map how all discharges from your construction disturbances through the natural buffer area will first be treated by the site's erosion and sediment controls. Also, show on the site map any velocity dissipation devices used to prevent erosion within the natural buffer area.)

- Insert width of natural buffer to be retained
- Insert either of the following:

  (1) The estimated sediment removal from a 50-foot buffer using applicable tables in Appendix F, Attachment 1. Include information about the buffer vegetation and soil type that predominate at your site

  OR

  (2) If you conducted a site-specific calculation for the estimated sediment removal of a 50-foot buffer, provide the specific removal efficiency, and information you relied upon to make your site-specific calculation
- Insert description of additional erosion and sediment controls to be used in combination with natural buffer area
- Insert the following information:
  - (1) Specify the model or other tool used to estimate sediment load reductions from the combination of the buffer area and additional erosion and sediment controls installed at your site, and
  - (2) Include the results of calculations showing that the combination of your buffer area and the additional erosion and sediment controls installed at your site will meet or exceed the sediment removal efficiency of a 50-foot buffer

☐ (iii) It is infeasible to provide and maintain an undisturbed natural buffer of any size, therefore I will implement erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

- Insert rationale for concluding that it is infeasible to provide and maintain a natural buffer of any size
- Insert either one of the following:

  (1) The estimated sediment removal from a 50-foot buffer using applicable tables in Appendix F, Attachment 1. Include information about the buffer vegetation and soil type that predominate at your site

  OR

  (2) If you conducted a site-specific calculation for the estimated sediment removal of a 50-foot buffer, provide the specific removal efficiency, and information you relied upon to make your site-specific calculation
- Insert description of additional erosion and sediment controls to be used in combination with natural buffer area
- Insert the following information:
  - (1) Specify the model or other tool used to estimate sediment load reductions from the combination of the buffer area and additional erosion and sediment controls installed at your site, and

- (2) Include the results of calculations showing that the combination of your buffer area and the additional erosion and sediment controls installed at your site will meet or exceed the sediment removal efficiency of a 50-foot buffer

☒ I qualify for one of the exceptions in Part 2.2.1.b. (If you have checked this box, provide information on the applicable buffer exception that applies, below.)

Buffer Exceptions

Which of the following exceptions to the buffer requirements applies to your site?

☒ There is no discharge of stormwater to waters of the U.S. through the area between the disturbed portions of the site and any waters of the U.S. located within 50 feet of your site .

(Note: If this exception applies, no further documentation is required for Section 4.1 of the Template.)

☐ No natural buffer exists due to preexisting development disturbances (e.g., structures, impervious surfaces) that occurred prior to the initiation of planning for this project.

(Note 1: If this exception applies, no further documentation is required for Section 4.1 of the Template.)

(Note 2: Where some natural buffer exists but portions of the area within 50 feet of the surface water are occupied by preexisting development disturbances, you must still comply with the one of the CGP Part 2.2.1.a compliance alternatives.)

☐ For "linear construction sites" (defined in Appendix A), site constraints (e.g., limited right-of-way) make it infeasible to meet any of the CGP Part 2.2.1.a compliance alternatives, provided that, to the extent feasible, you limit disturbances within 50 feet of the receiving water. Include documentation here of the following: (1) why it is infeasible for you to meet one of the buffer compliance alternatives, and (2) buffer width retained and/or supplemental erosion and sediment controls to treat discharges to the surface water

☐ The project qualifies as "small residential lot" construction (defined in Appendix A as "a lot being developed for residential purposes that will disturb less than 1 acre of land, but is part of a larger residential project that will ultimately disturb greater than or equal to 1 acre") (see Appendix F, Part F.3.2).

☐ For Alternative 1:

- Insert width of natural buffer to be retained
- Insert applicable requirements based on Table F-1
- Insert description of how you will comply with these requirements

☐ For Alternative 2:

- Insert (1) the assigned risk level based on Appendix F Applicable Table F-2 through F-6 and (2) the predominant soil type and average slope at your site
- Insert applicable requirements based on Appendix F, Table F-7
- Insert description of how you will comply with these requirements

(Note 1: If you alternatively choose to comply with any of the options that are available to other sites in Part 2.2.1.a and F.2.1 of this Appendix, then additional documentation may be needed.)

☐ Buffer disturbances are authorized under a CWA Section 404 permit. Insert description of any earth disturbances that will occur within the buffer area

(Note 1: If this exception applies, no further documentation is required for Section 4.1 of the Template.)

(Note 2: This exception only applies to the limits of disturbance authorized under the Section 404 permit and does not apply to any disturbances within 50 feet of a receiving water that are adjacent to the disturbances authorized under Section 404 and that are covered by this permit.)

☐ Buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail). Insert description of any earth disturbances that will occur within the buffer area

(Note: If this exception applies, no further documentation is required for Section 4.1 of the Template.)

4.2 Perimeter Controls

Instructions (see CGP Parts 2.2.3 and 7.2.6.b.ii):

- Describe sediment controls that will be used (e.g., silt fences, filter berms, compost filter socks, gravel barriers, temporary diversion dikes) to meet the Part 2.2.3 requirement to "install sediment controls along any perimeter areas of the site that are downslope from any exposed soil or other disturbed areas."
- For linear projects (as defined in Appendix A), where you have determined that the use of perimeter controls in portions of the site is infeasible (e.g. due to a limited or restricted right-of-way), document other practices that you will implement to minimize pollutant discharges to perimeter areas of the site.

General

- Silt fence will be installed downstream along the perimeter area of the site that could receive pollutant discharge. Stabilization of construction entrance will be constructed to limit off site tracking.

Specific Perimeter Controls

Silt Fence (BMP 36)	
Description: Silt Fence will be installed prior to earth disturbance.	
Installation	4/18/2022

Silt Fence (BMP 36)	
Maintenance Requirements	Silt fences should be inspected periodically for damage (such as tearing by wind, animals, or equipment) and for the amount of sediment that has accumulated. Remove the sediment when it reaches one-half the height of the silt fence. In situations where access is available, machinery can be used. Otherwise, the silt should be removed manually. The following are key elements to remember: ƒThe sediment deposits should be removed when heavy rain or high water is anticipated. ƒThe sediment deposits should be placed in an area where there is little danger of erosion. ƒThe silt fence should not be removed until adequate vegetative growth ensures no further erosion of the slopes. Generally, the fabric is cut at ground level, the wire and posts are removed, then the sediment is spread, seeded, and protected (mulched) immediately.
Design Specifications	SEE APPENDIX N OF DESIGN SPECIFICATIONS

[Repeat as needed for individual perimeter controls.]

4.3 Sediment Track-Out

Instructions (see CGP Parts 2.2.4 and 7.2.6.b.iii):

- Describe stormwater controls that will be used to minimize sediment track-out.
- Describe location(s) of vehicle exit(s), procedures to remove accumulated sediment off-site (e.g., vehicle tracking), and stabilization practices (e.g., stone pads or wash racks or both) to minimize off-site vehicle tracking of sediment. Also include the design, installation, and maintenance specifications for each control.

General

- Insert general description of how you will comply with CGP Part 2.2.4

Specific Track-Out Controls

Stabilization of Construction Entrance (BMP 5)	
Description: Stabilization of Construction Entrance/Exit	
Installation	5/2/2022

Stabilization of Construction Entrance (BMP 5)	
Maintenance Requirements	ƒThe entrance should be maintained in a condition that will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with additional 2 in. stone (as conditions demand) and repair or cleaning of any structures used to trap sediment. ƒAll materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains should be removed immediately. When necessary, vehicle wheels should be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it should be done on an area stabilized with aggregate that drains into an approved sediment trap. ƒTrapped sediment should be removed from the site or stabilized on site and prevented from entering storm drains, ditches, or waterways. Disturbed soil areas resulting from removal should be permanently stabilized. ƒThe stabilized construction entrance may be removed after final site stabilization is achieved or after the temporary BMPs are no longer needed.
Design Specifications	SEE APPENDIX N OF DESIGN SPECIFICATIONS

[Repeat as needed for individual track-out controls.]

4.4 Stockpiles or Land Clearing Debris Piles Comprised of Sediment or Soil

Instructions (see CGP Parts 2.2.5 and 7.2.6):

- Describe stormwater controls and other measures you will take to minimize the discharge of sediment or soil particles from stockpiled sediment or soil. Include a description of structural practices (e.g., diversions, berms, ditches, storage basins), including design, installation, and maintenance specifications, used to divert flows from stockpiled sediment or soil, retain or detain flows, or otherwise limit exposure and the discharge of pollutants from stockpiled sediment or soil.
- For piles that will be unused for 14 or more days, describe what cover or other appropriate temporary stabilization will be used.
- Also, describe any controls or procedures used to minimize exposure resulting from adding to or removing materials from the pile.

General

- A rock-stabilized entrance area will be installed on the site property at access locations to reduce off-site tracking onto surrounding roadways.

Specific Stockpile Controls

Stockpile Management (BMP 9)	
Description: STOCKPILE MANAGEMENT	
Installation	Click or tap to enter a date.
Maintenance Requirements	ƒInspect and verify that BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are underway, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation. ƒRepair and/or replace perimeter controls and covers as needed to keep them functioning properly.
Design Specifications	See Appendix N

[Repeat as needed for individual stockpile controls.]

4.5 Minimize Dust

Instructions (see CGP Parts 2.2.6 and 7.2.6):

Describe controls and procedures you will use at your site to minimize the generation of dust.

General

- Dust control will be maintained with an on-site water truck.

Specific Dust Controls

DUST CONTROL (BMP 7)	
Description: DUST CONTROL	
Installation	Click or tap to enter a date.
Maintenance Requirements	ƒDust control requires constant attention: it is not a one-time or once-in-awhile activity. Dust control sprinkling may have to be done several times a day during hot, dry weather. ƒAreas protected by mulch, adhesive emulsions, or barriers need to be checked at regular intervals according to the inspection schedule set forth in the stormwater plan. Remove sediments that accumulate behind any sediment fence or barrier when the accumulation reaches one half the height of the barrier. Dispose of the sediments only in an approved location (not in wetlands or where they will contribute to pollution at the disposal site).
Design Specifications	See Appendix N

[Repeat as needed for individual dust controls.]

4.6 Minimize Steep Slope Disturbances

Instructions (see CGP Parts 2.2.7 and 7.2.6):

- Describe how you will minimize the disturbance to steep slopes (as defined by CGP Appendix A).
- Describe controls (e.g., erosion control blankets, tackifiers), including design, installation and maintenance specifications, that will be implemented to minimize sediment discharges from slope disturbances.

General

- There are steep slopes on this project; however, they are being left undisturbed and will remain as undisturbed common areas.

Specific Steep Slope Controls

Insert name of steep slope control to be installed	
Description: Insert description of steep slope control to be installed	
Installation	Insert approximate date of installation
Maintenance Requirements	Insert maintenance requirements for the steep slope control
Design Specifications	Include copies of design specifications here

[Repeat as needed for individual steep slope controls.]

4.7 Topsoil

Instructions (see CGP Parts 2.2.8 and 7.2.6):

- Describe how topsoil will be preserved and identify these areas and associated control measures on your site map(s).
- If it is infeasible for you to preserve topsoil on your site, provide an explanation for why this is the case.

General

- Native topsoil will be preserved by stripping and stockpiling. Following grading and site restoration tasks, the topsoil will be placed on finished slopes to promote re-establishment of vegetation.

Specific Topsoil Controls

Topsoil (BMP 20)	
Description: Topsoil	
Installation	
Maintenance Requirements	Contractor will follow BMP guidance found in the Catalog of stormwater Best Management Practices for Idaho Cities and Counties.
Design Specifications	See Appendix N

[Repeat as needed for individual topsoil controls.]

4.8 Soil Compaction

Instructions (see CGP Parts 2.2.9 and 7.2.6):

- In areas where final vegetative stabilization will occur or where infiltration practices will be installed, describe the controls, including design, installation, and maintenance specifications that will be used to restrict vehicle or equipment access or condition the soil for seeding or planting.

General

- Compaction will be minimized in areas of the site where final vegetative stabilization will occur or where infiltration practices will be installed.

Specific Soil Compaction Controls

Minimize Soil Compaction	
Description: Minimize Soil Compaction	
Installation	On-going Throughout Project, practice as needed.
Maintenance Requirements	Restrict vehicle and equipment use in areas that will be used as grassed infiltration/swale areas to avoid soil compaction. Before seeding or planting areas of exposed soil that have been compacted, use techniques that rehabilitate and condition the soils as necessary to support vegetative growth.
Design Specifications	See Appendix N

[Repeat as needed for individual soil compaction controls.]

4.9 Storm Drain Inlets

Instructions (see CGP Parts 2.2.10 and 7.2.6.iv):

- Describe controls (e.g., inserts, rock-filled bags, or block and gravel) including design, installation, and maintenance specifications that will be implemented to protect all inlets that carry stormwater flow from your site to a receiving water, provided you have the authority to access the storm drain inlet. Inlet protection measures are not required when storm drain inlets to which your site discharges are conveyed to a sediment basin, sediment trap, or similarly effective control.

General

- Storm drain outlets will be protected with filter fabric fence or inserts. Storm drain pipe are conveyed to constructed swales.

Specific Storm Drain Inlet Controls

[Repeat as needed for individual storm drain inlet controls.]

Inlet Protection (BMP 31)	
Description: Inlet Protection	
Installation	Click or tap to enter a date.
Maintenance Requirements	Contractor will clean, or remove and replace the protection measures as sediment accumulates, the filter becomes clogged, and/ or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, contractor will remove the deposited sediment by the end of the same business day in which it is found or by the end of the following business day if removal by the same business day is not feasible.
Design Specifications	See Appendix N

4.10 Constructed Site Drainage Feature

Instructions (see CGP Parts 2.2.11 and 7.2.6):

If you will be installing a constructed site drainage feature, describe control practices (e.g., erosion controls and/or velocity dissipation devices such as check dams and sediment traps), including design specifications and details (volume, dimensions, outlet structure), that will be implemented at the construction site.

General

- Stormwater conveyance and infiltration will occur by a network of storm drains and by approved grassy infiltration swales. Storm drain daylight locations will be protected with rocked energy dissipation.

Specific Constructed Site Drainage Features

Outlet Protection (BMP 30)	
Description: Outlet Protection	
Installation	
Maintenance Requirements	Contractor will follow BMP guidance found in the Catalog of Stormwater Best Management Practices for Idaho Cities and Counties.
Design Specifications	See Appendix N

[Repeat as needed for individual constructed site drainage features.]

4.11 Sediment Basins or Similar Impoundments

Instructions (see CGP Parts 2.2.12 and 7.2.6.b.v):

If you will install a sediment basin or similar impoundment, include design specifications and other details (volume, dimensions, outlet structure) that will be implemented in conformance with CGP Parts 2.2.12 and 7.2.6.b.iv.

- Sediment basins must be situated outside of receiving waters and any natural buffers established under CGP Part 2.2.1; and designed to avoid collecting water from wetlands.
- At a minimum, sediment basins provide storage for either (1) the calculated volume of runoff from the 2-year, 24-hour storm (see https://www.epa.gov/npdes/construction-general-permit-2-year-24-hour-storm-frequencies), or (2) 3,600 cubic feet per acre drained.
- Sediment basins must also utilize outlet structures that withdraw water from the surface, unless infeasible.
- Use erosion controls and velocity dissipation devices to prevent erosion at inlets and outlets.

General

- It is not anticipated that temporary sediment basins will be needed.

4.12 Chemical Treatment

Instructions (see CGP Parts 2.2.13 and 7.2.6.b.vi):

If you are using treatment chemicals (e.g., polymers, flocculants, coagulants) at your site, provide details for each of the items below. This information is required as part of the SWPPP requirements in CGP Part 7.2.6.b.vi.

General

- It is not anticipated that chemical treatment will be needed.

4.13 Dewatering Practices

Instructions (see CGP Parts 2.4 and 7.2.6):

If you will be discharging accumulated stormwater and/or ground water drained from building foundations, vaults, trenches, or other similar points of accumulation, include design specifications and details of all dewatering practices that are installed and maintained to comply with CGP Part 2.4.

- Do not place dewatering controls on steep slopes.
- Use a suitable filtration device if dewatering water is found or expected to contain materials that cause a visible sheen on the water surface or visible oily deposits on the bottom or shoreline of the receiving water.
- Use well-vegetated, upland areas of the site to infiltrate dewatering water before discharging. Do not use receiving waters as part of the treatment area.
- Use stable, erosion-resistant surfaces to discharge from dewatering controls. Additionally, at all points where dewatering water is discharged, comply with the velocity dissipation requirements of Part 2.2.11.

General

- It is not anticipated that dewatering will be needed but if determined necessary then the BMP dewatering procedures that are shown below will be followed along with the requirements of the GCP.

Specific Dewatering Practices

Dewatering (BMP 46)	
Description: Dewatering	
Installation	Click or tap to enter a date.
Maintenance Requirements	Contractor will follow the CGP requirements in Section 2.3 and the BMP 46 guidance found in the Catalog of Stormwater Best Management Practices for Idaho Cities and Counties.
Design Specifications	See Appendix N

[Repeat as needed for individual dewatering practices.]

4.14 Other Stormwater Controls

Instructions:

- Describe any other stormwater controls that do not fit into the above categories.

General

- Insert general description of the problem this control is designed to address

4.15 Site Stabilization

Instructions (see CGP Parts 2.2.14 and 7.2.6.b.vii):

The CGP requires you to immediately initiate stabilization when work in an area of your site has permanently or temporarily stopped, and to complete certain stabilization activities within prescribed deadlines. Construction projects disturbing more than 5 acres at any one time have a different deadline than projects disturbing 5 acres or less at any one time. See CGP Part 2.2.14.a. Construction projects in arid, semi-arid, and drought-stricken areas during the seasonally dry period and projects discharging to a sediment- or nutrient-impaired water or a Tier 2, 2.5, or 3 water have different stabilization deadlines. See CGP Part 2.2.14.b. For your SWPPP, you must include the following:

- Describe the specific vegetative and/or non-vegetative practices that will be used to stabilize exposed soils where construction activities have temporarily or permanently ceased. Avoid using impervious surfaces for stabilization whenever possible.
- The stabilization deadline(s) that will be met in accordance with Part 2.2.14.a and 2.2.14.b.
- Once you begin construction, consider using the Grading/Stabilization Activities log in Appendix H of the Template to document your compliance with the stabilization requirements in CGP Part 2.2.14.

Total Amount of Land Disturbance Occurring at Any One Time

☐ *Five Acres or less*

☒ *More than Five Acres*

Use this template box if you are <u>not</u> located in an arid, semi-arid, or drought-stricken area and are not discharging to a sediment- or nutrient-impaired water or Tier 2, Tier 2.5, or Tier 3 water.

Straw Mulching (MBP 15), Hydromulching (MBP 16), Seeding (BMP 21)	
☒ *Vegetative* ☐ *Non-Vegetative* ☒ *Temporary* ☒ *Permanent*	
Description: ▪ Exposed soil will be stabilized with seeding, straw mulching and/or hydromulching	
Installation	Click or tap to enter a date.
Completion	Click or tap to enter a date.
Maintenance Requirements	Inspect all seeded areas on a regular basis and after each major storm event to check for areas where corrective measures may have to be made. ƒIndicate which areas need to be reseeded or where other remedial actions are necessary to assure establishment of permanent seeding. ƒContinue monitoring of the site/area until permanent vegetation is established.
Design Specifications	See Appendix N

[Repeat as needed for additional stabilization practices.]

Use this template box if you are located in an arid, semi-arid, or drought-stricken area.

Insert name of site stabilization practice	
☐ *Vegetative* ☐ *Non-Vegetative* ☐ *Temporary* ☐ *Permanent*	
Description: ▪ Insert description of stabilization practice to be installed ▪ Note how design will meet requirements of Part 2.2.14.b	
Dry Period	▪ Beginning month of seasonally dry period: Insert approximate date ▪ Ending month of seasonally dry period: Insert approximate date ▪ Site conditions during this period: Describe your site conditions during this period
Installation and completion schedule	Describe the schedule you will follow for initiating and completing vegetative stabilization ▪ Approximate installation date: Insert approximate date ▪ Approximate completion date: Insert approximate date
Maintenance Requirements	Insert maintenance requirements for the stabilization practice
Design Specifications	Include copies of design specifications here

[Repeat as needed for additional stabilization practices.]

Use this template box if you are discharging to a sediment- or nutrient-impaired water or to a water that is identified by your State, Tribe, or EPA as Tier 2, Tier 2.5, or Tier 3 for antidegradation purposes.

Insert name of site stabilization practice	
☐ *Vegetative* ☐ *Non-Vegetative* ☐ *Temporary* ☐ *Permanent*	
Description: ▪ Insert description of stabilization practice to be installed ▪ Note how design will meet requirements of Part 2.2.14.b.iii	
Installation	Insert approximate date of installation
Completion	*(Must be completed as soon as practicable, but no later than seven calendar days after stabilization has been initiated)* Insert approximate completion date
Maintenance Requirements	Insert maintenance requirements for the stabilization practice
Design Specifications	Include copies of design specifications here

[Repeat as needed for additional stabilization practices.]

Use this template box if unforeseen circumstances have delayed the initiation and/or completion of vegetative stabilization. Note: You will not be able to include this information in your initial SWPPP. If you are affected by circumstances such as those described in CGP Part 2.2.14.b.ii, you will need to modify your SWPPP to include this information.

<table>
<tr><td colspan="2">Insert name of site stabilization practice</td></tr>
<tr><td colspan="2">☐ Vegetative ☐ Non-Vegetative
☐ Temporary ☐ Permanent</td></tr>
<tr><td colspan="2">Description:
Insert description of stabilization practice to be installed
Note how design will meet requirements of Part 2.2.14.b.ii</td></tr>
<tr><td>Justification</td><td>Insert description of circumstances that prevent you from meeting the deadlines required in CGP CGP Parts 2.2.14.a</td></tr>
<tr><td rowspan="2">Installation and completion schedule</td><td>Vegetative Measures:
Describe the schedule you will follow for initiating and completing vegetative stabilization
Approximate installation date: Insert approximate date
Approximate completion date: Insert the approximate date</td></tr>
<tr><td>Non-Vegetative Measures:
(Must be completed within 14 days of the cessation of construction if disturbing 5 acres or less; within 7 days if disturbing more than 5 acres)
Approximate installation date: Insert the approximate date
Approximate completion date: Insert the approximate date</td></tr>
<tr><td>Maintenance Requirements</td><td>Insert maintenance requirements for the stabilization practice</td></tr>
<tr><td>Design Specifications</td><td>Include copies of design specifications here</td></tr>
</table>

[Repeat as needed for additional stabilization practices.]

SECTION 5: POLLUTION PREVENTION CONTROLS

5.1 Potential Sources of Pollution

Instructions (see CGP Part 7.2.3.g):

- Identify and describe all pollutant-generating activities at your site (e.g., paving operations; concrete, paint, and stucco washout and waste disposal; solid waste storage and disposal).
- For each pollutant-generating activity, include an inventory of pollutants or pollutant constituents associated with that activity (e.g., sediment, fertilizers, and/or pesticides, paints, solvents, fuels), which could be exposed to rainfall or snowmelt, and could be discharged in stormwater from your construction site. You must take into account where potential spills and leaks could occur that contribute pollutants to stormwater discharges, and any known hazardous or toxic substances, such as PCBs and asbestos, that will be disturbed or removed during construction.

Construction Site Pollutants

Insert text or use table below

Pollutant-Generating Activity	**Pollutants or Pollutant Constituents** (That could be discharged if exposed to stormwater)	**Location on Site** (Or reference SWPPP site map where this is shown)
Excavation	Sediment	All disturbed areas.
Asphalt Paving	Tack Coat, Asphalt	Roadways and Driveways
Portable toilet	Sanitary Sewer	As shown on site plan
Concrete	Wash water	Building Foundation, sidewalk, curb, thrust blocking
Vehicle Fueling	Diesel	Various
Solid Waste	Paper, plastic, etc	Picked up and hauled off site daily

[Include additional rows as necessary.]

5.2 Spill Prevention and Response

Instructions (see CGP Parts 2.3.6 and 7.2.6.b.viii):

- Describe procedures you will use to prevent and respond to leaks, spills, and other releases. You must implement the following at a minimum:
  - ✓ Procedures for expeditiously stopping, containing, and cleaning up spills, leaks, and other releases. Identify the name or title of the employee(s) responsible for detection and response of spills or leaks; and
  - ✓ Procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity consistent with Part 2.3.6 and established under either 40 CFR part 110, 40 CFR part 117, or 40 CFR part 302, occurs during a 24-hour period. Contact information must be in locations that are readily accessible and available to all employees.
- Some projects/site may be required to develop a Spill Prevention Control and Countermeasure (SPCC) plan under a separate regulatory program (Section 311 of the CWA). If you are required to develop an SPCC plan, or you already have one, you should include references to the relevant requirements from your plan.

In the event of a spills, leak or other released containing a hazardous substance or oil, Contractor will implement BMP 10 spill Prevention and Control section found in the current edition of the Stormwater Best Management Practices for Idaho Cities and Counties.

The stormwater team manager will be immediately notified of any spills or leaks that occur. The stormwater team, contractor and any sub-contractors will be responsible for detection and response of spills or leaks, and reporting spills if required.

The stormwater team manager will contract the appropriate facility personnel, emergency response agencies, and regulatory agencies where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or excess of a reportable quantity consistent with Part 2.3.6 and established under either 40 CFR Part 110, 40 CFR Part 117, or 40 CFP Part 302, occurs during a 24-hour period.

Contact Information
National Response Center (NRC): 1-800-424-8802
Idaho Department of Environmental Quality: 1-208-769-1422
EPA Region 10 Office: 1-800-424-4372 or 206-553-1200
Coast Guard: 1-800-424-8802

5.3 Fueling and Maintenance of Equipment

5.3 Fueling and Maintenance of Equipment or Vehicles

Instructions (see CGP Parts 2.3.1 and 7.2.6):

- Describe equipment/vehicle fueling and maintenance practices that will be implemented to eliminate the discharge of spilled or leaked chemicals (e.g., providing secondary containment *(examples: spill berms, dikes, spill containment pallets)* and cover where appropriate, and/or having spill kits readily available.)

General

- In the event of a spills, leak or other released containing a hazardous substance or oil, Contractor will implement BMP 10 spill Prevention and Control section found in the current edition of the Stormwater Best Management Practices for Idaho Cities and Counties.

Specific Pollution Prevention Practices

Spill Prevention and Control (BMP 10)	
Description: Spill Prevention and Control	
Implementation	Implement as needed
Maintenance Requirements	Check for leaking of fuel lines, fitting and valves and repair leaks as necessary. Contain leaking fuels and dispose contents into larger volume container and recycle stored contents.
Design Specifications	See Appendix N

[Repeat as needed.]

5.4 Washing of Equipment and Vehicles

Instructions (see CGP Parts 2.3.2 and 7.2.6):

- Describe equipment/vehicle washing practices that will be used to minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other types of wash waters (e.g., locating activities away from receiving waters and storm drain inlets or constructed or natural site drainage features and directing wash waters to a sediment basin or sediment trap, using filtration devices, such as filter bags or sand filters, or using other similarly effective controls).
- Describe how you will prevent the discharge of soaps, detergents, or solvents and provide storage by either (1) cover (*examples: plastic sheeting or temporary roofs*) to prevent these detergents from coming into contact with rainwater, or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas.

General

- It is not anticipated that vehicle washing will occur on-site. If vehicle washing does occur, contractor shall implement BMP 11 Vehicle/Equipment Washing & Maintenance to minimize the discharge or pollutants.
-

Specific Pollution Prevention Practices

Vehicle/Equipment Washing & Maintenance (BMP 11)	
Description: Vehicle/Equipment Washing & Maintenance	
Implementation	Implemented as needed
Maintenance Requirements	Inspect the washing area and drain or filters that will be collecting wash runoff. Check that system controls are working as intended.
Design Specifications	See Appendix N

[Repeat as needed.]

5.5 Storage, Handling, and Disposal of Building Products, Materials, and Wastes

Instructions (see CGP Parts 2.3.3 and 7.2.6):

- For any of the types of building products, materials, and wastes in Sections 5.5.1-5.5.6 below that you expect to use or store at your site, provide the information on how you will comply with the corresponding CGP provision and the specific practices that you will employ.

5.5.1 Building Materials and Building Products

(Note: Examples include asphalt sealants, copper flashing, roofing materials, adhesives, concrete admixtures, and gravel and mulch stockpiles.)

General

- Contractor will implement BMP 8 Cover for Material and Equipment found in the BMP catalog.

Specific Pollution Prevention Practices

Insert name of pollution prevention practice	
Description: Insert description of practice to be implemented	
Implementation	Insert approximate date of implementation
Maintenance Requirements	Insert maintenance requirements for the pollution prevention practice
Design Specifications	If applicable include copies of design specifications here

[Repeat as needed.]

5.5.2 Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials

General

- No pesticide, herbicides or insecticides will be used on-site. Contractor shall implement BMP 77: Outdoor Storage and BMP 46: Spill Prevention and Control. MSDS shall be readily accessible at all times.

Specific Pollution Prevention Practices

Outdoor Storage (BMP 77)	
Description: Outdoor Storage	
Implementation	As needed

Outdoor Storage (BMP 77)	
Maintenance Requirements	Material shall be stored in a central location and covered if not in use. Coverings shall be inspected regularly for tears or rips. Repairs to coverings shall be implemented as soon as possible.
Design Specifications	See Appendix

Spill Prevention and Control (BMP 46)	
Description: Spill Prevention and Control	
Implementation	As needed
Maintenance Requirements	Material shall be stored in a central location and covered when not in use. Material location shall be contained so any spills or leaks do not leave the controlled area.
Design Specifications	See Appendix.

[Repeat as needed.]

5.5.3 Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals

General

- See Section 5.3

5.5.4 Hazardous or Toxic Waste

(Note: Examples include paints, caulks, sealants, fluorescent light ballasts, solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids.)

General

- It is not anticipated that hazardous or Toxic Waste will be present during construction

5.5.5 Construction and Domestic Waste

(Note: Examples include packaging materials, scrap construction materials, masonry products, timber, pipe and electrical cuttings, plastics, styrofoam, concrete, demolition debris, and other trash or discarded materials.)

General

- Contractor shall implement BMP 12: Waste management. See Appendix N

Specific Pollution Prevention Practices

Waste Management (BMP12)	
Description: Waste Management	
Implementation	As-needed
Maintenance Requirements	Waste shall be stored in designated waste containers and emptied on a regular basis.
Design Specifications	See Appendix

[Repeat as needed.]

5.5.6 Sanitary Waste

General

- Contractor will implement BMP 14: Sanitary/Septic Waste Management.

Specific Pollution Prevention Practices

Sanitary/Septic Waste Management (BMP 14)	
Description: Sanitary/Septic Waste Management	
Implementation	As-needed
Maintenance Requirements	Portable toilet locations are shown on site plan. Inspect facilities regularly. Portable toilets shall be serviced as needed.
Design Specifications	See Appendix

[Repeat as needed.]

5.6 Washing of Applicators and Containers used for Stucco, Paint, Concrete, Form Release Oils, Cutting Compounds, or Other Materials

Instructions (see CGP Parts 2.3.4 and 7.2.6):

– Describe how you will comply with the CGP Part 2.3.4 requirement for washing applications and containers.

General

- Contractor shall implement BMP 13: Concrete Waste Management. See Appendix N

Specific Pollution Prevention Practices

Concrete Waste Management (BMP 13)	
Description: Concrete Waste Management	
Implementation	As-needed
Maintenance Requirements	Inspect site to make sure subcontractors are properly managing concrete waste. Use temporary pits to dispose concrete waste and empty regularly.
Design Specifications	See Appendix N

[Repeat as needed.]

5.7 Application of Fertilizers

Instructions (CGP Parts 2.3.5 and 7.2.6.x):

Describe how you will comply with the CGP Part 2.3.5 requirement for the application of fertilizers.

General

- Contractor shall implement BMP 78: Fertilizer Management. See Appendix N

Specific Pollution Prevention Practices

Fertilizer Management (BMP 78)	
Description: Fertilizer Management	
Implementation	As needed
Maintenance Requirements	Fertilizers shall be applied according to the label instructions. Take precautions to not overapply fertilizers. Max and Load sprayers in spill-controlled areas.
Design Specifications	See Appendix.

[Repeat as needed for individual fertilizer practices.]

5.8 Other Pollution Prevention Practices

Instructions:

Describe any additional pollution prevention practices that do not fit into the above categories.

General

- No other pollution prevention practices to report.

SECTION 6: INSPECTION, MAINTENANCE, AND CORRECTIVE ACTION

6.1 Inspection Personnel and Procedures

Instructions (see CGP Parts 4, 5, and 7.2.7):

Describe the procedures you will follow for maintaining your stormwater controls, conducting inspections, and, where necessary, taking corrective actions in accordance with CGP Parts 4, 5, and 7.2.7.

Site Inspection Schedule

Select the inspection frequency(ies) that applies, based on CGP Parts 4.2, 4.3, or 4.4

(Note: you may be subject to different inspection frequencies in different areas of the site. Check all that apply and indicate which portion(s) of the site it applies to.)

Standard Frequency:

☐ Every 7 calendar days

☒ Every 14 calendar days and within 24 hours of either:

- A storm event that produces 0.25 inches or more of rain within a 24-hour period (including when there are multiple, smaller storms that alone produce less than 0.25 inches but together produce 0.25 inches or more in 24 hours), or
- A storm event that produces 0.25 inches or more of rain within a 24-hour period on the first day of a storm and continues to produce 0.25 inches or more of rain on subsequent days (you conduct an inspection within 24 hours of the first day of the storm and within 24 hours after the last day of the storm that produces 0.25 inches or more of rain (i.e., only two inspections would be required for such a storm event)), or
- A discharge caused by snowmelt from a storm event that produces 3.25 inches or more of snow within a 24-hour period.

Increased Frequency (if applicable):

For areas of sites discharging to sediment or nutrient-impaired waters or to waters designated as Tier 2, Tier 2.5, or Tier 3

☒ Every 7 days and within 24 hours of either:

- A storm event that produces 0.25 inches or more of rain within a 24-hour period, or
- A discharge caused by snowmelt from a storm event that produces 3.25 inches or more of snow within a 24-hour period.

Reduced Frequency (if applicable)

For stabilized areas

☒ Twice during first month, no more than 14 calendar days apart; then once per month after first month until permit coverage is terminated consistent with Part 9 in any area of your site where the stabilization steps in 2.2.14.a have been completed.

- Specify locations where stabilization steps have been completed
- Insert date that they were completed

(Note: It is likely that you will not be able to include this in your initial SWPPP. If you qualify for this reduction (see CGP Part 4.4.1), you will need to modify your SWPPP to include this information. If construction activity resumes in this portion of the site at a later date, the inspection frequency immediately increases to that required in Parts 4.2 and 4.3, as applicable.)

For frozen conditions where construction activities are being conducted

☒ Once per month

Insert beginning and ending dates of frozen conditions on your site:

- Beginning date of frozen conditions: Insert approximate date
- Ending date of frozen conditions: Insert approximate date

For frozen conditions where construction activities are suspended

☒ Inspections are temporarily suspended

Insert beginning and ending dates of frozen conditions on your site:

- Beginning date of frozen conditions: Insert approximate date
- Ending date of frozen conditions: Insert approximate date

Rain Gauge Location (if applicable)
Online Resource www.wunderground.com
See Appendix M

Inspection Report Forms
See Appendix D

(Note: EPA has developed a sample inspection form that CGP operators can use. The form is available at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources)

6.2 Corrective Action

Instructions (CGP Parts 5 and 7.2.7):

- Describe the procedures for taking corrective action in compliance with CGP Part 5.

Personnel Responsible for Corrective Actions
The Stormwater Team manager is responsible to ensure that corrective actions are implemented.

Corrective Action Logs
See Appendix E

(Note: EPA has developed a sample corrective action log that CGP operators can use. The form is available at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources)

6.3 Delegation of Authority

Instructions:

- Identify the individual(s) or positions within the company who have been delegated authority to sign inspection reports.
- Attach a copy of the signed delegation of authority (see example in Appendix J of this SWPPP Template.)
- For more on this topic, see Appendix G, Subsection 11 of EPA's CGP.

Duly Authorized Representative(s) or Position(s):

Goins Roads and Excavation, LLC
Seth Madsen
Stormwater Inspector
P.O. Box 1295
Priest River, ID, 83856
208-610-9677
goinsroads@yahoo.com

SECTION 7: TURBIDITY BENCHMARK MONITORING FOR DEWATERING DISCHARGES

Instructions (see CGP Part 3.3 and 7.2.8):

- If you are required to comply with the Part 3.3 turbidity benchmark monitoring requirements, describe the procedures you will follow to:
  - ✓ Collect and evaluate samples,
  - ✓ Report results to EPA and keep records of monitoring information, and
  - ✓ Take corrective action when necessary.
- Include the specific type of turbidity meter you will use for monitoring, as well as any manuals or manufacturer instructions on how to operate and calibrate the meter.
- Describe any coordinating arrangement you may have with any other permitted operators on the same site with respect to compliance with the turbidity monitoring requirements, including which parties are tasked with specific responsibilities.
- If EPA has approved of an alternate turbidity benchmark pursuant to Part 3.3.2.b, include any data and other documentation you relied on to request use of the specific alternative benchmark.

Procedures:

Turbidity Measurements not required for this project.

SECTION 8: CERTIFICATION AND NOTIFICATION

Instructions (CGP Appendix G, Part G.11.2):

- The following certification statement must be signed and dated by a person who meets the requirements of Appendix G, Part G.11.2.
- This certification must be re-signed in the event of a SWPPP Modification.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title: _____

Signature: _____ Date: _____

[Repeat as needed for multiple construction operators at the site.]

SWPPP APPENDICES

Attach the following documentation to the SWPPP:

Appendix A – Site Maps

Appendix B – Copy of 2022 CGP
(Note: The 2022 CGP is available at https://www.epa.gov/npdes/2022-construction-general-permit-cgp)

Appendix C – NOI and EPA Authorization Email

Appendix D – Site Inspection Form and Dewatering Inspection Form (if applicable)
(Note: EPA has developed a sample site inspection form template that CGP operators can use. The template is available at https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates). Where the operator will be dewatering at the site, EPA has developed a separate dewatering inspection form template to use to document the required information. This template is available at https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates.

Appendix E – Corrective Action Log
(Note: EPA has developed a sample corrective action log that CGP operators can use. The form is available at https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates)

Appendix F – SWPPP Amendment Log

Appendix G – Subcontractor Certifications/Agreements

Appendix H – Grading and Stabilization Activities Log

Appendix I – Training Documentation

Appendix J – Delegation of Authority

Appendix K – Endangered Species Documentation

Appendix L – Historic Preservation Documentation

Appendix M – Rainfall Gauge Recording

Appendix N – Temporary Erosion Control Plan per City of Priest River

Appendix A – Site Maps

See Attached

Appendix B – Copy of 2022 CGP

See Attached

(Note: The 2022 CGP is available at https://www.epa.gov/npdes/2022-construction-general-permit-cgp)

Appendix C – Copy of NOI and EPA Authorization Email

See Attached

Appendix D – Copy of Site and Dewatering Inspection Forms

INSERT COPIES OF SITE AND DEWATERING INSPECTION FORMS YOU WILL USE TO PREPARE INSPECTION REPORTS

See Attached

(Note: EPA has developed a sample site inspection and dewatering inspection form templates that CGP operators can use. The template is available at https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates)

Appendix E – Copy of Corrective Action Log

INSERT COPY OF CORRECTIVE ACTION LOG YOU WILL USE

See Attached

(Note: EPA has developed a sample corrective action log that CGP operators can use. The form is available at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources)

Appendix F – *Sample* SWPPP Amendment Log

See Attached

Appendix G – *Sample* Subcontractor Certifications/Agreements

See Attached

Appendix H – *Sample* Grading and Stabilization Activities Log

See Attached

Appendix I –Training Documentation

See Attached

Appendix J – *Sample* Delegation of Authority Form

See Attached

Appendix K – Endangered Species Documentation

INSERT DOCUMENTATION CONSISTENT WITH SWPPP TEMPLATE SECTION 3.1 AND CGP APPENDIX D

See Attached

Appendix L – Historic Properties Documentation

INSERT DOCUMENTATION CONSISTENT WITH SWPPP TEMPLATE SECTION 3.2 AND CGP APPENDIX E

See Attached

Appendix M – Rainfall Gauge Recording

See Attached

Appendix N – Erosion Control Plans

See Attached

STORMWATER MANAGEMENT
and
EROSION CONTROL PLAN
for
EAGLE SUBDIVISION ROAD SYSTEM
PARCEL # RP60N05W252802A

Project: The applicant has obtained a grading permit (ST0005-22) and started the grading and earthwork for construction of the access roads serving the proposed Eagle PUD Subdivision located directly west of the Millie's Restaurant and east of the Priest Lake Golf Course on parcel number RP60N05W252802A, in Bonner County, Idaho. The lot is located on the west side of Priest Lake, Idaho off of Highway 57. This report provides an update to the stormwater management system for the access road system based on the road final design parameters.

Landowner: Millie's 40 Bren-Burk, LLC
2450 Fondren Suite 210
Houston, TX 77063

Prepared by: James A. Sewell & Associates, LLC
600 West 4th Street
Newport, WA 99166

PROFESSIONAL ENGINEER LICENSED 14712 STATE OF IDAHO KEVIN KOESEL

12-27-23

Date: Originally Submitted May 10, 2022, update December 26, 2023

INTRODUCTION

The purpose of this report is to assess the capability of the proposed site to manage stormwater runoff and control erosion from impervious surfaces attributed to the construction of the access road system that will serve the Eagle PUD Subdivision. The scope of this report is based on and limited to the known general and specific topography of the site, soil types as identified by site inspection, information obtained from the "Soil Survey of Bonner County", completion of two geotechnical reports prepared for the subject project, and observed surface site features.

EXISTING SITE CONDITIONS

The existing lot is about 40 acres in size. The site contains topographic relief beginning at the far north wetland area and proceeding uphill to the southeast to a hill top roughly 125 feet in elevation above the wetlands. The western portion of the property is generally mild or moderately sloping from east to west. The steepest slopes are located generally northeast of the lot center. The site has been logged in recent year with skid trails and logging roads bisecting the parcel. The site is adjacent to the Priest Lake Golf Course along its eastern border and contains an access to Luby Bay Road to the north. The site is also served off of State Highway 57 just south of the Millie's Restaurant. Grading activity has commenced to begin construction of the road system and building pad locations to a subgrade elevation.

PROPOSED SITE CONDITIONS

The future plan for the site is to develop a Planned Unit Development (PUD) subdivision consisting of small clustered residential units concentrated and close in proximity. The areas near State Highway 57 are being reserved for future commercial development. Several lots adjacent to the golf course will be constructed consistent with the covenants, conditions, and restrictions for homes on the golf course. A large portion of the site will be left as green space and undisturbed. Many of the common green areas are where the steepest slopes currently exist. A proposed access road system will be developed to serve future building sites. This road system is planned to be constructed in accordance with the Bonner County Public Road Standards. The site will contain public water distribution and pubic sewer collection systems. The water system will be designed to provide fire flow in accordance with the local fire district requirements.

SOILS

The Bonner County Soil Survey indicates that the site is located in an area that contains Caribouridge-Stein families, Andic Humudepts-Humic Udivitrands-Pearsoncreek families, and Glaciercreek-Humic Udivitrands-Pearsoncreek families. A soils map from the Natural Resource Soil Survey is shown below and included in Appendix D. Properties of the soil are found below and included in further detail in Appendix D.

Figure 1 – USDA NRCS Soils Map

Caribouridge-Stein families - 155

Setting:

Position on Landscape:	Outwash Terraces and Hillslopes
Elevation:	1,940 to 5,280 feet
Mean Annual Precipitation:	34 to 42 inches
Mean Annual Temperature:	34 to 48 degrees F
Frost Free Season:	60 to 130 days

Soil Properties:

Depth to restrictive feature:	More than 80 inches
Drainage:	Well drained
Permeability:	Moderately high
Available Water:	Low (about 4.7 inches)
Depth to Water Table:	More than 80 inches
Hydrologic Soil Group:	B

Typical Profile:	Caribouridge		Stein
0 to 1 inches	Slightly decomposed plant material	0 to 2 inches	Slightly decomposed plant material
1 to 3 inches	Ashy silt loam	2 to 9 inches	Ashy silt loam
3 to 16 inches	Gravelly ashy silt loam	9 to 20 inches	Very cobbly ashy silt loam
16 to 26 inches	Very cobbly coarse sandy loam	20 to 34 inches	Extremely gravelly fine sandy loam
26 to 46 inches	Very gravelly coarse sand	34 to 62 inches	Extremely gravelly coarse sand
46 to 61 inches	Extremely gravelly coarse sand		

Infiltration Parameters

Ksat of most restrictive layer:	0.57 in/hr.
Associated Swale Water Depth that will drain in 24 hours:	13.68”
Associated Swale Water Depth that will drain in 72 hours:	41.04”

Andic Humudepts-Humic Udivitrands-Pearsoncreek families - 350

Setting:

Position on Landscape:	Mountain Slopes
Elevation:	2,030 to 5,410 feet
Mean Annual Precipitation:	37 to 50 inches
Mean Annual Temperature:	34 to 48 degrees F
Frost Free Season:	60 to 130 days

Soil Properties:

Depth to restrictive feature:	More than 80 inches
Drainage:	Well drained
Permeability:	Moderately high
Available Water:	Low (about 5.5 inches)
Depth to Water Table:	More than 80 inches
Hydrologic Soil Group:	B

Typical Profile:	Andic-Humudepts		Humic Udivitrands
0 to 1 inches	Slightly decomposed plant material	0 to 1 inches	Slightly decomposed plant material
1 to 13 inches	Gravelly Ashy silt loam	1 to 3 inches	Gravelly Ashy Silt Loam
13 to 60 inches	Extremely Cobbly Silt Loam	3 to 16 inches	Extremely Gravelly Ashy Silt Loam
		16 to 33 inches	Extremely gravelly silt loam
		33 to 60 inches	Extremely gravelly coarse sand

Infiltration Parameters

Ksat of most restrictive layer:	0.57 in/hr.
Associated Swale Water Depth that will drain in 24 hours:	13.68”
Associated Swale Water Depth that will drain in 72 hours:	41.04”

Glaciercreek-Humic Udivitrands-Pearsoncreek families - 360

Setting:

Position on Landscape:	Mountain Slopes
Elevation:	2,000 to 6,230 feet
Mean Annual Precipitation:	39 to 52 inches
Mean Annual Temperature:	34 to 52 degrees F
Frost Free Season:	60 to 130 days

Soil Properties:

Depth to restrictive feature:	10 - 20 inches
Drainage:	Moderately Well drained
Permeability:	Moderately high
Available Water:	Very Low (about 2.9 inches)
Depth to Water Table:	About 10 - 16 inches
Hydrologic Soil Group:	D

Typical Profile:

	Andic-Humudepts		Humic Udivitrands
0 to 1 inches	Slightly decomposed plant material	0 to 1 inches	Slightly decomposed plant material
1 to 10 inches	Ashy silt loam	1 to 3 inches	Gravelly Ashy Silt Loam
10 to 18 inches	Gravelly Sandy Loam	3 to 16 inches	Extremely Gravelly Ashy Silt Loam
18 to 60 inches	Very Gravelly Loamy Coarse Sand	16 to 33 inches	Extremely gravelly silt loam
		33 to 60 inches	Extremely gravelly coarse sand

Infiltration Parameters

Ksat of most restrictive layer:	0.06 in/hr.
Associated Swale Water Depth that will drain in 24 hours:	1.44”
Associated Swale Water Depth that will drain in 72 hours:	4.32”

Soil types 155 and 350 are suitable to accommodate infiltration into the native soils. In general, it is desired for the design storm to infiltrate into the native soils within 24-hours and for the 100-yr storm event to infiltrate within 72 hours. With these criteria, the use of swales located within areas of the project that contain soil type 360 are avoided due to the potentially low infiltration rate.

The above information has been provided from the USDA Natural Resource Conservation Service, Web Soil Survey of the Bonner County Area, Idaho, version 8 issued September 9, 2021.

EXISTING IMPERVIOUS SURFACES

Currently, the proposed lot is undeveloped. It was recently logged and contains a number of logging roads and skid trails. Outside of the road construction to support the previous logging efforts, no other impervious areas exist. Recent activity on the site has included continuation of the logging and brush removal operation as well as grading for construction of the access road system and building pad locations.

Figure 2 – Eagle PUD Site, December 12, 2023

CREATED IMPERVIOUS SURFACE AREAS

Eagle Subdivision Access Road System will be constructed to serve the subdivision. This will include construction of a road system with hard surfaces, sidewalks and shared-use pathways. Drainage from the road system will be through roadside curbs, and ditches to direct stormwater to treatment swales. The impervious areas created by construction of the proposed access road and pathway system has been broken down into 23 different drainage basins. The impervious areas for each basin are listed as follows:

Impervious Area Breakdown

Basin	Description	Pavement, Concrete Surface, Roofs (sf)	Median, Turf (sf)	Gravel Areas (sf)	Total Basin Area (sf)
1	Glen Lakes Dr, East Ln	4,661	0	0	4,661
2	Glen Lakes Dr, West Ln	8,465	0	0	8,465
3	Glen Lakes, Dr., South Lane	5,036	0	0	5,036
4	Plum Brook Ct.	8,043	0	0	8,043
5	Regent Square Dr.	11,816	0	0	11,816
6	Songwood, West Lane	4,619	0	0	4,619
7	Songwood & Fairbanks	28,883	6,480	0	35,363
8	Regent/Fairbanks	13,263	0	0	13,263
9	Regent/St. James R. Ln.	6,310	0	0	6,310
10	Coral Ridge/St. James	27,996	0	0	27,996
11	Sterling Lakes/St. James	87,728	0	0	87,728
12	Phantom Ridge	13,992	0	0	13,992
13	Shared Use Path	8,055	0	0	8,055
14	Storage Access Road	0	0	7,728	7,728
15	Sterling Lakes, S. Lane	13,345	0	0	13,345
16	Sterling Lakes, N. Lane	12,800	0	0	12,800
17	Upper St. James E. Ln.	2,619	0	0	2,619
18	Unit “G” –Townhome	4,972	0	0	4,972
19	Upper St. James W. Ln.	2,450	0	0	2,450
20	Songwood North Lane	6,552	0	0	6,552
21	April Sound North Lane	3,305	0	0	3,305
22	Songwood N. Lane end	1,894	0	0	1,894
23	April Sound South Lane	4,482	0	0	4,482
	TOTAL	**281,286**	**6,480**	**7,728**	**295,494**

The total proposed increase in impervious surface is 281,286 square feet plus 7,728 square feet for a total of **289,014** square feet or **6.63** acres.

STORMWATER MANAGEMENT DESIGN PARAMETERS

Stormwater collection facilities in this report, such as grassed infiltration areas, are designed to intercept and treat runoff from proposed impervious surfaces attributed to new construction. The Bonner County Code Section 12-726: Performance Standards, requires that two conditions be satisfied. Initially the stormwater treatment system is required to hold and treat the first flush or initial ½-inch of rainfall from impervious surfaces. Secondly, it is required to maintain stormwater flow control by limiting the post-development runoff to pre-development conditions based on a 25-yr, 24-hour ITD design storm. The flow control analysis is completed using the

Modified Rational Method, or Bowstring Method. The following sections present the required basin area swale volumes as calculated to meet the treatment and flow control requirements of the Bonner County Code.

VOLUME OF MINIMUM ½-INCH OF RUNOFF AND BOWSTRING METHOD

The property was broken up into 4 separate stormwater catchment areas. Each area was analyzed to determine which of the two methods would control the design. The detailed calculations of each of the 4 swales can be found in Appendix B. A summary of the information and controlling design parameter for each swale can be found in the following Table 1.

Treatment Requirements

Required GIA Swale Treatment Areas				
Basin / Swales	**First 1/2-inch from impervious surfaces required (sq.ft.)**	**Swale Treatment Area Provided (sq.ft.)**	**Treatment Depth (in)**	**Overflow/Outlet**
1/S1	388	672	6	Retained in GIA
2/S2,S3,S4	705	1,058	6	Retained in GIA
3/S5	420	551	6	To Wetlands
4/S6	670	901	6	To Wetlands
5/S7	985	992	6	Drywell
6/S8,S9	385	1,501	6	Retained in GIA
7/S14	2,407	4,316	6	Retained in GIA
8/S15	1,105	1,126	6	Drywell
9/S17	526	1,540	6	Retained in GIA
10/S18	2,333	3,232	6	Retained in GIA
11/S19	7,311	13,750	6	Retained in GIA
12/S23	1,166	1,450	6	Retained in GIA
13/S27,S32	671	852	6	Retained in GIA
14/S26	644	1,202	6	Retained in GIA
15/S28,S30,S31,S33, S34	1,112	1,704	6	Retained in GIA
16/S37,S36,S35,S29	1,067	1,657	6	Retained in GIA
17/S25	218	271	6	Retained in GIA
18/S16	414	762	6	Retained in GIA
19/S24	204	252	6	Retained in GIA
20/S10,S11	546	679	6	Retained in GIA
21/S21, S22	275	344	6	Retained in GIA
22/S12,S13	158	460	6	Retained in GIA
23/S20	374	475	6	Retained in GIA

In order to meet the treatment requirements, the grassy infiltration areas are sized to capture the first ½" of rainfall, or first flush, off of the created impervious areas. For each catchment area, the first ½" of stormwater is stored and treated in the bottom 6-inches of each swale.

Flow Control Requirements

Required Swale Flow Control Volume				
Basin / Swales	**Required Flow Control Volume (ft^3)**	**Flow Control Volume Provided (ft^3)**	**Design Depth (in)**	**Overflow/Outlet**
	366	366	6	Retained in GIA
1/S1	609	617	7	Retained in GIA
2/S2,S3,S4	363	367	8	To Wetlands
3/S5	579	601	8	To Wetlands
4/S6	388	496	6	Drywell
5/S7	333	751	6	Retained in GIA
6/S8,S9	2,242	2,518	7	Retained in GIA
7/S14	434	563	6	Drywell
8/S15	454	770	6	Retained in GIA
9/S17	2,016	2,155	8	Retained in GIA
10/S18	6,316	6,875	6	Retained in GIA
11/S19	1,007	1,088	9	Retained in GIA
12/S23	582	639	9	Retained in GIA
13/S27,S32	360	601	6	Retained in GIA
14/S26	961	994	7	Retained in GIA
15/S28,S30,S31,S33, S34	922	967	7	Retained in GIA
16/S37,S36,S35,S29	189	203	9	Retained in GIA
17/S25	358	381	6	Retained in GIA
18/S16	176	189	9	Retained in GIA
19/S24	472	509	9	Retained in GIA
20/S10,S11	238	258	9	Retained in GIA
21/S21, S22	136	230	6	Retained in GIA
22/S12,S13	323	356	9	Retained in GIA
23/S20				

Storage Volume Required

The swale storage volume required is either the increase in runoff due to the addition of impervious surfaces from the 25-year, 24-hour storm or the first ½" of runoff from impervious surface areas, whichever is greater. In general, the flow control volume associated with the 25-year, 24-hour storm event requires a larger volume than the first ½ inch of runoff.

Swales 7 and 10 are located within areas of the project that are suitable for disposal through drywells. These swales were sized to meet the treatment requirements of the first ½" of rainfall onto the impervious areas. The drywell disposal rate was determined based on the pre-development discharge rate, the native soils and the recommendations found in the geotechnical report prepared by Liberty Geothechnical Engineers, Inc. For a single barrel drywell, the recommended infiltration rate is 0.3 cubic feet per second.

The remaining areas of the project were designed with grassy infiltration swales designed to retain and infiltrate the design storm. These are effectively retention ponds with zero overflow and sized to accommodate the design storm. Each swale has an overall depth of 12-inches. The bottom 6-inches of each swale contains enough volume to accommodate the treatment requirements associated with the first ½" of rain.

As an example, Swale 1 is associated with basin 1 which is the eastern lane of Glen Lakes Drive off of Luby Bay Road. This swale was sized to provide for the first ½-inch of stormwater without overflow or release of discharge to any other areas. Swale 1 is considered a retention pond and designed to collect the runoff associated with the 25-yr, 24-hr storm event determined from the Bowstring Method with percolation into the native soils. The 25-yr, 24-hr storm volume is designed to be percolated into the soil within 24-hours. The percolation rate was taken as the low end of the range published for the native soils from the Bonner County Web Soil Survey generated by USDA NRCS. For swale 2 this rate was 0.57 inches per hour. Based on this analysis the increased volume associated with the 25-yr, 24-hr storm is 366 cubic feet versus 194 cubic feet associated with the first ½ inch volume.

Swale 7 is associated with basin 5 which is the subdivision entrance onto State Highway 57. This swale was sized to provide storage for the first ½-inch of stormwater runoff with everything above that volume overflowing into a single barrel drywell. From the site geotechnical report prepared by Liberty Geotechnical Engineers, Inc., a single barrel drywell located in the native soils near swale 7 will accept 0.30 cubic feet per second (cfs) inflow. The pre-development runoff rate from this catchment for this same storm event was determine to be 0.125 cfs. The pre-development condition considers a woodland and forest site in rolling (2% -10%) terrain. The 25-yr, 24-hr required storm volume was analyzed through the Modified Rational Method, or Bowstring Method, for detention basins with an outflow of 0.125 cfs to a drywell. This outflow rate is equal to the pre-development runoff condition of 0.125 cfs. The required detention pond size was determined to be 388 cubic feet for swale 5 versus 492 cubic feet for swale 5 based on the first ½-inch of stormwater runoff.

Storage Volume Provided

The total storage volume provided for each swale considers both the required volume associated with treatment of the first ½-inch of runoff and the increase in runoff associated with the 25-yr, 24-hr storm event. In addition, the swales were analyzed to address runoff, or conveyance associated with the 100-yr, 24-hr storm event. All of the swales were sized large enough to

retain the increased volume associated with the 100-yr storm event. With the exception of basin 5 and basin 8 with provide overflow to a drywell, all other swales are sized to retain the 100-yr 24-hr storm volume. This eliminates the need to overflow and convey excess water to another area of the project.

A small stormwater collection system consisting of catch basins and interconnecting piping is included to help convey the stormwater collected at the top of St. James Dr. and transport this stormwater to the large retention pond, swale S14, located at the bottom of the hill near the multi-family townhomes. The top of St. James Drive includes soils that are primarily solid rock and do not provide the opportunity for stormwater treatment and infiltration.

See Appendix B for stormwater calculations.

CONVEYANCE

The parameters for stormwater conveyance address the designed flow path necessary for discharge from each swale after the stormwater swale volume exceeds the design storm. Normally, conveyance addresses a storm event equal to the 100-yr, 24-hr storm event. The means of conveying that storm volume includes review of the designated flow path, grade, pipe size, ditch line capacity, culvert capacity and flooded road sections.

The proposed development contains a total of 32 proposed swales. All but two of those swales have been designed as retention ponds with zero overflow. All of the retention swales have been designed to retain the 100-yr, 24-hr stormwater volume and therefore overflow and conveyance from those swales is not necessary.

Swales 7 and 10 both outlet to a single barrel drywell. These drywells have a capacity to infiltrate 0.3 cubic feet per second. Considering drywell infiltration in combination with the 100-yr storm event, the total swale volumes provided for swales 7 and 10 are greater than what is required for the 100-yr storm event.

Stormwater conveyance is required in two areas of the subdivision. Those areas are the top of the hill served by St. James Drive and the subdivision entrance. At the top of the hill, along St. James Drive the native soil is solid rock. A stormwater collection and conveyance system has been designed to collect and transport that stormwater to Swale 14 at the bottom of the hill. At the entrance to the subdivision a catch basin has been installed on the north side of the entrance road that collects and conveys stormwater to a drywell and swale on the south side of the road. The detailed calculations of each of the respective drainage paths and structures that serve the stormwater collection piping at the subdivision entrance as well as at the top of the hill along St. James Drive can be found in Appendix C.

TEMPORARY EROSION CONTROL PLAN

Erosion control shall be maintained through the use of existing vegetation, silt fencing, straw mulching, and reseeding of areas denuded of vegetation. Silt fencing shall be placed downslope of construction areas within 100 feet of surface water. Areas where construction activities temporarily cease for more than 21 days shall be stabilized with seeding or straw mulching. All erosion control measures shall be maintained in good working order. The contractor shall be responsible for maintenance of erosion control measures until such time that final stabilization of the site is complete. Once final stabilization is complete, the owner shall be responsible for maintenance of permanent erosion control measures.

Site Revegetation

Existing grass and meadow areas disturbed during construction shall be reseeded as soon as possible after finish grading. Seed mixture recommendations may be obtained from the U.S.D.A. Natural Resource Conservation Service, landscape architect or a commercially marketed grass mixture may be applied according to the attached instructions.

Fertilization

It is recommended that a soil analysis be performed prior to fertilization and seeding. The fertilization guidelines should be determined by the soils analysis. The fertilizer type and rate of application should follow the recommendation of the U.S.D.A. Natural Resource Conservation Service or landscape architect.

OPERATION AND MAINTENANCE PLAN

During Construction

During construction, the contractor shall walk the site and inspect storm water and erosion control measures at least once every 14 days and following any storm event of 0.5 inches or greater. Items the contractor shall inspect are:

- Silt Fence
  - ✓ Depth of sediment (sediment shall be removed from silt fence when it has reached 1/3 the height of the silt fence)
  - ✓ Tears in fabric
  - ✓ Fabric secured to fence posts
  - ✓ Fence posts firmly in ground

- Reseeding / Straw Mulching
  - ✓ Bare spots, washouts, and healthy growth

If maintenance is found to be necessary, the contractor shall begin repairs within 24 hours.

After Final Stabilization

Upon completion of construction and final stabilization, the owners shall take responsibility for operation and maintenance of the storm water management and erosion control system as well as the funding for the continued maintenance of this system. After final stabilization, the storm water management and erosion control system shall be inspected at least every six months. The items that shall be inspected are:

- Grassy Infiltration Areas (GIAs)
  - ✓ Check for sediment build up. If sediment depth exceeds 10% of GIA depth, excavate sediment and re-seed GIA bottom.
- Reseeded Areas
  - ✓ Bare spots, washouts, and health vegetation growth

In the event that the GIAs become clogged with sediment and cease to function properly, the topsoil should be replaced. The GIAs would be considered non-functioning if the runoff from small rain storms fails to infiltrate into the GIAs and there is standing water on top of the GIAs within 48 hours of a storm event.

IMPLEMENTATION SCHEDULE

The proposed construction schedule is as follows:

Spring 2022

- Install temporary erosion control prior to earth moving activities
- Clear & grub construction site
- Stockpile topsoil

Summer 2022 through Summer 2024

- Construct road subgrade including road cuts and embankments
- Construct access approach to each lot
- Construct and grade slopes adjacent to road system
- Seed road cut and fill slopes
- Seed disturbed soil as necessary

Fall 2024

- Install water and sewer utilities within road section
- Install road ballast and base rock
- Reseed disturbed soil as necessary

Spring 2025

- Remove temporary erosion control
- Final stabilization complete

EROSION CONTROL PLAN SUMMARY

With the proper implementation of the best management practices listed above and the recommendations listed in this report, the subject property is capable of supporting the proposed building construction and site development without substantial risk of soil erosion or sedimentation of surface waters. The site is capable of retaining and treating stormwater runoff in accordance with the Bonner County Revised Code.

APPENDIX A

Area Classification Map, Rainfall Intensity Diagram, Runoff Coefficients

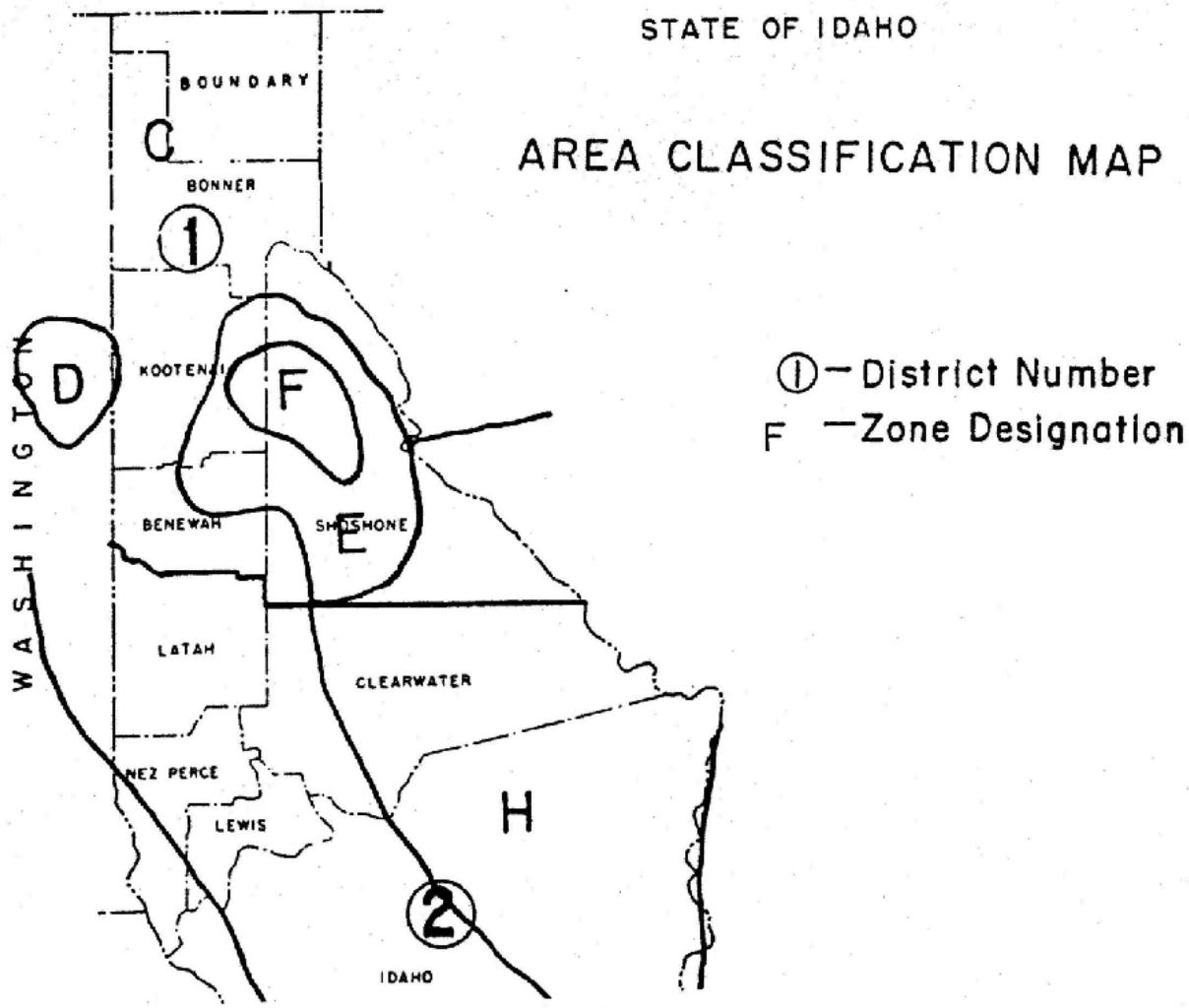


FIGURE 6-3 AREA CLASSIFICATION MAP FOR IDF CURVES - IDAHO
(IDAHO TRANSPORTATION DEPARTMENT)

67

FIGURE 6-4 ZONE C, INTENSITY-DURATION-FREQUENCY CURVE
(IDAHO TRANSPORTATION DEPARTMENT)

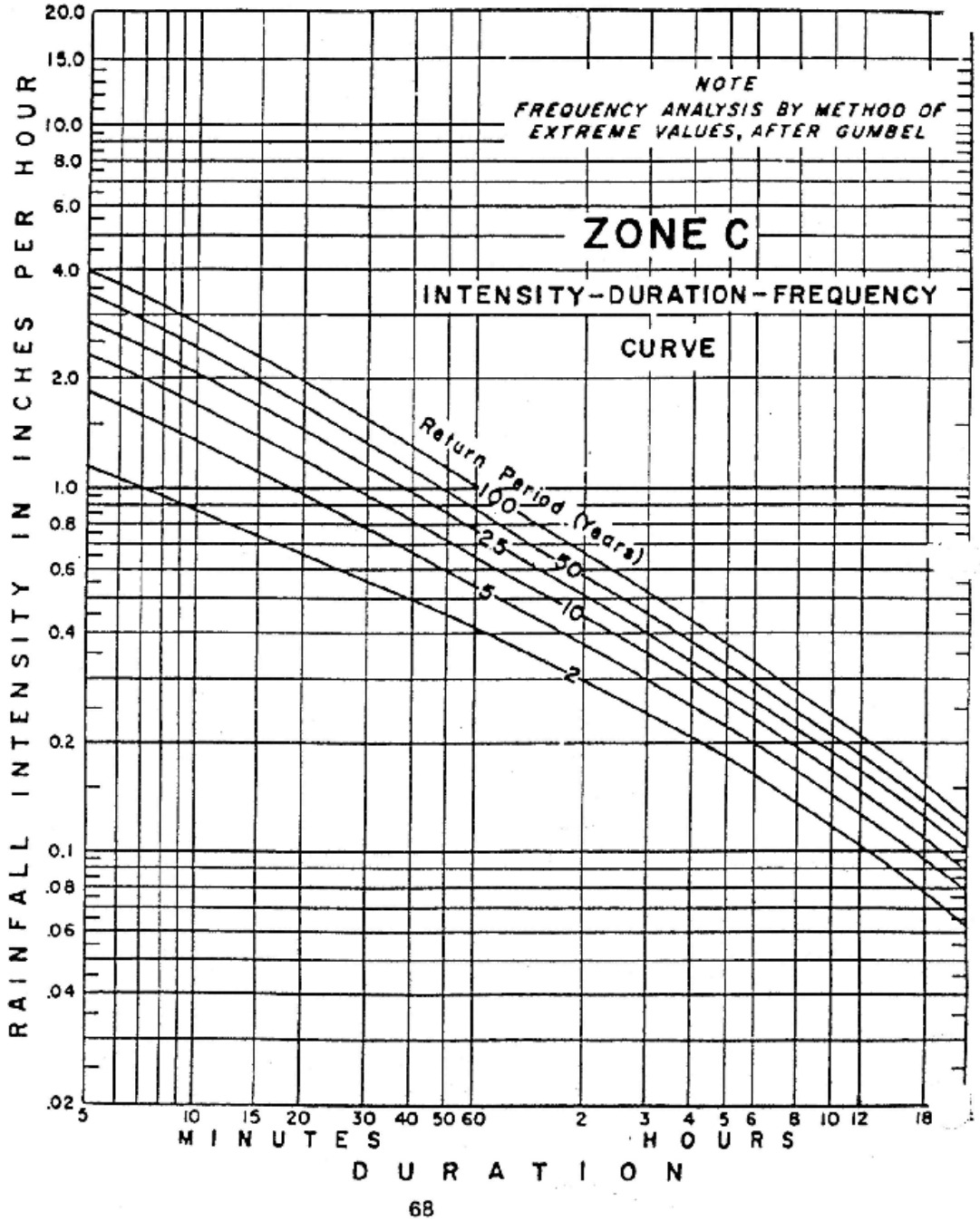


Table 1A.2. Values of Runoff Coefficient (C) for Rational Formula

Land Use	Description	Hydrologic Soils Group			
		A	B	C	D
Cultivated Land	Without conservation treatment	0.49	0.67	0.81	0.88
	With conservation treatment	0.27	0.43	0.67	0.67
Pasture or Range Land	Poor condition	0.38	0.63	0.78	0.84
	Good condition	---	0.25	0.51	0.65
Meadow	Good condition	---	---	0.41	0.61
Wood or Forest Land	Thin stand, poor cover, no mulch	---	0.34	0.59	0.70
	Good cover	---	---	0.45	0.59
Open Space, Lawn, Park, Golf Course, or Cemetery	Good condition (grass cover on 75% or more)	---	0.25	0.51	0.65
	Fair condition (grass cover on 50% to 75%)	---	0.45	0.63	0.74
Commercial and Business Area	85% impervious	0.84	0.90	0.93	0.96
Industrial District	72% impervious	0.67	0.81	0.88	0.92
Residential Lot Average lot size (acres): 1/8 1/4 1/3 1/2 1.0	Average % of lot impervious: 65 38 30 25 20	 0.59 0.29 --- --- ---	 0.76 0.55 0.49 0.45 0.41	 0.86 0.70 0.67 0.65 0.63	 0.90 0.80 0.78 0.76 0.74
Paved Area	Parking lots, roofs, driveways, etc.	0.99	0.99	0.99	0.99
Street or Road	Paved with curbs and storm sewers	0.99	0.99	0.99	0.99
	Gravel	0.57 0.49	0.76 0.69	0.84 0.80	0.88 0.84

Note: The designer must use judgment to select the appropriate C value within the range. Generally, larger areas with permeable soils, flat slopes, and dense vegetation should have the lowest C values. Smaller areas with dense soils, moderate to steep slopes, and sparse vegetation should assigned the highest C values.

APPENDIX B

Storm Water Calculations

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Client: Millie's 40
Date: 12/19/2023
Subj: Stormwater Management Calculations
Ref: Eagle PUD Road System
Juridiction: Bonner County

Design Criteria:
Treatment Required: 1st 1/2" from impervious areas
Flow Control: No increased discharge from site based on design storm
Flow Conveyance: Proove conveyance of the 100 yr storm event

Basin	Description	Treatment Area Required (sf)	Treatment Area Provided (sf)	Flow Control Volume Required (ft^3)	Flow Control Volume Provided (ft^3)	Swale Type	Swale Design Depth (in)	100 Yr Overflow To:
1	E. Lane Glen Lakes Dr.	388	672	336	336	GIA - Retention	6	Retain in GIA
2	W. Lane Glen Lakes Dr.	705	1058	609	617	GIA - Retention	7	Retain in GIA
3	S. Lane Glen Lakes Dr.	420	551	363	367	GIA - Retention	8	To wetlands
4	Plum Brook Ct	670	901	579	601	GIA - Retention	8	To wetlands
5	Regent Square Entrance	985	992	388	496	Detention	6	To Drywell
6	Songwood West Lane	385	1501	333	751	GIA - Retention	6	Retain in GIA
7	Songwood/Fairbanks	2407	4316	2242	2518	GIA - Retention	7	Retain in GIA
8	Regent/Fairbanks	1105	1126	434	563	Detention	6	To Drywell
9	Regent/St. James R. ln	526	1540	454	770	GIA - Retention	6	Retain in GIA
10	Coral Ridge/St. James	2333	3232	2016	2155	GIA - Retention	8	Retain in GIA
11	Sterling Lakes, St. James	7311	13750	6316	6875	GIA - Retention	6	Retain in GIA
12	Phantom Ridge	1166	1450	1007	1088	GIA - Retention	9	Retain in GIA
13	Shared Use Path	671	852	582	639	GIA - Retention	9	Retain in GIA
14	Gravel Rd to Storage	644	1202	360	601	GIA - Retention	6	Retain in GIA
15	Sterling Lakes, S. Lane	1112	1704	961	994	GIA - Retention	7	Retain in GIA
16	Sterling Lakes W&N lane	1067	1657	922	967	GIA - Retention	7	Retain in GIA
17	U. St. James E. Lane	218	271	189	203	GIA - Retention	9	Retain in GIA
18	4-plex Unit "G"	414	762	358	381	GIA - Retention	6	Retain in GIA
19	U. St. James W. Lane	204	252	176	189	GIA - Retention	9	Retain in GIA
20	Songwood, N. Lane	546	679	472	509	GIA - Retention	9	Retain in GIA
21	April Sound N. Lane	275	344	238	258	GIA - Retention	9	Retain in GIA
22	Songwood N. Lane end	158	460	136	230	GIA - Retention	6	Retain in GIA
23	April Sound S. Lane	374	475	323	356	GIA - Retention	9	Retain in GIA
	Total	24,085	**39,747**	19,792	**22,463**			

SOILS

From Liberty Geotech Report, For TP-6, TP-7, TP-10		
Single Drywell Infiltration Rate (6' depth)	0.3	cfs
Double Drywell Infiltration Rate (10' depth)	0.87	cfs

Swale Native Soil Type, NRCS **155**	Caribouridge	Stein Families			
NRCS Hydrologic Soil Group	B	B			
Saturated Hydraulic Conductivity, Ksat, (in/hr)	0.57	0.57			
Ksat range (in/hr)	0.57-1.98	0.57-1.98			
Maximum Swale Depth that will drain within 72 hours	41.04	41.04			inches
Maximum Swale Depth that will drain within 24 hours	13.68	13.68			
Percent of Map Unit	70%	15%			
Depth to Restrictive Layer (in)	>80"	>80"			
Available Water Supply, 0" - 60" (in)	4.7	4.8			

	TP-6		TP-7		TP-10
0-1.0'	Topsoil Silty Sand, (SM)	0 - 1.0'	Topsoil Silty Sand (SM)	0-1.0'	Topsoil Silty Sand (SM)
1.0' - 6.5'	Sand w/ Gravel, (SP)	1.0' - 7.5'	Sand w/ Gravel (SP)	1.0' - 9.0'	Sand w/ Gravel (SP)

Swale Native Soil Type, NRCS **350**	Andic Humudepts	Humic Udivitrands	Pearsoncreek - Shallow	Pearsoncreek - Dense Subsoil	
NRCS Hydrologic Soil Group	B	B	D	D	
Saturated Hydraulic Conductivity, Ksat, (in/hr)	0.57	0.57	0	0	
Ksat range (in/hr)	0.57-1.98	0.57-1.98	0.00 - 0.01	0.00 - 0.07	
Maximum Swale Depth that will drain within 72 hours	41.04	41.04	0	0	inches
Maximum Swale Depth that will drain within 24 hours	13.68	13.68	0	0	
Percent of Map Unit	30%	25%	20%	15%	
Depth to Restrictive Layer (in)	>80"	>80"	10" - 20"	10" - 20"	
Available Water Supply, 0" - 60" (in)	5.5	2.6	3.8	2.3	

	TP-9		TP-11
0-1.0'	Topsoil Silty Sand, (SM)	0 - 1.0'	Topsoil Silty Sand (SM)
1.0' - 6'	Sand w/ Gravel, (SP)	1.0' - 6.0'	Sand w/ Gravel (SP)
6'	Bedrock	6.0'	Bedrock

Swale Native Soil Type, NRCS **360**	Glaciercreek	Humic Udivitrands	Pearsoncreek - Dense Substratum	Pearsoncreek - Dense Subsoil	
NRCS Hydrologic Soil Group	D	B	C	D	
Saturated Hydraulic Conductivity, Ksat, (in/hr)	0.06	0.57	0	0	
Ksat range (in/hr)	0.06-0.20	0.57-1.98	0.00 - 0.01	0.00 - 0.07	
Maximum Swale Depth that will drain within 72 hours	4.32	41.04	0	0	inches
Maximum Swale Depth that will drain within 24 hours	1.44	13.68	0	0	
Percent of Map Unit	30%	25%	20%	15%	
Depth to Restrictive Layer (in)	10" - 20"	>80"	36" - 59"	10" - 20"	
Available Water Supply, 0" - 60" (in)	2.9	2.6	5.1	2.3	

	TP-4		TP-8
0-1.5'	Topsoil Silty Sand, (SM)	0 - 1.2'	Topsoil Silty Sand (SM)
1.5' - 4'	Sand w/ Gravel, (SP)	1.2' - 6.5'	Sand w/ Gravel (SP)
4'	Bedrock	6.5'	Bedrock

Rational Method - Runoff Coefficients, 10-yr Storm

Type of Cover	C Flat (<2%)	Rolling (2% - 10%)	Hilly (>10%)
Pavement and Roofs	0.9	0.9	0.9
Earth Shoulders	0.5	0.5	0.5
Drives and Walks	0.9	0.9	0.9
Gravel Pavement	0.5	0.55	0.6
Lawns, Sandy Soi	0.1	0.15	0.2
Lawns, Heavy Soil	0.17	0.22	0.35
Grass Shoulders	0.25	0.25	0.25
Side Slopes, Earth	0.6	0.6	0.6
Side Slopes, Turf	0.3	0.3	0.3
Median Area, Turf	0.25	0.3	0.3
Cultivated Land, Clay and Loam	0.5	0.55	0.6
Cultivated Land, Clay and Loam	0.25	0.3	0.35
Woodland and Forest	0.1	0.15	0.2
Meadow and Pasture Land	0.25	0.3	0.35

Rational Method - Runoff Coefficients, 50-yr Storm (20%)

Type of Cover	C Flat (<2%)	Rolling (2% - 10%)	Hilly (>10%)
Pavement and Roofs	0.95	0.95	0.95
Earth Shoulders	0.6	0.6	0.6
Drives and Walks	0.95	0.95	0.95
Gravel Pavement	0.6	0.66	0.72
Lawns, Sandy Soi	0.12	0.18	0.24
Lawns, Heavy Soil	0.204	0.264	0.42
Grass Shoulders	0.3	0.3	0.3
Side Slopes, Earth	0.72	0.72	0.72
Side Slopes, Turf	0.36	0.36	0.36
Median Area, Turf	0.3	0.36	0.36
Cultivated Land, Clay and Loam	0.6	0.66	0.72
Cultivated Land, Clay and Loam	0.3	0.36	0.42
Woodland and Forest	0.12	0.18	0.24
Meadow and Pasture Land	0.3	0.36	0.42

Rational Method - Runoff Coefficients, 25-yr Storm (+10%)

Type of Cover	C Flat (<2%)	Rolling (2% - 10%)	Hilly (>10%)
Pavement and Roofs	0.95	0.95	0.95
Earth Shoulders	0.55	0.55	0.55
Drives and Walks	0.95	0.95	0.95
Gravel Pavement	0.55	0.605	0.66
Lawns, Sandy Soi	0.11	0.165	0.22
Lawns, Heavy Soil	0.187	0.242	0.385
Grass Shoulders	0.275	0.275	0.275
Side Slopes, Earth	0.66	0.66	0.66
Side Slopes, Turf	0.33	0.33	0.33
Median Area, Turf	0.275	0.33	0.33
Cultivated Land, Clay and Loam	0.55	0.605	0.66
Cultivated Land, Clay and Loam	0.275	0.33	0.385
Woodland and Forest	0.11	0.165	0.22
Meadow and Pasture Land	0.275	0.33	0.385

Rational Method - Runoff Coefficients, 100-yr Storm (25%)

Type of Cover	C Flat (<2%)	Rolling (2% - 10%)	Hilly (>10%)
Pavement and Roofs	0.95	0.95	0.95
Earth Shoulders	0.6875	0.6875	0.6875
Drives and Walks	0.95	0.95	0.95
Gravel Pavement	0.6875	0.75625	0.825
Lawns, Sandy Soi	0.1375	0.20625	0.275
Lawns, Heavy Soil	0.23375	0.3025	0.48125
Grass Shoulders	0.34375	0.34375	0.34375
Side Slopes, Earth	0.825	0.825	0.825
Side Slopes, Turf	0.4125	0.4125	0.4125
Median Area, Turf	0.34375	0.4125	0.4125
Cultivated Land, Clay and Loam	0.6875	0.75625	0.825
Cultivated Land, Clay and Loam	0.34375	0.4125	0.48125
Woodland and Forest	0.1375	0.20625	0.275
Meadow and Pasture Land	0.34375	0.4125	0.48125

T_C = $T_T1 + T_T2 + \ldots$

where:

T_c Time of Concentration

T_t Time of travel for that individual flow segment

T_t = $L/(K*(S)^{1/2})$

where:

L = length of segment

S = slope of segment (feet/foot)

K = ground cover coefficient from table 5-6, SRSM

TABLE 5-6
GROUND COVER COEFFICIENTS

Type of Cover	K (feet/minute)
Forest with heavy ground cover	150
Minimum tillage cultivation	280
Short pasture grass or lawn	420
Nearly bare ground	600
Small roadside ditch w/grass	900
Paved area	1,200
Gutter flow:	
4 inches deep	1,500
6 inches deep	2,400
8 inches deep	3,100
Storm Sewers:	
12 inch diameter	3,000
18 inch diameter	3,900
24 inch diameter	4,700
Open Channel Flow (n = .040):	
12 inches deep	1,100
Narrow Channel (w/d =1):	
2 feet deep	1,800
4 feet deep	2,800
Open Channel Flow (n = .040):	
1 foot deep	2,000
Wide Channel (w/d =9):	
2 feet deep	3,100
4 feet deep	5,000

Source: WSDOT Hydraulics Manual, March 2004

Basin	Segment	T_t min	S (ft/ft)	L (ft)	K	Segment Desc.	T_c min
1	1	0.07	0.02	12	1,200	Pavement	5.00
	2	1.38	0.006	160	1,500	Concrete Gutter	
	3	-	0.01	0	3,000		
							1.45
2	1	0.07	0.02	12	1,200	Pavement	5.00
	2	0.82	0.06	300	1,500	Concrete Gutter	
	3	-	0.004	0	1,200		
							0.89
3	1	0.07	0.02	12	1,200	Pavement	5.00
	2	2.07	0.006	240	1,500	Concrete Gutter	
	3	-	0.004	0	3,000		
							2.14
4	1	1.13	0.0175	180	1,200	Pavement	5.00
	2	0.04	0.45	15	600	Embankment Slope	
	3	0.08	0.004	15	3,000		
							1.25
5	1	0.12	0.02	20	1,200	Pavement	5.00
	2	1.11	0.055	390	1,500	Concrete Gutter	
	3	0.32	0.004	60	3,000	Pipe, 12"	
							1.54
6	1	0.12	0.02	20	1,200	Pavement	5.00
	2	0.35	0.03	90	1,500	Concrete Gutter	
	3	-	0.004	0	3,000	Pipe, 12"	
							0.46
7	1	0.07	0.02	12	1,200	Pavement	5.00
	2	0.42	0.05	140	1,500	Concrete Gutter	
	3	2.26	0.004	60	420	Lawn	
							2.75
8	1	0.12	0.02	20	1,200	Pavement	5.00
	2	0.99	0.06	365	1,500	Concrete Gutter	
	3	-	0.004	0	420	Lawn	
							1.11
9	1	0.12	0.02	20	1,200	Pavement	5.00
	2	0.78	0.06	285	1,500	Concrete Gutter	
	3	0.15	0.33	75	900	Grass ditch	
							1.04
10	1	0.12	0.02	20	1,200	Pavement	5.00
	2	1.71	0.08	725	1,500	Concrete Gutter	
	3	0.10	0.05	20	900	Grass ditch	
							1.93
11	1	0.12	0.02	20	1,200	Pavement	5.00
	2	1.18	0.08	500	1,500	Concrete Gutter	
	3	0.71	0.08	600	3,000	Pipe, 12"	
							2.00
12	1	0.07	0.02	12	1,200	Pavement	5.00
	2	0.94	0.08	400	1,500	Concrete Gutter	
	3	-	0.05	0	3,000	Pipe, 12"	
							1.01
13	1	0.46	0.13	200	1,200	Pavement	6.05
	2	5.59	0.002	300	1,200	Pavement	
	3	-	0.05	0	3,000	Pipe, 12"	
							6.05
14	1	9.32	0.002	250	600	Gravel	9.32
	2	-	0.002	0	1,200	Pavement	
	3	-	0.05	0	3,000	Pipe, 12"	
							9.32
15	1	0.12	0.02	20	1,200	Pavement	5.00
	2	0.75	0.05	250	1,500	Concrete Gutter	
	3	-	0.05	0	3,000	Pipe, 12"	
							0.86
16	1	0.12	0.02	20	1,200	Pavement	5.00
	2	0.78	0.05	260	1,500	Concrete Gutter	
	3	0.15	0.05	30	900	Grass ditch	
							1.04
17	1	0.07	0.02	12	1,200	Pavement	5.00
	2	0.36	0.05	120	1,500	Concrete Gutter	
	3	-	0.05	0	900	Grass ditch	
							0.43
18	1	-	0.13	0	1,200	Pavement	5.00
	2	-	0.05	0	1,500	Concrete Gutter	
	3	0.22	0.01	20	900	Grass ditch	
							0.22
19	1	0.07	0.02	12	1,200	Pavement	5.00
	2	0.36	0.05	120	1,500	Concrete Gutter	
	3	-	0.05	0	900	Grass ditch	
							0.43
20	1	0.07	0.02	12	1,200	Pavement	5.00
	2	0.37	0.05	125	1,500	Concrete Gutter	
	3	-	0.05	0	900	Grass ditch	
							0.44
21	1	0.07	0.02	12	1,200	Pavement	5.00
	2	0.38	0.07	150	1,500	Concrete Gutter	
	3	-	0.05	0	900	Grass ditch	
							0.45
22	1	0.07	0.02	12	1,200	Pavement	5.00
	2	0.30	0.05	100	1,500	Concrete Gutter	
	3	-	0.05	0	900	Grass ditch	
							0.37
23	1	0.07	0.02	12	1,200	Pavement	5.00
	2	0.38	0.07	150	1,500	Concrete Gutter	
	3	-	0.05	0	900	Grass ditch	
							0.45

Design Storm for Flow Control:
Spokane County 10-yr, 24 hour
Bonner County 25-yr, 24 hour

Design Storm for Conveyance:
100 yr - 24 hour

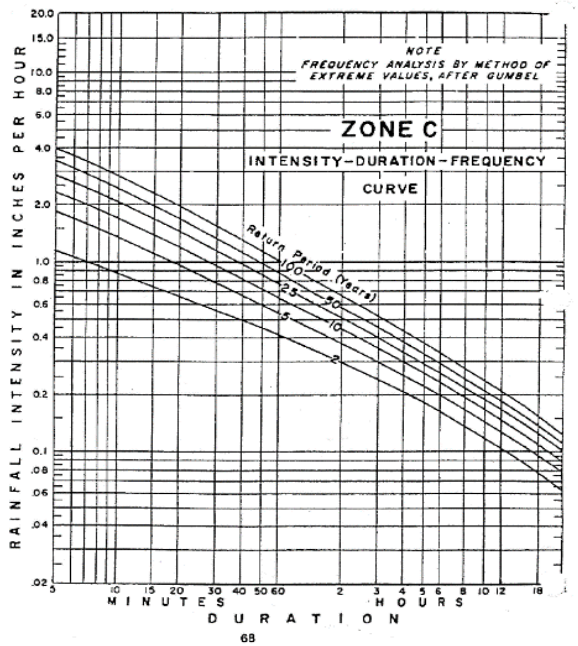
$I = m/T_c^n$

	2 yr	10 yr	25 yr	50 yr	100 yr
m	3.47	6.98	9.09	10.68	12.33
n	0.556	0.609	0.626	0.635	0.643
T_c	5	5	5	5	5
I (in/hr) at T_c	1.42	2.62	3.32	3.84	4.38

Deer Park, Isopluvial Map, SRSM, Precipitation in Inches for the 24-hr Storm

	1.400	1.800	2.200	2.400	2.600	2 yr	10 yr	25 yr	50 yr	100 yr
SRSM						Bonner County From ITD Storm Curve				
Time (min)	I (in/hr)	I (in/hr)	I (in/hr)	I (in/hr)	I (in/hr)					
5	1.42	2.62	3.32	3.84	4.38	1.15	2.3	2.80	3.4	4
10	0.96	1.72	2.15	2.47	2.81	0.87	1.7	2.10	2.5	2.9
15	0.77	1.34	1.67	1.91	2.16	0.74	1.45	1.75	2	2.2
20	0.66	1.13	1.39	1.59	1.80	0.66	1.25	1.50	1.75	2
25	0.58	0.98	1.21	1.38	1.56	0.6	1.08	1.35	1.5	1.75
30	0.52	0.88	1.08	1.23	1.38	0.56	0.95	1.25	1.4	1.6
35	0.48	0.80	0.98	1.12	1.25	0.53	0.9	1.10	1.25	1.5
40	0.45	0.74	0.90	1.03	1.15	0.5	0.82	0.95	1.15	1.4
45	0.42	0.69	0.84	0.95	1.07	0.47	0.78	0.90	1.08	1.28
50	0.39	0.64	0.79	0.89	1.00	0.45	0.71	0.85	1	1.15
55	0.37	0.61	0.74	0.84	0.94	0.43	0.68	0.82	0.95	1.08
60	0.36	0.58	0.70	0.79	0.89	0.41	0.65	0.77	0.9	1
65	0.34	0.55	0.67	0.75	0.84	0.4	0.62	0.75	0.87	0.97
70	0.33	0.53	0.64	0.72	0.80	0.39	0.59	0.72	0.83	0.93
75	0.31	0.50	0.61	0.69	0.77	0.38	0.57	0.69	0.8	0.9
80	0.30	0.48	0.59	0.66	0.74	0.37	0.56	0.66	0.77	0.87
85	0.29	0.47	0.56	0.64	0.71	0.36	0.55	0.63	0.73	0.73
90	0.28	0.45	0.54	0.61	0.68	0.35	0.54	0.60	0.7	0.8
95	0.28	0.44	0.53	0.59	0.66	0.34	0.53	0.55	0.68	0.78
100	0.27	0.42	0.51	0.57	0.64	0.33	0.52	0.50	0.67	0.77

FIGURE 6-4 ZONE C, INTENSITY-DURATION-FREQUENCY CURVE
(IDAHO TRANSPORTATION DEPARTMENT)



James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas

Basin:	Total
Description:	Impervious Area
Basin Area:	6.784 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	0	0.000	0.0000
Earth Shoulders	0.55	0	0.000	0.0000
Drives and Walks	0.95	0	0.000	0.0000
Gravel Pavement	0.605	0	0.000	0.0000
Lawns, Sandy Soi	0.165	0	0.000	0.0000
Lawns, Heavy Soil	0.242	0	0.000	0.0000
Grass Shoulders	0.275	0	0.000	0.0000
Side Slopes, Earth	0.66	0	0.000	0.0000
Side Slopes, Turf	0.33	0	0.000	0.0000
Median Area, Turf	0.33	0	0.000	0.0000
Cultivated Land, Clay and Loam	0.605	0	0.000	0.0000
Cultivated Land, Clay and Loam	0.33	0	0.000	0.0000
Woodland and Forest	0.165	295,494	6.784	1.1193
Meadow and Pasture Land	0.33	0	0.000	0.0000
Total	295,494	295,494	6.784	1.11930
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	281,286	6.4574	6.1346
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95	0	0.0000	0.0000
Gravel Pavement	0.605	7,728	0.1774	0.1073
Lawns, Sandy Soi	0.165	0	0.0000	0.0000
Lawns, Heavy Soil	0.242	0	0.0000	0.0000
Grass Shoulders	0.275	0	0.0000	0.0000
Side Slopes, Earth	0.66	0	0.0000	0.0000
Side Slopes, Turf	0.33	0	0.0000	0.0000
Median Area, Turf	0.33	6,480	0.1488	0.0491
Cultivated Land, Clay and Loam	0.605	0	0.0000	0.0000
Cultivated Land, Clay and Loam	0.33	0	0.0000	0.0000
Woodland and Forest	0.165	0	0.0000	0.0000
Meadow and Pasture Land	0.33	0	0.0000	0.0000
Total	295,494	295,494	6.784	6.291
		Post Development Composite C		**0.927**

Treatment Requirements

First Flush - Bonner County		
Impervious Surface Area		289,014 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		12042.25 cubic feet
Swale Area Required at 6-inch depth		24084.50 sq. ft
SRSM - Basic Treatment for PGIS, Moderate-Use Sites		
	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	7517.28 cubic feet
$V=1815AP^{1.53}$	All other conditions	12042.25 cubic feet
where:		
V =	Swale Volume in cubic feet	
A =	Impervious area to be treated (acres)	
P =	6-month NRCS Type II-24 hr storm	
	for Spokane region this = 1	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	1
Description:	E. Lane Glen Lakes Dr.
Basin Area:	0.107 acres
Terrain:	Flat

Pre-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.55		0.000	0.0000
Lawns, Sandy Soi	0.11		0.000	0.0000
Lawns, Heavy Soil	0.187		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.275		0.000	0.0000
Cultivated Land, Clay and Loam	0.55		0.000	0.0000
Cultivated Land, Clay and Loam	0.275		0.000	0.0000
Woodland and Forest	0.11	4,661	0.107	0.0118
Meadow and Pasture Land	0.275		0.000	0.0000
Total	4,661	4,661	0.107	0.01177
		Pre Development Composite C		**0.11**

Post-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	4,661	0.1070	0.1017
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.55		0.0000	0.0000
Lawns, Sandy Soi	0.11		0.0000	0.0000
Lawns, Heavy Soil	0.187		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.275		0.0000	0.0000
Cultivated Land, Clay and Loam	0.55		0.0000	0.0000
Cultivated Land, Clay and Loam	0.275		0.0000	0.0000
Woodland and Forest	0.11		0.0000	0.0000
Meadow and Pasture Land	0.275		0.0000	0.0000
Total	4,661	4,661	0.107	0.102
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County		
Impervious Surface Area		4,661 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		194.21 cubic feet
Swale Area Required at 6-inch depth		388.42 sq. ft
SRSM - Basic Treatment for PGIS, Moderate-Use Sites		
	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	121.23 cubic feet
$V=1815AP^{1.53}$	All other conditions	194.21 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr	
Q = CIA				
Intensity (inches) @ T=5min.	2.80		4.00	
Pre-Development Runoff =	**0.033**	cfs	**0.047**	cfs
Post-Development Runoff =	**0.285**	cfs	**0.407**	cfs
Increase in Runoff	0.252	cfs		
Time of Concentration	5.00	Min.		
Post Construction Runoff	0.285	cfs		
Allowable Release Rate	0.033	cfs	0.047	cfs
Design Release Rate	0	cfs	0	cfs
Maximum Storage Required (ft^3)	**336**	**cu. Ft.**	**478**	cu. Ft.

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.28	**114**	**0.00**	**114**
5	300	2.80	0.28	114	0.00	114
10	600	2.10	0.21	150	0.00	150
15	900	1.75	0.18	178	0.00	178
20	1200	1.50	0.15	199	0.00	199
25	1500	1.35	0.14	220	0.00	220
30	1800	1.25	0.13	242	0.00	242
35	2100	1.10	0.11	246	0.00	246
40	2400	0.95	0.10	242	0.00	242
45	2700	0.90	0.09	256	0.00	256
50	3000	0.85	0.09	268	0.00	268
55	3300	0.82	0.08	284	0.00	284
60	3600	0.77	0.08	290	0.00	290
65	3900	0.75	0.08	305	0.00	305
70	4200	0.72	0.07	315	0.00	315
75	4500	0.69	0.07	323	0.00	323
80	4800	0.66	0.07	329	0.00	329
85	5100	0.63	0.06	333	0.00	333
90	5400	0.60	0.06	336	0.00	336
95	5700	0.55	0.06	324	0.00	324
100	6000	0.50	0.05	310	0.00	310

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.41	**163**	**0.00**	**163**
5	300	4.00	0.41	163	0.00	163
10	600	2.90	0.29	207	0.00	207
15	900	2.20	0.22	224	0.00	224
20	1200	2.00	0.20	265	0.00	265
25	1500	1.75	0.18	285	0.00	285
30	1800	1.60	0.16	309	0.00	309
35	2100	1.50	0.15	336	0.00	336
40	2400	1.40	0.14	356	0.00	356
45	2700	1.28	0.13	365	0.00	365
50	3000	1.15	0.12	363	0.00	363
55	3300	1.08	0.11	373	0.00	373
60	3600	1.00	0.10	376	0.00	376
65	3900	0.97	0.10	395	0.00	395
70	4200	0.93	0.09	407	0.00	407
75	4500	0.90	0.09	421	0.00	421
80	4800	0.87	0.09	434	0.00	434
85	5100	0.73	0.07	386	0.00	386
90	5400	0.80	0.08	447	0.00	447
95	5700	0.78	0.08	460	0.00	460
100	6000	0.77	0.08	478	0.00	478

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	388.42 ft^2	Swale Design Depth	6 in		
Provided Swale Area	672.00 ft^2	25yr-24hr Depth	5.99 in.		
Min. Swale Volume, Flow Control	336 ft^3	100 yr- 24hr volume	478 ft^2	8.5	
Provided Swale Volume	336 ft^3	Swale Total Volume (ft^3)	672 12" Depth		

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	2
Description:	W. Lane Glen Lakes Dr.
Basin Area:	0.194 acres
Terrain:	Flat

Pre-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.55		0.000	0.0000
Lawns, Sandy Soi	0.11		0.000	0.0000
Lawns, Heavy Soil	0.187		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.275		0.000	0.0000
Cultivated Land, Clay and Loam	0.55		0.000	0.0000
Cultivated Land, Clay and Loam	0.275		0.000	0.0000
Woodland and Forest	0.11	8,465	0.194	0.0214
Meadow and Pasture Land	0.275		0.000	0.0000
Total	8,465	8,465	0.194	0.02138
		Pre Development Composite C		**0.11**

Post-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	8,465	0.1943	0.1846
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.55		0.0000	0.0000
Lawns, Sandy Soi	0.11		0.0000	0.0000
Lawns, Heavy Soil	0.187		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.275		0.0000	0.0000
Cultivated Land, Clay and Loam	0.55		0.0000	0.0000
Cultivated Land, Clay and Loam	0.275		0.0000	0.0000
Woodland and Forest	0.11		0.0000	0.0000
Meadow and Pasture Land	0.275		0.0000	0.0000
Total	8,465	8,465	0.194	0.185
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		8,465 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		352.71 cubic feet
Swale Area Required at 6-inch depth		705.42 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	220.18 cubic feet
$V=1815AP^{1.53}$	All other conditions	352.71 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr	
Q = CIA				
Intensity (inches) @ T=5min.	2.80		4.00	
Pre-Development Runoff =	**0.060**	cfs	**0.086**	cfs
Post-Development Runoff =	**0.517**	cfs	**0.738**	cfs
Increase in Runoff	0.457	cfs		
Time of Concentration	5.00	Min.		
Post Construction Runoff	0.517	cfs		
Allowable Release Rate	0.060	cfs	0.086	cfs
Design Release Rate	0	cfs	0	cfs
Maximum Storage Required (ft^3)	**609**	**cu. Ft.**	**867**	cu. Ft.

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.52	**208**	**0.00**	**208**
5	300	2.80	0.52	208	0.00	208
10	600	2.10	0.39	272	0.00	272
15	900	1.75	0.32	324	0.00	324
20	1200	1.50	0.28	361	0.00	361
25	1500	1.35	0.25	399	0.00	399
30	1800	1.25	0.23	439	0.00	439
35	2100	1.10	0.20	447	0.00	447
40	2400	0.95	0.18	439	0.00	439
45	2700	0.90	0.17	466	0.00	466
50	3000	0.85	0.16	487	0.00	487
55	3300	0.82	0.15	515	0.00	515
60	3600	0.77	0.14	526	0.00	526
65	3900	0.75	0.14	554	0.00	554
70	4200	0.72	0.13	572	0.00	572
75	4500	0.69	0.13	586	0.00	586
80	4800	0.66	0.12	597	0.00	597
85	5100	0.63	0.12	605	0.00	605
90	5400	0.60	0.11	609	0.00	609
95	5700	0.55	0.10	589	0.00	589
100	6000	0.50	0.09	563	0.00	563

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.74	**297**	**0.00**	**297**
5	300	4.00	0.74	297	0.00	297
10	600	2.90	0.54	376	0.00	376
15	900	2.20	0.41	407	0.00	407
20	1200	2.00	0.37	481	0.00	481
25	1500	1.75	0.32	518	0.00	518
30	1800	1.60	0.30	562	0.00	562
35	2100	1.50	0.28	610	0.00	610
40	2400	1.40	0.26	647	0.00	647
45	2700	1.28	0.24	662	0.00	662
50	3000	1.15	0.21	659	0.00	659
55	3300	1.08	0.20	678	0.00	678
60	3600	1.00	0.18	683	0.00	683
65	3900	0.97	0.18	717	0.00	717
70	4200	0.93	0.17	739	0.00	739
75	4500	0.90	0.17	765	0.00	765
80	4800	0.87	0.16	787	0.00	787
85	5100	0.73	0.13	701	0.00	701
90	5400	0.80	0.15	813	0.00	813
95	5700	0.78	0.14	835	0.00	835
100	6000	0.77	0.14	867	0.00	867

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	705.42	ft^2	Swale Design Depth	7	in
Provided Swale Area	1058.00	ft^2	25yr-24hr Depth	6.91	in.
Min. Swale Volume, Flow Control	609	ft^3	100 yr- 24hr volume	867	ft^2 9.8
Provided Swale Volume	617	ft^3	Swale Total Volume (ft^3)	1058	12" Depth

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	3
Description:	S. Lane Glen Lakes Dr.
Basin Area:	0.116 acres
Terrain:	Flat

Pre-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.55		0.000	0.0000
Lawns, Sandy Soi	0.11		0.000	0.0000
Lawns, Heavy Soil	0.187		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.275		0.000	0.0000
Cultivated Land, Clay and Loam	0.55		0.000	0.0000
Cultivated Land, Clay and Loam	0.275		0.000	0.0000
Woodland and Forest	0.11	5,036	0.116	0.0127
Meadow and Pasture Land	0.275		0.000	0.0000
Total	5,036	5,036	0.116	0.01272
		Pre Development Composite C		**0.11**

Post-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	5,036	0.1156	0.1098
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.55		0.0000	0.0000
Lawns, Sandy Soi	0.11		0.0000	0.0000
Lawns, Heavy Soil	0.187		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.275		0.0000	0.0000
Cultivated Land, Clay and Loam	0.55		0.0000	0.0000
Cultivated Land, Clay and Loam	0.275		0.0000	0.0000
Woodland and Forest	0.11		0.0000	0.0000
Meadow and Pasture Land	0.275		0.0000	0.0000
Total	5,036	5,036	0.116	0.110
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		5,036 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		209.83 cubic feet
Swale Area Required at 6-inch depth		419.67 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	130.99 cubic feet
$V=1815AP^{1.53}$	All other conditions	209.83 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr	100-yr 24-hr
Q = CIA		
Intensity (inches) @ T=5min.	2.80	4.00
Pre-Development Runoff =	**0.036** cfs	**0.051** cfs
Post-Development Runoff =	**0.308** cfs	**0.439** cfs
Increase in Runoff	0.272 cfs	
Time of Concentration	5.00 Min.	
Post Construction Runoff	0.308 cfs	
Allowable Release Rate	0.036 cfs	0.051 cfs
Design Release Rate	0 cfs	0 cfs
Maximum Storage Required (ft^3)	**363 cu. Ft.**	**516** cu. Ft.

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.31	**124**	**0.00**	**124**
5	300	2.80	0.31	124	0.00	124
10	600	2.10	0.23	162	0.00	162
15	900	1.75	0.19	193	0.00	193
20	1200	1.50	0.16	214	0.00	214
25	1500	1.35	0.15	238	0.00	238
30	1800	1.25	0.14	261	0.00	261
35	2100	1.10	0.12	266	0.00	266
40	2400	0.95	0.10	261	0.00	261
45	2700	0.90	0.10	277	0.00	277
50	3000	0.85	0.09	290	0.00	290
55	3300	0.82	0.09	306	0.00	306
60	3600	0.77	0.08	313	0.00	313
65	3900	0.75	0.08	330	0.00	330
70	4200	0.72	0.08	340	0.00	340
75	4500	0.69	0.08	349	0.00	349
80	4800	0.66	0.07	355	0.00	355
85	5100	0.63	0.07	360	0.00	360
90	5400	0.60	0.07	363	0.00	363
95	5700	0.55	0.06	350	0.00	350
100	6000	0.50	0.05	335	0.00	335

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.44	**177**	**0.00**	**177**
5	300	4.00	0.44	177	0.00	177
10	600	2.90	0.32	224	0.00	224
15	900	2.20	0.24	242	0.00	242
20	1200	2.00	0.22	286	0.00	286
25	1500	1.75	0.19	308	0.00	308
30	1800	1.60	0.18	334	0.00	334
35	2100	1.50	0.16	363	0.00	363
40	2400	1.40	0.15	385	0.00	385
45	2700	1.28	0.14	394	0.00	394
50	3000	1.15	0.13	392	0.00	392
55	3300	1.08	0.12	404	0.00	404
60	3600	1.00	0.11	407	0.00	407
65	3900	0.97	0.11	426	0.00	426
70	4200	0.93	0.10	439	0.00	439
75	4500	0.90	0.10	455	0.00	455
80	4800	0.87	0.10	468	0.00	468
85	5100	0.73	0.08	417	0.00	417
90	5400	0.80	0.09	483	0.00	483
95	5700	0.78	0.09	497	0.00	497
100	6000	0.77	0.08	516	0.00	516

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	419.67 ft^2	Swale Design Depth	8 in		
Provided Swale Area	551.00 ft^2	25yr-24hr Depth	7.90 in.		
Min. Swale Volume, Flow Control	363 ft^3	100 yr- 24hr volume	516 ft^2		11.2
Provided Swale Volume	367 ft^3	Swale Total Volume (ft^3)	551 12" Depth		

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	4
Description:	Plum Brook Ct
Basin Area:	0.185 acres
Terrain:	Flat

Pre-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.55		0.000	0.0000
Lawns, Sandy Soi	0.11		0.000	0.0000
Lawns, Heavy Soil	0.187		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.275		0.000	0.0000
Cultivated Land, Clay and Loam	0.55		0.000	0.0000
Cultivated Land, Clay and Loam	0.275		0.000	0.0000
Woodland and Forest	0.11	8,043	0.185	0.0203
Meadow and Pasture Land	0.275		0.000	0.0000
Total	8,043	8,043	0.185	0.02031
		Pre Development Composite C		**0.11**

Post-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	8,043	0.1846	0.1754
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.55		0.0000	0.0000
Lawns, Sandy Soi	0.11		0.0000	0.0000
Lawns, Heavy Soil	0.187		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.275		0.0000	0.0000
Cultivated Land, Clay and Loam	0.55		0.0000	0.0000
Cultivated Land, Clay and Loam	0.275		0.0000	0.0000
Woodland and Forest	0.11		0.0000	0.0000
Meadow and Pasture Land	0.275		0.0000	0.0000
Total	8,043	8,043	0.185	0.175
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		8,043 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		335.13 cubic feet
Swale Area Required at 6-inch depth		670.25 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	209.20 cubic feet
$V=1815AP^{1.53}$	All other conditions	335.13 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr	
Q = CIA				
Intensity (inches) @ T=5min.	2.80		4.00	
Pre-Development Runoff =	**0.057**	cfs	**0.081**	cfs
Post-Development Runoff =	**0.491**	cfs	**0.702**	cfs
Increase in Runoff	0.434	cfs		
Time of Concentration	5.00	Min.		
Post Construction Runoff	0.491	cfs		
Allowable Release Rate	0.057	cfs	0.081	cfs
Design Release Rate	0	cfs	0	cfs
Maximum Storage Required (ft^3)	**579**	**cu. Ft.**	**824**	cu. Ft.

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.49	**197**	**0.00**	**197**
5	300	2.80	0.49	197	0.00	197
10	600	2.10	0.37	259	0.00	259
15	900	1.75	0.31	308	0.00	308
20	1200	1.50	0.26	343	0.00	343
25	1500	1.35	0.24	379	0.00	379
30	1800	1.25	0.22	417	0.00	417
35	2100	1.10	0.19	425	0.00	425
40	2400	0.95	0.17	417	0.00	417
45	2700	0.90	0.16	442	0.00	442
50	3000	0.85	0.15	463	0.00	463
55	3300	0.82	0.14	489	0.00	489
60	3600	0.77	0.14	500	0.00	500
65	3900	0.75	0.13	526	0.00	526
70	4200	0.72	0.13	543	0.00	543
75	4500	0.69	0.12	557	0.00	557
80	4800	0.66	0.12	568	0.00	568
85	5100	0.63	0.11	575	0.00	575
90	5400	0.60	0.11	579	0.00	579
95	5700	0.55	0.10	560	0.00	560
100	6000	0.50	0.09	535	0.00	535

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.70	**282**	**0.00**	**282**
5	300	4.00	0.70	282	0.00	282
10	600	2.90	0.51	357	0.00	357
15	900	2.20	0.39	387	0.00	387
20	1200	2.00	0.35	457	0.00	457
25	1500	1.75	0.31	492	0.00	492
30	1800	1.60	0.28	534	0.00	534
35	2100	1.50	0.26	579	0.00	579
40	2400	1.40	0.25	614	0.00	614
45	2700	1.28	0.22	629	0.00	629
50	3000	1.15	0.20	626	0.00	626
55	3300	1.08	0.19	644	0.00	644
60	3600	1.00	0.18	649	0.00	649
65	3900	0.97	0.17	681	0.00	681
70	4200	0.93	0.16	702	0.00	702
75	4500	0.90	0.16	727	0.00	727
80	4800	0.87	0.15	748	0.00	748
85	5100	0.73	0.13	666	0.00	666
90	5400	0.80	0.14	772	0.00	772
95	5700	0.78	0.14	794	0.00	794
100	6000	0.77	0.14	824	0.00	824

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	670.25	ft^2	Swale Design Depth	8	in
Provided Swale Area	901.00	ft^2	25yr-24hr Depth	7.71	in.
Min. Swale Volume, Flow Control	579	ft^3	100 yr- 24hr volume	824	ft^2 11.0
Provided Swale Volume	601	ft^3	Swale Total Volume (ft^3)	901	12" Depth

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	5
Description:	Regent Square Entrance
Basin Area:	0.271 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	11,816	0.271	0.0448
Meadow and Pasture Land	0.33		0.000	0.0000
Total	11,816	11,816	0.271	0.04476
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	11,816	0.2713	0.2577
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605		0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	11,816	11,816	0.271	0.258
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County		
Impervious Surface Area		11,816 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		492.33 cubic feet
Swale Area Required at 6-inch depth		984.67 sq. ft
SRSM - Basic Treatment for PGIS, Moderate-Use Sites		
	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	307.34 cubic feet
$V=1815AP^{1.53}$	All other conditions	492.33 cubic feet
where:		
V =	Swale Volume in cubic feet	
A =	Impervious area to be treated (acres)	
P =	6-month NRCS Type II-24 hr storm	
	for Spokane region this = 1	

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.125**	cfs	**0.179**	cfs	
Post-Development Runoff =	**0.722**	cfs	**1.031**	cfs	
Increase in Runoff	0.596	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.722	cfs			
Allowable Release Rate	0.125	cfs	0.179	cfs	
Design Release Rate	0.125	cfs	0.125	cfs	56.1 gpm
Maximum Storage Required (ft^3)	**388**	**cu. Ft.**	**603**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.72	**290**	**37.50**	**253**
5	300	2.80	0.72	290	37.50	253
10	600	2.10	0.54	380	75.00	305
15	900	1.75	0.45	452	112.50	339
20	1200	1.50	0.39	503	150.00	353
25	1500	1.35	0.35	557	187.50	370
30	1800	1.25	0.32	613	225.00	388
35	2100	1.10	0.28	624	262.50	362
40	2400	0.95	0.24	613	300.00	313
45	2700	0.90	0.23	650	337.50	312
50	3000	0.85	0.22	679	375.00	304
55	3300	0.82	0.21	719	412.50	306
60	3600	0.77	0.20	735	450.00	285
65	3900	0.75	0.19	773	487.50	286
70	4200	0.72	0.19	798	525.00	273
75	4500	0.69	0.18	818	562.50	256
80	4800	0.66	0.17	834	600.00	234
85	5100	0.63	0.16	845	637.50	207
90	5400	0.60	0.15	851	675.00	176
95	5700	0.55	0.14	822	712.50	110
100	6000	0.50	0.13	786	750.00	36

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	1.03	**414**	**37.50**	**377**
5	300	4.00	1.03	414	37.50	377
10	600	2.90	0.75	525	75.00	450
15	900	2.20	0.57	568	112.50	456
20	1200	2.00	0.52	671	150.00	521
25	1500	1.75	0.45	722	187.50	535
30	1800	1.60	0.41	784	225.00	559
35	2100	1.50	0.39	851	262.50	589
40	2400	1.40	0.36	903	300.00	603
45	2700	1.28	0.33	924	337.50	587
50	3000	1.15	0.30	919	375.00	544
55	3300	1.08	0.28	947	412.50	534
60	3600	1.00	0.26	954	450.00	504
65	3900	0.97	0.25	1000	487.50	513
70	4200	0.93	0.24	1031	525.00	506
75	4500	0.90	0.23	1067	562.50	505
80	4800	0.87	0.22	1099	600.00	499
85	5100	0.73	0.19	979	637.50	341
90	5400	0.80	0.21	1134	675.00	459
95	5700	0.78	0.20	1166	712.50	454
100	6000	0.77	0.20	1211	750.00	461

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	984.67	ft^2	Swale Design Depth	6	in	
Provided Swale Area	992.00	ft^2	25yr-24hr Depth	4.69	in.	
Min. Swale Volume, Flow Control	388	ft^3	100 yr- 24hr volume	603	ft^2	7.3
Provided Swale Volume	496	ft^3	Swale Total Volume (ft^3)	992	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	6
Description:	Songwood West Lane
Basin Area:	0.106 acres
Terrain:	Flat

Pre-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.55		0.000	0.0000
Lawns, Sandy Soi	0.11		0.000	0.0000
Lawns, Heavy Soil	0.187		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.275		0.000	0.0000
Cultivated Land, Clay and Loam	0.55		0.000	0.0000
Cultivated Land, Clay and Loam	0.275		0.000	0.0000
Woodland and Forest	0.11	4,619	0.106	0.0117
Meadow and Pasture Land	0.275		0.000	0.0000
Total	4,619	4,619	0.106	0.01166
		Pre Development Composite C		**0.11**

Post-Development Condition - C

Type of Cover	Flat	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	4,619	0.1060	0.1007
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.55		0.0000	0.0000
Lawns, Sandy Soi	0.11		0.0000	0.0000
Lawns, Heavy Soil	0.187		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.275		0.0000	0.0000
Cultivated Land, Clay and Loam	0.55		0.0000	0.0000
Cultivated Land, Clay and Loam	0.275		0.0000	0.0000
Woodland and Forest	0.11		0.0000	0.0000
Meadow and Pasture Land	0.275		0.0000	0.0000
Total	4,619	4,619	0.106	0.101
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		4,619 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		192.46 cubic feet
Swale Area Required at 6-inch depth		384.92 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	120.14 cubic feet
$V=1815AP^{1.53}$	All other conditions	192.46 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.033**	cfs	**0.047**	cfs	
Post-Development Runoff =	**0.282**	cfs	**0.403**	cfs	
Increase in Runoff	0.249	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.282	cfs			
Allowable Release Rate	0.033	cfs	0.047	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**333**	**cu. Ft.**	**473**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.28	**113**	**0.00**	**113**
5	300	2.80	0.28	113	0.00	113
10	600	2.10	0.21	149	0.00	149
15	900	1.75	0.18	177	0.00	177
20	1200	1.50	0.15	197	0.00	197
25	1500	1.35	0.14	218	0.00	218
30	1800	1.25	0.13	239	0.00	239
35	2100	1.10	0.11	244	0.00	244
40	2400	0.95	0.10	239	0.00	239
45	2700	0.90	0.09	254	0.00	254
50	3000	0.85	0.09	266	0.00	266
55	3300	0.82	0.08	281	0.00	281
60	3600	0.77	0.08	287	0.00	287
65	3900	0.75	0.08	302	0.00	302
70	4200	0.72	0.07	312	0.00	312
75	4500	0.69	0.07	320	0.00	320
80	4800	0.66	0.07	326	0.00	326
85	5100	0.63	0.06	330	0.00	330
90	5400	0.60	0.06	333	0.00	333
95	5700	0.55	0.06	321	0.00	321
100	6000	0.50	0.05	307	0.00	307

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.40	**162**	**0.00**	**162**
5	300	4.00	0.40	162	0.00	162
10	600	2.90	0.29	205	0.00	205
15	900	2.20	0.22	222	0.00	222
20	1200	2.00	0.20	262	0.00	262
25	1500	1.75	0.18	282	0.00	282
30	1800	1.60	0.16	307	0.00	307
35	2100	1.50	0.15	333	0.00	333
40	2400	1.40	0.14	353	0.00	353
45	2700	1.28	0.13	361	0.00	361
50	3000	1.15	0.12	359	0.00	359
55	3300	1.08	0.11	370	0.00	370
60	3600	1.00	0.10	373	0.00	373
65	3900	0.97	0.10	391	0.00	391
70	4200	0.93	0.09	403	0.00	403
75	4500	0.90	0.09	417	0.00	417
80	4800	0.87	0.09	430	0.00	430
85	5100	0.73	0.07	383	0.00	383
90	5400	0.80	0.08	443	0.00	443
95	5700	0.78	0.08	456	0.00	456
100	6000	0.77	0.08	473	0.00	473

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	384.92	ft^2	Swale Design Depth	6	in	
Provided Swale Area	1501.00	ft^2	25yr-24hr Depth	2.66	in.	
Min. Swale Volume, Flow Control	333	ft^3	100 yr- 24hr volume	473	ft^2	3.8
Provided Swale Volume	751	ft^3	Swale Total Volume (ft^3)	1501	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	7
Description:	Songwood/Fairbanks
Basin Area:	0.812 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	35,363	0.812	0.1340
Meadow and Pasture Land	0.33		0.000	0.0000
Total	35,363	35,363	0.812	0.13395
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	28,883	0.6631	0.6299
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605		0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33	6,480	0.1488	0.0491
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	35,363	35,363	0.812	0.679
		Post Development Composite C		**0.836**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		28,883 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		1203.46 cubic feet
Swale Area Required at 6-inch depth		2406.92 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	751.25 cubic feet
$V=1815AP^{1.53}$	All other conditions	1203.46 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.375**	cfs	**0.536**	cfs	
Post-Development Runoff =	**1.901**	cfs	**2.716**	cfs	
Increase in Runoff	1.526	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	1.901	cfs			
Allowable Release Rate	0.375	cfs	0.536	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**2242**	**cu. Ft.**	**3190**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	1.90	**764**	**0.00**	**764**
5	300	2.80	1.90	764	0.00	764
10	600	2.10	1.43	1001	0.00	1001
15	900	1.75	1.19	1191	0.00	1191
20	1200	1.50	1.02	1326	0.00	1326
25	1500	1.35	0.92	1468	0.00	1468
30	1800	1.25	0.85	1614	0.00	1614
35	2100	1.10	0.75	1645	0.00	1645
40	2400	0.95	0.65	1614	0.00	1614
45	2700	0.90	0.61	1712	0.00	1712
50	3000	0.85	0.58	1790	0.00	1790
55	3300	0.82	0.56	1894	0.00	1894
60	3600	0.77	0.52	1936	0.00	1936
65	3900	0.75	0.51	2038	0.00	2038
70	4200	0.72	0.49	2103	0.00	2103
75	4500	0.69	0.47	2156	0.00	2156
80	4800	0.66	0.45	2197	0.00	2197
85	5100	0.63	0.43	2225	0.00	2225
90	5400	0.60	0.41	2242	0.00	2242
95	5700	0.55	0.37	2167	0.00	2167
100	6000	0.50	0.34	2072	0.00	2072

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	2.72	**1092**	**0.00**	**1092**
5	300	4.00	2.72	1092	0.00	1092
10	600	2.90	1.97	1382	0.00	1382
15	900	2.20	1.49	1497	0.00	1497
20	1200	2.00	1.36	1768	0.00	1768
25	1500	1.75	1.19	1904	0.00	1904
30	1800	1.60	1.09	2066	0.00	2066
35	2100	1.50	1.02	2243	0.00	2243
40	2400	1.40	0.95	2378	0.00	2378
45	2700	1.28	0.87	2435	0.00	2435
50	3000	1.15	0.78	2422	0.00	2422
55	3300	1.08	0.73	2495	0.00	2495
60	3600	1.00	0.68	2514	0.00	2514
65	3900	0.97	0.66	2636	0.00	2636
70	4200	0.93	0.63	2717	0.00	2717
75	4500	0.90	0.61	2812	0.00	2812
80	4800	0.87	0.59	2896	0.00	2896
85	5100	0.73	0.50	2578	0.00	2578
90	5400	0.80	0.54	2989	0.00	2989
95	5700	0.78	0.53	3073	0.00	3073
100	6000	0.77	0.52	3190	0.00	3190

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	2406.92	ft^2	Swale Design Depth	7	in	
Provided Swale Area	4316.00	ft^2	25yr-24hr Depth	6.23	in.	
Min. Swale Volume, Flow Control	2242	ft^3	100 yr- 24hr volume	3190	ft^2	8.9
Provided Swale Volume	2518	ft^3	Swale Total Volume (ft^3)	4316	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	8
Description:	Regent/Fairbanks
Basin Area:	0.304 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	13,263	0.304	0.0502
Meadow and Pasture Land	0.33		0.000	0.0000
Total	13,263	13,263	0.304	0.05024
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	13,263	0.3045	0.2893
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605		0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	13,263	13,263	0.304	0.289
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		13,263 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		552.63 cubic feet
Swale Area Required at 6-inch depth		1105.25 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	344.97 cubic feet
$V=1815AP^{1.53}$	All other conditions	552.63 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr	100-yr 24-hr	
Q = CIA			
Intensity (inches) @ T=5min.	2.80	4.00	
Pre-Development Runoff =	**0.141** cfs	**0.201** cfs	
Post-Development Runoff =	**0.810** cfs	**1.157** cfs	
Increase in Runoff	0.669 cfs		
Time of Concentration	5.00 Min.		
Post Construction Runoff	0.810 cfs		
Allowable Release Rate	0.141 cfs	0.201 cfs	
Design Release Rate	0.141 cfs	0.141 cfs	63.3 gpm
Maximum Storage Required (ft^3)	**434 cu. Ft.**	**675** cu. Ft.	

Modified Rational Method - (Bowstring Method) 25-yr 24-hr

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.81	**326**	**42.30**	**283**
5	300	2.80	0.81	326	42.30	283
10	600	2.10	0.61	426	84.60	342
15	900	1.75	0.51	507	126.90	380
20	1200	1.50	0.43	565	169.20	396
25	1500	1.35	0.39	626	211.50	414
30	1800	1.25	0.36	688	253.80	434
35	2100	1.10	0.32	701	296.10	405
40	2400	0.95	0.27	688	338.40	349
45	2700	0.90	0.26	729	380.70	349
50	3000	0.85	0.25	763	423.00	340
55	3300	0.82	0.24	807	465.30	342
60	3600	0.77	0.22	825	507.60	317
65	3900	0.75	0.22	868	549.90	318
70	4200	0.72	0.21	896	592.20	304
75	4500	0.69	0.20	918	634.50	284
80	4800	0.66	0.19	936	676.80	259
85	5100	0.63	0.18	948	719.10	229
90	5400	0.60	0.17	955	761.40	193
95	5700	0.55	0.16	923	803.70	119
100	6000	0.50	0.14	883	846.00	37

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) 100-yr 24-hr

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	1.16	**465**	**42.30**	**423**
5	300	4.00	1.16	465	42.30	423
10	600	2.90	0.84	589	84.60	504
15	900	2.20	0.64	638	126.90	511
20	1200	2.00	0.58	753	169.20	584
25	1500	1.75	0.51	811	211.50	599
30	1800	1.60	0.46	880	253.80	626
35	2100	1.50	0.43	955	296.10	659
40	2400	1.40	0.40	1013	338.40	675
45	2700	1.28	0.37	1037	380.70	657
50	3000	1.15	0.33	1032	423.00	609
55	3300	1.08	0.31	1063	465.30	597
60	3600	1.00	0.29	1071	507.60	563
65	3900	0.97	0.28	1123	549.90	573
70	4200	0.93	0.27	1157	592.20	565
75	4500	0.90	0.26	1198	634.50	564
80	4800	0.87	0.25	1234	676.80	557
85	5100	0.73	0.21	1098	719.10	379
90	5400	0.80	0.23	1273	761.40	512
95	5700	0.78	0.23	1309	803.70	505
100	6000	0.77	0.22	1359	846.00	513

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	1105.25 ft^2	Swale Design Depth	6 in		
Provided Swale Area	1126.00 ft^2	25yr-24hr Depth	4.62 in.		
Min. Swale Volume, Flow Control	434 ft^3	100 yr- 24hr volume	675 ft^2		7.2
Provided Swale Volume	563 ft^3	Swale Total Volume (ft^3)	1126	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	9
Description:	Regent/St. James R. ln
Basin Area:	0.145 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	6,310	0.145	0.0239
Meadow and Pasture Land	0.33		0.000	0.0000
Total	6,310	6,310	0.145	0.02390
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	6,310	0.1449	0.1376
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605		0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	6,310	6,310	0.145	0.138
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County		
Impervious Surface Area		6,310 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		262.92 cubic feet
Swale Area Required at 6-inch depth		525.83 sq. ft
SRSM - Basic Treatment for PGIS, Moderate-Use Sites		
	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	164.12 cubic feet
$V=1815AP^{1.53}$	All other conditions	262.92 cubic feet
where:		
V =	Swale Volume in cubic feet	
A =	Impervious area to be treated (acres)	
P =	6-month NRCS Type II-24 hr storm	
	for Spokane region this = 1	

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.067**	cfs	**0.096**	cfs	
Post-Development Runoff =	**0.385**	cfs	**0.550**	cfs	
Increase in Runoff	0.318	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.385	cfs			
Allowable Release Rate	0.067	cfs	0.096	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**454**	**cu. Ft.**	**647**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.39	**155**	**0.00**	**155**
5	300	2.80	0.39	155	0.00	155
10	600	2.10	0.29	203	0.00	203
15	900	1.75	0.24	241	0.00	241
20	1200	1.50	0.21	269	0.00	269
25	1500	1.35	0.19	298	0.00	298
30	1800	1.25	0.17	327	0.00	327
35	2100	1.10	0.15	333	0.00	333
40	2400	0.95	0.13	327	0.00	327
45	2700	0.90	0.12	347	0.00	347
50	3000	0.85	0.12	363	0.00	363
55	3300	0.82	0.11	384	0.00	384
60	3600	0.77	0.11	392	0.00	392
65	3900	0.75	0.10	413	0.00	413
70	4200	0.72	0.10	426	0.00	426
75	4500	0.69	0.09	437	0.00	437
80	4800	0.66	0.09	445	0.00	445
85	5100	0.63	0.09	451	0.00	451
90	5400	0.60	0.08	454	0.00	454
95	5700	0.55	0.08	439	0.00	439
100	6000	0.50	0.07	420	0.00	420

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.55	**221**	**0.00**	**221**
5	300	4.00	0.55	221	0.00	221
10	600	2.90	0.40	280	0.00	280
15	900	2.20	0.30	303	0.00	303
20	1200	2.00	0.28	358	0.00	358
25	1500	1.75	0.24	386	0.00	386
30	1800	1.60	0.22	419	0.00	419
35	2100	1.50	0.21	455	0.00	455
40	2400	1.40	0.19	482	0.00	482
45	2700	1.28	0.18	494	0.00	494
50	3000	1.15	0.16	491	0.00	491
55	3300	1.08	0.15	506	0.00	506
60	3600	1.00	0.14	509	0.00	509
65	3900	0.97	0.13	534	0.00	534
70	4200	0.93	0.13	551	0.00	551
75	4500	0.90	0.12	570	0.00	570
80	4800	0.87	0.12	587	0.00	587
85	5100	0.73	0.10	523	0.00	523
90	5400	0.80	0.11	606	0.00	606
95	5700	0.78	0.11	623	0.00	623
100	6000	0.77	0.11	647	0.00	647

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	525.83	ft^2	Swale Design Depth	6	in	
Provided Swale Area	1540.00	ft^2	25yr-24hr Depth	3.54	in.	
Min. Swale Volume, Flow Control	454	ft^3	100 yr- 24hr volume	647	ft^2	5.0
Provided Swale Volume	770	ft^3	Swale Total Volume (ft^3)	1540	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	10
Description:	Coral Ridge/St. James
Basin Area:	0.643 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	27,996	0.643	0.1060
Meadow and Pasture Land	0.33		0.000	0.0000
Total	27,996	27,996	0.643	0.10605
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	27,996	0.6427	0.6106
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605		0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	27,996	27,996	0.643	0.611
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County		
Impervious Surface Area		27,996 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		1166.50 cubic feet
Swale Area Required at 6-inch depth		2333.00 sq. ft
SRSM - Basic Treatment for PGIS, Moderate-Use Sites		
	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	728.18 cubic feet
$V=1815AP^{1.53}$	All other conditions	1166.50 cubic feet
where:		
V =	Swale Volume in cubic feet	
A =	Impervious area to be treated (acres)	
P =	6-month NRCS Type II-24 hr storm	
	for Spokane region this = 1	

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.297**	cfs	**0.424**	cfs	
Post-Development Runoff =	**1.710**	cfs	**2.442**	cfs	
Increase in Runoff	1.413	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	1.710	cfs			
Allowable Release Rate	0.297	cfs	0.424	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**2016**	**cu. Ft.**	**2869**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	1.71	**687**	**0.00**	**687**
5	300	2.80	1.71	687	0.00	687
10	600	2.10	1.28	900	0.00	900
15	900	1.75	1.07	1071	0.00	1071
20	1200	1.50	0.92	1192	0.00	1192
25	1500	1.35	0.82	1320	0.00	1320
30	1800	1.25	0.76	1452	0.00	1452
35	2100	1.10	0.67	1479	0.00	1479
40	2400	0.95	0.58	1451	0.00	1451
45	2700	0.90	0.55	1540	0.00	1540
50	3000	0.85	0.52	1610	0.00	1610
55	3300	0.82	0.50	1703	0.00	1703
60	3600	0.77	0.47	1740	0.00	1740
65	3900	0.75	0.46	1833	0.00	1833
70	4200	0.72	0.44	1891	0.00	1891
75	4500	0.69	0.42	1939	0.00	1939
80	4800	0.66	0.40	1975	0.00	1975
85	5100	0.63	0.38	2001	0.00	2001
90	5400	0.60	0.37	2016	0.00	2016
95	5700	0.55	0.34	1948	0.00	1948
100	6000	0.50	0.31	1863	0.00	1863

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	2.44	**982**	**0.00**	**982**
5	300	4.00	2.44	982	0.00	982
10	600	2.90	1.77	1243	0.00	1243
15	900	2.20	1.34	1346	0.00	1346
20	1200	2.00	1.22	1590	0.00	1590
25	1500	1.75	1.07	1712	0.00	1712
30	1800	1.60	0.98	1858	0.00	1858
35	2100	1.50	0.92	2017	0.00	2017
40	2400	1.40	0.85	2139	0.00	2139
45	2700	1.28	0.78	2190	0.00	2190
50	3000	1.15	0.70	2178	0.00	2178
55	3300	1.08	0.66	2243	0.00	2243
60	3600	1.00	0.61	2260	0.00	2260
65	3900	0.97	0.59	2370	0.00	2370
70	4200	0.93	0.57	2443	0.00	2443
75	4500	0.90	0.55	2529	0.00	2529
80	4800	0.87	0.53	2604	0.00	2604
85	5100	0.73	0.45	2319	0.00	2319
90	5400	0.80	0.49	2687	0.00	2687
95	5700	0.78	0.48	2763	0.00	2763
100	6000	0.77	0.47	2869	0.00	2869

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	2333.00	ft^2	Swale Design Depth	8	in	
Provided Swale Area	3232.00	ft^2	25yr-24hr Depth	7.48	in.	
Min. Swale Volume, Flow Control	2016	ft^3	100 yr- 24hr volume	2869	ft^2	10.7
Provided Swale Volume	2155	ft^3	Swale Total Volume (ft^3)	3232	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	11
Description:	Sterling Lakes, St. James
Basin Area:	2.014 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	87,728	2.014	0.3323
Meadow and Pasture Land	0.33		0.000	0.0000
Total	87,728	87,728	2.014	0.33230
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	87,728	2.0140	1.9133
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605		0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	87,728	87,728	2.014	1.913
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County		
Impervious Surface Area		87,728 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		3655.33 cubic feet
Swale Area Required at 6-inch depth		7310.67 sq. ft
SRSM - Basic Treatment for PGIS, Moderate-Use Sites		
	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	2281.81 cubic feet
$V=1815AP^{1.53}$	All other conditions	3655.33 cubic feet
where:		
V =	Swale Volume in cubic feet	
A =	Impervious area to be treated (acres)	
P =	6-month NRCS Type II-24 hr storm	
	for Spokane region this = 1	

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.930**	cfs	**1.329**	cfs	
Post-Development Runoff =	**5.357**	cfs	**7.653**	cfs	
Increase in Runoff	4.427	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	5.357	cfs			
Allowable Release Rate	0.930	cfs	1.329	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**6316**	**cu. Ft.**	**8990**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	5.36	**2154**	**0.00**	**2154**
5	300	2.80	5.36	2154	0.00	2154
10	600	2.10	4.02	2821	0.00	2821
15	900	1.75	3.35	3355	0.00	3355
20	1200	1.50	2.87	3737	0.00	3737
25	1500	1.35	2.58	4138	0.00	4138
30	1800	1.25	2.39	4549	0.00	4549
35	2100	1.10	2.10	4634	0.00	4634
40	2400	0.95	1.82	4548	0.00	4548
45	2700	0.90	1.72	4825	0.00	4825
50	3000	0.85	1.63	5045	0.00	5045
55	3300	0.82	1.57	5337	0.00	5337
60	3600	0.77	1.47	5454	0.00	5454
65	3900	0.75	1.43	5743	0.00	5743
70	4200	0.72	1.38	5926	0.00	5926
75	4500	0.69	1.32	6075	0.00	6075
80	4800	0.66	1.26	6190	0.00	6190
85	5100	0.63	1.21	6270	0.00	6270
90	5400	0.60	1.15	6316	0.00	6316
95	5700	0.55	1.05	6105	0.00	6105
100	6000	0.50	0.96	5837	0.00	5837

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	7.65	**3077**	**0.00**	**3077**
5	300	4.00	7.65	3077	0.00	3077
10	600	2.90	5.55	3895	0.00	3895
15	900	2.20	4.21	4218	0.00	4218
20	1200	2.00	3.83	4982	0.00	4982
25	1500	1.75	3.35	5364	0.00	5364
30	1800	1.60	3.06	5822	0.00	5822
35	2100	1.50	2.87	6319	0.00	6319
40	2400	1.40	2.68	6702	0.00	6702
45	2700	1.28	2.45	6862	0.00	6862
50	3000	1.15	2.20	6825	0.00	6825
55	3300	1.08	2.07	7030	0.00	7030
60	3600	1.00	1.91	7083	0.00	7083
65	3900	0.97	1.86	7427	0.00	7427
70	4200	0.93	1.78	7655	0.00	7655
75	4500	0.90	1.72	7924	0.00	7924
80	4800	0.87	1.66	8160	0.00	8160
85	5100	0.73	1.40	7266	0.00	7266
90	5400	0.80	1.53	8421	0.00	8421
95	5700	0.78	1.49	8659	0.00	8659
100	6000	0.77	1.47	8990	0.00	8990

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	7310.67	ft^2	Swale Design Depth	6	in
Provided Swale Area	13750.00	ft^2	25yr-24hr Depth	5.51	in.
Min. Swale Volume, Flow Control	6316	ft^3	100 yr- 24hr volume	8990	ft^2 7.8
Provided Swale Volume	6875	ft^3	Swale Total Volume (ft^3)	13750	12" Depth

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	12
Description:	Phantom Ridge
Basin Area:	0.321 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	13,992	0.321	0.0530
Meadow and Pasture Land	0.33		0.000	0.0000
Total	13,992	13,992	0.321	0.05300
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	13,992	0.3212	0.3052
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605		0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	13,992	13,992	0.321	0.305
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		13,992 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		583.00 cubic feet
Swale Area Required at 6-inch depth		1166.00 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	363.93 cubic feet
$V=1815AP^{1.53}$	All other conditions	583.00 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.148**	cfs	**0.212**	cfs	
Post-Development Runoff =	**0.854**	cfs	**1.221**	cfs	
Increase in Runoff	0.706	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.854	cfs			
Allowable Release Rate	0.148	cfs	0.212	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**1007**	**cu. Ft.**	**1434**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.85	**343**	**0.00**	**343**
5	300	2.80	0.85	343	0.00	343
10	600	2.10	0.64	450	0.00	450
15	900	1.75	0.53	535	0.00	535
20	1200	1.50	0.46	596	0.00	596
25	1500	1.35	0.41	660	0.00	660
30	1800	1.25	0.38	725	0.00	725
35	2100	1.10	0.34	739	0.00	739
40	2400	0.95	0.29	725	0.00	725
45	2700	0.90	0.27	770	0.00	770
50	3000	0.85	0.26	805	0.00	805
55	3300	0.82	0.25	851	0.00	851
60	3600	0.77	0.23	870	0.00	870
65	3900	0.75	0.23	916	0.00	916
70	4200	0.72	0.22	945	0.00	945
75	4500	0.69	0.21	969	0.00	969
80	4800	0.66	0.20	987	0.00	987
85	5100	0.63	0.19	1000	0.00	1000
90	5400	0.60	0.18	1007	0.00	1007
95	5700	0.55	0.17	974	0.00	974
100	6000	0.50	0.15	931	0.00	931

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	1.22	**491**	**0.00**	**491**
5	300	4.00	1.22	491	0.00	491
10	600	2.90	0.88	621	0.00	621
15	900	2.20	0.67	673	0.00	673
20	1200	2.00	0.61	795	0.00	795
25	1500	1.75	0.53	855	0.00	855
30	1800	1.60	0.49	929	0.00	929
35	2100	1.50	0.46	1008	0.00	1008
40	2400	1.40	0.43	1069	0.00	1069
45	2700	1.28	0.39	1094	0.00	1094
50	3000	1.15	0.35	1089	0.00	1089
55	3300	1.08	0.33	1121	0.00	1121
60	3600	1.00	0.31	1130	0.00	1130
65	3900	0.97	0.30	1185	0.00	1185
70	4200	0.93	0.28	1221	0.00	1221
75	4500	0.90	0.27	1264	0.00	1264
80	4800	0.87	0.27	1301	0.00	1301
85	5100	0.73	0.22	1159	0.00	1159
90	5400	0.80	0.24	1343	0.00	1343
95	5700	0.78	0.24	1381	0.00	1381
100	6000	0.77	0.23	1434	0.00	1434

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	1166.00	ft^2	Swale Design Depth	9	in	
Provided Swale Area	1450.00	ft^2	25yr-24hr Depth	8.34	in.	
Min. Swale Volume, Flow Control	1007	ft^3	100 yr- 24hr volume	1434	ft^2	11.9
Provided Swale Volume	1088	ft^3	Swale Total Volume (ft^3)	1450	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	13
Description:	Shared Use Path
Basin Area:	0.185 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	8,055	0.185	0.0305
Meadow and Pasture Land	0.33		0.000	0.0000
Total	8,055	8,055	0.185	0.03051
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	8,055	0.1849	0.1757
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605		0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	8,055	8,055	0.185	0.176
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		8,055 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		335.63 cubic feet
Swale Area Required at 6-inch depth		671.25 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	209.51 cubic feet
$V=1815AP^{1.53}$	All other conditions	335.63 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.085**	cfs	**0.122**	cfs	
Post-Development Runoff =	**0.492**	cfs	**0.703**	cfs	
Increase in Runoff	0.406	cfs			
Time of Concentration	6.05	Min.			
Post Construction Runoff	0.492	cfs			
Allowable Release Rate	0.085	cfs	0.122	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**582**	**cu. Ft.**	**828**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
6.05	**363.15**	**2.80**	0.49	**229**	**0.00**	**229**
5	300	2.80	0.49	198	0.00	198
10	600	2.10	0.37	267	0.00	267
15	900	1.75	0.31	315	0.00	315
20	1200	1.50	0.26	349	0.00	349
25	1500	1.35	0.24	385	0.00	385
30	1800	1.25	0.22	422	0.00	422
35	2100	1.10	0.19	430	0.00	430
40	2400	0.95	0.17	421	0.00	421
45	2700	0.90	0.16	446	0.00	446
50	3000	0.85	0.15	466	0.00	466
55	3300	0.82	0.14	493	0.00	493
60	3600	0.77	0.14	504	0.00	504
65	3900	0.75	0.13	530	0.00	530
70	4200	0.72	0.13	547	0.00	547
75	4500	0.69	0.12	560	0.00	560
80	4800	0.66	0.12	571	0.00	571
85	5100	0.63	0.11	578	0.00	578
90	5400	0.60	0.11	582	0.00	582
95	5700	0.55	0.10	563	0.00	563
100	6000	0.50	0.09	538	0.00	538

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
6.05	**363.15**	**4.00**	0.70	**327**	**0.00**	**327**
5	300	4.00	0.70	282	0.00	282
10	600	2.90	0.51	369	0.00	369
15	900	2.20	0.39	396	0.00	396
20	1200	2.00	0.35	465	0.00	465
25	1500	1.75	0.31	499	0.00	499
30	1800	1.60	0.28	541	0.00	541
35	2100	1.50	0.26	586	0.00	586
40	2400	1.40	0.25	621	0.00	621
45	2700	1.28	0.22	635	0.00	635
50	3000	1.15	0.20	631	0.00	631
55	3300	1.08	0.19	650	0.00	650
60	3600	1.00	0.18	654	0.00	654
65	3900	0.97	0.17	686	0.00	686
70	4200	0.93	0.16	706	0.00	706
75	4500	0.90	0.16	731	0.00	731
80	4800	0.87	0.15	752	0.00	752
85	5100	0.73	0.13	670	0.00	670
90	5400	0.80	0.14	776	0.00	776
95	5700	0.78	0.14	798	0.00	798
100	6000	0.77	0.14	828	0.00	828

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	671.25	ft^2	Swale Design Depth	9	in	
Provided Swale Area	852.00	ft^2	25yr-24hr Depth	8.20	in.	
Min. Swale Volume, Flow Control	582	ft^3	100 yr- 24hr volume	828	ft^2	11.7
Provided Swale Volume	639	ft^3	Swale Total Volume (ft^3)	852	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	14
Description:	Gravel Rd to Storage
Basin Area:	0.177 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	7,728	0.177	0.0293
Meadow and Pasture Land	0.33		0.000	0.0000
Total	7,728	7,728	0.177	0.02927
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	0	0.0000	0.0000
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	7,728	0.1774	0.1073
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	7,728	7,728	0.177	0.107
		Post Development Composite C		**0.605**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		7,728 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		322.00 cubic feet
Swale Area Required at 6-inch depth		644.00 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	201.01 cubic feet
$V=1815AP^{1.53}$	All other conditions	322.00 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.082**	cfs	**0.117**	cfs	
Post-Development Runoff =	**0.301**	cfs	**0.429**	cfs	
Increase in Runoff	0.219	cfs			
Time of Concentration	9.32	Min.			
Post Construction Runoff	0.301	cfs			
Allowable Release Rate	0.082	cfs	0.117	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**360**	**cu. Ft.**	**512**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
9.32	**559.02**	**2.80**	0.30	**199**	**0.00**	**199**
5	300	2.80	0.30	121	0.00	121
10	600	2.10	0.23	178	0.00	178
15	900	1.75	0.19	205	0.00	205
20	1200	1.50	0.16	224	0.00	224
25	1500	1.35	0.14	245	0.00	245
30	1800	1.25	0.13	267	0.00	267
35	2100	1.10	0.12	270	0.00	270
40	2400	0.95	0.10	264	0.00	264
45	2700	0.90	0.10	279	0.00	279
50	3000	0.85	0.09	291	0.00	291
55	3300	0.82	0.09	307	0.00	307
60	3600	0.77	0.08	313	0.00	313
65	3900	0.75	0.08	329	0.00	329
70	4200	0.72	0.08	339	0.00	339
75	4500	0.69	0.07	347	0.00	347
80	4800	0.66	0.07	353	0.00	353
85	5100	0.63	0.07	358	0.00	358
90	5400	0.60	0.06	360	0.00	360
95	5700	0.55	0.06	348	0.00	348
100	6000	0.50	0.05	332	0.00	332

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
9.32	**559.02**	**4.00**	0.43	**284**	**0.00**	**284**
5	300	4.00	0.43	173	0.00	173
10	600	2.90	0.31	246	0.00	246
15	900	2.20	0.24	257	0.00	257
20	1200	2.00	0.21	298	0.00	298
25	1500	1.75	0.19	317	0.00	317
30	1800	1.60	0.17	342	0.00	342
35	2100	1.50	0.16	369	0.00	369
40	2400	1.40	0.15	389	0.00	389
45	2700	1.28	0.14	397	0.00	397
50	3000	1.15	0.12	394	0.00	394
55	3300	1.08	0.12	405	0.00	405
60	3600	1.00	0.11	407	0.00	407
65	3900	0.97	0.10	426	0.00	426
70	4200	0.93	0.10	438	0.00	438
75	4500	0.90	0.10	453	0.00	453
80	4800	0.87	0.09	466	0.00	466
85	5100	0.73	0.08	414	0.00	414
90	5400	0.80	0.09	480	0.00	480
95	5700	0.78	0.08	493	0.00	493
100	6000	0.77	0.08	512	0.00	512

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	644.00	ft^2	Swale Design Depth	6	in
Provided Swale Area	1202.00	ft^2	25yr-24hr Depth	3.59	in.
Min. Swale Volume, Flow Control	360	ft^3	100 yr- 24hr volume	512	ft^2 5.1
Provided Swale Volume	601	ft^3	Swale Total Volume (ft^3)	1202	12" Depth

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	15
Description:	Sterling Lakes, S. Lane
Basin Area:	0.306 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	13,345	0.306	0.0505
Meadow and Pasture Land	0.33		0.000	0.0000
Total	13,345	13,345	0.306	0.05055
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	13,345	0.3064	0.2910
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	0	0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	13,345	13,345	0.306	0.291
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		13,345 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		556.04 cubic feet
Swale Area Required at 6-inch depth		1112.08 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	347.10 cubic feet
$V=1815AP^{1.53}$	All other conditions	556.04 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.142**	cfs	**0.202**	cfs	
Post-Development Runoff =	**0.815**	cfs	**1.164**	cfs	
Increase in Runoff	0.673	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.815	cfs			
Allowable Release Rate	0.142	cfs	0.202	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**961**	**cu. Ft.**	**1367**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.81	**328**	**0.00**	**328**
5	300	2.80	0.81	328	0.00	328
10	600	2.10	0.61	429	0.00	429
15	900	1.75	0.51	510	0.00	510
20	1200	1.50	0.44	568	0.00	568
25	1500	1.35	0.39	629	0.00	629
30	1800	1.25	0.36	692	0.00	692
35	2100	1.10	0.32	705	0.00	705
40	2400	0.95	0.28	692	0.00	692
45	2700	0.90	0.26	734	0.00	734
50	3000	0.85	0.25	767	0.00	767
55	3300	0.82	0.24	812	0.00	812
60	3600	0.77	0.22	830	0.00	830
65	3900	0.75	0.22	874	0.00	874
70	4200	0.72	0.21	901	0.00	901
75	4500	0.69	0.20	924	0.00	924
80	4800	0.66	0.19	942	0.00	942
85	5100	0.63	0.18	954	0.00	954
90	5400	0.60	0.17	961	0.00	961
95	5700	0.55	0.16	929	0.00	929
100	6000	0.50	0.15	888	0.00	888

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	1.16	**468**	**0.00**	**468**
5	300	4.00	1.16	468	0.00	468
10	600	2.90	0.84	593	0.00	593
15	900	2.20	0.64	642	0.00	642
20	1200	2.00	0.58	758	0.00	758
25	1500	1.75	0.51	816	0.00	816
30	1800	1.60	0.47	886	0.00	886
35	2100	1.50	0.44	961	0.00	961
40	2400	1.40	0.41	1019	0.00	1019
45	2700	1.28	0.37	1044	0.00	1044
50	3000	1.15	0.33	1038	0.00	1038
55	3300	1.08	0.31	1069	0.00	1069
60	3600	1.00	0.29	1077	0.00	1077
65	3900	0.97	0.28	1130	0.00	1130
70	4200	0.93	0.27	1164	0.00	1164
75	4500	0.90	0.26	1205	0.00	1205
80	4800	0.87	0.25	1241	0.00	1241
85	5100	0.73	0.21	1105	0.00	1105
90	5400	0.80	0.23	1281	0.00	1281
95	5700	0.78	0.23	1317	0.00	1317
100	6000	0.77	0.22	1367	0.00	1367

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	1112.08	ft^2	Swale Design Depth	7	in	
Provided Swale Area	1704.00	ft^2	25yr-24hr Depth	6.77	in.	
Min. Swale Volume, Flow Control	961	ft^3	100 yr- 24hr volume	1367	ft^2	9.6
Provided Swale Volume	994	ft^3	Swale Total Volume (ft^3)	1704	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	16
Description:	Sterling Lakes W&N lane
Basin Area:	0.294 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	12,800	0.294	0.0485
Meadow and Pasture Land	0.33		0.000	0.0000
Total	12,800	12,800	0.294	0.04848
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	12,800	0.2938	0.2792
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	0	0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	12,800	12,800	0.294	0.279
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		12,800 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		533.33 cubic feet
Swale Area Required at 6-inch depth		1066.67 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	332.93 cubic feet
$V=1815AP^{1.53}$	All other conditions	533.33 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr	100-yr 24-hr	
Q = CIA			
Intensity (inches) @ T=5min.	2.80	4.00	
Pre-Development Runoff =	**0.136** cfs	**0.194** cfs	
Post-Development Runoff =	**0.782** cfs	**1.117** cfs	
Increase in Runoff	0.646 cfs		
Time of Concentration	5.00 Min.		
Post Construction Runoff	0.782 cfs		
Allowable Release Rate	0.136 cfs	0.194 cfs	
Design Release Rate	0 cfs	0 cfs	0.0 gpm
Maximum Storage Required (ft^3)	**922 cu. Ft.**	**1312** cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.78	**314**	**0.00**	**314**
5	300	2.80	0.78	314	0.00	314
10	600	2.10	0.59	412	0.00	412
15	900	1.75	0.49	489	0.00	489
20	1200	1.50	0.42	545	0.00	545
25	1500	1.35	0.38	604	0.00	604
30	1800	1.25	0.35	664	0.00	664
35	2100	1.10	0.31	676	0.00	676
40	2400	0.95	0.27	664	0.00	664
45	2700	0.90	0.25	704	0.00	704
50	3000	0.85	0.24	736	0.00	736
55	3300	0.82	0.23	779	0.00	779
60	3600	0.77	0.21	796	0.00	796
65	3900	0.75	0.21	838	0.00	838
70	4200	0.72	0.20	865	0.00	865
75	4500	0.69	0.19	886	0.00	886
80	4800	0.66	0.18	903	0.00	903
85	5100	0.63	0.18	915	0.00	915
90	5400	0.60	0.17	922	0.00	922
95	5700	0.55	0.15	891	0.00	891
100	6000	0.50	0.14	852	0.00	852

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	1.12	**449**	**0.00**	**449**
5	300	4.00	1.12	449	0.00	449
10	600	2.90	0.81	568	0.00	568
15	900	2.20	0.61	615	0.00	615
20	1200	2.00	0.56	727	0.00	727
25	1500	1.75	0.49	783	0.00	783
30	1800	1.60	0.45	850	0.00	850
35	2100	1.50	0.42	922	0.00	922
40	2400	1.40	0.39	978	0.00	978
45	2700	1.28	0.36	1001	0.00	1001
50	3000	1.15	0.32	996	0.00	996
55	3300	1.08	0.30	1026	0.00	1026
60	3600	1.00	0.28	1033	0.00	1033
65	3900	0.97	0.27	1084	0.00	1084
70	4200	0.93	0.26	1117	0.00	1117
75	4500	0.90	0.25	1156	0.00	1156
80	4800	0.87	0.24	1191	0.00	1191
85	5100	0.73	0.20	1060	0.00	1060
90	5400	0.80	0.22	1229	0.00	1229
95	5700	0.78	0.22	1263	0.00	1263
100	6000	0.77	0.21	1312	0.00	1312

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	1066.67 ft^2	Swale Design Depth	7 in		
Provided Swale Area	1657.00 ft^2	25yr-24hr Depth	6.67 in.		
Min. Swale Volume, Flow Control	922 ft^3	100 yr- 24hr volume	1312 ft^2		9.5
Provided Swale Volume	967 ft^3	Swale Total Volume (ft^3)	1657	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	17
Description:	U. St. James E. Lane
Basin Area:	0.060 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	2,619	0.060	0.0099
Meadow and Pasture Land	0.33		0.000	0.0000
Total	2,619	2,619	0.060	0.00992
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	2,619	0.0601	0.0571
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	0	0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	2,619	2,619	0.060	0.057
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		2,619 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		109.13 cubic feet
Swale Area Required at 6-inch depth		218.25 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	68.12 cubic feet
$V=1815AP^{1.53}$	All other conditions	109.13 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr	100-yr 24-hr	
Q = CIA			
Intensity (inches) @ T=5min.	2.80	4.00	
Pre-Development Runoff =	**0.028** cfs	**0.040** cfs	
Post-Development Runoff =	**0.160** cfs	**0.228** cfs	
Increase in Runoff	0.132 cfs		
Time of Concentration	5.00 Min.		
Post Construction Runoff	0.160 cfs		
Allowable Release Rate	0.028 cfs	0.040 cfs	
Design Release Rate	0 cfs	0 cfs	0.0 gpm
Maximum Storage Required (ft^3)	**189 cu. Ft.**	**268** cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.16	**64**	**0.00**	**64**
5	300	2.80	0.16	64	0.00	64
10	600	2.10	0.12	84	0.00	84
15	900	1.75	0.10	100	0.00	100
20	1200	1.50	0.09	112	0.00	112
25	1500	1.35	0.08	124	0.00	124
30	1800	1.25	0.07	136	0.00	136
35	2100	1.10	0.06	138	0.00	138
40	2400	0.95	0.05	136	0.00	136
45	2700	0.90	0.05	144	0.00	144
50	3000	0.85	0.05	151	0.00	151
55	3300	0.82	0.05	159	0.00	159
60	3600	0.77	0.04	163	0.00	163
65	3900	0.75	0.04	171	0.00	171
70	4200	0.72	0.04	177	0.00	177
75	4500	0.69	0.04	181	0.00	181
80	4800	0.66	0.04	185	0.00	185
85	5100	0.63	0.04	187	0.00	187
90	5400	0.60	0.03	189	0.00	189
95	5700	0.55	0.03	182	0.00	182
100	6000	0.50	0.03	174	0.00	174

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.23	**92**	**0.00**	**92**
5	300	4.00	0.23	92	0.00	92
10	600	2.90	0.17	116	0.00	116
15	900	2.20	0.13	126	0.00	126
20	1200	2.00	0.11	149	0.00	149
25	1500	1.75	0.10	160	0.00	160
30	1800	1.60	0.09	174	0.00	174
35	2100	1.50	0.09	189	0.00	189
40	2400	1.40	0.08	200	0.00	200
45	2700	1.28	0.07	205	0.00	205
50	3000	1.15	0.07	204	0.00	204
55	3300	1.08	0.06	210	0.00	210
60	3600	1.00	0.06	211	0.00	211
65	3900	0.97	0.06	222	0.00	222
70	4200	0.93	0.05	229	0.00	229
75	4500	0.90	0.05	237	0.00	237
80	4800	0.87	0.05	244	0.00	244
85	5100	0.73	0.04	217	0.00	217
90	5400	0.80	0.05	251	0.00	251
95	5700	0.78	0.04	258	0.00	258
100	6000	0.77	0.04	268	0.00	268

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	218.25 ft^2	Swale Design Depth	9 in		
Provided Swale Area	271.00 ft^2	25yr-24hr Depth	8.35 in.		
Min. Swale Volume, Flow Control	189 ft^3	100 yr- 24hr volume	268 ft^2		11.9
Provided Swale Volume	203 ft^3	Swale Total Volume (ft^3)	271 12" Depth		

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	18
Description:	4-plex Unit "G"
Basin Area:	0.114 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	4,972	0.114	0.0188
Meadow and Pasture Land	0.33		0.000	0.0000
Total	4,972	4,972	0.114	0.01883
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	4,972	0.1141	0.1084
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	0	0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	4,972	4,972	0.114	0.108
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County		
Impervious Surface Area		4,972 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		207.17 cubic feet
Swale Area Required at 6-inch depth		414.33 sq. ft
SRSM - Basic Treatment for PGIS, Moderate-Use Sites		
	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	129.32 cubic feet
$V=1815AP^{1.53}$	All other conditions	207.17 cubic feet
where:		
V =	Swale Volume in cubic feet	
A =	Impervious area to be treated (acres)	
P =	6-month NRCS Type II-24 hr storm	
	for Spokane region this = 1	

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.053**	cfs	**0.075**	cfs	
Post-Development Runoff =	**0.304**	cfs	**0.434**	cfs	
Increase in Runoff	0.251	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.304	cfs			
Allowable Release Rate	0.053	cfs	0.075	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**358**	**cu. Ft.**	**509**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.30	**122**	**0.00**	**122**
5	300	2.80	0.30	122	0.00	122
10	600	2.10	0.23	160	0.00	160
15	900	1.75	0.19	190	0.00	190
20	1200	1.50	0.16	212	0.00	212
25	1500	1.35	0.15	235	0.00	235
30	1800	1.25	0.14	258	0.00	258
35	2100	1.10	0.12	263	0.00	263
40	2400	0.95	0.10	258	0.00	258
45	2700	0.90	0.10	273	0.00	273
50	3000	0.85	0.09	286	0.00	286
55	3300	0.82	0.09	302	0.00	302
60	3600	0.77	0.08	309	0.00	309
65	3900	0.75	0.08	325	0.00	325
70	4200	0.72	0.08	336	0.00	336
75	4500	0.69	0.07	344	0.00	344
80	4800	0.66	0.07	351	0.00	351
85	5100	0.63	0.07	355	0.00	355
90	5400	0.60	0.07	358	0.00	358
95	5700	0.55	0.06	346	0.00	346
100	6000	0.50	0.05	331	0.00	331

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.43	**174**	**0.00**	**174**
5	300	4.00	0.43	174	0.00	174
10	600	2.90	0.31	221	0.00	221
15	900	2.20	0.24	239	0.00	239
20	1200	2.00	0.22	282	0.00	282
25	1500	1.75	0.19	304	0.00	304
30	1800	1.60	0.17	330	0.00	330
35	2100	1.50	0.16	358	0.00	358
40	2400	1.40	0.15	380	0.00	380
45	2700	1.28	0.14	389	0.00	389
50	3000	1.15	0.12	387	0.00	387
55	3300	1.08	0.12	398	0.00	398
60	3600	1.00	0.11	401	0.00	401
65	3900	0.97	0.11	421	0.00	421
70	4200	0.93	0.10	434	0.00	434
75	4500	0.90	0.10	449	0.00	449
80	4800	0.87	0.09	462	0.00	462
85	5100	0.73	0.08	412	0.00	412
90	5400	0.80	0.09	477	0.00	477
95	5700	0.78	0.08	491	0.00	491
100	6000	0.77	0.08	509	0.00	509

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	414.33	ft^2	Swale Design Depth	6	in	
Provided Swale Area	762.00	ft^2	25yr-24hr Depth	5.64	in.	
Min. Swale Volume, Flow Control	358	ft^3	100 yr- 24hr volume	509	ft^2	8.0
Provided Swale Volume	381	ft^3	Swale Total Volume (ft^3)	762	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	19
Description:	U. St. James W. Lane
Basin Area:	0.056 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	2,450	0.056	0.0093
Meadow and Pasture Land	0.33		0.000	0.0000
Total	2,450	2,450	0.056	0.00928
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	2,450	0.0562	0.0534
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	0	0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	2,450	2,450	0.056	0.053
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County		
Impervious Surface Area		2,450 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		102.08 cubic feet
Swale Area Required at 6-inch depth		204.17 sq. ft
SRSM - Basic Treatment for PGIS, Moderate-Use Sites		
	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	63.72 cubic feet
$V=1815AP^{1.53}$	All other conditions	102.08 cubic feet
where:		
V =	Swale Volume in cubic feet	
A =	Impervious area to be treated (acres)	
P =	6-month NRCS Type II-24 hr storm	
	for Spokane region this = 1	

Flow Control	25-yr 24-hr	100-yr 24-hr	
Q = CIA			
Intensity (inches) @ T=5min.	2.80	4.00	
Pre-Development Runoff =	**0.026** cfs	**0.037** cfs	
Post-Development Runoff =	**0.150** cfs	**0.214** cfs	
Increase in Runoff	0.124 cfs		
Time of Concentration	5.00 Min.		
Post Construction Runoff	0.150 cfs		
Allowable Release Rate	0.026 cfs	0.037 cfs	
Design Release Rate	0 cfs	0 cfs	0.0 gpm
Maximum Storage Required (ft^3)	**176 cu. Ft.**	**251** cu. Ft.	

Modified Rational Method - (Bowstring Method) 25-yr 24-hr

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.15	**60**	**0.00**	**60**
5	300	2.80	0.15	60	0.00	60
10	600	2.10	0.11	79	0.00	79
15	900	1.75	0.09	94	0.00	94
20	1200	1.50	0.08	104	0.00	104
25	1500	1.35	0.07	116	0.00	116
30	1800	1.25	0.07	127	0.00	127
35	2100	1.10	0.06	129	0.00	129
40	2400	0.95	0.05	127	0.00	127
45	2700	0.90	0.05	135	0.00	135
50	3000	0.85	0.05	141	0.00	141
55	3300	0.82	0.04	149	0.00	149
60	3600	0.77	0.04	152	0.00	152
65	3900	0.75	0.04	160	0.00	160
70	4200	0.72	0.04	166	0.00	166
75	4500	0.69	0.04	170	0.00	170
80	4800	0.66	0.04	173	0.00	173
85	5100	0.63	0.03	175	0.00	175
90	5400	0.60	0.03	176	0.00	176
95	5700	0.55	0.03	171	0.00	171
100	6000	0.50	0.03	163	0.00	163

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) 100-yr 24-hr

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.21	**86**	**0.00**	**86**
5	300	4.00	0.21	86	0.00	86
10	600	2.90	0.15	109	0.00	109
15	900	2.20	0.12	118	0.00	118
20	1200	2.00	0.11	139	0.00	139
25	1500	1.75	0.09	150	0.00	150
30	1800	1.60	0.09	163	0.00	163
35	2100	1.50	0.08	176	0.00	176
40	2400	1.40	0.07	187	0.00	187
45	2700	1.28	0.07	192	0.00	192
50	3000	1.15	0.06	191	0.00	191
55	3300	1.08	0.06	196	0.00	196
60	3600	1.00	0.05	198	0.00	198
65	3900	0.97	0.05	207	0.00	207
70	4200	0.93	0.05	214	0.00	214
75	4500	0.90	0.05	221	0.00	221
80	4800	0.87	0.05	228	0.00	228
85	5100	0.73	0.04	203	0.00	203
90	5400	0.80	0.04	235	0.00	235
95	5700	0.78	0.04	242	0.00	242
100	6000	0.77	0.04	251	0.00	251

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	204.17 ft^2	Swale Design Depth	9 in		
Provided Swale Area	252.00 ft^2	25yr-24hr Depth	8.40 in.		
Min. Swale Volume, Flow Control	176 ft^3	100 yr- 24hr volume	251 ft^2		12.0
Provided Swale Volume	189 ft^3	Swale Total Volume (ft^3)	252	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	20
Description:	Songwood, N. Lane
Basin Area:	0.150 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	6,552	0.150	0.0248
Meadow and Pasture Land	0.33		0.000	0.0000
Total	6,552	6,552	0.150	0.02482
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	6,552	0.1504	0.1429
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	0	0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	6,552	6,552	0.150	0.143
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		6,552 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		273.00 cubic feet
Swale Area Required at 6-inch depth		546.00 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	170.42 cubic feet
$V=1815AP^{1.53}$	All other conditions	273.00 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.069**	cfs	**0.099**	cfs	
Post-Development Runoff =	**0.400**	cfs	**0.572**	cfs	
Increase in Runoff	0.331	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.400	cfs			
Allowable Release Rate	0.069	cfs	0.099	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**472**	**cu. Ft.**	**671**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.40	**161**	**0.00**	**161**
5	300	2.80	0.40	161	0.00	161
10	600	2.10	0.30	211	0.00	211
15	900	1.75	0.25	251	0.00	251
20	1200	1.50	0.21	279	0.00	279
25	1500	1.35	0.19	309	0.00	309
30	1800	1.25	0.18	340	0.00	340
35	2100	1.10	0.16	346	0.00	346
40	2400	0.95	0.14	340	0.00	340
45	2700	0.90	0.13	360	0.00	360
50	3000	0.85	0.12	377	0.00	377
55	3300	0.82	0.12	399	0.00	399
60	3600	0.77	0.11	407	0.00	407
65	3900	0.75	0.11	429	0.00	429
70	4200	0.72	0.10	443	0.00	443
75	4500	0.69	0.10	454	0.00	454
80	4800	0.66	0.09	462	0.00	462
85	5100	0.63	0.09	468	0.00	468
90	5400	0.60	0.09	472	0.00	472
95	5700	0.55	0.08	456	0.00	456
100	6000	0.50	0.07	436	0.00	436

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.57	**230**	**0.00**	**230**
5	300	4.00	0.57	230	0.00	230
10	600	2.90	0.41	291	0.00	291
15	900	2.20	0.31	315	0.00	315
20	1200	2.00	0.29	372	0.00	372
25	1500	1.75	0.25	401	0.00	401
30	1800	1.60	0.23	435	0.00	435
35	2100	1.50	0.21	472	0.00	472
40	2400	1.40	0.20	501	0.00	501
45	2700	1.28	0.18	512	0.00	512
50	3000	1.15	0.16	510	0.00	510
55	3300	1.08	0.15	525	0.00	525
60	3600	1.00	0.14	529	0.00	529
65	3900	0.97	0.14	555	0.00	555
70	4200	0.93	0.13	572	0.00	572
75	4500	0.90	0.13	592	0.00	592
80	4800	0.87	0.12	609	0.00	609
85	5100	0.73	0.10	543	0.00	543
90	5400	0.80	0.11	629	0.00	629
95	5700	0.78	0.11	647	0.00	647
100	6000	0.77	0.11	671	0.00	671

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	546.00	ft^2	Swale Design Depth	9	in
Provided Swale Area	679.00	ft^2	25yr-24hr Depth	8.34	in.
Min. Swale Volume, Flow Control	472	ft^3	100 yr- 24hr volume	671	ft^2 11.9
Provided Swale Volume	509	ft^3	Swale Total Volume (ft^3)	679	12" Depth

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	21
Description:	April Sound N. Lane
Basin Area:	0.076 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	3,305	0.076	0.0125
Meadow and Pasture Land	0.33		0.000	0.0000
Total	3,305	3,305	0.076	0.01252
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	3,305	0.0759	0.0721
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	0	0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	3,305	3,305	0.076	0.072
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		3,305 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		137.71 cubic feet
Swale Area Required at 6-inch depth		275.42 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	85.96 cubic feet
$V=1815AP^{1.53}$	All other conditions	137.71 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.035**	cfs	**0.050**	cfs	
Post-Development Runoff =	**0.202**	cfs	**0.288**	cfs	
Increase in Runoff	0.167	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.202	cfs			
Allowable Release Rate	0.035	cfs	0.050	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**238**	**cu. Ft.**	**339**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.20	**81**	**0.00**	**81**
5	300	2.80	0.20	81	0.00	81
10	600	2.10	0.15	106	0.00	106
15	900	1.75	0.13	126	0.00	126
20	1200	1.50	0.11	141	0.00	141
25	1500	1.35	0.10	156	0.00	156
30	1800	1.25	0.09	171	0.00	171
35	2100	1.10	0.08	175	0.00	175
40	2400	0.95	0.07	171	0.00	171
45	2700	0.90	0.06	182	0.00	182
50	3000	0.85	0.06	190	0.00	190
55	3300	0.82	0.06	201	0.00	201
60	3600	0.77	0.06	205	0.00	205
65	3900	0.75	0.05	216	0.00	216
70	4200	0.72	0.05	223	0.00	223
75	4500	0.69	0.05	229	0.00	229
80	4800	0.66	0.05	233	0.00	233
85	5100	0.63	0.05	236	0.00	236
90	5400	0.60	0.04	238	0.00	238
95	5700	0.55	0.04	230	0.00	230
100	6000	0.50	0.04	220	0.00	220

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.29	**116**	**0.00**	**116**
5	300	4.00	0.29	116	0.00	116
10	600	2.90	0.21	147	0.00	147
15	900	2.20	0.16	159	0.00	159
20	1200	2.00	0.14	188	0.00	188
25	1500	1.75	0.13	202	0.00	202
30	1800	1.60	0.12	219	0.00	219
35	2100	1.50	0.11	238	0.00	238
40	2400	1.40	0.10	252	0.00	252
45	2700	1.28	0.09	259	0.00	259
50	3000	1.15	0.08	257	0.00	257
55	3300	1.08	0.08	265	0.00	265
60	3600	1.00	0.07	267	0.00	267
65	3900	0.97	0.07	280	0.00	280
70	4200	0.93	0.07	288	0.00	288
75	4500	0.90	0.06	299	0.00	299
80	4800	0.87	0.06	307	0.00	307
85	5100	0.73	0.05	274	0.00	274
90	5400	0.80	0.06	317	0.00	317
95	5700	0.78	0.06	326	0.00	326
100	6000	0.77	0.06	339	0.00	339

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	275.42	ft^2	Swale Design Depth	9	in	
Provided Swale Area	344.00	ft^2	25yr-24hr Depth	8.30	in.	
Min. Swale Volume, Flow Control	238	ft^3	100 yr- 24hr volume	339	ft^2	11.8
Provided Swale Volume	258	ft^3	Swale Total Volume (ft^3)	344	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	22
Description:	Songwood N. Lane end
Basin Area:	0.043 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	1,894	0.043	0.0072
Meadow and Pasture Land	0.33		0.000	0.0000
Total	1,894	1,894	0.043	0.00717
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	1,894	0.0435	0.0413
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	0	0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	1,894	1,894	0.043	0.041
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		1,894 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		78.92 cubic feet
Swale Area Required at 6-inch depth		157.83 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	49.26 cubic feet
$V=1815AP^{1.53}$	All other conditions	78.92 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.020**	cfs	**0.029**	cfs	
Post-Development Runoff =	**0.116**	cfs	**0.165**	cfs	
Increase in Runoff	0.096	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.116	cfs			
Allowable Release Rate	0.020	cfs	0.029	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**136**	**cu. Ft.**	**194**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.12	**46**	**0.00**	**46**
5	300	2.80	0.12	46	0.00	46
10	600	2.10	0.09	61	0.00	61
15	900	1.75	0.07	72	0.00	72
20	1200	1.50	0.06	81	0.00	81
25	1500	1.35	0.06	89	0.00	89
30	1800	1.25	0.05	98	0.00	98
35	2100	1.10	0.05	100	0.00	100
40	2400	0.95	0.04	98	0.00	98
45	2700	0.90	0.04	104	0.00	104
50	3000	0.85	0.04	109	0.00	109
55	3300	0.82	0.03	115	0.00	115
60	3600	0.77	0.03	118	0.00	118
65	3900	0.75	0.03	124	0.00	124
70	4200	0.72	0.03	128	0.00	128
75	4500	0.69	0.03	131	0.00	131
80	4800	0.66	0.03	134	0.00	134
85	5100	0.63	0.03	135	0.00	135
90	5400	0.60	0.02	136	0.00	136
95	5700	0.55	0.02	132	0.00	132
100	6000	0.50	0.02	126	0.00	126

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.17	**66**	**0.00**	**66**
5	300	4.00	0.17	66	0.00	66
10	600	2.90	0.12	84	0.00	84
15	900	2.20	0.09	91	0.00	91
20	1200	2.00	0.08	108	0.00	108
25	1500	1.75	0.07	116	0.00	116
30	1800	1.60	0.07	126	0.00	126
35	2100	1.50	0.06	136	0.00	136
40	2400	1.40	0.06	145	0.00	145
45	2700	1.28	0.05	148	0.00	148
50	3000	1.15	0.05	147	0.00	147
55	3300	1.08	0.04	152	0.00	152
60	3600	1.00	0.04	153	0.00	153
65	3900	0.97	0.04	160	0.00	160
70	4200	0.93	0.04	165	0.00	165
75	4500	0.90	0.04	171	0.00	171
80	4800	0.87	0.04	176	0.00	176
85	5100	0.73	0.03	157	0.00	157
90	5400	0.80	0.03	182	0.00	182
95	5700	0.78	0.03	187	0.00	187
100	6000	0.77	0.03	194	0.00	194

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	157.83	ft^2	Swale Design Depth	6	in	
Provided Swale Area	460.00	ft^2	25yr-24hr Depth	3.56	in.	
Min. Swale Volume, Flow Control	136	ft^3	100 yr- 24hr volume	194	ft^2	5.1
Provided Swale Volume	230	ft^3	Swale Total Volume (ft^3)	460	12" Depth	

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Jurisdiction:	Bonner County
Design Storm for Flow Control:	25-yr 24-hr
Treatment Requirement:	1st 1/2 from impervious areas
Basin:	23
Description:	April Sound S. Lane
Basin Area:	0.103 acres
Terrain:	Rolling (2% - 10%)

Pre-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95		0.000	0.0000
Earth Shoulders	0.55		0.000	0.0000
Drives and Walks	0.95		0.000	0.0000
Gravel Pavement	0.605		0.000	0.0000
Lawns, Sandy Soi	0.165		0.000	0.0000
Lawns, Heavy Soil	0.242		0.000	0.0000
Grass Shoulders	0.275		0.000	0.0000
Side Slopes, Earth	0.66		0.000	0.0000
Side Slopes, Turf	0.33		0.000	0.0000
Median Area, Turf	0.33		0.000	0.0000
Cultivated Land, Clay and Loam	0.605		0.000	0.0000
Cultivated Land, Clay and Loam	0.33		0.000	0.0000
Woodland and Forest	0.165	4,482	0.103	0.0170
Meadow and Pasture Land	0.33		0.000	0.0000
Total	4,482	4,482	0.103	0.01698
		Pre Development Composite C		**0.165**

Post-Development Condition - C

Type of Cover	Rolling (2% - 10%)	Area (ft^2)	Area (acres)	Weighed C
Pavement and Roofs	0.95	4,482	0.1029	0.0977
Earth Shoulders	0.55	0	0.0000	0.0000
Drives and Walks	0.95		0.0000	0.0000
Gravel Pavement	0.605	0	0.0000	0.0000
Lawns, Sandy Soi	0.165		0.0000	0.0000
Lawns, Heavy Soil	0.242		0.0000	0.0000
Grass Shoulders	0.275		0.0000	0.0000
Side Slopes, Earth	0.66		0.0000	0.0000
Side Slopes, Turf	0.33		0.0000	0.0000
Median Area, Turf	0.33		0.0000	0.0000
Cultivated Land, Clay and Loam	0.605		0.0000	0.0000
Cultivated Land, Clay and Loam	0.33		0.0000	0.0000
Woodland and Forest	0.165		0.0000	0.0000
Meadow and Pasture Land	0.33		0.0000	0.0000
Total	4,482	4,482	0.103	0.098
		Post Development Composite C		**0.950**

Treatment Requirements

First Flush - Bonner County

Impervious Surface Area		4,482 sq. ft
Volume of 1st 1/2" from Impervious Surfaces		186.75 cubic feet
Swale Area Required at 6-inch depth		373.50 sq. ft

SRSM - Basic Treatment for PGIS, Moderate-Use Sites

	Subgrade Soils <12% fines, & infiltration rate	
$V=1133AP^{1.53}$	>0.15 in/hr	116.58 cubic feet
$V=1815AP^{1.53}$	All other conditions	186.75 cubic feet

where:

V =	Swale Volume in cubic feet
A =	Impervious area to be treated (acres)
P =	6-month NRCS Type II-24 hr storm
	for Spokane region this = 1

Flow Control	25-yr 24-hr		100-yr 24-hr		
Q = CIA					
Intensity (inches) @ T=5min.	2.80		4.00		
Pre-Development Runoff =	**0.048**	cfs	**0.068**	cfs	
Post-Development Runoff =	**0.274**	cfs	**0.391**	cfs	
Increase in Runoff	0.226	cfs			
Time of Concentration	5.00	Min.			
Post Construction Runoff	0.274	cfs			
Allowable Release Rate	0.048	cfs	0.068	cfs	
Design Release Rate	0	cfs	0	cfs	0.0 gpm
Maximum Storage Required (ft^3)	**323**	**cu. Ft.**	**459**	cu. Ft.	

Modified Rational Method - (Bowstring Method) **25-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**2.80**	0.27	**110**	**0.00**	**110**
5	300	2.80	0.27	110	0.00	110
10	600	2.10	0.21	144	0.00	144
15	900	1.75	0.17	171	0.00	171
20	1200	1.50	0.15	191	0.00	191
25	1500	1.35	0.13	211	0.00	211
30	1800	1.25	0.12	232	0.00	232
35	2100	1.10	0.11	237	0.00	237
40	2400	0.95	0.09	232	0.00	232
45	2700	0.90	0.09	247	0.00	247
50	3000	0.85	0.08	258	0.00	258
55	3300	0.82	0.08	273	0.00	273
60	3600	0.77	0.08	279	0.00	279
65	3900	0.75	0.07	293	0.00	293
70	4200	0.72	0.07	303	0.00	303
75	4500	0.69	0.07	310	0.00	310
80	4800	0.66	0.06	316	0.00	316
85	5100	0.63	0.06	320	0.00	320
90	5400	0.60	0.06	323	0.00	323
95	5700	0.55	0.05	312	0.00	312
100	6000	0.50	0.05	298	0.00	298

Intensity from ITD curve for Zone C, District 1, IDF curve 25 yr - 24 hour

Modified Rational Method - (Bowstring Method) **100-yr 24-hr**

#1	#2	#3	#4	#5	#6	#7
Time	Time	Intensity	Q dev.	V in	V out	Storage
Inc.	Inc.					
(min.)	(sec.)	(in./hr.)	(cfs)	(cu. ft.)	(cu. ft.)	(cu. ft.)
	(#1*60)		(A*C*#3)		(Outf.*#2)	(#5-#6)
5.00	**300.00**	**4.00**	0.39	**157**	**0.00**	**157**
5	300	4.00	0.39	157	0.00	157
10	600	2.90	0.28	199	0.00	199
15	900	2.20	0.22	215	0.00	215
20	1200	2.00	0.20	255	0.00	255
25	1500	1.75	0.17	274	0.00	274
30	1800	1.60	0.16	297	0.00	297
35	2100	1.50	0.15	323	0.00	323
40	2400	1.40	0.14	342	0.00	342
45	2700	1.28	0.13	351	0.00	351
50	3000	1.15	0.11	349	0.00	349
55	3300	1.08	0.11	359	0.00	359
60	3600	1.00	0.10	362	0.00	362
65	3900	0.97	0.09	379	0.00	379
70	4200	0.93	0.09	391	0.00	391
75	4500	0.90	0.09	405	0.00	405
80	4800	0.87	0.09	417	0.00	417
85	5100	0.73	0.07	371	0.00	371
90	5400	0.80	0.08	430	0.00	430
95	5700	0.78	0.08	442	0.00	442
100	6000	0.77	0.08	459	0.00	459

Intensity from ITD curve for Zone C, District 1, IDF curve 100 yr - 24 hour

Min. Swale Area, Treatment (6")	373.50	ft^2	Swale Design Depth	9	in	
Provided Swale Area	475.00	ft^2	25yr-24hr Depth	8.15	in.	
Min. Swale Volume, Flow Control	323	ft^3	100 yr- 24hr volume	459	ft^2	11.6
Provided Swale Volume	356	ft^3	Swale Total Volume (ft^3)	475	12" Depth	

APPENDIX C

Storm Water Conveyance Calculations

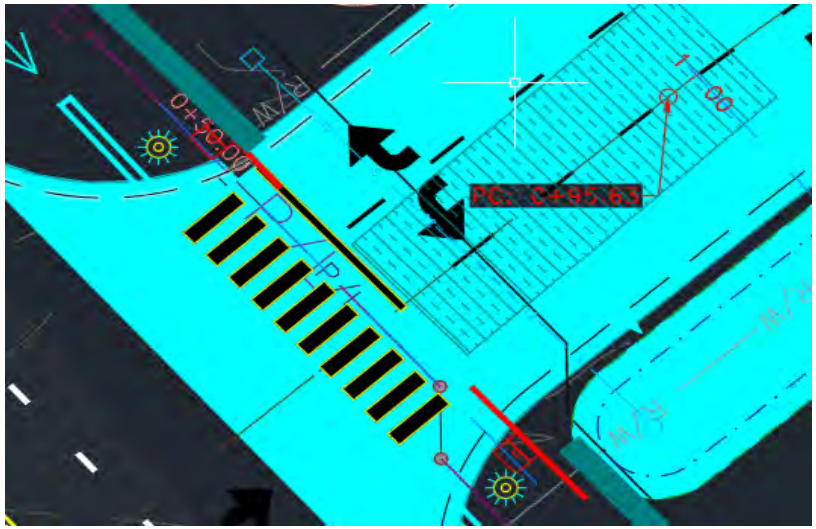
James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Client: Millie's 40
Date: 12/19/2023
Subj: Stormwater Management Calculations - Conveyance System
Ref: Eagle PUD Road System
Juridiction: Bonner County

Basin	Location	Description	100 Yr Peak Volume Required (cfs)	Conveyance Method	Capacity Provided (cfs)
5	Regent Square Entrance	N. CB to S. Drywell	0.329	8" Pipe	1.49
11	St. James Dr.	CB1 to SD-2	0.76	8" Pipe	3.16
	St. James Dr.	SD-2 to SD-3	2.15	8" Pipe	3.28
	St. James Dr.	SD-3 to SD-4	2.63	8" Pipe	3.96
	St. James Dr.	CB5 to SD-4	0.23	8" Pipe	2.59
	St. James Dr.	SD-4 to SD-6	3.01	8" Pipe	4.37
	St. James Dr.	CB7 to SD-6	0.49	8" Pipe	1.61
	St. James Dr.	SD-6 to SD-8	3.68	12" Pipe	4.14
	St. James Dr.	SD-8 to SD-9	3.80	12" Pipe	4.31
	St. James Dr.	SD-9 to Outlet	3.80	12" Pipe	17.53

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

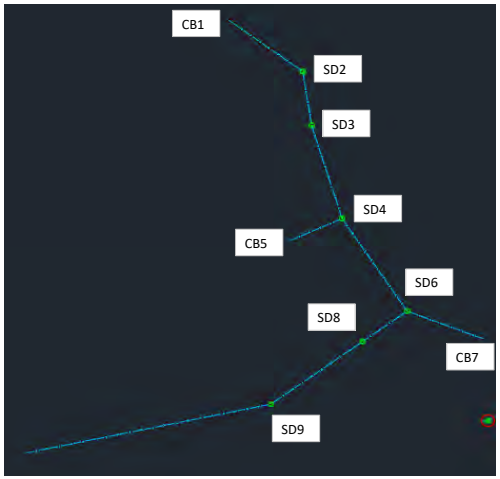
Basin: 5
Conveyance Catch Basin to Drywell

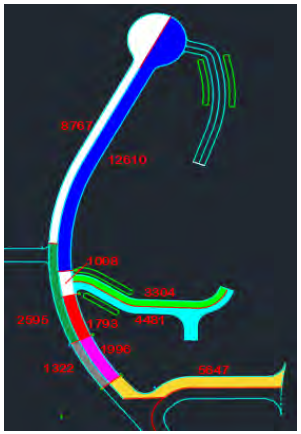


Piping Section	Upstream I.E.	Downstream I.E.	Length of Pipe (ft.)	Slope (%)	Slope (ft/ft)	Pipe Diameter (in)	Pipe Diameter (ft)	Pipe Type	Mannings n	Full Pipe Area (ft^2)	Hydaulic Radius R, D/4	$R^{(2/3)}$	Q, Flow (ft^3/sec)	V, Velocity (ft/sec)	Q, Flow GPM
Catch Basin to Drywell	2566	2565	66	1.52%	0.015152	8	0.67	PVC	0.013	0.349	0.17	0.30	1.491	4.27	669

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156
509-447-3626

Basin: 11
Conveyance St. James Dr.





Composite C 0.95
I at T=5 4 inches

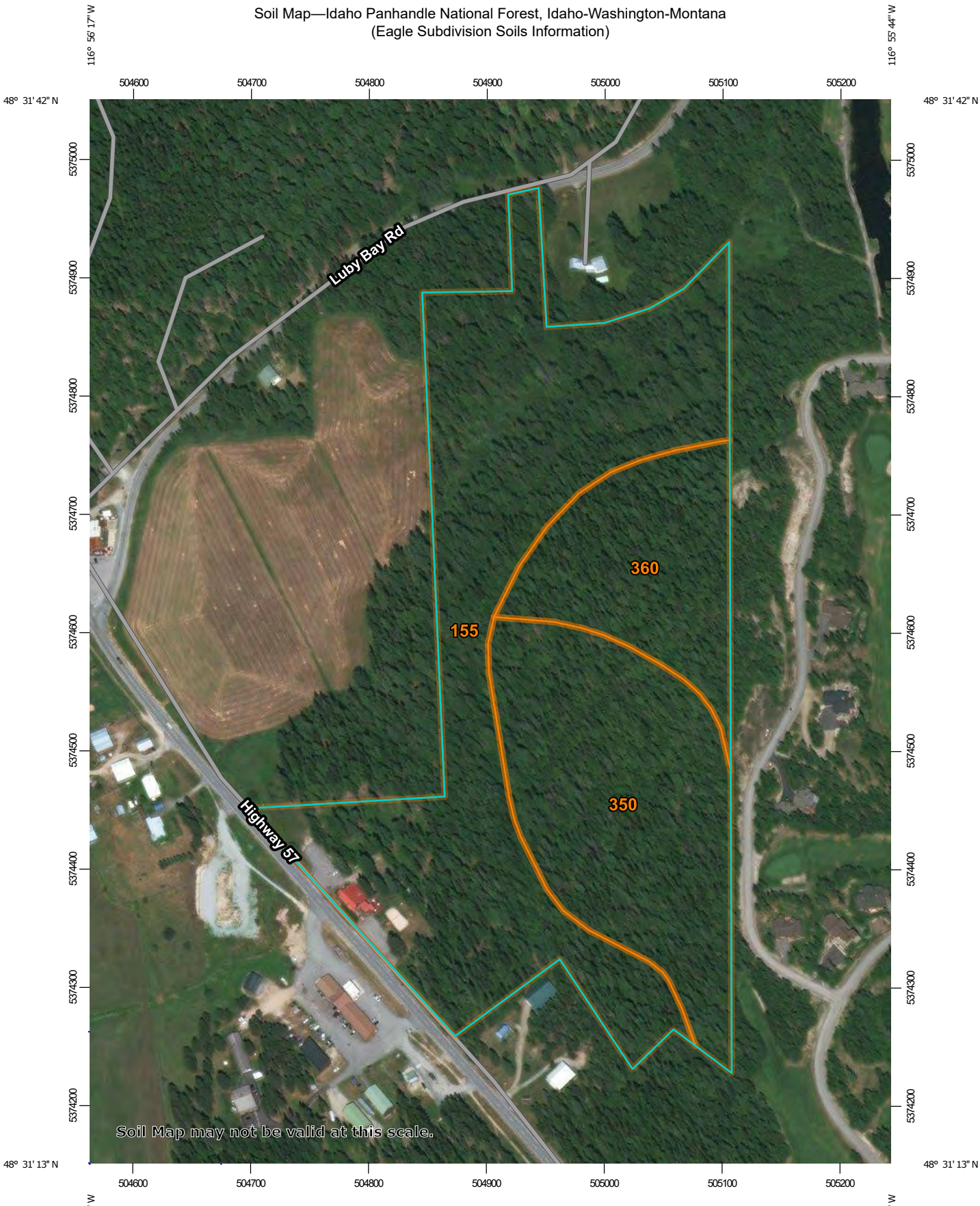
Piping Section	Upstream I.E.	Downstream I.E.	Length of Pipe (ft.)	Slope (%)	Slope (ft/ft)	Pipe Diameter (in)	Pipe Diameter (ft)	Pipe Type	Mannings n	Full Pipe Area (ft^2)	Hydaulic Radius R, D/4	$R^{(2/3)}$	Q, Flow (ft^3/sec)	V, Velocity (ft/sec)	Q, Flow GPM	100 yr Peak (cfs)
CB1 to SD-2	2648.75	2645	55.03	6.81%	0.068145	8	0.67	PVC	0.013	0.349	0.17	0.30	3.161	9.06	1419	0.76
SD-2 to SD-3	2644.9	2642	39.49	7.34%	0.073436	8	0.67	PVC	0.013	0.349	0.17	0.30	3.282	9.41	1473	2.15
SD-3 to SD-4	2641.9	2634	73.81	10.70%	0.107032	8	0.67	PVC	0.013	0.349	0.17	0.30	3.962	11.36	1778	2.63
CB5 to SD-4	2635.6	2634	35	4.57%	0.045714	8	0.67	PVC	0.013	0.349	0.17	0.30	2.589	7.42	1162	0.23
SD-4 to SD-6	2633.9	2623	83.65	13.03%	0.130305	8	0.67	PVC	0.013	0.349	0.17	0.30	4.372	12.53	1962	3.01
CB7 to SD-6	2624	2623	56.75	1.76%	0.017621	8	0.67	PVC	0.013	0.349	0.17	0.30	1.608	4.61	721	0.49
SD-6 to SD-8	2622.74	2622.25	36.13	1.35%	0.013451	12	1.00	PVC	0.013	0.785	0.25	0.40	4.141	5.28	1859	3.68
SD-8 to SD-9	2622.15	2621	78.83	1.46%	0.014588	12	1.00	PVC	0.013	0.785	0.25	0.40	4.313	5.49	1936	3.80
SD-9 to Outlet	2620.9	2578	177.88	24.12%	0.241174	12	1.00	PVC	0.013	0.785	0.25	0.40	17.535	22.34	7870	3.80

	Structure	Alignment Station	Road Station	Straight Plan Length (ft)	Road Station Length (ft)	Pipe Plan Length (ft)	Invert IN	Invert OUT	Slope (ft/ft)	Pipe Length	FG Elevation	Grate Elevation	Grate to I.E.	Drainage Area (ft^2)	100 yr Peak (cfs)
High pt	CB 1	-59.03	850					2648.75			2652	2651.5	2.75	8,767	0.76
				59.03	43.02	55.03			0.068145	55.1576					
	SD-2	0	806.98				2645	2644.9			2649.75	2649.25	4.35	24,681	2.15
				43.49	47.17	39.49			0.073436	39.61					
	SD-3	43.49	759.81				2642	2641.9			2646.75	2646.25	4.35	30,170	2.63
				77.81	84.02	73.81			0.107032	74.25					
	SD-4	121.3	675.79				2634	2633.9			2638.69	2638.19	4.29	34,558	3.01
				39	0	35			0.045714	35.04					
	CB-5	39	675.79					2635.6			2638.85	2638.35	2.75	2,595	0.23
				87.65	92.79	83.65			0.130305	84.36					
	SD-6	208.95	583				2623	2622.74			2631.7	2631.2	8.464	42,201	3.68
	CB-7	-58.75						2624			2627.25	2626.75	2.75	5,647	0.49
				58.75		56.75			0.017621	56.7588					
	SD-6	0	583				2623	2622.74			2631.7	2631.2	8.464	42,201	3.68
				40.13		36.13			0.013451	36.1333					
	SD-8	40.13	583				2622.25	2622.15			2631.86	2631.36	9.21	43,523	3.80
				82.83		78.83			0.014588	78.8384					
	SD-9	122.96	583				2621	2620.9			2630	2630	9.1	43,523	3.80
				179.88		177.88			0.241174	182.9801					
Low Pt	Outlet	302.84					2578								

APPENDIX D

NRCS Soil Survey Map and Descriptions

Soil Map—Idaho Panhandle National Forest, Idaho-Washington-Montana
(Eagle Subdivision Soils Information)



Map Scale: 1:4,380 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Idaho Panhandle National Forest, Idaho-Washington-Montana
Survey Area Data: Version 8, Sep 9, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2010—Nov 4, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
155	Caribouridge-Stien families, complex, outwash plains of mixed geology	23.4	55.3%
350	Andic Humudepts-Humic Udivitrands-Pearsoncreek families, dense substratum complex, glaciated mountain slopes, granitic geology, south aspects	12.2	28.8%
360	Glaciercreek-Humic Udivitrands-Pearsoncreek families, dense substratum complex, glaciated mountain slopes, granitic geology, north aspects	6.8	16.0%
Totals for Area of Interest		**42.3**	**100.0%**

Idaho Panhandle National Forest, Idaho-Washington-Montana

155—Caribouridge-Stien families, complex, outwash plains of mixed geology

Map Unit Setting

National map unit symbol: 2lfzx
Elevation: 1,940 to 5,280 feet
Mean annual precipitation: 34 to 42 inches
Mean annual air temperature: 34 to 48 degrees F
Frost-free period: 60 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Caribouridge and similar soils: 70 percent
Stien and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Caribouridge

Setting

Landform: Outwash terraces, hillslopes
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Volcanic ash over sandy alluvium and/or sandy outwash

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 3 inches: ashy silt loam
Bw1 - 3 to 16 inches: gravelly ashy silt loam
2Bw2 - 16 to 26 inches: very cobbly coarse sandy loam
2C1 - 26 to 46 inches: very gravelly coarse sand
2C2 - 46 to 61 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B
Ecological site: F043AY526WA - Warm-Frigid, Udic, Loamy Foothills/Mountainsides, ashy surface (western redcedar, moist herb) Thuja plicata / Clintonia uniflora, F043AY529WA - Warm-Frigid, Dry-Udic, Loamy Foothills/Mountainsides, ashy surface (Grand Fir Moist Herb) Abies grandis/Clintonia uniflora
Other vegetative classification: grand fir/queencup beadlily (CN520), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Description of Stien

Setting

Landform: Outwash terraces, hillslopes
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Volcanic ash over sandy alluvium and/or sandy outwash

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
Bw1 - 2 to 9 inches: ashy silt loam
Bw2 - 9 to 20 inches: very cobbly ashy silt loam
2Bw3 - 20 to 34 inches: extremely gravelly fine sandy loam
2C - 34 to 62 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F043AY517WA - Warm-Frigid, Xeric, Loamy Foothills/Mountainsides, ashy surface (Douglas-Fir/Warm Dry Shrub) Pseudotsuga menziesii / Physocarpus malvaceus - Symphoricarpos albus, F043AY521WA - Warm-Frigid, Moist-Xeric Loamy Foothills/Mountainsides, ashy surface (Grand Fir Warm Dry Shrub) Abies grandis - Pseudotsuga menziesii / Physocarpus malvaceus - Symphoricarpos albus
Other vegetative classification: grand fir/twinflower (CN590), Douglas-fir/common snowberry (CN310), Douglas-fir/ninebark (CN260)
Hydric soil rating: No

Minor Components

Pearsoncreek, sandy substratum

Percent of map unit: 10 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: F043AY526WA - Warm-Frigid, Udic, Loamy Foothills/Mountainsides, ashy surface (western redcedar, moist herb) Thuja plicata / Clintonia uniflora, F043AY529WA - Warm-Frigid, Dry-Udic, Loamy Foothills/Mountainsides, ashy surface (Grand Fir Moist Herb) Abies grandis/Clintonia uniflora
Other vegetative classification: grand fir/queencup beadlily (CN520), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Nanamkin

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F043AY516WA - Cool-Frigid, Xeric, Sandy Outwash Terraces, mixed ash surface (Douglas-fir/Cool Dry Grass) Pseudotsuga menziesii - Calamagrostis rubescens
Other vegetative classification: Douglas-fir/pinegrass-kinnikinnick phase (CN322)
Hydric soil rating: No

Data Source Information

Soil Survey Area: Idaho Panhandle National Forest, Idaho-Washington-Montana
Survey Area Data: Version 8, Sep 9, 2021

Idaho Panhandle National Forest, Idaho-Washington-Montana

350—Andic Humudepts-Humic Udivitrands-Pearsoncreek families, dense substratum complex, glaciated mountain slopes, granitic geology, south aspects

Map Unit Setting

National map unit symbol: 2lg37
Elevation: 2,030 to 5,410 feet
Mean annual precipitation: 37 to 50 inches
Mean annual air temperature: 34 to 48 degrees F
Frost-free period: 60 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Andic humudepts and similar soils: 30 percent
Humic udivitrands and similar soils: 25 percent
Pearsoncreek, shallow, and similar soils: 20 percent
Pearsoncreek, dense subsoil, and similar soils: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Andic Humudepts

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Volcanic ash over till

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 13 inches: gravelly ashy silt loam
2Bw - 13 to 60 inches: extremely cobbly silt loam

Properties and qualities

Slope: 10 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B
Ecological site: F043AY524WA - Frigid, Udic, Loamy, Foothills/ Mountainsides, ashy surface (Western Hemlock/Moist Forbes) Tsuga heterophylla / Clintonia uniflora , Tsuga heterophylla / Asarum caudatum
Other vegetative classification: western hemlock/queencup beadlily (CN570), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Description of Humic Udivitrands

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Volcanic ash over till

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A1 - 1 to 3 inches: gravelly ashy silt loam
A2 - 3 to 16 inches: extremely gravelly ashy silt loam
2Bw - 16 to 33 inches: extremely gravelly silt loam
3C - 33 to 60 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 10 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: F043AY524WA - Frigid, Udic, Loamy, Foothills/ Mountainsides, ashy surface (Western Hemlock/Moist Forbes) Tsuga heterophylla / Clintonia uniflora , Tsuga heterophylla / Asarum caudatum
Other vegetative classification: western hemlock/queencup beadlily (CN570), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Description of Pearsoncreek, Shallow

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave

Across-slope shape: Linear
Parent material: Volcanic ash over dense till

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: ashy silt loam
Bs - 7 to 14 inches: ashy silt loam
2Bw - 14 to 18 inches: very gravelly very fine sandy loam
2Bd - 18 to 60 inches: very gravelly very fine sandy loam

Properties and qualities

Slope: 10 to 35 percent
Depth to restrictive feature: 10 to 20 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: About 13 to 25 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: F043AY524WA - Frigid, Udic, Loamy, Foothills/ Mountainsides, ashy surface (Western Hemlock/Moist Forbes) Tsuga heterophylla / Clintonia uniflora , Tsuga heterophylla / Asarum caudatum, F043AY526WA - Warm-Frigid, Udic, Loamy Foothills/Mountainsides, ashy surface (western redcedar, moist herb) Thuja plicata / Clintonia uniflora
Other vegetative classification: western hemlock/queencup beadlily (CN570), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Description of Pearsoncreek, Dense Subsoil

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Volcanic ash over till

Typical profile

Oi - 0 to 3 inches: slightly decomposed plant material
A - 3 to 8 inches: gravelly ashy silt loam
AB - 8 to 11 inches: extremely cobbly ashy silt loam
2Bw - 11 to 16 inches: extremely gravelly silt loam
2Bd - 16 to 23 inches: extremely gravelly silt loam
2BC - 23 to 60 inches: extremely gravelly silt loam

Properties and qualities

Slope: 10 to 35 percent

Depth to restrictive feature: 10 to 20 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.07 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: F043AY528WA - Warm-Frigid, Udic, Loamy Foothills/Mountainsides, low AWC subsoils (western redcedar, moist herb) Thuja plicata / Clintonia uniflora
Other vegetative classification: western hemlock/queencup beadlily (CN570), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Minor Components

Humic udivitrands, dense substratum

Percent of map unit: 4 percent
Landform: Mountain slopes
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Other vegetative classification: western hemlock/queencup beadlily (CN570), western hemlock/oakfern (CN565), western redcedar/devil's club (CN550)
Hydric soil rating: No

Pearsoncreek, moderately deep

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Other vegetative classification: western hemlock/queencup beadlily (CN570), western hemlock/oakfern (CN565), western redcedar/devil's club (CN550)
Hydric soil rating: No

Idamont

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainbase
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: western redcedar/queencup beadlily (CN530), western hemlock/queencup beadlily (CN570)

Hydric soil rating: No

Data Source Information

Soil Survey Area: Idaho Panhandle National Forest, Idaho-Washington-Montana
Survey Area Data: Version 8, Sep 9, 2021

Idaho Panhandle National Forest, Idaho-Washington-Montana

360—Glaciercreek-Humic Udivitrands-Pearsoncreek families, dense substratum complex, glaciated mountain slopes, granitic geology, north aspects

Map Unit Setting

National map unit symbol: 2lg3d
Elevation: 2,000 to 6,230 feet
Mean annual precipitation: 39 to 52 inches
Mean annual air temperature: 34 to 52 degrees F
Frost-free period: 60 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Glaciercreek and similar soils: 30 percent
Humic udivitrands and similar soils: 25 percent
Pearsoncreek, dense substratum, and similar soils: 20 percent
Pearsoncreek, dense subsoil, and similar soils: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glaciercreek

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Volcanic ash over alluvium derived from granite

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 10 inches: ashy silt loam
2Bw - 10 to 18 inches: gravelly sandy loam
3Cd - 18 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 15 to 40 percent
Depth to restrictive feature: 10 to 20 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 10 to 16 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: F044AY504WA - Frigid, Udic, Loamy Foothills and Drainageways, high water table (Western Hemlock/Moist Forbes) Tsuga heterophylla / Clintonia uniflora , Tsuga heterophylla / Asarum caudatum
Other vegetative classification: western hemlock/queencup beadlily (CN570), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Description of Humic Udivitrands

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Volcanic ash over till

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A1 - 1 to 3 inches: gravelly ashy silt loam
A2 - 3 to 16 inches: extremely gravelly ashy silt loam
2Bw - 16 to 33 inches: extremely gravelly silt loam
3C - 33 to 60 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 15 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: F043AY524WA - Frigid, Udic, Loamy, Foothills/ Mountainsides, ashy surface (Western Hemlock/Moist Forbes) Tsuga heterophylla / Clintonia uniflora , Tsuga heterophylla / Asarum caudatum
Other vegetative classification: western hemlock/queencup beadlily (CN570), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Description of Pearsoncreek, Dense Substratum

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank

Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash over dense till

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 14 inches: cobbly ashy silt loam
2Bw1 - 14 to 24 inches: very cobbly fine sandy loam
2Bw2 - 24 to 41 inches: very gravelly fine sandy loam
2Bd - 41 to 51 inches: very gravelly fine sandy loam
2Cd - 51 to 61 inches: very gravelly fine sandy loam

Properties and qualities

Slope: 15 to 40 percent
Depth to restrictive feature: 39 to 59 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: About 31 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F043AY524WA - Frigid, Udic, Loamy, Foothills/ Mountainsides, ashy surface (Western Hemlock/Moist Forbes) Tsuga heterophylla / Clintonia uniflora , Tsuga heterophylla / Asarum caudatum, F043AY526WA - Warm-Frigid, Udic, Loamy Foothills/Mountainsides, ashy surface (western redcedar, moist herb) Thuja plicata / Clintonia uniflora
Other vegetative classification: western hemlock/queencup beadlily (CN570), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Description of Pearsoncreek, Dense Subsoil

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Volcanic ash over till

Typical profile

Oi - 0 to 3 inches: slightly decomposed plant material
A - 3 to 8 inches: gravelly ashy silt loam
AB - 8 to 11 inches: extremely cobbly ashy silt loam
2Bw - 11 to 16 inches: extremely gravelly silt loam
2Bd - 16 to 23 inches: extremely gravelly silt loam
2BC - 23 to 60 inches: extremely gravelly silt loam

Properties and qualities

Slope: 15 to 40 percent
Depth to restrictive feature: 10 to 20 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.07 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: F043AY528WA - Warm-Frigid, Udic, Loamy Foothills/Mountainsides, low AWC subsoils (western redcedar, moist herb) Thuja plicata / Clintonia uniflora
Other vegetative classification: western hemlock/queencup beadlily (CN570), western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Minor Components

Pend oreille, dense subsoil

Percent of map unit: 4 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainbase
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: western redcedar/queencup beadlily (CN530), western hemlock/queencup beadlily (CN570)
Hydric soil rating: No

Caribouridge, dense subsoil

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Other vegetative classification: western hemlock/queencup beadlily (CN570), western hemlock/oakfern (CN565), western redcedar/devil's club (CN550)
Hydric soil rating: No

Pearsoncreek, moderately deep

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Linear

Other vegetative classification: western hemlock/queencup beadlily (CN570), western hemlock/oakfern (CN565), western redcedar/devil's club (CN550)
Hydric soil rating: No

Data Source Information

Soil Survey Area: Idaho Panhandle National Forest, Idaho-Washington-Montana
Survey Area Data: Version 8, Sep 9, 2021

APPENDIX E

Site Geotechnical Report

Geotechnical Engineering Report
Priest Lake Project
Parcel No: RP60N05W252802A
Lamb Creek, Idaho

Prepared For:
Dennis Cunningham
ActiveWest Development & Building
PO Box 3398
Coeur d'Alene, Idaho 83816

% Kyle Cotten, P.E.
Kyle Cotten Consulting
10018 W Creek Side Rd
Coeur d'Alene, ID 83814

Prepared By:

LIBERTY GEOTECH

Liberty Geotechnical Engineering, Inc.
3012 N Sullivan Rd
Spokane Valley, Washington 99216
(509) 213-0400

PROFESSIONAL ENGINEER LICENSED 17056 STATE OF IDAHO BENJAMIN VANCE

2021.12.03 11:50:04-08'00'

Report Date: December 3, 2021
Job Number: 21362

Table of Contents

Appendices

1.0 EXECUTIVE SUMMARY

The following geotechnical engineering report has been prepared for the Priest Lake Project located along Luby Bay Road and State Highway 57 in Lamb Creek, Idaho. From a geotechnical perspective, the following concepts were identified as favorable for the proposed construction:

- The site is suitable for the proposed residential development provided the report recommendations are implemented.
- The native soil at the site will provide adequate foundation bearing capacity, stormwater drainage, and support for pavements on the proposed development.

The following items have been identified at the project site and proposed construction that should be carefully considered during design and construction:

- Groundwater was observed in the northern portion of the property where boreholes BH-1 and BH-2, and test pits TP-1 and TP-2, were located. The groundwater was noticed at a depth of four to six feet below the ground surface but rose to approximately two feet below the ground surface after excavation. No basements should be proposed in this area.
- Granitic bedrock is highly variable across the site. The shallow bedrock was observed in TP-3 to TP-5 and TP-9 to TP-11, which are mainly located at the middle portion and southwest end of the property.
- Global stability should be performed on all foundations that are within 5 feet of slopes steeper than 2H:1V (horizontal to vertical).
- Foundations should not rest on both bedrock and the native soil to reduce the risk of differential settlement. Portions of the house bearing on bedrock should be over-excavated by one foot and replaced with a compacted *Structural Fill.*
- The report is based on residential development. If development plans change, a revised report should be requested. No development plans should
- At this time, approved plan sheets have not been provided to Liberty Geotech. When plans are available, they should be provided to our firm for review to ensure the proposed construction matches the anticipated construction.
- The site features a relatively level slope and gently rolling hill towards the northeast of the property. Buildings constructed on the hillside require benching to prepare the subgrade prior to placing *Structural Fill* or other soil products. The benches should be created in accordance with the diagram in Appendix E.
- Undocumented fill from the road cut was observed in TP-3 to a depth three feet below the ground surface. The undocumented fill should be removed and replaced with a compacted *Structural Fill* below all settlement-prone structures and pavement.

Liberty Geotech should be involved in the design development and earthwork construction to help ensure that the report recommendations are incorporated into the design and construction. Liberty Geotech is available to discuss these items further in-person or via a conference call.

2.0 PROPOSED CONSTRUCTION

The proposed construction is a 40.1-acre residential development consisting of 93 residential lots. The type of construction is assumed to be one to two-story, wood-framed, single-family residences. The building foundation is assumed to be shallow, concrete footings with concrete slab-on-grade flooring support in the garage and a suspended wood-framed flooring system. No basement or subgrade floor areas are anticipated.

It has been verbally communicated by Dennis Cunningham with ActiveWest Development & Building that approximately five feet of fill will be placed on the northeast development (in the approximate vicinity of BH-2, TP-2, BH-1, and TP-1). No plans have been provided yet.

Furthermore, the recommendations included in this report are based on the site plan prepared by JAS and associates LLC, dated August 27, 2021.

3.0 GEOTECHNICAL EXPLORATION

Subsurface exploration was performed by excavating 11 test pits with a SANY SY26U mini-excavator. Subsurface exploration was performed at the project site on November 5, 2021. The test pits were excavated through the topsoil, undocumented fill, and glacial flood deposits and terminated due to bedrock, groundwater, proposed depth, and maximum equipment excavation depth. The contractor or client is recommended to notify Liberty Geotech if the soil conditions are different from those described in the following sections.

In addition, two exploratory borings were performed to a depth of 30-feet and 40-feet below the ground surface. The drilling was performed with a track mounted mini-drill rig. Standard penetration test (SPT) soil sampling and profiling by auger cuttings was performed. The sampler diameter was a standard split spoon sampler. The exploratory boring logs are attached in Appendix B: *Subsurface Exploration Results*.

Throughout this report, test pits and boreholes are abbreviated TP and B, respectively, and are hyphenated with a numbering system that corresponds to Appendix A: *Exploration Site Plan* and Appendix B: *Subsurface Exploration Results*. The test pits and boreholes depicted in Appendix A were located using the accuracy of a cell phone location system. The locations were not surveyed, and the accuracy is expected to be within 10-feet of the depicted location. Also, the elevation of each test pit was estimated using Google Earth™ mapping service with the GWS84 EGM96 geoid.

3.1 Geology, Topography, and Current Site Use

The *Geologic Map of the Bonners Ferry 30' X 60' Quadrangle, Idaho and Montana* (Miller, 2004) was reviewed to determine the geologic deposit at the site. The geologic map indicated that the geologic units were the Glacial and alluvial deposits (Quaternary), and the Granodiorite of Reeder Creek (Cretaceous). In addition, the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS, 2021) was reviewed. The soil survey indicates that the soil units are the following:

- Caribouridge-Stien families, complex, outwash plains of mixed geology consisting of slightly decomposed plant material from the ground surface to a depth of 1 inch, ashy silt loam from 1 inch to 3 inches, gravelly ashy silt loam from 3 inches to 16 inches, very cobbly coarse sandy loam from 16 inches to 26 inches, very gravelly coarse sand from 26 inches to 46 inches, and an extremely gravelly coarse sand from 46 inches to 61 inches. The soil survey describes the soil as volcanic ash over sandy alluvium and/or sandy outwash.
- Andic Humudepts-Humic Udivitrands-Pearsoncreek families, dense substratum complex, glaciated mountain slopes, granitic geology, south aspects consisting of slightly decomposed plant material from the ground surface to a depth of 1 inch, gravelly ashy silt loam from 1 inch to 13 inches, and an extremely cobbly silt loam from 13 inches to 60 inches. The soil survey describes the soil as volcanic ash over till.
- Glaciercreek-Humic Udivitrands-Pearsoncreek families, dense substratum complex, glaciated mountain slopes, granitic geology, north aspects consisting of slightly decomposed plant material from the ground surface to a depth of 1 inch, ashy silt loam from 1 inch to 10 inches, gravelly sandy loam from 10 inches to 18 inches, and very gravelly loamy coarse sand from 18 inches to 60 inches. The soil survey describes the soil as volcanic ash over alluvium derived from granite.

The site is currently undeveloped and is vegetated with pine trees and grasses. Based on the elevation obtained from Google Earth™, the site features rolling hills towards the north. Furthermore, according to the historical aerial photographs obtained from Google Earth™, it appears that there's no significant historical disturbance at the site.

3.2 Summary of Soil and Rock Encountered During Exploration

The soil encountered during the exploration is generally consistent with the geologic research. The northern section of the property where both boreholes, and TP-1 and TP-2 encountered topsoil overlying glacial flood deposits. A 1 ½-thick clay layer was observed in TP-1. Shallow groundwater was also noticed approximately four to six feet below the ground surface. The glacial flood deposits consist of loose to medium dense silty sand and poorly to well-graded sand. In addition, the boreholes encountered clayey sand to a depth of 20-feet below the ground surface.

The middle portion of the property towards the southwest end where TP-3 to TP-5 and TP-9 to TP-11 encountered glacial flood deposits and terminated on bedrock at depths ranging from 2 ¾-feet to 6-feet below the ground surface. Additionally, undocumented fill deriving from the roadcut was observed in TP-3 to a depth three feet below the ground surface.

The remaining test pits encountered a topsoil overlying glacial flood deposits consisting of medium dense poorly-graded sand with gravel.

3.3 Estimated Groundwater and Bedrock Elevations

Groundwater was observed in the northern portion of the property where boreholes BH-1 and BH-2, and test pits TP-1 and TP-2. The groundwater was noticed at a depth of four to six feet below the ground surface. The water table was confined and rose approximately 2 feet when encountered.

According to the well logs in the vicinity of the site (Idaho Department of Water Resources), the static water level is approximately 120-feet below the ground surface. Seasonal and annual fluctuations in groundwater levels should be anticipated.

Termination due to bedrock was encountered in TP-3, TP-4, TP-5, TP-9, and TP-11 at depths ranging from 2 ¾-feet to 6-feet below the ground surface.

4.0 LABORATORY TESTING RESULTS

Soil samples were obtained in the exploration locations at varying depths to characterize the glacial flood deposits. The results of the laboratory testing results are presented in Appendix C: *Laboratory Testing Results*. The laboratory testing was performed, referencing the following American Society for Testing and Material Standard Methods (ASTM):

- ASTM D1140 *Amount of Material in Soils Finer than the No. 200 Sieve*,
- ASTM D2216 *Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass,*
- ASTM D4318 *Liquid Limit, Plastic Limit, and Plasticity Index of Soils,* and
- ASTM D6913 *Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis*.

4.1 Summary of Laboratory Testing Results

The following table summarizes the laboratory tests that were performed on the soil samples obtained from the site. Additional details are provided in Appendix B and D.

Table 4.1.A - Summary of Laboratory Testing

Soil Unit	Lab Tests Performed	Summary of Results
Glacial flood	• Percent Passing No. 200	Soil is classified as sandy silt.

deposits	Sieve ● Gradation Sieve ● Natural Moisture Content	● C_u: 2.6 - 9.5 ● C_C: <1.5 ● % Passing No. 200: 2% - 57% ● Moisture Content: 21.4% - 25.1%

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 Earthwork

The following recommendations should be considered by the general contractors and earthwork subcontractors prior to providing a cost estimate for the earthwork on the project.

5.1.1 Subgrade Preparation

Clear and grub all vegetation, strip all topsoil and remove undocumented fill to prepare the subgrades under all shallow foundations, floor areas (either slab-on-grade or wood framed flooring areas), deck column pads, or concrete paved areas. Topsoil and undocumented fill removal is estimated to be 6 inches to 3.0 feet across the building footprints. Portions of the house bearing on bedrock should be over-excavated by one foot and replaced with a compacted *Structural Fill.*

The topography on the site will require benching to prepare the subgrade prior to placing *Structural Fill* or other soil products. The benches should be created in accordance with Appendix F: *Benching and Slope Fill Construction*.

Liberty Geotech should be contacted once the subgrade areas have been exposed to review the subgrade conditions.

5.1.2 Earthwork Soil Products, Compaction, and Testing Frequency

Different soil products should be used for different applications. The following table presents recommendations for anticipated earthwork construction:

Table 5.1.2.A - Soil product selection.

Soil Product	Project Use	Soil Description
Structural Fill	● Fill areas under foundation. ● Fill to achieve subgrade under slab or driveway. ● Backfill of shallow foundations.	Soil classified as: ● GP-GM or GW-GM ● GM ● SP-SM or SW-SM ● SM Soil should be free of organics, deleterious material, and all material

	• Fill outside 3 feet of the back face of retaining walls. • Soil restraining a retaining wall from sliding.	larger than 6-inches in diameter.
Concrete Slab Cushion	• Fill immediately below slab-on-grades, sidewalks and exterior hardscapes.	Soil should meet the percent passing the following sieve size: • 1": 80-100% • No. 4: 25-65% • No. 200: 7% maximum Soil should be free of organics, clay fines, deleterious material, and all material larger than 2-inches in diameter.
Crushed Surfacing	• Fill immediately below slab-on-grades, asphaltic-pavement, concrete pavement, sidewalks and exterior hardscapes.	Crushed rock should meet the percent passing the following sieve size: • 1-¼": 99-100% • 1": 80-100% • ⅝": 50-80% • No. 4: 25-45% • No. 40: 3-18% • No. 200: 7.5% maximum • Sand equivalent: 40 minimum Also, the material should be free of wood, roots, bark, and deleterious material. For roadway base the following requirements should also be met: • Fracture face: 75%, minimum • Los Angeles Wear, 500 rev: 35%, maximum. • Degradation factor: 15 minimum.
Landscaping Fill	• Non-structural fill areas. • Vegetated areas.	Soil meeting the following requirements: • Silt or Clay: 35% to 70% • Sand: 20% to 60% • Organic material: 2% to 20% • Deleterious materials (gravel, rock, slag, cinder, roots, sod): 5% max • pH between 5 and 7

The following table provides compaction recommendations specific to ASTM D1557 *Laboratory Compaction Characteristics of Soil Using Modified Effort.* All fill products should be compacted in lifts of soil not exceeding 12 inches measured prior to compaction.

Table 5.1.2.B - Compaction recommendation.

Project Use	Recommended Compaction
• Fill areas under foundation. • Fill to achieve subgrade under slab or driveway. • Fill immediately below slab-on-grades. • Fill immediately below the asphaltic-concrete pavement, concrete pavement, sidewalks, and exterior hardscapes.	95 percent of the maximum dry density of Modified Proctor.
• Exterior wall backfill. • Utility trench backfills.	92 percent of the maximum dry density of Modified Proctor.
• Non-structural fill areas. • Vegetated areas.	80 to 85 percent of the maximum dry density of Modified Proctor.

If more than 30 percent of native or imported *Structural Fill* material is retained on the ¾" sieve, ASTM D1557 *Laboratory Compaction Characteristics of Soil Using Modified Effort* is not recommended. In this case, a soil specific method specification can be developed. A nuclear density gauge can be used during earthwork operations to establish a moisture and compaction method that provides an acceptable maximum dry density. Method specification earthwork operations are recommended to have full-time soil testing to ensure adequate compaction.

The soil products are recommended to have passing compaction testing results at the following frequency to ensure the soil is uniformly meeting compaction requirements. Failing test results should be retested after additional compactive effort and, if necessary, water is added. At least 90% of the compaction testing results must achieve the required maximum dry density.

Table 5.1.2.C - Testing Frequency.

Project Use	Testing Frequency
• Below interior building concrete slabs for fill less than a vertical foot.	2,500 square feet and a minimum of 2 tests.
• Along the building footings for every vertical foot of fill.	50 lineal feet and a minimum of 2 tests.
• Structural fill placements larger than one foot in height	100 cubic yards
• Fill under asphalt parking areas and exterior concrete flatwork	5,000 square feet and a minimum of 2 tests.
• Utility trenches for every two vertical feet of trench backfill.	100 lineal feet and a minimum of 2 tests.

The jurisdictional requirements should be conformed to if there is a conflict with the requirements of Table 5.1.2.C. Excavations deeper than four feet must have adequate trenching protection or sloped back in accordance with state and federal requirements in order to be compaction tested.

5.1.3 Excavation Construction Considerations

Topsoil and glacial flood deposits are removable with a toothed-bucket on an excavator. The bedrock is highly variable across the site. Some bedrock may require removal to level the site during stripping operations. A hydraulic breaker is anticipated to be required to excavate the shallow foundations. Blasting for foundation excavation is not anticipated to be required. It would be advisable to step the footing foundation if hard rock is encountered that cannot be removed by a hydraulic breaker. Blasting may be considered to remove isolated rock outcroppings if it is more economical than removal with a hydraulic breaker. A blasting plan should be prepared if blasting is required.

No excavation support or sloped excavation have been reviewed in preparation of this report. The contractor should perform excavations in accordance with state and federal regulations. If requested, Liberty Geotech is available to provide further analysis of excavation support or shoring design. Liberty Geotech is not responsible for the safety of trenches, excavations or shoring support.

5.1.4 Weather-Related Earthwork Considerations

Wet weather, freezing conditions, or snow can impede or prevent earthwork operations. The following recommendations should be considered by the contractors and owners during construction:

1. It is not recommended that soil products are placed during freezing conditions. No concrete or soil products should be placed on frozen soil.
2. The steeply-sloped topography may cause hazardous working conditions during winter or wet weather conditions.
3. The on-site soils and other imported materials may become saturated during earthwork operations and will reduce operation production.
4. Stockpiles of soil products should be protected during wet weather. Soil products that have been compacted should be protected and not travelled on during wet weather to prevent disturbing the subgrade.

This report does not provide recommendations for erosion, runoff, trackout from trucks removing site stripping, or environmental considerations associated with earthwork operations.

5.2 Shallow Foundation Design

The following design parameters are provided based on the project understanding described in Section 2.0. Liberty Geotech should be notified to revise or confirm the following recommendations if the building location, locations of the site improvements, or structural loads change.

- Allowable bearing capacity for foundations: 3,500 psf, south of TP-3.
- Allowable bearing capacity for foundations: 1,500 psf, east of TP-3.
- Footing embedment for exterior foundations*:* 2 feet, or as required by the local jurisdiction for frost embedment.
- Estimated total settlement for foundations on *Structural Fill:* Less than 1 inch.
- A sliding coefficient of friction between the shallow foundations and native soil of 0.35 may be used.

Differential settlement can occur when two different foundations exert different bearing pressures on the soil. The magnitude of the differential settlement depends on the foundation pressure difference. Or, differential settlement can occur due to differences in the soil resistance to the foundation pressure. Footing foundations are not recommended to bear on both *Structural Fill* and bedrock to prevent differential settlement. The potential for differential settlement for this site is low due to the shallow bedrock. Differential settlement is anticipated to be less than ½ inch.

All foundations constructed on bedrock do not need to be embedded for frost heave. Foundations that are constructed on *Structural Fill* should be embedded 2-feet below the adjacent exterior ground surface to mitigate frost heave.

5.3 Concrete Slab Design and Construction Considerations

The following recommendations should be considered to be the minimum design requirements. The structural engineer's design supersedes these recommendations. A structural engineer should design concrete slabs supporting more than 200 pounds per square foot.

- The concrete slab should be a minimum of four inches thick.
- The slab reinforcement is recommended to not be less than No. 3 rebar, 18 inches on center in both directions, and constructed in the middle of the slab. There is a high probability that the concrete slab will crack if rebar is not constructed in the slab.
- The modulus of subgrade support is recommended to be 200 pounds per square inch per inch (pci).
- The slab should be supported with four inches of compacted *Concrete Slab Cushion* soil in accordance with Section 5.1.

Vapor transmission through the concrete slabs may damage moisture sensitive floor coverings. The design and ownership team should carefully consider the design publication *Guide to*

Concrete Floor and Slab Construction (ACI, 2015) before omitting a vapor retarder under the slab. The design and ownership team may consider omitting a vapor retarder under the slab based on lack of clay in the native soil, depth to groundwater, usage of *Concrete Slab Cushion*, and no proposed moisture sensitive floor coverings. If a moisture retarder is used, it should meet the requirements of ASTM E1643: *Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*.

Concrete slabs can crack because of numerous reasons. The following considerations should be mitigated during construction to reduce the risk of the concrete slabs cracking.

- The concrete mix design can be altered based on the ambient temperature, aggregate moisture content, anticipated time in the mix truck, and finishing methods. A poorly designed mix that does not incorporate these factors can cause concrete slabs to crack.
- The contractor's means and methods can cause concrete slabs to crack including improper placement of rebar support, improper crack control joints, improper curing methods or poor finishing techniques, and placing concrete during cold or hot weather.

5.4 Seismicity and Liquefaction

The proposed site is designated a **Site Class D**. The following table presents seismicity coefficients referencing the 2018 International Building Code (IBC) code. The acceleration parameters listed are based on interpolated values calculated from the IBC 2015 code (OSHPD). The interpolations were visually confirmed with the maps in Table 1613.2.1(1) through 1613.2.1(8) in the 2018 IBC.

Table 5.4.A Seismic Design Parameters

0.2 Second MCE Spectral Response Acceleration	S_s	0.31
0.2 Second MCE Spectral Response Acceleration	S_1	0.106
1.0 Second MCE Spectral Response Acceleration	S_{DS}	0.32
1.0 Second MCE Spectral Response Acceleration	S_{D1}	0.168
Design Peak Ground Acceleration	PGA_M	0.203

Latitude: 48.525461

Longitude: -116.93290

There is a very low potential for liquefaction based on the regional seismicity, and shallow bedrock.

5.5 Lateral Earth Pressure Design

The following table provides equivalent fluid pressures recommended to be used by the structural engineer to design retaining or basement walls. Walls with a back slope or slope in front of the wall (toe slope) should have global stability analyzed.

Table 5.5.A Lateral Earth Pressure Design Parameters

Equivalent Fluid Pressure Designation	Unit Weight (PCF)
Active Equivalent Fluid Pressure	35
At-rest Equivalent Fluid Pressure	50
Passive Equivalent Fluid Pressure	350

Flexible walls or concrete walls that are allowed to crack may be designed for the active equivalent fluid pressure. Soil that is preventing a retaining wall or foundation wall from sliding may be analyzed with the passive equivalent fluid pressure. Soil behind retaining walls or next to basement foundation walls should be free-draining *Retaining Wall Fill*.

5.6 Drainage and Stormwater Infiltration Recommendations

At this time, the location for drainage and stormwater infiltration was not yet determined. The soil conditions at the southeast portion (TP6, TP-7 and TP-10) of the property are suitable for subsurface infiltration. The following recommendations should be used by the civil engineer to design bio-infiltration swales, drywell structures, or infiltration galleries:

- The depth to a restrictive layer is at least 120-feet below the ground surface based on review of well logs available in the vicinity of the site.
- Swales and drywells should be located 10-feet from the edge of buildings and concrete hardscapes to minimize the effects of infiltration.
- Swales and drywells should not be located where shallow bedrock and groundwater were encountered.
- Hardscaping and landscaping should be sloped at least five percent away from buildings or settlement-prone site improvements.

Infiltration is not recommended for the northern development based on the shallow groundwater table. Subsurface infiltration using bio-infiltration swales or infiltration galleries may be designed with a hydraulic conductivity of 15 inches per hour, should be used for infiltration design. Single and double-depth drywells may utilize a design outflow rate of 0.3 and 0.87 cubic feet per second, respectively. Single and double depth drywells must conform to the jurisdiction specification in which they were constructed.

5.7 Pavement Section Design Recommendations

The following pavement design recommendations are provided for 3.0 inches of asphaltic-concrete pavement over 6.0 inches of *Crushed Surfacing*. The Structural Number for this pavement section is 1.98 and the number of passes with an equivalent single-axle load (ESAL) is 85,000. The following design parameters were used in the analysis:

- Subgrade support modulus, M_r: 9,000 psi.
- Reliability percent: 80%.
- Standard deviation: 0.45.
- Asphaltic-concrete layer coefficient, a1: 0.42.
- Aggregate base layer coefficient, a2: 0.12.
- Drainage coefficient of aggregate base, m: 1.0.

Paving operations can be observed and tested by Liberty Geotech at the request of the owner. Asphalt should be compacted to 92 percent of the Rice density. Liberty Geotech can provide additional traffic analysis or life-cycle cost analysis upon request.

6.0 DESIGN REVIEW AND CONSTRUCTION OBSERVATIONS

6.1 Geotechnical Consultant versus Geotechnical Inspector

In order to retain Liberty Geotech as the geotechnical engineer of record, the client must contact Liberty Geotech or require their contractor to contact Liberty Geotech to perform the observations and notifications that are recommended within this report. Liberty Geotech is not the engineer of record and has no liability for the construction or design based on this report if observations and material testing are not performed and meet the recommendations contained within this report. In addition, Liberty Geotech's liability is limited to the authorized proposal dated {proposal date}.

6.2 Revisions and Transfer of Geotechnical Recommendations

Liberty Geotech should be notified to update recommendations if the proposed development changes or subsurface soil or groundwater conditions vary from those described in this report. This report cannot be relied upon by property owners adjacent to this property without confirmation of their specific site soil conditions. Also, the report recommendations cannot be transferred to other business entities or subsequent property owners without written authorization. No warranty or certification of construction is provided with this report. Liberty Geotech should review the final construction drawings to confirm the incorporation of the recommendations of this report.

7.0 REFERENCES

ACI Committee 302. “Guide for Concrete Floor and Slab Construction.” ACI 302.1R-15. American Concrete Institute, P.O. Box 19150 Redford Station, Detroit, Michigan 48219.

Miller, Fred K., and Burmester, Russell F., 2004. Geologic Map of the Bonners Ferry 30' X 60' Quadrangle, Idaho and Montana. Idaho Geologic Survey.

Idaho Department of Water Resources. “Well Construction and Drilling.” Accessed November 22, 2021. http://idwr.idaho.gov/wells/find-a-well.html/

OSHPD. “Seismic Design Maps.” Accessed November 22, 2021. https://seismicmaps.org/

United States Department of Agriculture, Natural Resources Conservation Service. “Web Soil Survey.” Accessed November 22, 2021. http://websoilsurvey.nrcs.usda.gov/

APPENDIX A

Exploration Site Plan

EXPLORATION SITE PLAN

PRIEST LAKE PROJECTS

48.52495, -116.93193

PRIEST LAKE, IDAHO

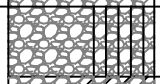
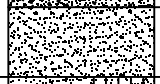
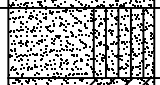
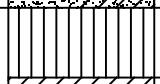
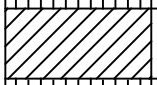
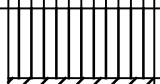
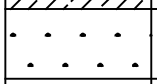
LIBERTY GEOTECH

JOB NO. 21362	DECEMBER 3, 2021	PLATE 1

APPENDIX B

Subsurface Exploration Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS GROUP SYMBOL	SOIL DECRIPTION
COURSE GRAINED SOIL	GRAVEL	CLEAN GRAVEL		GW	WELL-GRADED GRAVEL
				GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES		GM	SILTY GRAVEL SILTY GRAVEL WITH SAND
				GC	CLAYEY GRAVEL CLAYEY GRAVEL WITH SAND
	SAND	CLEAN SAND		SW	WELL-GRADED SAND
				SP	POORLY-GRADED SAND
		SAND WITH FINES		SM	SILTY SAND
				SC	CLAYEY SAND
	SILT AND CLAY LIQUID LIMIT LESS THAN 50%			ML	INELASTIC SILT
				CL	LEAN CLAY
				OL	ORGANIC SILT
FINE GRAINED SOIL	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%			MH	ELASTIC SILT
				CH	FAT CLAY
				OH	ORGANIC CLAY
				PT	PEAT

ABBREVATIONS
BGS - BELOW EXISTING GROUND SURFACE
N.E. - NOT ENCOUNTERED

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist										
GLACIAL FLOOD DEPOSITS - Sandy Silt (ML) Loose, Reddish Brown, Moist				1-Gallon Bag		57		21.4		About a foot and a half of clay.
GLACIAL FLOOD DEPOSITS - Well-Graded Sand (SW) , Light Gray, Moist										Ground water seeping, Sidewall caving
	2570	5								

Test pit terminated at 5-feet bgs due to groundwater.

Client: ActiveWest Development & Building	Test Pit Number: 1		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: 4	Logged By: JW		Sheet: 1 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist										
GLACIAL FLOOD DEPOSITS - Silty Sand (SM) Medium Dense, Reddish Brown, Moist										
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) , Light Gray, Moist	2575	5		1-Gallon Bag		2		21.8		Ground water seeping

Test pit terminated at 5-feet bgs due to groundwater.

Client: ActiveWest Development & Building	Test Pit Number: 2		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: 4	Logged By: JW		Sheet: 2 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
UNDOCUMENTED FILL - Silty Sand (SM) Loose, Brown, Moist	2615	0								Fill from road cut.
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Medium Dense, Tan, Moist		5		1-Gallon Bag						Cobbles observed

Test pit terminated at 5-feet bgs due to bedrock.

Client: ActiveWest Development & Building	Test Pit Number: 3		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: NE	Logged By: JW		Sheet: 3 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist	2640									Fill from road cut.
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Medium Dense, Tan, Moist										Cobbles observed

Test pit terminated at 4-feet bgs due to bedrock.

Client: ActiveWest Development & Building	Test Pit Number: 4		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: NE	Logged By: JW		Sheet: 4 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist	2625									
GLACIAL FLOOD DEPOSITS - Silty Sand (SM) Loose, Brown, Moist										

Test pit terminated at 2.75-feet bgs due to bedrock.

Client: ActiveWest Development & Building	Test Pit Number: 5		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: NE	Logged By: JW		Sheet: 5 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist	2600									
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Medium Dense, Tan, Moist		5								Cobbles and boulders observed.
	2595									

Test pit terminated at 6.5-feet bgs due to maximum equipment excavation depth.

Client: ActiveWest Development & Building	Test Pit Number: 6		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: NE	Logged By: JW		Sheet: 6 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist										
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Medium Dense, Tan, Moist	2610	5								Cobbles and boulders observed.

Test pit terminated at 7.5-feet bgs due to proposed depth.

Client: ActiveWest Development & Building	Test Pit Number: 7		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: NE	Logged By: JW		Sheet: 7 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist										
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Medium Dense, Tan, Moist	2635	5								Cobbles and boulders observed.

Test pit terminated at 6.5-feet bgs due to bedrock.

Client: ActiveWest Development & Building	Test Pit Number: 8		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: NE	Logged By: JW		Sheet: 8 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist										
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Medium Dense, Tan, Moist	2635	5								Cobbles and boulders observed.

Test pit terminated at 6-feet bgs due to bedrock.

Client: ActiveWest Development & Building	Test Pit Number: 9		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: NE	Logged By: JW		Sheet: 9 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist										
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Medium Dense, Tan, Moist	2580	5		1-Gallon Bag		4				
	2575									

Test pit terminated at 9-feet bgs due to proposed depth.

Client: ActiveWest Development & Building	Test Pit Number: 10		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: NE	Logged By: JW		Sheet: 10 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	LL, PL, PI	% PASSING NO. 200 SIEVE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silty Sand (SM) Loose, Brown, Moist										
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Gravel (SP) Medium Dense, Tan, Moist	2615	5								

Test pit terminated at 6-feet bgs due to bedrock.

Client: ActiveWest Development & Building	Test Pit Number: 11		
Project: Priest Lake Project	Project Number: 21362		
Equipment: SANY SY26U	Date Excavated: 11/5/2021		
Depth to Groundwater: NE	Logged By: JW		Sheet: 11 of 11

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	BLOW COUNTS (NVALUE)	% PASSING NO. 200 SIEVE	MOISTURE CONTENT (%)	LL, PL, PI	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silt with Sand (ML) Soft, Dark Brown, Moist										
GLACIAL FLOOD DEPOSITS - Clayey Sand (SC) Loose, Reddish Brown, Moist	2575									Profile logged by cuttings only, due to heaving sands.
GLACIAL FLOOD DEPOSITS - Clayey Sand (SC) Loose to Medium Dense, Reddish Brown, Moist						19	25.10			
		5				20	21.80			
	2570									
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Loose to Medium Dense, Tan, Saturated		10								
	2565									
		15								
	2560									
		20								Smooth Drilling
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Loose to Medium Dense, Tan, Saturated										Profile logged by cuttings only, due to heaving sands.
	2555									

Client: ActiveWest Development & Building	Borehole Number: 1		
Project: Priest Lake Project	Project Number: 21362		
Equipment: Tracks Mounted Mini Drill Rig	Date Excavated: 11/5-6/2021		
Depth to Groundwater: 4	Logged By: JW		Sheet: 1 of 4

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	BLOW COUNTS (NVALUE)	% PASSING NO. 200 SIEVE	MOISTURE CONTENT (%)	LL, PL, PI	VOID RATIO (%)	ADDITIONAL NOTES
	2545	25								Chatter at 2.5' to 5.0'.
		30		SS	5-3-5 (8)					No return.

Boreholes terminated at 30-feet bgs due to auger refusal.

Client: ActiveWest Development & Building	Borehole Number: 1		
Project: Priest Lake Project	Project Number: 21362		
Equipment: Tracks Mounted Mini Drill Rig	Date Excavated: 11/5-6/2021		
Depth to Groundwater: 4	Logged By: JW		Sheet: 2 of 4

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	BLOW COUNTS (NVALUE)	% PASSING NO. 200 SIEVE	MOISTURE CONTENT (%)	LL, PL, PI	VOID RATIO (%)	ADDITIONAL NOTES
TOPSOIL - Silt with Sand (ML) Soft, Dark Brown, Moist										
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand (SP) Loose to Medium Dense, Tan, Saturated	2580	5		SS	8-8-7 (15)					Light chatter at 2'.
				SS	2-5-7 (12)					Grounwater and heaving.
	2575	10		SS	4-1-0 (1)					
				SS	8-2-1 (3)					
	2570	15		SS	3-6-21 (27)					Auger was advacimg with sampler due to heaving sand.
	2565	20								Profile logged by cuttings at 17.5'.
GLACIAL FLOOD DEPOSITS - Poorly-Graded Sand with Silt (SP-SM) Loose to Medium Dense, Tan, Saturated										

Client: ActiveWest Development & Building	Borehole Number: 2		
Project: Priest Lake Project	Project Number: 21362		
Equipment: Tracks Mounted Mini Drill Rig	Date Excavated: 11/5-6/2021		
Depth to Groundwater: 6.4	Logged By: JW		Sheet: 3 of 4

USCS DESCRIPTION	ELEVATION (FT)	DEPTH (FT)	LITHOLOGY	SAMPLE INTERVAL	BLOW COUNTS (NVALUE)	% PASSING NO. 200 SIEVE	MOISTURE CONTENT (%)	LL, PL, PI	VOID RATIO (%)	ADDITIONAL NOTES
	2565	25								
	2565	30								
		35								
		40		SS	2-1-1 (2)	19				

Client: ActiveWest Development & Building	Borehole Number: 2		
Project: Priest Lake Project	Project Number: 21362		
Equipment: Tracks Mounted Mini Drill Rig	Date Excavated: 11/5-6/2021		
Depth to Groundwater: 6.4	Logged By: JW		Sheet: 4 of 4

APPENDIX C

Laboratory Testing Results

ASTM D6913 Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

Project: Priest Lake Project **Test No.:** 2 **Testing Date:** 11/9/2021

Job No: 21362 **Sample Location:** B-2 @ 40-41.5 **Lab Technician:** Garrett Higgins

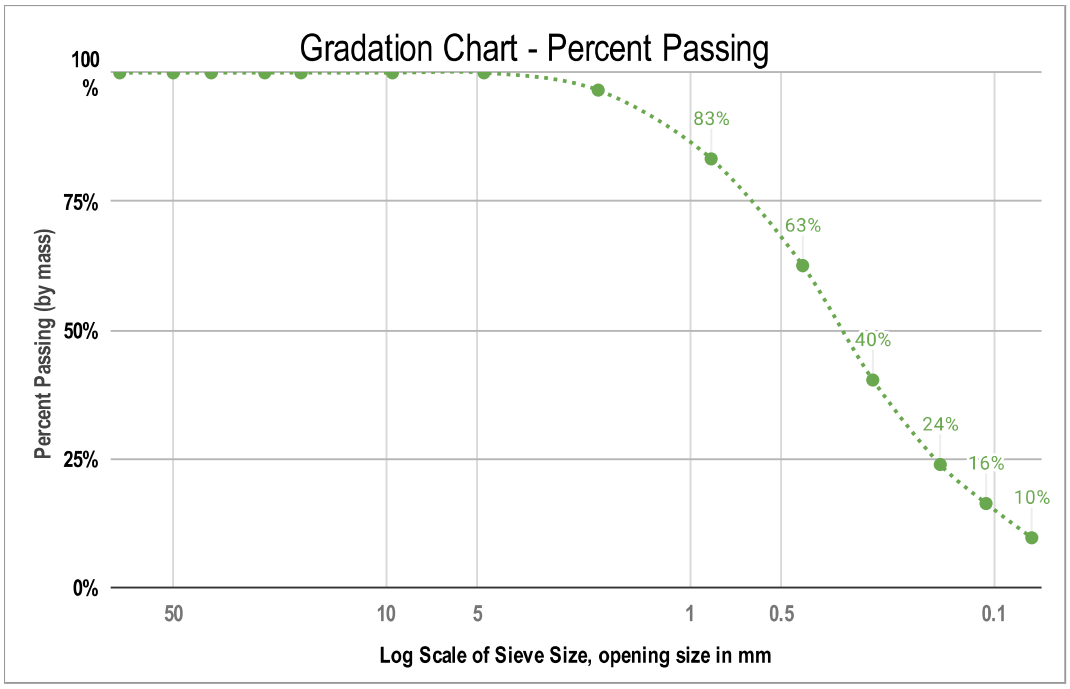
Method Used: Method A
Total Sample Mass: 162 grams
Drying Method: Oven Dry

Max Particle Size: No. 10
Minimum Sample Size: 50 grams

LIBERTY GEOTECH

Summary:

3"	100%
2"	100%
1.5"	100%
1"	100%
3/4"	100%
3/8"	100%
#4	100%
#10	97%
#20	83%
#40	63%
#60	40%
#100	24%
#140	16%
#200	10%
Pan	0%



Notes:

Excluded Material: None.

Additional Results

Soil Classification: Poorly-Graded Sand with Silt
Percent Moisture: 19.0%
%Gravel: 0% **%Sand:** 90% **%Fines:** 10%
Coefficient of Uniformity, Cu: 5.3
Coefficient of Curvature, Cc: 1.3

ASTM D6913 Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

Project: Priest lake Project | **Test No.:** 3 | **Testing Date:** 11/15/2021

Job No: 21362 | **Sample Location:** TP-1 @ 2' | **Lab Technician:** Alex Raney

Method Used: Method A | Max Particle Size: No. 10

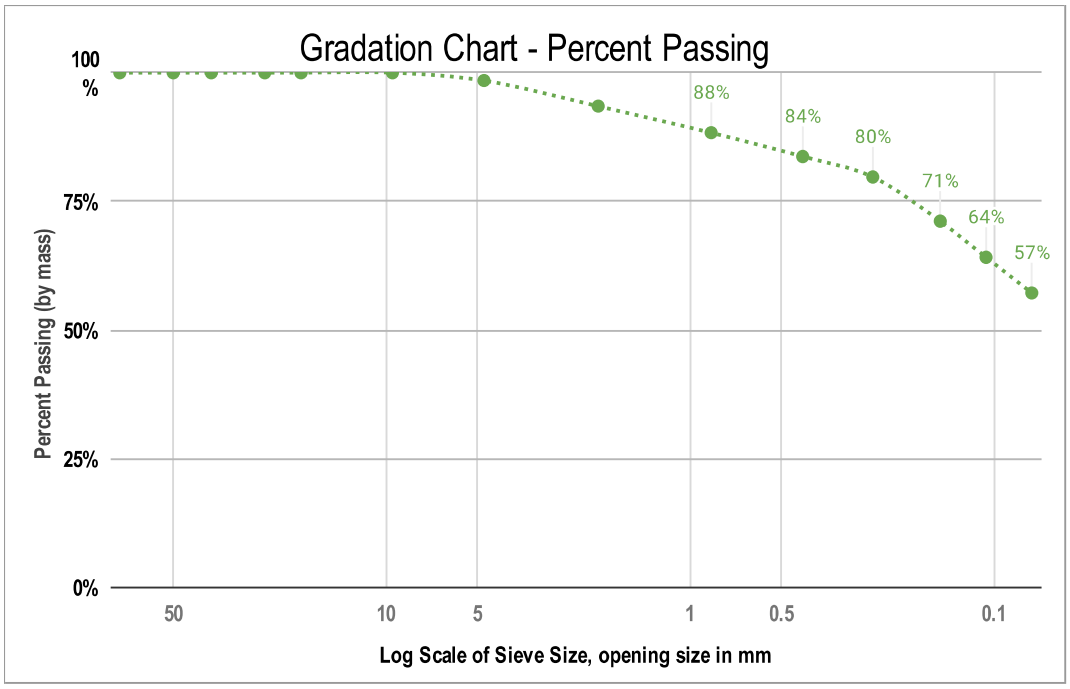
Total Sample Mass: 410 grams | Minimum Sample Size: 50 grams

Drying Method: Oven Dry

LIBERTY GEOTECH

Summary:

3"	100%
2"	100%
1.5"	100%
1"	100%
3/4"	100%
3/8"	100%
#4	98%
#10	94%
#20	88%
#40	84%
#60	80%
#100	71%
#140	64%
#200	57%
Pan	0%



Notes:

Excluded Material: None.

Additional Results

Soil Classification: Sandy Silt

Percent Moisture: 21.4%

%Gravel: 2% **%Sand:** 41% **%Fines:** 57%

ASTM D6913 Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

Project: Priest lake Project **Test No.:** 4 **Testing Date:** 11/15/2021

Job No: 21362 **Sample Location:** TP-2@4ft **Lab Technician:** Alex Raney

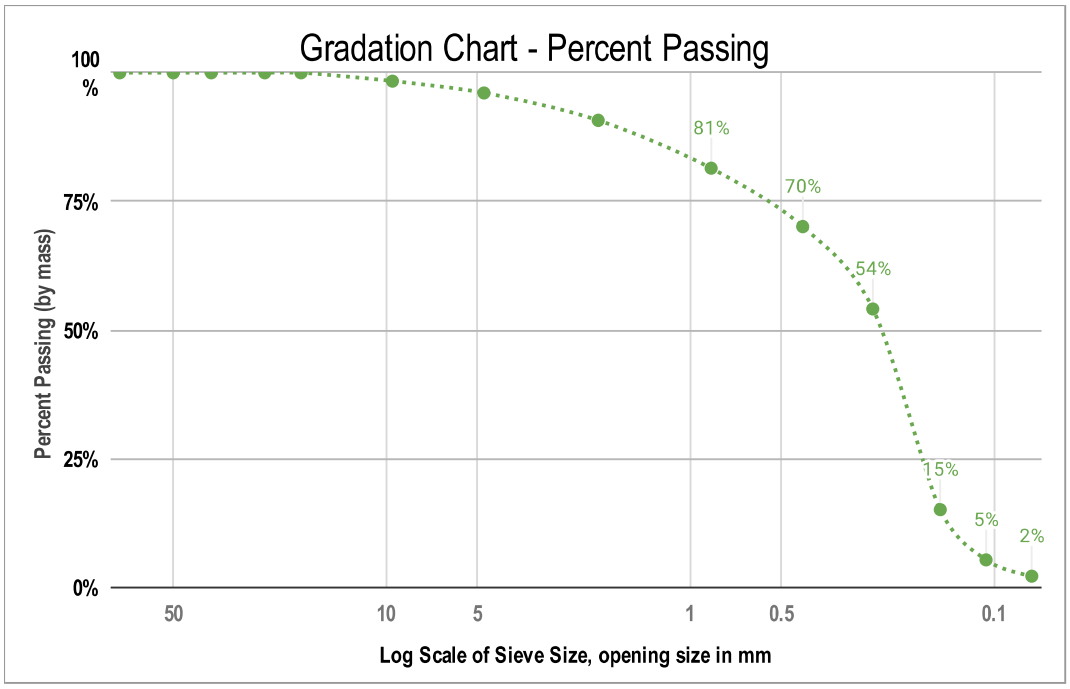
Method Used: Method A
Total Sample Mass: 940 grams
Drying Method: Oven Dry

Max Particle Size: No. 10
Minimum Sample Size: 50 grams

LIBERTY GEOTECH

Summary:

3"	100%
2"	100%
1.5"	100%
1"	100%
3/4"	100%
3/8"	98%
#4	96%
#10	91%
#20	81%
#40	70%
#60	54%
#100	15%
#140	5%
#200	2%
Pan	0%



Notes:

Excluded Material: None.

Additional Results

Soil Classification: Poorly-Graded Sand
Percent Moisture: 21.8%

%Gravel: 4% **%Sand:** 94% **%Fines:** 2%

Coefficient of Uniformity, Cu: 2.6
Coefficient of Curvature, Cc: 0.8

ASTM D6913 Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

Project: Priest lake Project **Test No.:** 6 **Testing Date:** 12/1/2021

Job No: 21362 **Sample Location:** TP-10 @ 8' **Lab Technician:** Alex Raney

Method Used: Method A Max Particle Size: 3/4"

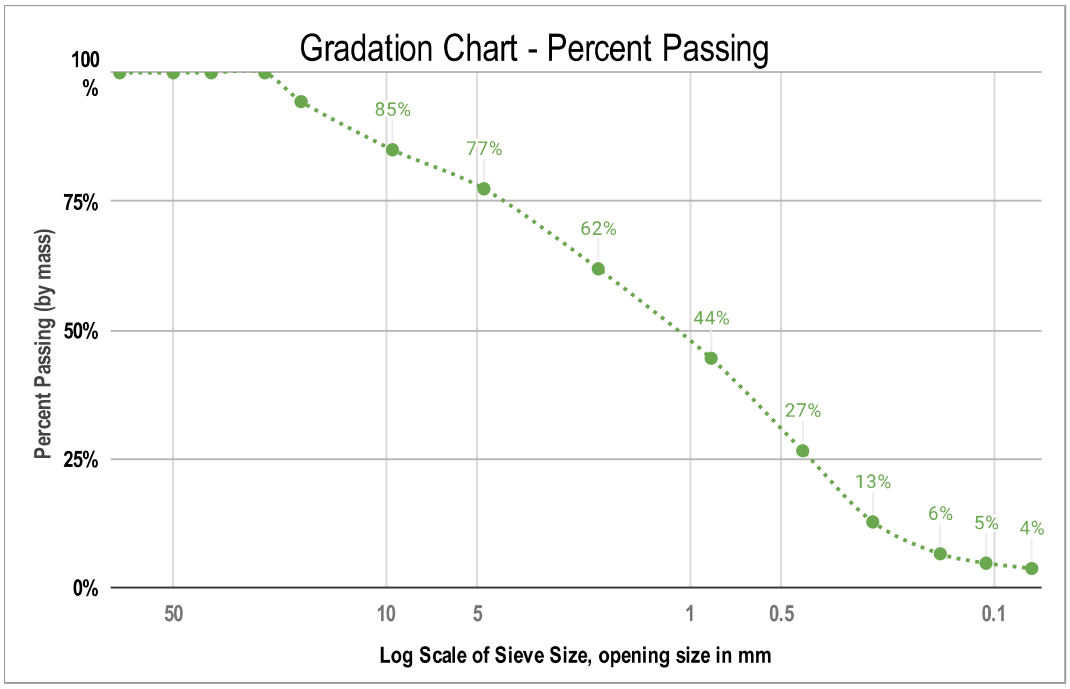
Total Sample Mass: 1,364 grams Minimum Sample Size: 1,300 grams

Drying Method: Oven Dry

LIBERTY GEOTECH

Summary:

3"	100%
2"	100%
1.5"	100%
1"	100%
3/4"	94%
3/8"	85%
#4	77%
#10	62%
#20	44%
#40	27%
#60	13%
#100	6%
#140	5%
#200	4%
Pan	0%



Notes:

Excluded Material: None.

Additional Results

Soil Classification: Poorly-Graded Sand with Gravel

Percent Moisture: Not Tested

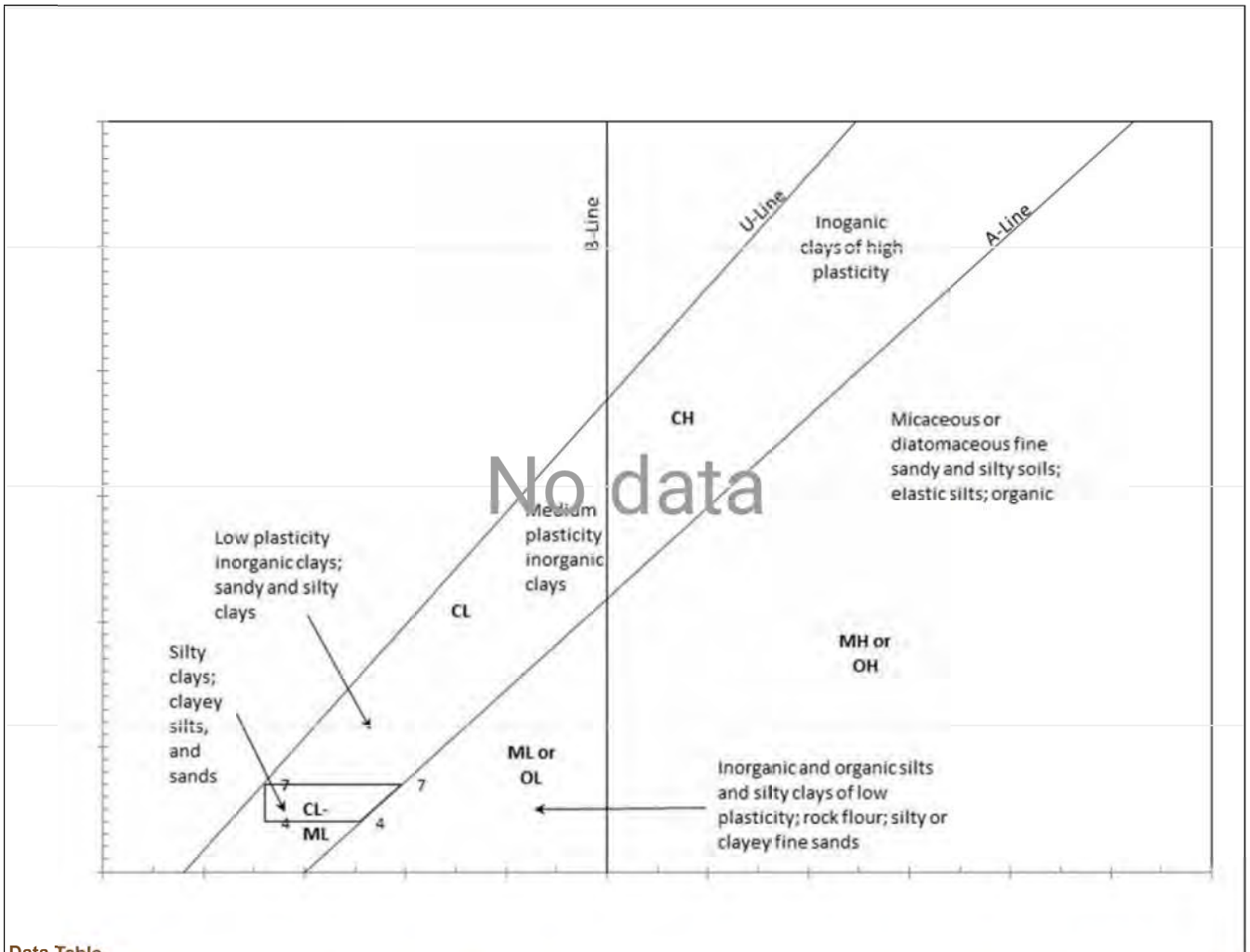
%Gravel: 23% **%Sand:** 74% **%Fines:** 4%

Coefficient of Uniformity, Cu: 9.5

Coefficient of Curvature, Cc: 0.7

ASTM D4318 Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index, LL PL PI

Project: Priest lake Project
Job No: 21362
Test No.: 3
Testing Date: 11/15/2021
Laboratory Technician: Alex Raney
Number of Tests: 1



Data Table

Test No.	Location	Liquid Limit	Plastic Limit	Plastic Index	Soil Decription and Color	% Ret. on No. 40	As Rec. Moisture %
1	TP-1 at 2 Ft	NP	NP	NP	Brown Sandy Silt	16	21.4
2							
3							
4							
5							
6							

The plastic limit was determined by hand rolled method. The liquid limit was determined with a manual liquid limit device with a plastic grooving tool. The dry preparation method was used, unless otherwise noted.

APPENDIX D

Photo Log

Appendix D: Photo Log

PHOTO 1: TP-1

PHOTO 2: TP-1 GROUNDWATER SEEPAGE AT 4-FEET.

PHOTO 3: TP-2

PHOTO 4: TP-2 GROUNDWATER SEEPAGE AT 4-FEET.

Appendix D: Photo Log

PHOTO 5: TP-2

PHOTO 6: TP-2

PHOTO 7: TP-2 IRON STAINING ON SOIL

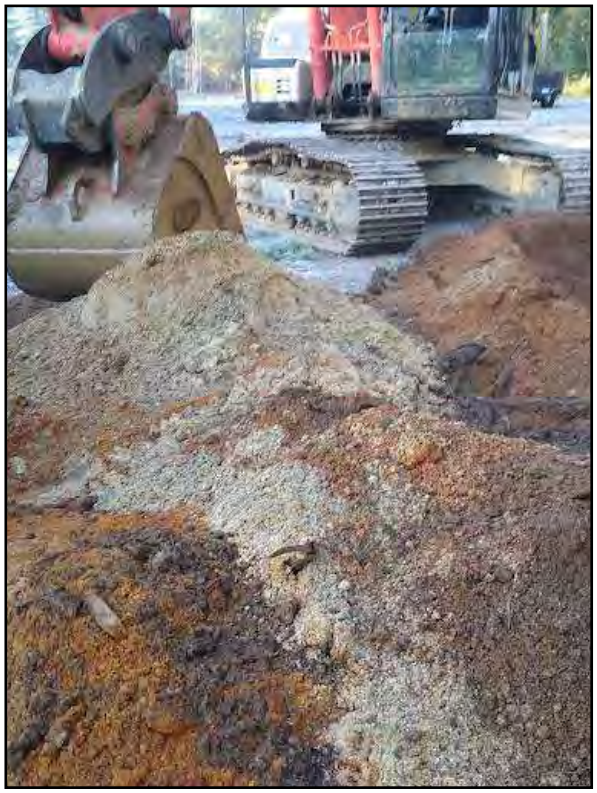


PHOTO 8: TP-2

Appendix D: Photo Log

PHOTO 9: TP-3

PHOTO 10: TP-3

PHOTO 11: TP-3 UNDOCUMENTED FILL FROM ROADWAY CUT.

PHOTO 12: TP-4

Appendix D: Photo Log

PHOTO 13: TP-4

PHOTO 14: TP-5

PHOTO 15: TP-5

PHOTO 16: TP-6

Appendix D: Photo Log

PHOTO 17: TP-6

PHOTO 18: TP-7

PHOTO 19: TP-7

PHOTO 20: TP-8

Appendix D: Photo Log

PHOTO 21: TP-8

PHOTO 22: TP-8

PHOTO 23: TP-9

PHOTO 24: TP-9

Appendix D: Photo Log

PHOTO 25: TP-9

PHOTO 26: TP-10

PHOTO 27: TP-10 SANDY STOCKPILE

PHOTO 28: TP-11

Appendix D: Photo Log

PHOTO 29: TP-11

PHOTO 30: B-2 AT 2-4 FEET.

PHOTO 31: B-2 AT 5-6.5 FEET.

PHOTO 32: B-2 CUTTING AT 20-FEET

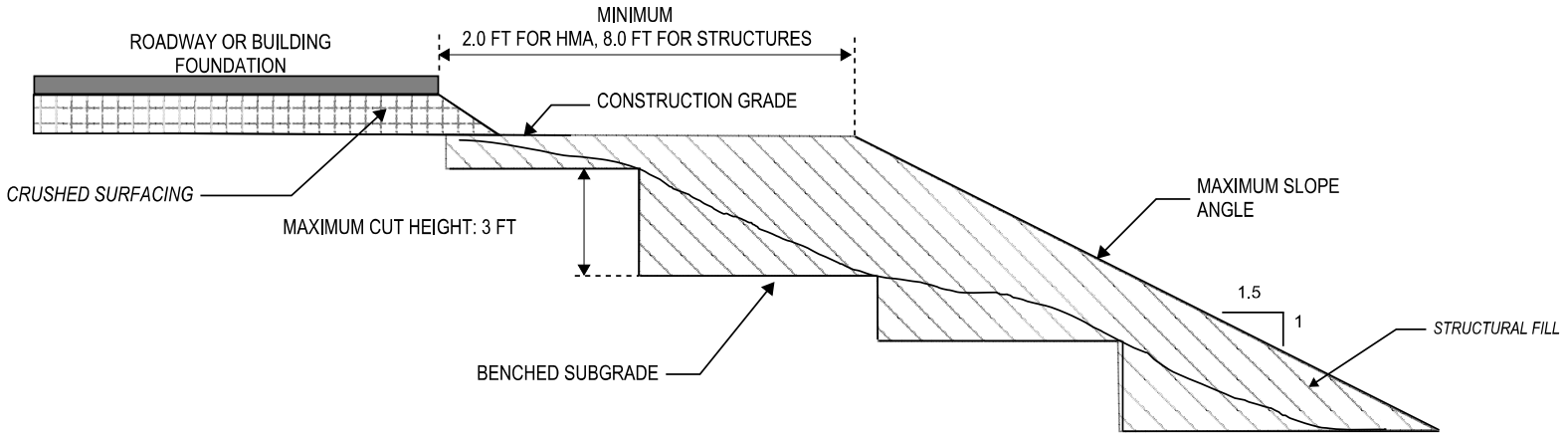
Appendix D: Photo Log

PHOTO 33: B-2

APPENDIX E

BENCHING AND SLOPE FILL REQUIREMENTS

BENCHING AND CONSTRUCTION REQUIREMENTS FOR SLOPE CONSTRUCTION



GENERAL NOTES

1. THE SLOPE BENCHING SHOULD BE CONSTRUCTED ON SUBGRADE SURFACE THAT HAVE BEEN PREPARED IN ACCORDANCE WITH THE *SITE STRIPPING* OF THE GEOTECHNICAL REPORT. THE SUBGRADE SHOULD BE APPROVED BY THE GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF THE FIRST LIFT.
2. ALL SLOPING SURFACES SHOULD BE BENCHED WITH A MAXIMUM VERTICAL CUT OF 3 FEET.
3. ALL LOOSE LIFT HEIGHTS SHOULD BE LIMITED TO 12 INCHES PRIOR TO COMPACTION
4. REFER TO THE GEOTECH REPORT FOR ADDITIONAL DESIGN RECOMMENDATIONS AND CONSTRUCTION RECOMMENDATIONS.

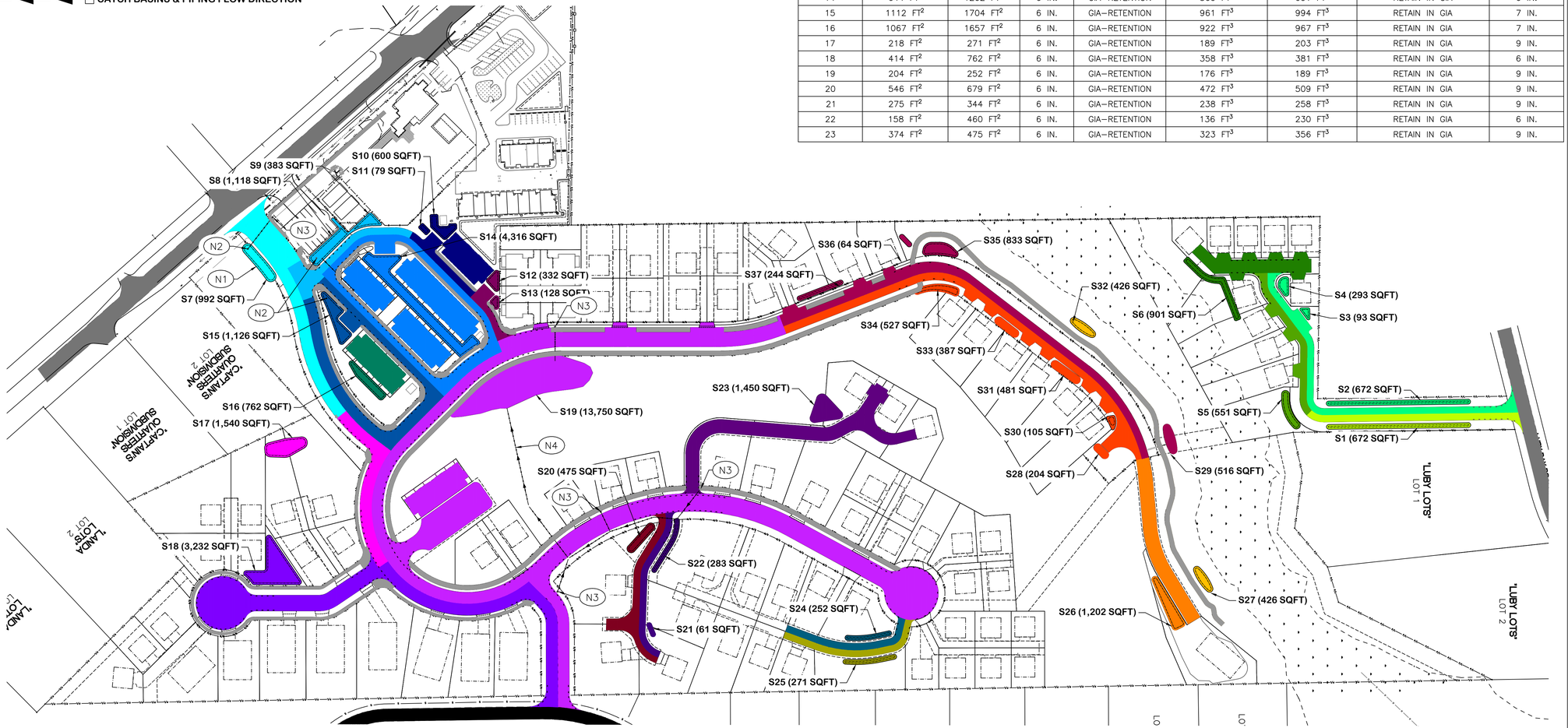
BENCHING AND SLOPE FILL REQUIREMENTS PRIEST LAKE PROJECTS 48.52495, -116.93193 PRIEST LAKE, IDAHO		
LIBERTY GEOTECH		
JOB NO. 21362	DECEMBER 3, 2021	PLATE 2

NOTES FOR THIS DETAIL

(N1) PROPOSED SWALE, TYP.
(N2) PROPOSED SINGLE BARREL DRYWELL, SEE DETAIL 4.4/66
(N3) PROPOSED CATCH BASIN, SEE DETAIL 4.3/66
(N4) PROPOSED PVC ASTM D3034 STORM DRAIN PIPE

1 BASIN / SWALES 1 CATCHMENT AREA
2 BASIN / SWALES 2,3,4 CATCHMENT AREA
3 BASIN / SWALES 5 CATCHMENT AREA
4 BASIN / SWALES 6 CATCHMENT AREA
5 BASIN / SWALES 7 CATCHMENT AREA
6 BASIN / SWALES 8, 9 CATCHMENT AREA
7 BASIN / SWALES 9 CATCHMENT AREA
8 BASIN / SWALES 15 CATCHMENT AREA
9 BASIN / SWALES 17 CATCHMENT AREA
10 BASIN / SWALES 18 CATCHMENT AREA
11 BASIN / SWALES 19 CATCHMENT AREA
12 BASIN / SWALES 23 CATCHMENT AREA
13 BASIN / SWALES 27, 32 CATCHMENT AREA
14 BASIN / SWALES 26 CATCHMENT AREA
15 BASIN / SWALES 28, 30, 31, 33, 34 CATCHMENT AREA
16 BASIN / SWALES 29, 35, 36, 37 CATCHMENT AREA
17 BASIN / SWALES 25 CATCHMENT AREA
18 BASIN / SWALES 16 CATCHMENT AREA
19 BASIN / SWALES 24 CATCHMENT AREA
20 BASIN / SWALES 10, 11 CATCHMENT AREA
21 BASIN / SWALES 21, 22 CATCHMENT AREA
22 BASIN / SWALES 12, 13 CATCHMENT AREA
23 BASIN / SWALES 20 CATCHMENT AREA

CATCH BASINS & PIPING FLOW DIRECTION



SWALE TABLE

BASIN/SWALE	TREATMENT AREA REQUIRED	TREATMENT AREA PROVIDED	DEPTH TO OVERFLOW	SWALE TYPE	25YR-24HR VOLUME REQUIRED	25YR-24HR VOLUME REQUIRED	100 YR OVERFLOW TO:	DESIGN DEPTH
1	388 FT^2	672 FT^2	6 IN.	GIA-RETENTION	336 FT^3	336 FT^3	RETAIN IN GIA	6 IN.
2	705 FT^2	1058 FT^2	6 IN.	GIA-RETENTION	609 FT^3	617 FT^3	RETAIN IN GIA	7 IN.
3	420 FT^2	551 FT^2	6 IN.	GIA-RETENTION	363 FT^3	367 FT^3	TO WETLANDS	8 IN.
4	670 FT^2	901 FT^2	6 IN.	GIA-RETENTION	579 FT^3	601 FT^3	TO WETLANDS	8 IN.
5	985 FT^2	992 FT^2	6 IN.	DETENTION	388 FT^3	496 FT^3	TO DRYWELL	6 IN.
6	385 FT^2	1501 FT^2	6 IN.	GIA-RETENTION	333 FT^3	751 FT^3	RETAIN IN GIA	6 IN.
7	2407 FT^2	4316 FT^2	6 IN.	GIA-RETENTION	2242 FT^3	2518 FT^3	RETAIN IN GIA	7 IN.
8	1105 FT^2	1126 FT^2	6 IN.	DETENTION	434 FT^3	563 FT^3	TO DRYWELL	6 IN.
9	526 FT^2	1540 FT^2	6 IN.	GIA-RETENTION	454 FT^3	770 FT^3	RETAIN IN GIA	6 IN.
10	2333 FT^2	3232 FT^2	6 IN.	GIA-RETENTION	2016 FT^3	2155 FT^3	RETAIN IN GIA	8 IN.
11	7311 FT^2	13750 FT^2	6 IN.	GIA-RETENTION	6316 FT^3	6875 FT^3	RETAIN IN GIA	6 IN.
12	1166 FT^2	1452 FT^2	6 IN.	GIA-RETENTION	1007 FT^3	1088 FT^3	RETAIN IN GIA	9 IN.
13	671 FT^2	852 FT^2	6 IN.	GIA-RETENTION	582 FT^3	639 FT^3	RETAIN IN GIA	9 IN.
14	644 FT^2	1202 FT^2	6 IN.	GIA-RETENTION	360 FT^3	601 FT^3	RETAIN IN GIA	6 IN.
15	1112 FT^2	1704 FT^2	6 IN.	GIA-RETENTION	961 FT^3	994 FT^3	RETAIN IN GIA	7 IN.
16	1067 FT^2	1657 FT^2	6 IN.	GIA-RETENTION	922 FT^3	967 FT^3	RETAIN IN GIA	7 IN.
17	218 FT^2	271 FT^2	6 IN.	GIA-RETENTION	189 FT^3	203 FT^3	RETAIN IN GIA	9 IN.
18	414 FT^2	762 FT^2	6 IN.	GIA-RETENTION	358 FT^3	381 FT^3	RETAIN IN GIA	6 IN.
19	204 FT^2	252 FT^2	6 IN.	GIA-RETENTION	176 FT^3	189 FT^3	RETAIN IN GIA	9 IN.
20	546 FT^2	679 FT^2	6 IN.	GIA-RETENTION	472 FT^3	509 FT^3	RETAIN IN GIA	9 IN.
21	275 FT^2	344 FT^2	6 IN.	GIA-RETENTION	238 FT^3	258 FT^3	RETAIN IN GIA	9 IN.
22	158 FT^2	460 FT^2	6 IN.	GIA-RETENTION	136 FT^3	230 FT^3	RETAIN IN GIA	6 IN.
23	374 FT^2	475 FT^2	6 IN.	GIA-RETENTION	323 FT^3	356 FT^3	RETAIN IN GIA	9 IN.

4.1 **STORMWATER SWALE CATCHMENT AREAS**
SCALE: 1"=100'

0 50 100 200
SCALE IN FEET

PROFESSIONAL ENGINEER LICENSED 14712 STATE OF IDAHO KEVIN KOESEL
ENGINEER'S STAMP

No.	DATE	REVISION	DRN/CHK

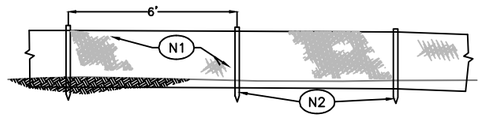
James A. Sewell and Associates, LLC
CONSULTING ENGINEERS
NEWPORT, WASHINGTON, 99156
(509) 447-3626

SHEET TITLE: STORMWATER SWALE CATCHMENT AREAS
PROJECT: EAGLE PUD & MILLIE'S EXPANSION PROJECT 2022
PRIEST LAKE, BONNER COUNTY, IDAHO

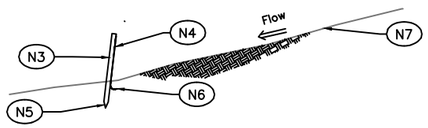
DATE:	1-12-24
SCALE:	AS SHOWN
DRAWN BY:	DLO
CHECKED BY:	KAK
FILE NAME:	BRENDE-ROAD-5-2-23
DATA No.:	13420-20-001

NOTES FOR THIS DETAIL

- N1 PROPOSED FILTER FABRIC
- N2 PROPOSED POSTS
- N3 PROPOSED POSTS DOWNHILL
- N4 PROPOSED FILTER FABRIC UPHILL
- N5 PROPOSED STAKES DRIVEN 1' MINIMUM
- N6 BURY BOTTOM EDGE OF FABRIC 6"
- N7 GROUND LINE

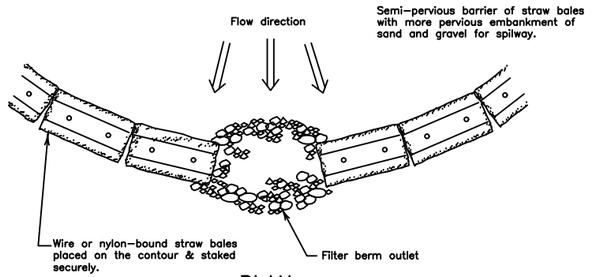


DOWNHILL VIEW

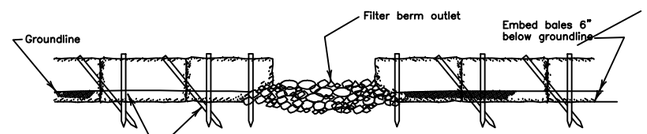


1.1 SILT FENCING DETAIL

N.T.S.



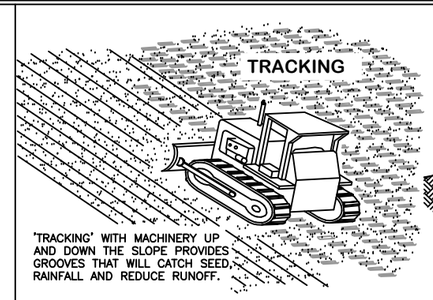
PLAN

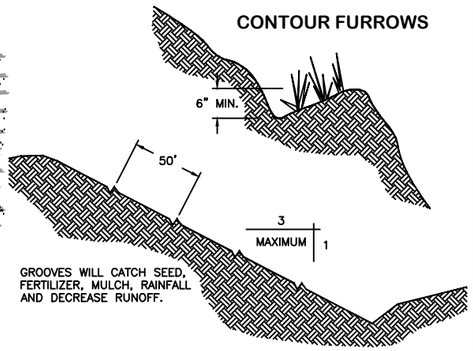


ELEVATION

3.1 STRAW BALE BARRIER

N.T.S.



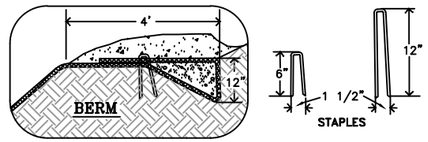


1.4 SURFACE ROUGHENING

N.T.S.

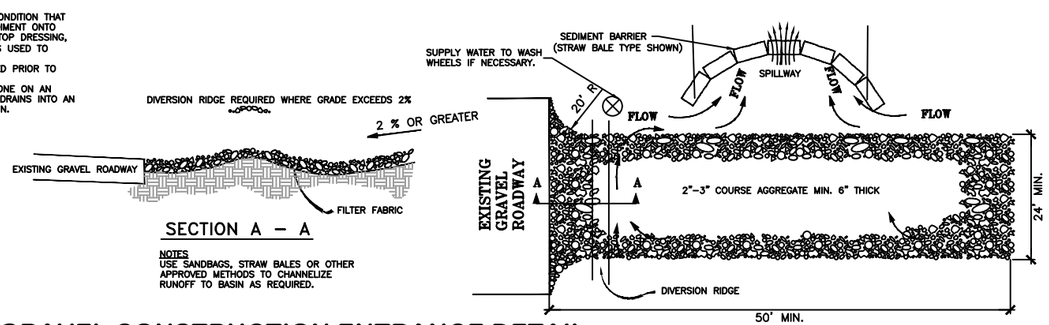
NOTES:

1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.



NOTES

1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABLIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

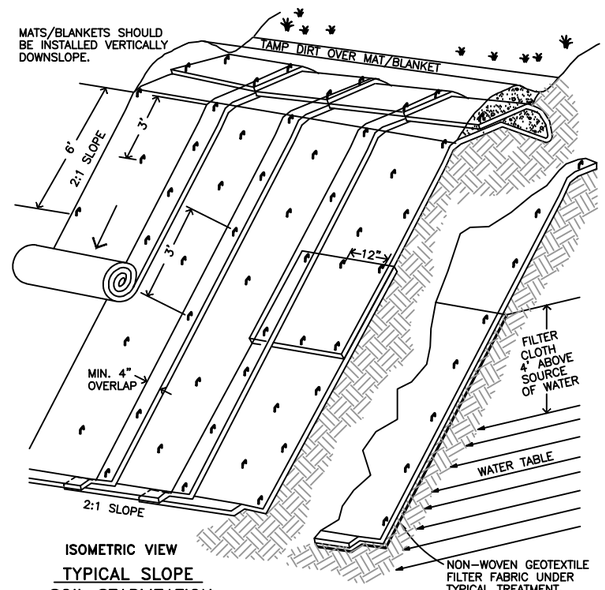


SECTION A – A

NOTES
USE SANDBAGS, STRAW BALES OR OTHER APPROVED METHODS TO CHANNELIZE RUNOFF TO BASIN AS REQUIRED.

4.1 TEMPORARY GRAVEL CONSTRUCTION ENTRANCE DETAIL

SCALE– NOT TO SCALE



ISOMETRIC VIEW

TYPICAL SLOPE SOIL STABLIZATION

WET SLOPE LINING

4.4 EROSION BLANKETS & TURF REINFORCEMENT MATS SLOPE INSTALLATION

SCALE– NOT TO SCALE

PROFESSIONAL ENGINEER LICENSED 14712 STATE OF IDAHO KEVIN KOESEL

ENGINEER'S STAMP

No.	DATE	REVISION	DRN/CHK

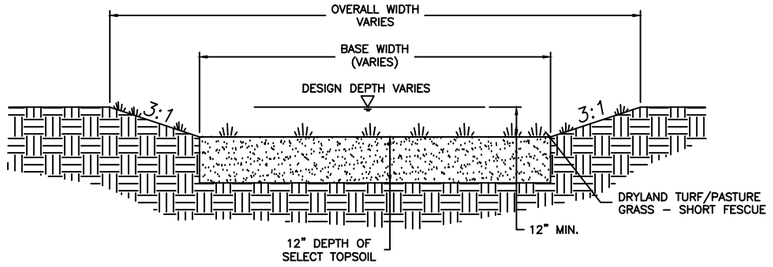
James A. Sewell and Associates, LLC
CONSULTING ENGINEERS
NEWPORT, WASHINGTON, 99156
(509) 447-3626

SHEET TITLE: STORMWATER DETAILS 2

PROJECT: EAGLE PUD & MILLIE'S EXPANSION PROJECT 2022
PRIEST LAKE, BONNER COUNTY, IDAHO

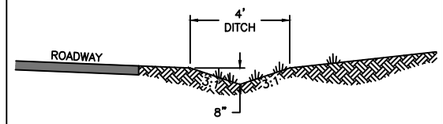
DATE:	12-15-23
SCALE:	AS SHOWN
DRAWN BY:	JMB
CHECKED BY:	KAK
FILE NAME:	BRENDE-ROAD-5-2-23
DATA No.:	13420-20-001

SHEET 64 OF 67



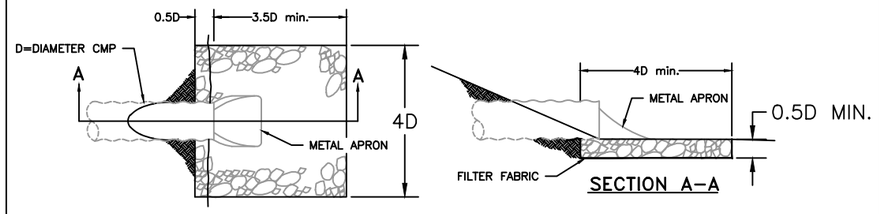
1.1 TYPICAL SWALE PROFILE

SCALE: N.T.S.



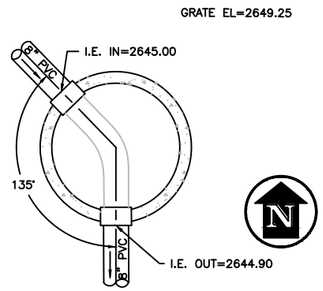
1.3 GRASSED V-DITCH

N.T.S.



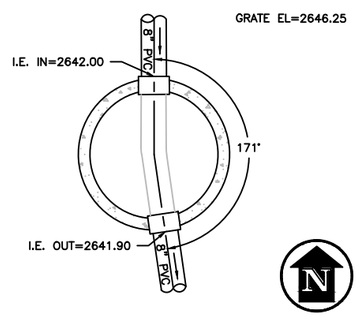
1.4 ROCK DISCHARGE APRON

SCALE– NOT TO SCALE



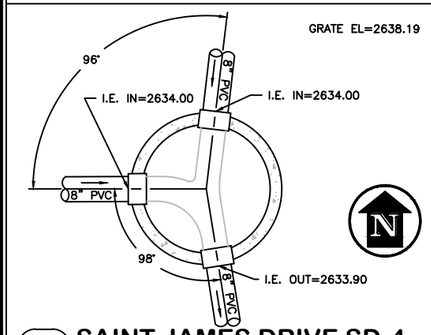
2.1 APRIL SOUND DRIVE SD-2

SCALE: N.T.S.



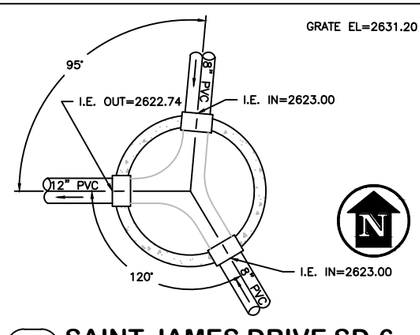
2.2 APRIL SOUND DRIVE SD-3

SCALE: N.T.S.



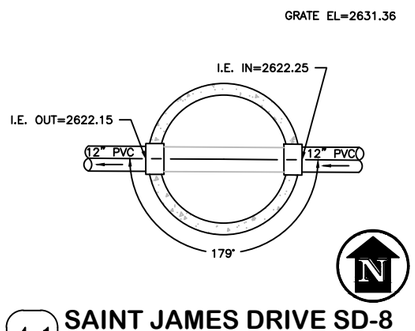
3.1 SAINT JAMES DRIVE SD-4

SCALE: N.T.S.



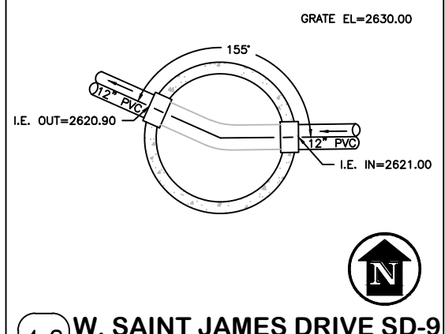
3.2 SAINT JAMES DRIVE SD-6

SCALE: N.T.S.



4.1 SAINT JAMES DRIVE SD-8

SCALE: N.T.S.



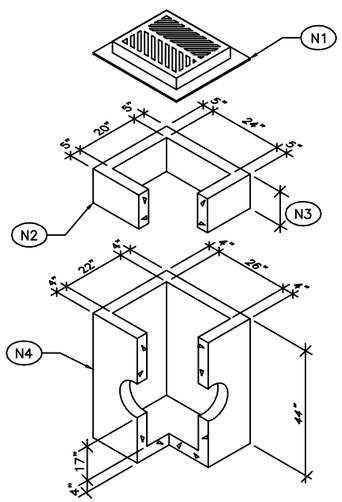
4.2 W. SAINT JAMES DRIVE SD-9

SCALE: N.T.S.

NOTES FOR THIS DETAIL

- (N1) CATCH BASIN FRAME AND GRATE
- (N2) RISER SECTION
- (N3) AS REQUIRED TO MEET GRADE, 2" MINIMUM
- (N4) PRECAST BASE SECTION

NOTE
CATCH BASINS SHALL BE CONSTRUCTED WITH ASTM C 478 AND ASTM C 890 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN SPECIFICATIONS.

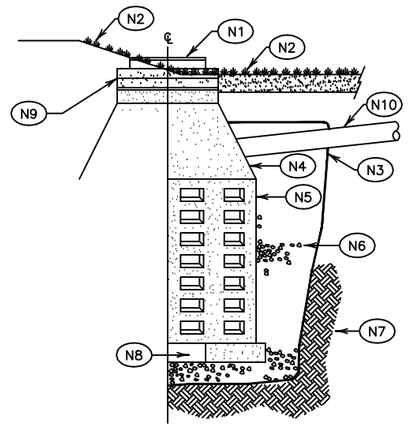


4.3 TYPICAL CATCH BASIN

SCALE: N.T.S.

NOTES FOR THIS DETAIL

- (N1) 4"X 24" CAST IRON RING AND SLOTTED LID. 6" AT GRADE
- (N2) SWALE FINISHED SURFACE
- (N3) DRAINAGE FABRIC, AMOCO #4545 OR EQUAL. SURROUND DRAINFIELD ROCK.
- (N4) PRECAST DRYWELL CONE, 48" TO 24" I.D. X 24" HIGH. WILBERT VAULT No. 1801, OR APPROVED EQUAL.
- (N5) PRECAST CONCRETE DRYWELL,
  TYPE A–48" I.D. X 4'–4" HIGH. WILBERT VAULT #1802
  TYPE B–48" I.D. X 8'–8" HIGH, WILBERT VAULT #1802 & 1803
  OR APPROVED EQUAL.
- (N6) 1/2" – 2–1/2" MINUS WASHED DRAINFIELD ROCK
  TYPE A–25 Cu Yd., MIN.
  TYPE B–40 Cu Yd., MIN.
- (N7) UNDISTURBED NATIVE SOIL
- (N8) DRYWELL BASE, 60"O.D.X 5" W/24" OPENING
- (N9) (2) 3" GRADE RINGS, WILBERT VAULT OR APPROVED EQUAL.
- (N10) STORMWATER CONVEYANCE PIPING, GROUT ENTRANCE INTO DRYWELL.



4.4 DRYWELL DETAIL

SCALE: N.T.S.

PROFESSIONAL ENGINEER LICENSED 14712 STATE OF IDAHO KEVIN KOESEL

ENGINEER'S STAMP

No.	DATE	REVISION	DRN/CHK

James A. Sewell and Associates, LLC
CONSULTING ENGINEERS
NEWPORT, WASHINGTON, 99156
(509) 447–3626

SHEET TITLE: STORMWATER DETAILS 1

PROJECT: EAGLE PUD & MILLIE'S EXPANSION PROJECT 2022
PRIEST LAKE, BONNER COUNTY, IDAHO

DATE:	12–15–23
SCALE:	AS SHOWN
DRAWN BY:	JMB
CHECKED BY:	KAK
FILE NAME:	BRENDE-ROAD-5-2-23
DATA No.:	13420–20–001

DIVISION 07

Proposed Covenants, Codes and Restrictions

DIVISION 08

Critical Area Information

***Tom Duebendorfe**r* - Biological Consultant, Professional Wetland Scientist

October 28, 2021

Jennifer Owens
Land Use Planner
James A. Sewell & Associates, LLC
1319 North Division Avenue
Sandpoint, ID 83864
(208) 263-4160
jowens@jasewell.com

Re: Wetland Delineation Letter Report for property located south of Luby Bay Rd, Priest River, ID RP60N05W252802A; T60N, R 5W, portion of Section 25

Dear Jennifer:

Per your request for environmental services, I am submitting this Wetland Delineation Letter Report for the property referenced above (Figures 1, 2). On October 20, 2021, I visited the site and used the Regional Supplement to the Corps of Engineers (Corps) Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region U.S. Army Corps of Engineers 2010, to determine whether the three required wetland parameters (hydrophytic vegetation, hydric soils, and wetland hydrology) were present. Marty Taylor from your office delineated and flagged the wetland and Sewell & Associates surveyed the boundary flags. I verified that the wetland delineation was accurate, and completed a site visit for the documentation necessary to prepare this letter report.

Site Conditions

The property is presently undeveloped and forested. It is located south of 370 Luby Bay Rd, in the Lamb Creek area of Priest Lake. It is bound essentially by undeveloped properties. Topography varies, but is generally high mountainous slopes dropping steeply down to a lower swale-like feature near the north end of the property. The property has been selectively logged with some primitive logging roads throughout. The National Wetland Inventory (NWI) mapped a relatively narrow scrub-shrub wetland occurring from east to west across the north portion of the property. The 7.5' USGS quad map is Priest Lake SW.

Vegetation

The vegetation consists of two main associations:

Forested: hemlock (*Tsuga heterophylla* [FACU]*) grandfir (*Abies grandis* [FACU]), cedar (*Thuja plicata* [FAC]), larch (*Larix occidentalis* [FACU]), Douglas fir (*Pseudotsuga menziesii* [FACU]), snowberry (*Symphoricarpos albus* [FACU]), raspberry (*Rubus idaeus* [FACU]), twinberry (*Linnaea borealis* [FACU]), and weedy disturbed upland forest herbs (thistle, pearly everlasting, pussytoes). This association is largely non-hydrophytic.

Wetland Shrub: cottonwood (*Populus balsamifera* [FAC]), alder (*Alnus incana* [FACW]), spiraea (*Spiraea douglasii* [FACW]), occasional hawthorn (*Crataegus douglasii* [FAC]) and dogwood (*Cornus alba* [FACW]). canarygrass (*Phalaris arundinacea* [FACW]), and ladyfern (*Athyrium filix-femina* [FAC]). This association lies within the NWI-mapped scrub-shrub wetland and is hydrophytic.

Soils

The Natural Resources Conservation Service (NRCS) identified the area investigated as underlain by non-hydric soils: Caribouridge-Stein families, Andic Humudepts, and Glaciercreek-Pearsoncreek families (Figure 3). None of the soils in the higher steeper forest areas showed evidence of seasonal saturation, however the topographically lower area (associated with the scrub-shrub swale in the northern portion of the property) had clearly black, hydric soils.

*Wetland Indicator Status; UPL: upland; FACU: facultative upland; FAC: facultative; FACW: facultative wetland; OBL: obligate

Hydrology

The National Wetland Inventory (NWI) mapped a band of PSS1C (palustrine, scrub-shrub, deciduous, seasonally flooded) wetland as occurring in the northern portion of the property (Figure 3). Hydrology was not observed — however, given the soil characteristics, topography, and vegetation, I determined it likely that the area undergoes seasonal surface hydrology.

Wetland Determination

Figure 4 shows the property with Sewell's surveyed wetland boundaries. The wetland would be classified largely as PSS1C (palustrine, scrub-shrub, deciduous, seasonally flooded) though some areas contain large cottonwood. It is dominated largely by alder, spiraea, hawthorn, dogwood, canarygrass, and ladyfern, with some areas of smaller cedar and cottonwood. General flow (minor, if present) is to the west. Figure 4 also shows the Data Plot and Photograph locations.

Regulatory Implications

On Figure 4, the wetland boundary is shown as white line, and the 40' County building setback as a blue line. At this point in the development process, there is no intent to fill any of the mapped wetland areas.

Thank you for requesting my services. Let me know if you have any questions or need additional information.

Sincerely,

Tom Duebendorfer, MA, PWS (Emeritus)

encls: Regulatory Requirements
Figure 1: Vicinity Map
Figure 2: Property Map
Figure 3: National Wetland Inventory and NRCS Soils Map
Figure 4: Wetland Boundary, County Setbacks, Data Plot and Photograph Location Map
Photosheet
Data Plots (6) 2-page forms
Résumé

References Used (not necessarily cited):

Bonner County Viewer (on-line mapping tool)

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Office of Biological Services, Fish and Wildlife Service, U.S. Dept. of the Interior, FWS/OBS-79/31.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

ESRI. ArcMap 10.5.1 GIS software. Arrow Series 100 GPS unit.

Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson. 1977 (and as updated 2018 in 2nd Edition). Vascular Plants of the Pacific Northwest. University of Washington Press. Seattle, Washington (five volumes).

NAIP 2013. USDA Aerial photography of Bonner County, ID.

NRCS. US Department of Agriculture, National Resources Conservation Service. Soil Survey (website).

NRCS. 2010. United States Department of Agriculture, Natural Resources Conservation Service. 2010. Field Indicators of Hydric Soils in the United States, Version 7.0. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

NTCHS. 1995. National Technical Committee for Hydric Soils, Natural Resources Conservation Service (formerly Soil Conservation Service).

Vepraskas, M.J. 1992. Redoximorphic Features for Identifying Aquic Conditions. North Carolina Agricultural Research Service. Raleigh, North Carolina.

U.S. Army Corps of Engineers 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region.

USDI. National Wetland Inventory mapping (website).

USGS. Priest Lake SW, ID 7.5' topographic quadrangle.

Regulatory Permitting Process: Types of Permits - Corps of Engineers

Under the Clean Water Act, the Corps has the authority to regulate the discharge or fill or dredged material into "Waters of the US". There are three Permits the Corps uses to regulate fill into wetlands. The Regional General and Individual Permits (not described here) are probably not appropriate for your site.

(1) Nationwide General (NWP): This permit is authorized for specific activities nationwide with minimal impact and minimal evaluation time. The NWPs typically have a ½ acre limit for fill in wetlands and 300 linear foot limit for fill in stream channels. A Pre-Construction Notification application (PCN) must be submitted to the appropriate field office (Walla Walla District). Typically, *less than 1/10-acre of wetland fill does not require mitigation* (though a PCN is required), and up to ½ acre of wetland fill, requires mitigation. (See below for **compensation methods**). There are Regional Conditions for Nationwide Permits (www.nww.usace.army.mil/Portals/28/Users/108/44/1644/Final%20NWW%20Regional%20Conditions%202017%20NWPs.pdf). There are 54 Nationwide Permits each regarding specific activities proposed in wetlands (www.nww.usace.army.mil/Business-With-Us/Regulatory-Division/Nationwide-Permits/).

When any permit application is received, it is evaluated based upon three criteria: avoidance, minimization, and mitigation. Once the applicant meets these criteria, a permit can be issued. It is taking Corps presently about 60 days to process permits.

Compensation Methods for unavoidable Wetland Impacts

According to the 2008 Final Mitigation Rule (Federal Register/Vol. 73, No. 70 / Thursday, April 10, 2008 / Rules and Regulations), under § 332.1 (c) the Final Mitigation Rule maintains the requirements set forth in Section 404(b)(1) Guidelines at 40 CFR part 230 which state that *"the permit applicant [is required] to take all appropriate and practicable steps to avoid and minimize adverse impacts to waters of the United States. Practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. Compensatory mitigation for unavoidable impacts may be required to ensure that an activity requiring a section 404 permit complies with the Section 404(b)(1) Guidelines"* (emphasis mine). According to § 230.93 (a)(2), restoration of impacted wetland is the first priority in the compensation sequence followed by purchasing credits (employing the use of approved Wetland Mitigation Banks within the service area) § 230.93 (b)(2).

The 1999 Montana Wetland Assessment Method is used to calculate the number of Wetland Credits to be purchased from the Valencia Wetland Mitigation Bank (Bank) in Priest River *should there be any wetland impacts (fill > 1/10 acre) required as a result of the proposed development*. The Assessment will result in a score between 1 and 12. This score is multiplied by the area to be filled. That result is the number of credits required to be purchased from the Bank. Currently one credit costs $28,000. Obviously, the smaller the area of wetland impact, the less it will cost in mitigation credits. The Assessment may take up to 6 hours to complete.

Bonner County imposes 40' wetland-to-structure setbacks, unless it can be determined that the wetlands are low quality at which a 20' buffer is allowed.

Figure 1
Vicinity Map
L T Partnership Ltd

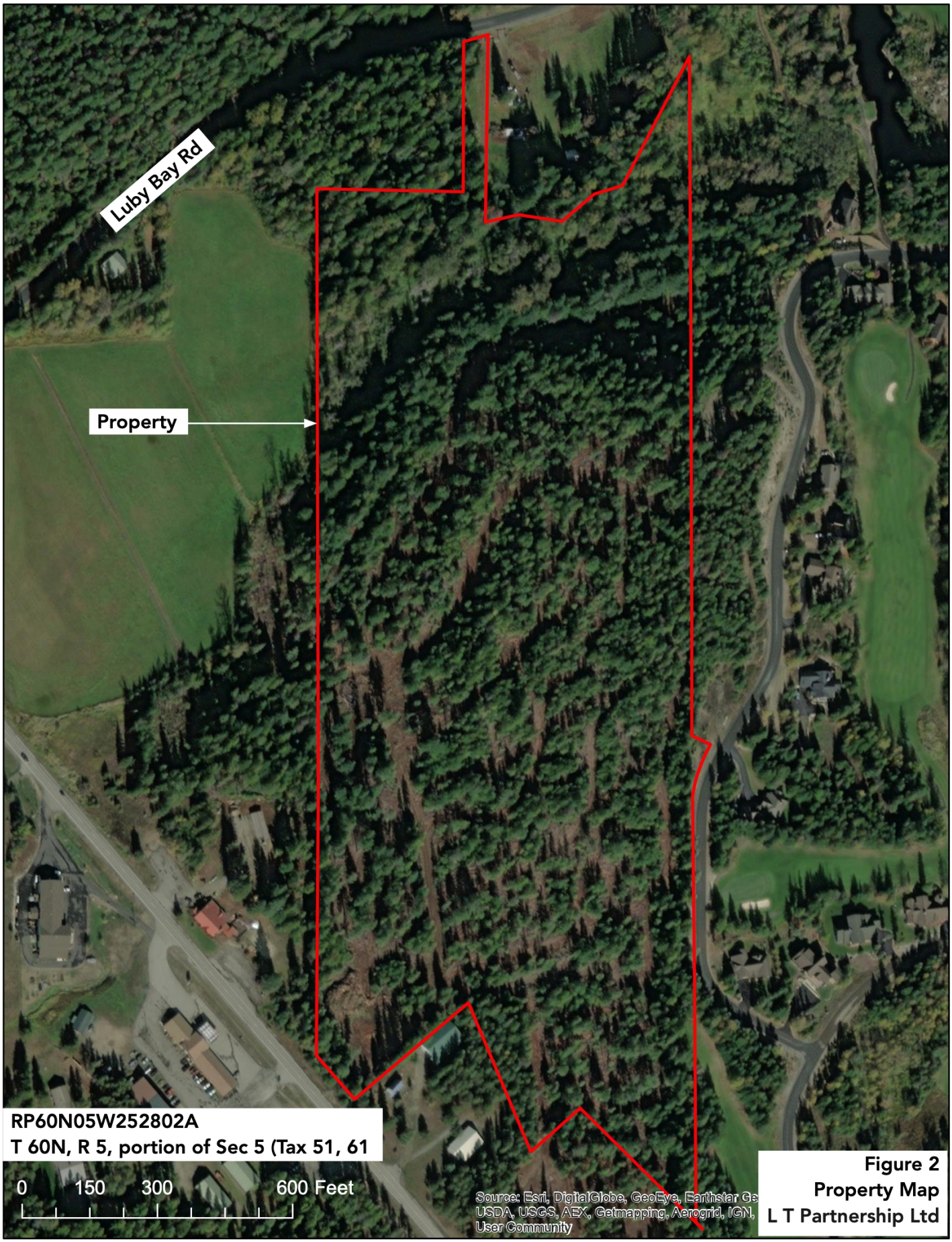


Figure 2
Property Map
L T Partnership Ltd

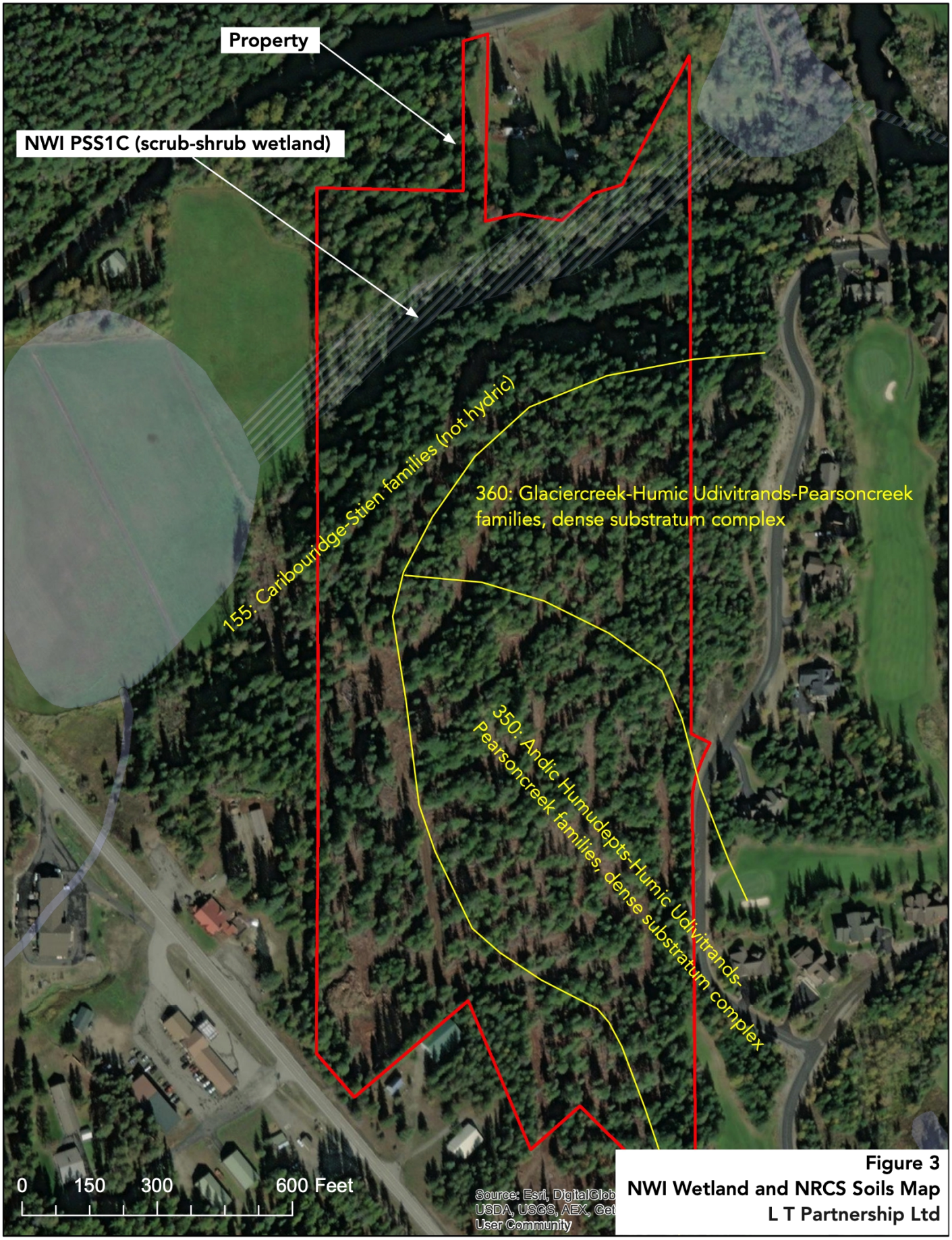


Figure 3
NWI Wetland and NRCS Soils Map
L T Partnership Ltd

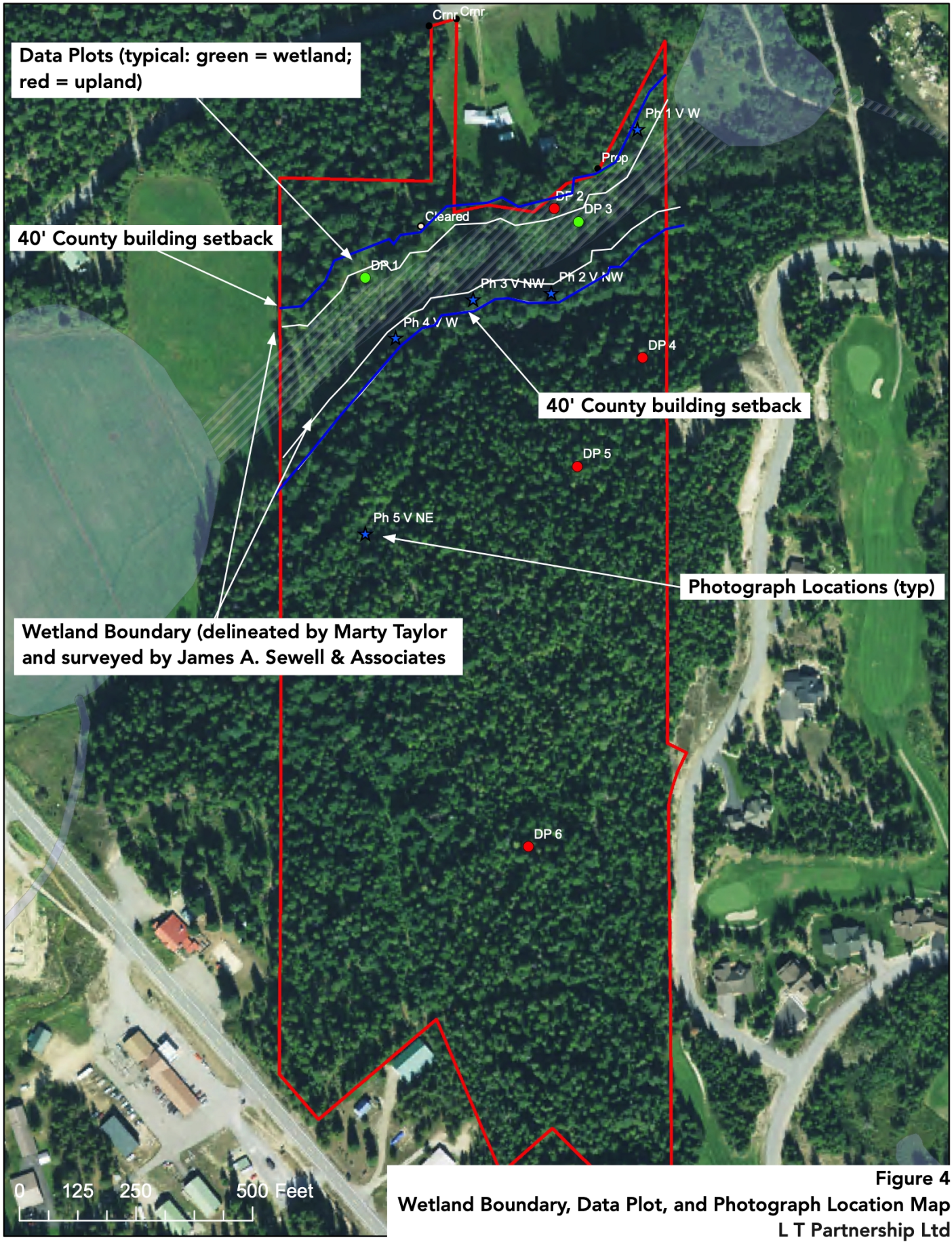


Figure 4
Wetland Boundary, Data Plot, and Photograph Location Map
L T Partnership Ltd

Photo 1. View W showing open cedar area just north of north wetland boundary. Wetland boundary in blue.

Photo 2. View NW showing open cedar area just south of south wetland boundary. Wetland boundary in blue.

Photo 3. View NW showing open cedar area just south of south wetland boundary. Wetland boundary in blue.

Photo 4. View W showing open cedar area just south of south wetland boundary. Wetland boundary in blue.

Photo 5. View NE showing typical upland forest on slopes.

Photosheet
10/20/21

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: LT Partnership **City/County:** Bonner **Sampling Date:** 20-Oct-21

Applicant/Owner: Sewell and Assiociates **State:** ID **Sampling Point:** DP 1

Investigator(s): Tom Duebendorfer, PWS **Section, Township, Range:** S 25 T 60N R 5W

Landform (hillslope, terrace, etc.): Footslope **Local relief (concave, convex, none):** flat **Slope:** 0.0 % / 0.0 °

Subregion (LRR): LRR E **Lat.:** 48° 31'34.9"N **Long.:** 116° 56'00.9"'W **Datum:** WGS 84

Soil Map Unit Name: Caribouridge-Stein **NWI classification:** none

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ **(If no, explain in Remarks.)**

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **significantly disturbed?** **Are "Normal Circumstances" present?** Yes ◉ No ○

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **naturally problematic?** **(If needed, explain any answers in Remarks.)**

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ◉ No ○

Hydric Soil Present? Yes ◉ No ○

Wetland Hydrology Present? Yes ◉ No ○

Is the Sampled Area within a Wetland? Yes ◉ No ○

Remarks:
All three parameters met. Plot located in north end of wetland.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Rel.Strat. Cover	Indicator Status
Tree Stratum (Plot size:)				
1. Populus balsamifera	20	☑	66.7%	FAC
2. Thuja plicata	10	☑	33.3%	FAC
3.	0	☐	0.0%	
4.	0	☐	0.0%	
	30		= Total Cover	
Sapling/Shrub Stratum (Plot size:)				
1. Alnus incana	10	☑	100.0%	FACW
2.	0	☐	0.0%	
3.	0	☐	0.0%	
4.	0	☐	0.0%	
5.	0	☐	0.0%	
	10		= Total Cover	
Herb Stratum (Plot size:)				
1. Phalaris arundinacea	80	☑	94.1%	FACW
2. Athyrium filix-femina	5	☐	5.9%	FAC
3.	0	☐	0.0%	
4.	0	☐	0.0%	
5.	0	☐	0.0%	
6.	0	☐	0.0%	
7.	0	☐	0.0%	
8.	0	☐	0.0%	
9.	0	☐	0.0%	
10.	0	☐	0.0%	
11.	0	☐	0.0%	
	85		= Total Cover	
Woody Vine Stratum (Plot size:)				
1.	0	☐	0.0%	
2.	0	☐	0.0%	
	0		= Total Cover	

% Bare Ground in Herb Stratum: 0

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	90	x 2 =	180
FAC species	35	x 3 =	105
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	125 (A)		285 (B)

Prevalence Index = B/A = 2.280

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrologic Vegetation
- ☑ 2 - Dominance Test is > 50%
- ☑ 3 - Prevalence Index is ≤3.0 [1]
- ☐ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants [1]
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:
Vegetation is hydrophytic - both tests met

*Indicator suffix = National status or professional decision assigned because Regional status not defined by FWS.

Soil

Sampling Point: DP 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 2/1	100%					Silt Loam	

[1]Type: C=Concentration. D=Depletion. RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2]Location: PL=Pore Lining. M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Muck Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except in MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks:

Soil showing hydric indicators

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☑ Drainage Patterns (B10)
- ☐ Dry Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitor well, aerial photos, previous inspections), if available:

Remarks:

Evidence of ponding - seasonal hydrology very likely

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: LT Partnership **City/County:** Bonner **Sampling Date:** 20-Oct-21

Applicant/Owner: Sewell and Assiociates **State:** ID **Sampling Point:** DP 2

Investigator(s): Tom Duebendorfer, PWS **Section, Township, Range:** S 25 T 60N R 5W

Landform (hillslope, terrace, etc.): Footslope **Local relief (concave, convex, none):** flat **Slope:** 0.0 % / 0.0 °

Subregion (LRR): LRR E **Lat.:** 48° 31'36.4"N **Long.:** 116° 55'54.9"""W **Datum:** WGS 84

Soil Map Unit Name: Caribouridge-Stein **NWI classification:** none

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ **(If no, explain in Remarks.)**

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **significantly disturbed?** **Are "Normal Circumstances" present?** Yes ◉ No ○

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **naturally problematic?** **(If needed, explain any answers in Remarks.)**

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Hydric Soil Present?	Yes ○	No ◉	
Wetland Hydrology Present?	Yes ○	No ◉	

Remarks:
Although vegetation is hydrophytic (one species), no groundcover; hydric soils and wetland hydrology not observed. Upland plot located north of wetland.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
Tree Stratum (Plot size:)			
1. Thuja plicata	70	☑ 100.0%	FAC
2.		☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.		☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
	0	= Total Cover	
Herb Stratum (Plot size:)			
1.		☐ 0.0%	
2.		☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
9.	0	☐ 0.0%	
10.	0	☐ 0.0%	
11.	0	☐ 0.0%	
	0	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
	0	= Total Cover	

% Bare Ground in Herb Stratum: 0

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	70	x 3 =	210
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	70 (A)		210 (B)

Prevalence Index = B/A = 3.000

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrologic Vegetation
- ☑ 2 - Dominance Test is > 50%
- ☑ 3 - Prevalence Index is ≤3.0 [1]
- ☐ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants [1]
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:
Vegetation is hydrophytic - prevalence test met

*Indicator suffix = National status or professional decision assigned because Regional status not defined by FWS.

Soil

Sampling Point: DP 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR	3/2	100%						Silt Loam	

[1]Type: C=Concentration. D=Depletion. RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2]Location: PL=Pore Lining. M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Muck Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except in MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

Soil not showing hydric indicators

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitor well, aerial photos, previous inspections), if available:

Remarks:

No evidence of ponding - seasonal hydrology unlikely. Hydrology absent. Plot loicated 2'+ higher than wetland.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: LT Partnership **City/County:** Bonner **Sampling Date:** 20-Oct-21

Applicant/Owner: Sewell and Assiociates **State:** ID **Sampling Point:** DP 3

Investigator(s): Tom Duebendorfer, PWS **Section, Township, Range:** S 25 T 60N R 5W

Landform (hillslope, terrace, etc.): Footslope **Local relief (concave, convex, none):** flat **Slope:** 0.0 % / 0.0 °

Subregion (LRR): LRR E **Lat.:** 48° 31'36.2"N **Long.:** 116° 55'54.1"""W **Datum:** WGS 84

Soil Map Unit Name: Caribouridge-Stein **NWI classification:** none

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ **(If no, explain in Remarks.)**

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **significantly disturbed?** **Are "Normal Circumstances" present?** Yes ◉ No ○

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **naturally problematic?** **(If needed, explain any answers in Remarks.)**

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ◉ No ○

Hydric Soil Present? Yes ◉ No ○

Wetland Hydrology Present? Yes ◉ No ○

Is the Sampled Area within a Wetland? Yes ◉ No ○

Remarks:
All three parameters met. Plot located in wetland swale.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
Tree Stratum (Plot size:)			
1. Thuja plicata	25	☑ 50.0%	FAC
2. Populus balsamifera	25	☑ 50.0%	FAC
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. Spiraea douglasii	50	☑ 100.0%	FACW
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
	50	= Total Cover	
Herb Stratum (Plot size:)			
1. Phalaris arundinacea	25	☑ 100.0%	FACW
2.		☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
9.	0	☐ 0.0%	
10.	0	☐ 0.0%	
11.	0	☐ 0.0%	
	25	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
	0	= Total Cover	

% Bare Ground in Herb Stratum: 0

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	75	x 2 =	150
FAC species	50	x 3 =	150
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	125 (A)		300 (B)

Prevalence Index = B/A = 2.400

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrologic Vegetation
- ☑ 2 - Dominance Test is > 50%
- ☑ 3 - Prevalence Index is ≤3.0 [1]
- ☐ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants [1]
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:
Vegetation is hydrophytic - both tests met

*Indicator suffix = National status or professional decision assigned because Regional status not defined by FWS.

Soil

Sampling Point: DP 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR	2/1	100%						Silt Loam	

[1]Type: C=Concentration. D=Depletion. RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2]Location: PL=Pore Lining. M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Muck Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except in MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks:

Soil showing hydric indicators

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☑ Drainage Patterns (B10)
- ☐ Dry Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitor well, aerial photos, previous inspections), if available:

Remarks:

Evidence of ponding - seasonal hydrology likely. Plot loicated in wetland swale.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: LT Partnership **City/County:** Bonner **Sampling Date:** 20-Oct-21

Applicant/Owner: Sewell and Assiociates **State:** ID **Sampling Point:** DP 4

Investigator(s): Tom Duebendorfer, PWS **Section, Township, Range:** S 25 T 60N R 5W

Landform (hillslope, terrace, etc.): Footslope **Local relief (concave, convex, none):** flat **Slope:** 0.0 % / 0.0 °

Subregion (LRR): LRR E **Lat.:** 48° 31'33.3"N **Long.:** 116° 55'52.0"'W **Datum:** WGS 84

Soil Map Unit Name: Glacier Creek **NWI classification:** none

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ **(If no, explain in Remarks.)**

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **significantly disturbed?** **Are "Normal Circumstances" present?** Yes ◉ No ○

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **naturally problematic?** **(If needed, explain any answers in Remarks.)**

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ○ No ◉

Hydric Soil Present? Yes ○ No ◉

Wetland Hydrology Present? Yes ○ No ◉

Is the Sampled Area within a Wetland? Yes ○ No ◉

Remarks:
None of three required parameters observed

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
Tree Stratum (Plot size:)			
1. Thuja plicata	20	☑ 33.3%	FAC
2. Tsuga heterophylla	40	☑ 66.7%	FACU
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
	60	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.		☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. Linnaea borealis	20	☑ 87.0%	FACU
2. Tiarella trifoliata var. unifoliata	2	☐ 8.7%	UPL
3. Goodyera oblongifolia	1	☐ 4.3%	FACU
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
9.	0	☐ 0.0%	
10.	0	☐ 0.0%	
11.	0	☐ 0.0%	
	23	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
	0	= Total Cover	

% Bare Ground in Herb Stratum: 0

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	61	x 4 =	244
UPL species	2	x 5 =	10
Column Totals:	83 (A)		314 (B)

Prevalence Index = B/A = 3.783

Hydrophytic Vegetation Indicators:

- ☐ **1 - Rapid Test for Hydrologic Vegetation**
- ☐ **2 - Dominance Test is > 50%**
- ☐ **3 - Prevalence Index is ≤3.0** [1]
- ☐ **4 - Morphological Adaptations** [1] **(Provide supporting data in Remarks or on a separate sheet)**
- ☐ **5 - Wetland Non-Vascular Plants** [1]
- ☐ **Problematic Hydrophytic Vegetation** [1] **(Explain)**

[1] **Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.**

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:
Vegetation is not hydrophytic - neither test met

*Indicator suffix = National status or professional decision assigned because Regional status not defined by FWS.

Soil

Sampling Point: DP 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR	3/4	100%						Silt Loam	

[1]Type: C=Concentration. D=Depletion. RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2]Location: PL=Pore Lining. M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Muck Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except in MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

Soil not showing hydric indicators

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitor well, aerial photos, previous inspections), if available:

Remarks:

No evidence of ponding - steep hillslope

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: LT Partnership **City/County:** Bonner **Sampling Date:** 20-Oct-21

Applicant/Owner: Sewell and Assiociates **State:** ID **Sampling Point:** DP 5

Investigator(s): Tom Duebendorfer, PWS **Section, Township, Range:** S 25 T 60N R 5W

Landform (hillslope, terrace, etc.): Footslope **Local relief (concave, convex, none):** flat **Slope:** 0.0 % / 0.0 °

Subregion (LRR): LRR E **Lat.:** 48° 31'31.0"N **Long.:** 116° 55'54.1"'W **Datum:** WGS 84

Soil Map Unit Name: Glacier Creek **NWI classification:** none

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ **(If no, explain in Remarks.)**

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **significantly disturbed?** **Are "Normal Circumstances" present?** Yes ◉ No ○

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **naturally problematic?** **(If needed, explain any answers in Remarks.)**

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ○ No ◉

Hydric Soil Present? Yes ○ No ◉

Wetland Hydrology Present? Yes ○ No ◉

Is the Sampled Area within a Wetland? Yes ○ No ◉

Remarks:
None of three required parameters observed

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
Tree Stratum (Plot size:)			
1. Tsuga heterophylla	30	☑ 50.0%	FACU
2. Thuja plicata	20	☑ 33.3%	FAC
3. Larix occidentalis	10	☐ 16.7%	FACU
4.	0	☐ 0.0%	
	60	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.		☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. Cirsium vulgare	40	☑ 70.2%	FACU
2. Anaphalis margaritacea	10	☐ 17.5%	UPL
3. Epilobium brachycarpum	5	☐ 8.8%	UPL
4. Antennaria racemosa	2	☐ 3.5%	UPL
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
9.	0	☐ 0.0%	
10.	0	☐ 0.0%	
11.	0	☐ 0.0%	
	57	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
	0	= Total Cover	

% Bare Ground in Herb Stratum: 0

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	80	x 4 =	320
UPL species	17	x 5 =	85
Column Totals:	117 (A)		465 (B)

Prevalence Index = B/A = 3.974

Hydrophytic Vegetation Indicators:

- ☐ **1 - Rapid Test for Hydrologic Vegetation**
- ☐ **2 - Dominance Test is > 50%**
- ☐ **3 - Prevalence Index is ≤3.0** [1]
- ☐ **4 - Morphological Adaptations** [1] **(Provide supporting data in Remarks or on a separate sheet)**
- ☐ **5 - Wetland Non-Vascular Plants** [1]
- ☐ **Problematic Hydrophytic Vegetation** [1] **(Explain)**

[1] **Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.**

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:
Vegetation is not hydrophytic - neither test met

*Indicator suffix = National status or professional decision assigned because Regional status not defined by FWS.

Soil

Sampling Point: DP 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR	3/4	100%						Silt Loam	

[1]Type: C=Concentration. D=Depletion. RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2]Location: PL=Pore Lining. M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Muck Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except in MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

Soil not showing hydric indicators

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitor well, aerial photos, previous inspections), if available:

Remarks:

No evidence of ponding - steep hillslope

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: LT Partnership **City/County:** Bonner **Sampling Date:** 20-Oct-21

Applicant/Owner: Sewell and Assiociates **State:** ID **Sampling Point:** DP 6

Investigator(s): Tom Duebendorfer, PWS **Section, Township, Range:** S 25 T 60N R 5W

Landform (hillslope, terrace, etc.): Footslope **Local relief (concave, convex, none):** flat **Slope:** 0.0 % / 0.0 °

Subregion (LRR): LRR E **Lat.:** 48° 31'22.9"N **Long.:** 116° 55'55.4"'W **Datum:** WGS 84

Soil Map Unit Name: Andic Humudepts **NWI classification:** none

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ **(If no, explain in Remarks.)**

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **significantly disturbed?** **Are "Normal Circumstances" present?** Yes ◉ No ○

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **naturally problematic?** **(If needed, explain any answers in Remarks.)**

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Hydric Soil Present?	Yes ○	No ◉	
Wetland Hydrology Present?	Yes ○	No ◉	

Remarks:
None of three required parameters observed

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
Tree Stratum (Plot size:)			
1. Tsuga heterophylla	20	☑ 50.0%	FACU
2. Thuja plicata	10	☑ 25.0%	FAC
3. Abies grandis	10	☑ 25.0%	FACU
4.	0	☐ 0.0%	
	40	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. Rubus idaeus	5	☑ 100.0%	FACU
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
	5	= Total Cover	
Herb Stratum (Plot size:)			
1. Cirsium vulgare	10	☑ 33.3%	FACU
2. Verbascum thapsus	10	☑ 33.3%	FACU
3. Anaphalis margaritacea	10	☑ 33.3%	UPL
4.		☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
9.	0	☐ 0.0%	
10.	0	☐ 0.0%	
11.	0	☐ 0.0%	
	30	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
	0	= Total Cover	

% Bare Ground in Herb Stratum: 0

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 14.3% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	10	x 3 =	30
FACU species	55	x 4 =	220
UPL species	10	x 5 =	50
Column Totals:	75 (A)		300 (B)

Prevalence Index = B/A = 4.000

Hydrophytic Vegetation Indicators:

- ☐ **1 - Rapid Test for Hydrologic Vegetation**
- ☐ **2 - Dominance Test is > 50%**
- ☐ **3 - Prevalence Index is ≤3.0** [1]
- ☐ **4 - Morphological Adaptations** [1] **(Provide supporting data in Remarks or on a separate sheet)**
- ☐ **5 - Wetland Non-Vascular Plants** [1]
- ☐ **Problematic Hydrophytic Vegetation** [1] **(Explain)**

[1] **Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.**

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:
Vegetation is not hydrophytic - neither test met

*Indicator suffix = National status or professional decision assigned because Regional status not defined by FWS.

Soil

Sampling Point: DP 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		%	Redox Features Color (moist)		%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR	3/4	100%						Silt Loam	

[1]Type: C=Concentration. D=Depletion. RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2]Location: PL=Pore Lining. M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Muck Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (except in MLRA 1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

Soil not showing hydric indicators

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (LRR A)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- ☐ Drainage Patterns (B10)
- ☐ Dry Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (LRR A)
- ☐ Frost Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitor well, aerial photos, previous inspections), if available:

Remarks:

No evidence of ponding - steep hillslope

Tom Duebendorfer - Professional Wetland Scientist (#000157), Biologist, Botanist

OBJECTIVE

Provide botanical and ecological services to a wide range of organizations and individuals for projects involving land development, wetland delineation, vegetation mapping, rare plant surveys, resource inventories, Environmental Assessments, Biological Evaluations and Assessments, and research-level studies on specific habitats or species.

EDUCATION

WSPSS, SWS Hydric Soils Workshop, Soils and Hydrology, June 2009
Wetland Training Institute, Soils and Hydrology, August 1990
Humboldt State University, Arcata, California
M.A. Biology May 1987
California State Teaching Credential May 1987
B.A. Biology June 1977
University of California, Irvine (2 years - biology major)

EMPLOYMENT

- **Self-employed wetland and botanical consultant (1981 to present)**

  Provided botanical and wildlife surveys, floristic research, habitat characterization, ecological sampling, synecological analysis, aerial photo mapping, wetland delineation, impact analysis, restoration and mitigation, resource planning, permitting, rare and endangered plant surveys, plant taxonomy, soil analysis, computer-aided multivariate analyses and statistics, computer-aided graphics and drafting. Involved with design (as part author/editor) of Washington Dept of Ecology Hydrogeomorphic approach to wetland function assessment program (Assessment Team). Trained in E WA DOE Assessment Methodology (assisted in development of the methodology). Wetland Mitigation Bank preparation. Teaches wetland delineation and plant identification courses to Tribes, agencies, and groups.

  Project locations include rare plant surveys/studies and wetland work in southern, central, northern and coastal California; coastal, southwestern, and northeastern Oregon; north, east-central, and southwest Idaho; eastern and western Washington; and northwest Montana.

- **Senior Wetland Ecologist, Client/Project Manager, Corporate Botanist (1989-1994)**

  David Evans and Associates, Inc. Bellevue, Washington

  Provided wetland delineation, impact assessment, conceptual and final mitigation design, monitoring, cumulative impact assessment, wetland permitting, habitat characterization, rare plant and T&E animal surveys, Biological Evaluations and Assessments, as well as instruction and guidance in systematics and classification to staff in 7 west coast offices. Maintained excellent rapport with clients and other project team members (both in office and as field crew leader). Managed projects from proposals, contracting, budgeting, scheduling and invoicing, to collections.

  Project locations include: Pacific Northwest, from central and coastal Oregon to eastern, western, and coastal Washington, and northwest Montana.

CERTIFICATIONS

Professional Wetland Scientist, Society of Wetland Scientists (#000157)
Certified Wetland Delineator, Corps of Engineers (Seattle District)
Qualified Wetland Specialist, Spokane County, Washington
Qualified Wetland Specialist, City of Spokane, Washington
Completed Training in NEPA/EPA Process
Completed Soils and Hydrology workshops (WTI); Hydric Soils (WSSPSS - Updates 2009)

Tom Duebendorfer - Professional Wetland Scientist (#000157), Biologist, Botanist

SPECIFIC EXPERIENCE

Habitats include: dune coastline, coastal and inland forested, scrub, and marsh wetlands, oak woodlands, steppe scrubland, grasslands, sagebrush, agricultural areas (wetlands), coniferous and deciduous montane, alpine, bog (fen), and serpentine vegetation.

Permitting knowledge and direct use of wetland methodologies (USFWS, US Army Corps of Engineers, WA Dept of Ecology, and local county and city jurisdictions); knowledge of Corps Permit process. Restoration activities. Biological Assessments (BA), USFS Evaluations (BE), Environmental Assessments (EA); SEPA/NEPA; T&E species monitoring, Raptor Monitoring, Wetland Mitigation Bank Design.

Rare plant studies include approximately 45 sensitive plant and vegetation surveys on private, state, and federal lands for small to medium scale hydroelectric plants, stream corridors, sewage treatment facilities, water treatment facilities, prison site, seeding experiments, road and highway construction, transmission corridors (utilities), fiber optic cable routes, and mining companies. Biological Evaluations for USFS-listed sensitive species in four states.

Clients (independently and during tenure as employee) include:

Small- and Large-scale Developers:
Burlington-Northern, Puget Western, Glacier Park Company, Trillium Corporation, Quadrant, Blackhawk/Port Blakely Communities, Coldwater Creek, Valencia Wetlands Trust, Waterfront Property Mgmt., Kirk-Hughes Development, Fortress LLC, & others

Public Entities:
Washington Department of Ecology, Benewah County (through EDA), Federal Highways Administration, Bureau of Reclamation, King Co., US Army Corps of Engineers, Spokane County Engineering and Public Works, Oregon Nature Conservancy, Humboldt County Planning, Humboldt State University Research Program; Benewah County; Idaho Soil and Conservation District, City of Winchester, Idaho Transportation Department, Washington Department of Transportation, Kalispell Indian Tribe, City of Colville, Rathdrum

Communications (fiber optic projects):
AT&T, MCI/WorldCom, Cascade Utilities

Exploratory and Active Mining Companies:
Emerald Creek Garnet Company, American Gold Resources, Cal Nickel Corp., Baretta, Noranda

Assisting other Consulting Firms and Numerous Private Landowners.
The Soils Group, Intermountain Resources, Inc., Hart-Crowser, Inc., Welch-Comer Eng., Land Profile, Inc., Selkirk Environmental, David Evans and Associates, J.A. Sewell and Assoc., EarthTech, ALSC Architects; Ecological Resources, Forsgren Assoc., JUB Eng., Adolfson Assoc. Copper Basin Constr., Toothman-Orton Eng., Rocky Point Investments, HAWKEFA, Tate Engineering.

PUBLICATIONS

Duebendorfer, T.E. 1990. *"An Integrated Approach to Enhancing Rare Plant Populations through Habitat Restoration: II. Habitat Characterization through Classification of Dune Vegetation."* Pp. 478-487 in: Bonnicksen, T.M. and H.G. Hughes, eds. Proceedings of the first annual meeting of the Society for Ecological Restoration and Management. Also presented at Society of Wetland Scientists, May 1993.

Pickart, A.J., L.M. Miller, and T.E. Duebendorfer. 1998. *"Yellow bush lupine invasion in northern California coastal dunes. I. Ecological impacts and manual restoration techniques".* Restoration Ecology Vol 6 No 1, pp59-68.

Seattle Audubon Series, *"Wetland Plants of the Western Washington and NW Oregon"* (Cooke 1997, editor): My role was as a contributor and technical editor.

Hruby, T., S. Stanley, T. Granger, T. Duebendorfer, R. Friesz, B. Lang, B. Leonard, K. March, and A. Wald. 2000. Methods for Assessing Wetlands Functions. Volume II, Part 1: Assessment Methods - Depressional Wetlands in the Columbia Basin of Eastern Washington, WA State Department of Ecology Publication #00-06-47.

Fieldbook of Plant Uses (North Idaho) - self published field booklet (2019)

Geotechnical Engineering Report
Active West/Millie's Site
Worley, Idaho

Prepared for:
Kevin Koesel, PE
James A. Sewell and Associates
600 4th Street West
Newport, WA 99156

Prepared by:
Budinger & Associates, Inc.
1101 N. Fancher Road
Spokane Valley, WA 99212

6/17/2021

John Finnegan, PE, LHG
Geotechnical Engineer, Principal

Jason Pritzl, GIT
Lead Geologist

Budinger
& Associates

CONTENTS

EMBEDDED TABLES

ATTACHED FIGURES

CONTEXT

This conceptual phase geotechnical conditions report (GCR) presents the results of limited geotechnical evaluation for development of the subject property. These services were contracted with James A. Sewell and Associates, represented by Kevin Koesel, PE.

Project Considerations

We understand a new residential housing subdivision is proposed on 41 acres near Priest Lake, Idaho. The project is currently in the feasibility phase. Cuts of 15 feet or more are anticipated to construct roads and building pads. Bedrock is anticipated at relatively shallow depths and the amount of rock excavation needed to complete the project is a primary concern.

This report addresses general geotechnical information needed to complete planning, layout, and conceptual design. Additional geotechnical services will be needed to complete a geotechnical engineering report (GER) appropriate for civil design, structural design, and construction.

Location

The site consists of Bonner County parcel number RP60N05W252802A in Lamb Creek, Idaho on the southwest side of Priest Lake. It is on the east side of Highway 57, between Millie's restaurant and the Priest Lake Golf & Tennis Club. There is currently no physical address. It is in the west ½ of Section 25, Township 60 N, Range 5 W, Boise Meridian. The location is illustrated in the *Vicinity Map* and *Site Plan*.

Scope

This geotechnical study involved limited interpretation of subsurface soil, rock, and groundwater conditions to assess the suitability of the site for the overall conceptual design phase. We endeavored to conduct these services in accordance with generally accepted geotechnical engineering practices as outlined in proposal S21368, dated April 13, 2021.

Design Phase Evaluation

Information needed to complete design-level geotechnical services include anticipated structural and traffic loads, finish floor elevations, stormwater infiltration requirements, and locations and heights of retaining walls, if required.

ENCOUNTERED CONDITIONS

Physical Setting

The site is on a small hill composed of Cretaceous granodiorite (*Krc*) (USGS, 2003) encompassed by topographical drainages infilled with Quaternary glacial and alluvial deposits (*Qag*). During the last ice age, the Purcell Lobe of the Cordilleran Ice Sheet extended into northern Idaho and scoured pre-existing rock and sedimentary formations. As global climate warmed, the ice melted and retreated resulting in deposition of sediment accumulated by the ice into consequentially developed basins and channels.

The *Krc* formation consists of *"Medium- and coarse-grained, muscovite-bearing, biotite granodiorite"* and the *Qag* unit is described as *"Till from continental glaciation and all alluvial material in modern drainages. Generally pale-tan or pale-gray unconsolidated boulders, gravel,*

sand, and silt."

Soil types at the site, as mapped by the Natural Resources Conservation Service (NRCS) USDA Web Soil Survey, consisted of the following:

Table 1. NRCS Soil Information

Soil Unit Name	Hydrologic Soil Group	Typical Saturated Hydraulic Conductivity (in/hr)	Typical Corrosion Risk to Concrete & Steel (both)
Caribouridge-Stien families, complex, 0 to 30 percent slopes (Unit 155)	B[1]	18.25	moderate
Andic Humudepts- Humic Udivitrands-Pearsoncreek families, dense substratum complex, 10 to 35 percent slopes (Unit 350)	B	2.29	moderate
Glaciercreek-Humic Udivitrands-Pearsoncreek families, dense substratum complex, 15 to 40 percent slopes (Unit 360)	D[2]	1.87	moderate

1. *Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.*
2. *Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.*

Surface Conditions

We performed reconnaissance of the site on April 29, 2021. The site consisted of heavily forested, partially harvested, land. Historical aerial images (Google Earth) indicate selective logging occurred twice in the last 25 years. The hilltop elevation was approximately 2,695 feet (WGS84) near the center of the site. The lowest elevation (2,570 feet) was observed at the southwest corner near the highway. The ground surface near the highway was generally level. Hill slopes ranged from approximately 10 to 65 percent; they were steepest on the east side overlooking the golf course. Small outcroppings of granitic rock and large boulders at the ground surface were observed in several areas throughout the site. Thick stands of young to mature conifers were present between the corridors cleared-out during the logging process. A large number of branches, tree debris, and stumps were left in the corridors.

Subsurface Conditions

Subsurface explorations were limited to the eastern proposed roadway and performed concurrently with the site reconnaissance. Conditions encountered in the excavations are described in the *Test Boring Logs* in accordance with methods described in *Field Exploration*. The following groups of subsurface materials were differentiated based on characteristics relevant to this project:

Surficial soil

Silty sand and silt were encountered in the borings beginning at the ground surface and extending to

depths ranging from 1 to 3.5 feet below ground surface (BGS). The *surficial soil* was generally loose. The fines percentages (passing the US #200 sieve) ranged from 17 to 51 percent.

Sand.
Sand with gravel was encountered in Boring 1 (B-1) and B-3 beneath *surficial soil*. The thickness was 4 feet and 1-foot in B-1 and B-3, respectively.

Bedrock.
Bedrock consisting of granodiorite was encountered in the borings beginning at depths ranging from 1 to 7.5 feet BGS and extending to depths greater than 15 feet BGS. The *bedrock* varied from moderately weathered to fresh and appeared to be fresh and competent at depths ranging from 5 to 8 feet BGS. Drilling advancement rates generally decreased with depth.

Surface and Groundwater Hydrology

Surface water was not observed onsite. The nearest surface water was observed in Lamb Creek approximately 1,300 feet west of the site. Although surface water was not observed, the area along the northern boundary of the site is defined by the United States Fish and Wildlife Service (USFWS) as a *freshwater forested/shrub wetland* and classified as *PSS1C*. The classification *PSS1C* includes, but is not limited to, the presence of surface water *"for extended periods especially early in the growing season but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface."*

Groundwater was not encountered during explorations. Mottled textures in the soil that would indicate the presence of fluctuating groundwater over long periods of time were not observed. Local well reports obtained through the Idaho Department of Water Resources website were reviewed. The reports indicate that groundwater begins at depths greater than 100 feet beneath the site and occurs in joints and fractures within *bedrock*.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

This GCR is suitable for conceptual planning and preliminary design. Additional geotechnical services will be needed to complete a GER when design-level information is available.

The subgrade contains loose *surficial soil* of low bearing capacities extending to a maximum depth of 3.5 feet BGS. Removal and replacement of *surficial soil* is an expedient way to mitigate hazards from settlement.

The encountered soils exhibited relatively high fines percentages and are not-well suited for re-use as structural fill. Soils with high fines content are frost-susceptible, moisture-sensitive, and can be difficult to work with in wet conditions.

Geotechnical site characterization criteria for use of rapid infiltration structures, such as drywells and infiltration trenches, requires the presence of a suitable target soil with high permeability, wide horizontal extent, and suitable thickness above limiting layers such as fine-grained soils, rock, or groundwater. These conditions were not encountered in the explorations. Subsurface infiltration of stormwater may be more feasible in other areas of the site at lower elevations towards the base of the hill.

Perched groundwater may occur during wet seasons and periods of snowmelt.

The encountered *bedrock* does not appear to be easily diggable. Heavy ripping, hammering, and possibly blasting will be necessary depending upon the proximity of final design subgrades to the surface of *bedrock*.

Seismic Considerations

The recommended seismic site class designation is Site Class C, "*very dense soil and soft rock*." Spectral response acceleration parameters, adjusted for Site Class C, were calculated using USGS, U.S. Seismic Design Web Services through the Applied Technology Council website (ATC, 2021). The values of predicted earthquake ground motion for short period structural elements (0.2 second spectral response acceleration, Ss) and for long period structural elements (1.0 second spectral response acceleration, S_1) are provided in the table below. The design parameters (S_{DS} and S_{D1}) are equal to ⅔ of the maximum earthquake spectral response accelerations (S_{MS} and S_{M1}).

Table 2. Seismic Design Parameters

Site Class	Latitude	Longitude	Ss	S_1	S_{DS}	S_{D1}	PGA
C	48.52 N	116.93 W	0.310g	0.106g	0.248g	0.120g	0.132g

Due to the presence of shallow bedrock and the potential for groundwater to become perched atop it in the loose sand, but with a low probability of very high ground acceleration, the liquefaction potential is considered low.

Earthwork

Excavation. Development of the eastern proposed road alignment and building sites will involve *bedrock* excavation but settlement risks will be minimized in such areas. In portions of the site receiving fill, *surficial soil* will pose greater settlement risks. Foundations that span both soil and *bedrock* should be over-excavated to avoid differential settlement risks.

Compact the upper 12 inches of soil subgrade that is to receive fill to a minimum of 92 percent of the maximum dry unit weight as determined by ASTM D1557 (modified Proctor – MP).

Slopes. Permanent, soil cut and fill slopes should be no steeper than 2 horizontal to 1 vertical (2H:1V) unless evaluated by a geotechnical engineer. Flatter surfaces will be easier to vegetate and maintain. Slopes of 3H:1V or flatter should be considered where possible. These slopes exclude drainage and surface water retention facilities where the slopes should be no steeper than 3H:1V.

The maximum height of permanent vertical rock cuts should not exceed 6 feet unless evaluated by a geotechnical engineer.

Temporary slopes are the responsibility of the contractor. The overburden soils are granular in nature, consistent with Type C materials per OSHA excavation criteria. OSHA specifies a maximum inclination of 1½ horizontal to 1 vertical in the temporary condition for Type C soils.

Protection of subgrade. Following compaction of soil subgrade, protect surfaces from degradation during inclement weather. Protection measures include erosion control maintenance, preventing tracking soil and rock offsite, and preventing driving on wet subgrade soil. Reduce frost penetration in freezing weather by leaving surfaces of soil un-compacted if left for an extended

duration. Prevent frost penetration in freezing weather by placing a temporary loose, insulating layer of soil on top, such as overnight.

Fill material. The encountered soils are not suitable for re-use as structural fill. They exhibit high fines percentages and are considered moisture sensitive and may be difficult to compact in wet conditions. Imported fill material such as naturally occurring pit run gravel similar to *ITD Table 703.04-1, (2 in.)* aggregate base specifications is recommended. Contact us to review fill material alternatives.

Pavement

The extent of anticipated cuts for road construction in the area investigated indicates that road subgrade will vary from dense sand to strong rock. The area is a relatively short section of the proposed road system and may not be representative of overall conditions. Future exploration and collection of proposed traffic data will be required for pavement design.

Stormwater Drainage

We recommend grading surfaces to allow positive drainage away from structures and pavements. Roof and roadway runoff should be collected and disposed of such that water is not allowed to accumulate near the structures or pavements.

We do not recommend the use of drywells due to the limited permeability of the encountered soils and presence of shallow *bedrock* in the area evaluated. The use of bio-infiltration swales (grassed percolation areas) and limited subsurface infiltration through gravel galleries may be feasible, but additional explorations and laboratory testing should be performed in the proposed stormwater disposal areas.

Additional Services

Effective geotechnical services involve cooperation with the owner, designer, and constructor as follows:

1. Preliminary study to assist in planning and to economically adapt the project to its geologic environment.
2. Soil exploration and analysis to characterize subsurface conditions and recommend design criteria.
3. Consultation with the designer to adapt the specific design to the site in accordance with the recommendations.
4. Construction observation to verify the conditions encountered and to make recommendations for modifications as necessary.
5. Construction material testing, quality control, and special inspection.

This GCR satisfies Item 1 of the 5-phase endeavor. Additional geotechnical services will be needed to complete a GER when design-level information is available. We are eager to provide assistance with design and construction as appropriate to assist in completing a safe and economical project.

FIELD EXPLORATION

The fieldwork was conducted by staff geologist Jack Pappas, GIT, and supervised by geotechnical engineer John Finnegan, PE, on June 3, 2021. The field activities generally consisted of the

following:

- Reconnaissance of the site and surrounding area;
- Logging subsurface conditions for 3 test borings; and,
- Obtaining split-spoon samples of the soils.

Results are presented in *Figures*.

Test Borings

Borings were advanced with a Geoprobe 7822 drill rig with an automatic standard penetration test (SPT) hammer utilizing a 4.5-inch outside diameter air-rotary overburden system.

Soil Samples

Samples collected during boring operations were obtained by driving split-spoon samplers through the drill casing.

Standard Penetration Tests - ASTM D 1586. To obtain samples of soil, SPTs were conducted by driving a 2-inch outside diameter split-spoon sampler with a 140-pound hammer actuated by a Geoprobe automatic hammer to provide a test of penetration resistance. The resulting blow count for each foot of sampler advancement, representing uncorrected N-values, is presented in the *Test Boring Logs*. The energy ratio is much higher with the automatic hammer compared to the reference cathead/rope system.

3-inch split-spoon samples (3"SS) - ASTM D 3550. Split-spoon samples were obtained with a 3.0-inch outside by 2.4-inch inside diameter split-spoon sampler similar to the 2-inch SPT sampler. Blow counts with the 3"SS do not represent SPT N-values since the end area of the 3-inch sampler is approximately twice that of the standard sampler.

Soil and Rock Classification

Field descriptions of soils and rock were completed in accordance with the current version of the ITD, Materials Manual, Sections 400, Guidelines for Geotechnical Engineering Investigations and Section 600, Geotechnical Analysis and Design. A key to the descriptions is provided in *Guide to Soil and Rock Descriptions.*

Location

Horizontal & vertical control. The *Site Plan* is based on plans provided by the client. Boring locations were defined by Budinger & Associates then surveyed and marked in the field by the client. Elevations presented in the *Test Boring Logs* are from the provided survey data.

LABORATORY ANALYSIS

Laboratory testing was performed on representative samples of the soils encountered to provide data used in our assessment of soil characteristics.

Tests were conducted, where practical, in accordance with nationally recognized standards (ASTM, AASHTO, etc.), which are intended to model in-situ soil conditions and behavior. The results are presented in *Figures.*

Index Parameters

Moisture content – ASTM D2216. Moisture contents were determined by direct weight proportion (weight of water/weight of dry soil) determined by drying soil samples in an oven until reaching constant weight.

Gradation – ASTM D6913. Gradation analysis was performed by the mechanical sieve method. The mechanical sieve method is utilized to determine particle size distribution based upon the dry weight of sample passing through sieves of varying mesh sizes. The results of gradation are provided in *Grain Size Distribution Results*.

Atterberg Limits – ASTM D4318. Atterberg limits describe the properties of a soil's fine-grained constituents by relating the water content to the soil's limits of engineering behavior. As the water content increases, the state of the soil changes from a brittle solid to a plastic solid and then to a viscous liquid.

The liquid limit (LL) is the water content above which the soil tends to behave as a viscous liquid. Similarly, the plastic limit (PL) is defined as the water content below which the soil tends to behave as a brittle solid. The plasticity index describes the range of water content over which a soil is plastic and is derived by subtracting the PL from the LL. The soil is classified as "non-plastic" if rolling a 1/8-inch bead is not possible at any water content.

Chemical Parameters

pH – **AASHTO T-289**. Measurement of the pH of soils are made with a potentiometer using a pH sensitive electrode system. The pH of the soil is a useful variable in determining the solubility of soil minerals and the mobility of ions in the soil and assessing the viability of the soil-plant environment.

LIMITATIONS

The conclusions and recommendations presented herein are based upon the results of field explorations and laboratory testing results. They are predicated upon our understanding of the project, its design, and its location as defined in by the client. We endeavored to conduct this study in accordance with generally accepted geotechnical engineering practices in this area.

This GCR presents our professional interpretation of exploration data developed, which we believe meets the standards of the geotechnical profession in this area; we make no other warranties, express or implied. Attached is a document titled "*Important Information About Your Geotechnical Engineering Report*," which we recommend you review carefully to better understand the context within which these services were completed.

Unless test locations are specified by others or limited by accessibility, the scope of analysis is intended to develop data from a representative portion of the site. However, the areas tested are discreet. Interpolation between these discreet locations is made for illustrative purposes only but should be expected to vary. If a greater level of detail is desired, the client should request an increased scope of exploration.

REFERENCES

American Society of Civil Engineers, 2010, ASCE Standard 7-05.

Applied Technology Council (ATC), Hazards by Location, Seismic Loads Application. Available online at https://hazards.atcouncil.org/#/ .

ASTM International, 2011, Standard Practice for Classification of Soils for Engineering Purposes, D 2487-11.

Idaho Department of Water Resources, Well Construction and Drilling, available online at https://idwr.idaho.gov/wells/find-a-well.html

Idaho Transportation Department, 2020, Materials Manual

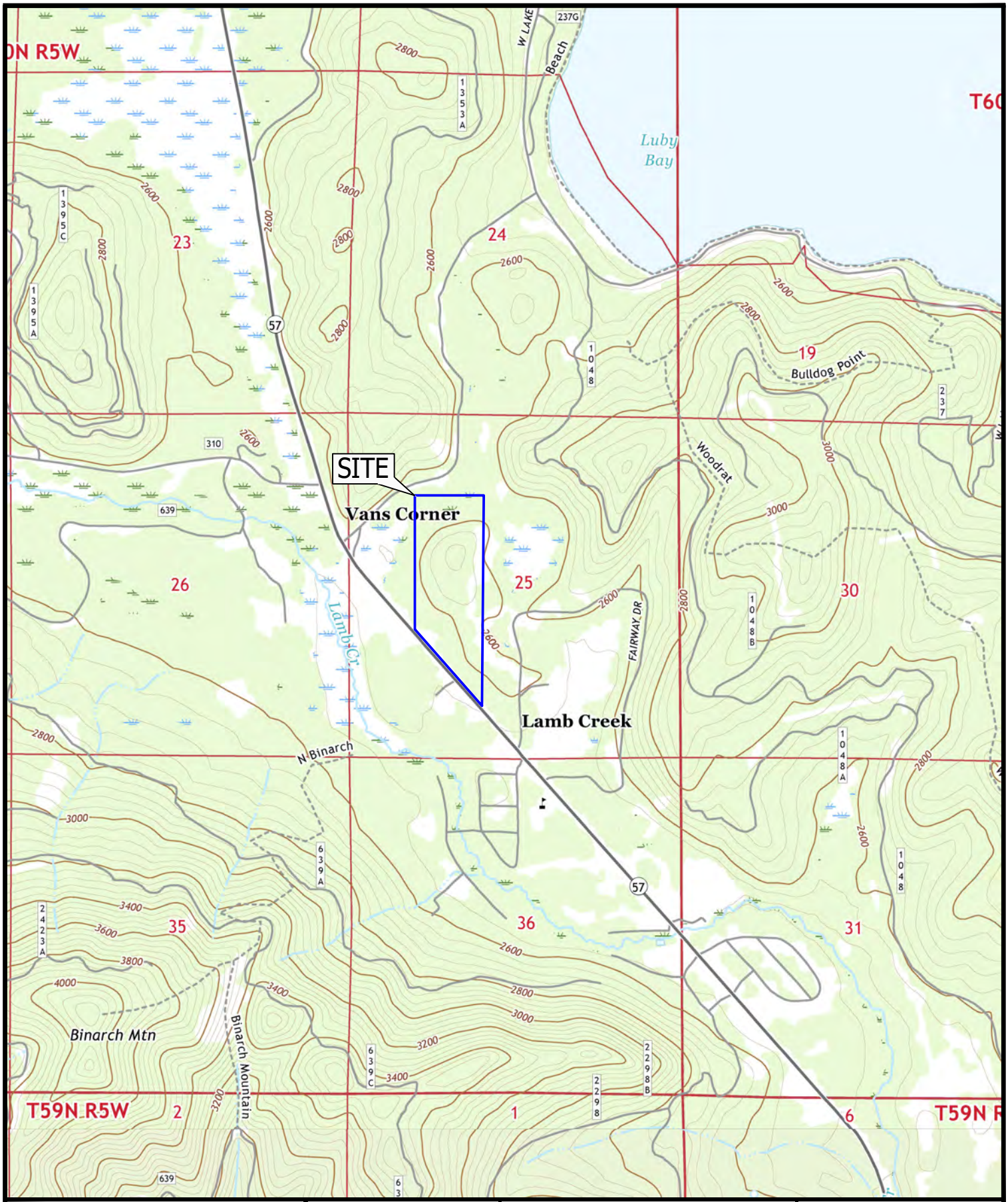
Idaho Transportation Department, 2018, Standard Specifications for Highway Construction.

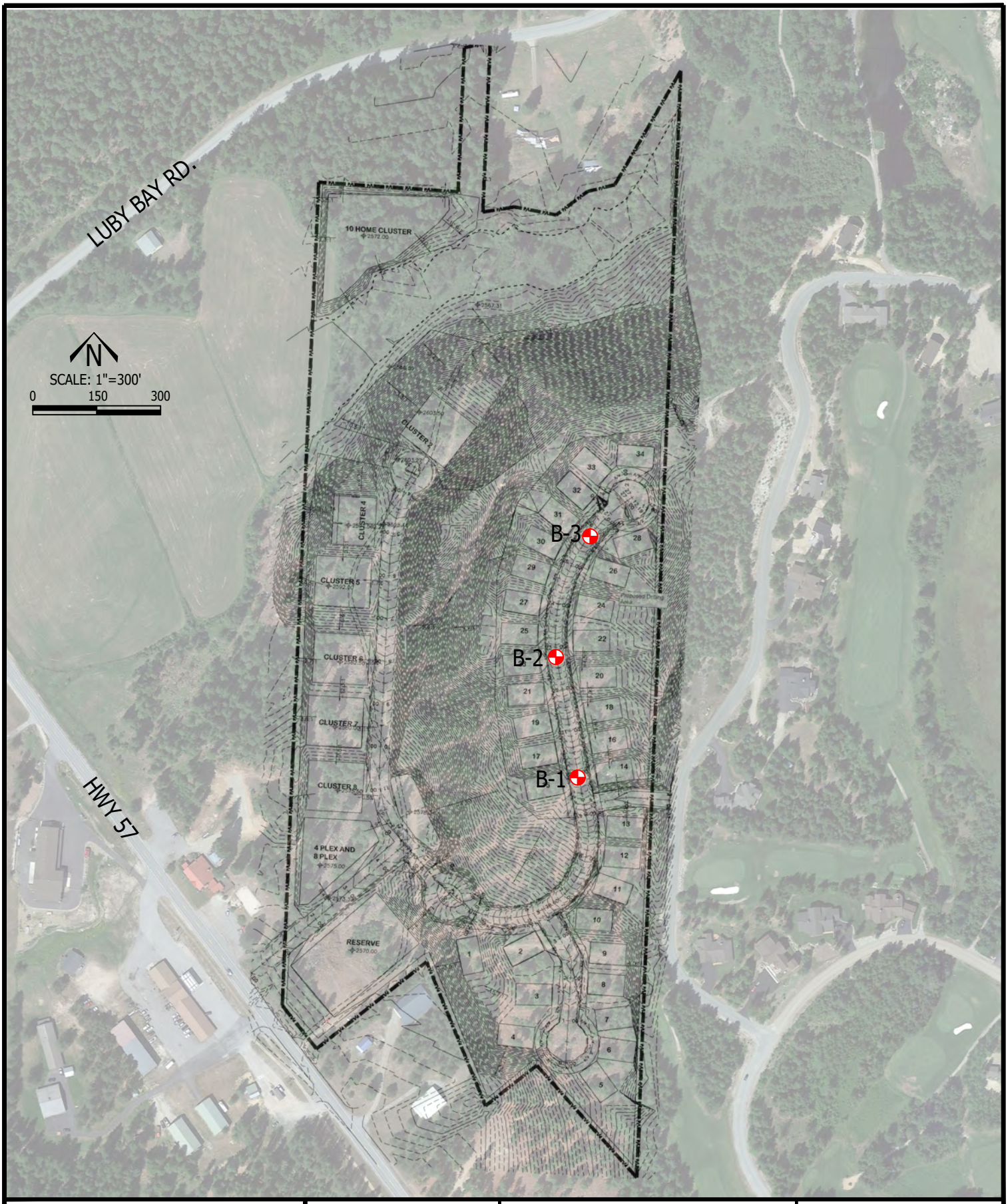
International Code Council, 2018, International Building Code.

Natural Resources Conservation Service (NRCS), United States Department of Agriculture (USDA), Web Soil Survey, 2019, Available online at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

United States Fish and Wildlife Service (USFWS), National Wetlands Inventory, Wetlands Mapper, available online at https://www.fws.gov/wetlands/data/Mapper.html

United States Geological Survey (USGS), 2003, Geologic Map of the Bonners Ferry 30' X 60' Quadrangle, Idaho and Montana, Miscellaneous Field Studies Map MF-2426.


SITE
Vans Corner
Lamb Creek
Luby Bay
W LAKE
Beach
Bulldog Point
Woodrat
FAIRWAY DR
N Binarch
Lamb Cr
Binarch Mtn
Binarch Mountain
T59N R5W
T59N R
23
24
25
26
19
30
35
36
31
1
2
6
57
310
639
SCALE: 1"=2000'
0 1000 2000
SECTION 25
T 60 N R 5 W
USGS 2020
Budinger & Associates
VICINITY MAP
ACTIVE WEST/MILLIE'S SITE INVESTIGATION
LAMB CREEK, IDAHO
FIGURE 1
PROJECT NUMBER S21368
DATE: 6/2021



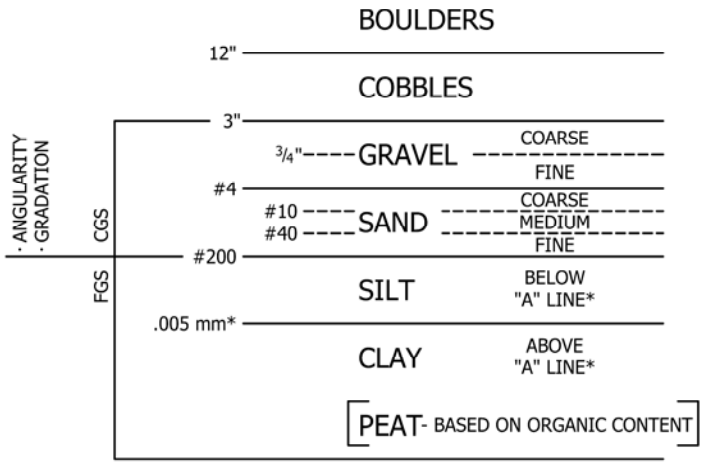
TEST BORING LOCATION (B-1)

Budinger & Associates

SITE PLAN	FIGURE 2
ACTIVE WEST/MILLIE'S SITE INVESTIGATION LAMB CREEK, IDAHO	PROJECT NUMBER S21368
	DATE: 6/2021

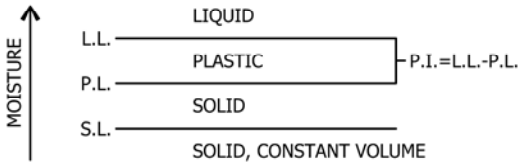
GUIDE TO SOIL & ROCK DESCRIPTIONS

SOIL CLASSIFICATION

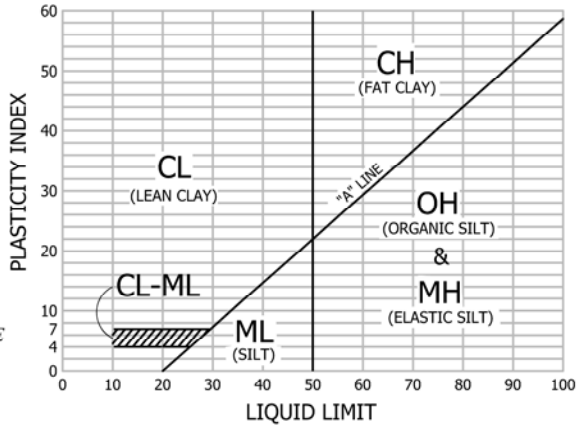


** SEE PLASTICITY CHART*
CGS - COARSE GRAINED SOIL - MORE THAN 50% RETAINED ON A #200 SIEVE
FGS - FINE GRAINED SOIL - 50% MORE PASSES, #200 SIEVE
FINES - PORTION FINER THAN #200 SIEVE

ATTERBERG LIMITS



PLASTICITY CHART



NOTE - CHART APPLIES TO FGS AND MINUS #40 SIEVE FRACTION OF CGS

GUIDE TO SOIL DESCRIPTION MODIFIERS, MOISTURE, AND CONDITION PRESENTED ON LOGS

MODIFIER	ESTIMATED PERCENTAGE OF MATERIAL
SUFFIX "LY" OR "Y"	30% OR MORE FOR COARSE PARTS IN FGS GREATER THAN 12% FOR FINES IN CGS
WITH	15% - 29% FOR COARSE PARTS IN FGS 5% - 12% FOR FINES IN CGS

NOTE - VISUAL ESTIMATES OF MATERIAL PERCENTAGES TYPICALLY VARY 0 TO 10% FROM THOSE DETERMINED BY LABORATORY TESTING.

MOISTURE

DRY
MOIST
SATURATED OR WET

SOIL CONDITION

CGS:
- VERY LOOSE
- LOOSE
- MEDIUM DENSE
- DENSE
- VERY DENSE

FGS:
- VERY SOFT
- SOFT
- MEDIUM STIFF
- STIFF
- VERY STIFF
- HARD

SAMPLES

- STANDARD 2" PENETRATION TEST SAMPLER WITH BLOWS PER FOOT
- 3" SPLIT SPOON SAMPLER WITH BLOWS PER FOOT
- DRILL CUTTING SAMPLE
- BULK SAMPLE
- THIN-WALLED TUBE SAMPLE
- DIAMOND CORE RUN WITH % RECOVERY & ROCK QUALITY DESIGNATION
- 2.5" SPLIT SPOON SAMPLER WITH BLOWS PER FOOT
- CONTINUOUS SOIL SAMPLE
- R — REFUSAL OF SAMPLE (50+ BLOWS PER 6")

ROCK WEATHERING	ROCK CONDITION
FRESH	EXTREMELY WEAK
SLIGHTLY WEATHERED	VERY WEAK
MODERATELY WEATHERED	MODERATELY WEAK
HIGHLY WEATHERED	MODERATELY STRONG
COMPLETELY WEATHERED	STRONG
RESIDUAL SOIL	VERY STRONG

Budinger & Associates

FIGURE 3

TEST BORING 1

Date of Boring: 6-3-21
Driller: Budinger & Assoc., Inc.
Type of Drill: Geoprobe 7822DT Drill, Automatic SPT Hammer
Location: Proposed STA 20+00
Surface: slash and logs

Elevation: 2646 ft
Logged by: J. Pappas
Size of hole: air rotary overburden system, 4.5 in O.D. casing

DEPTH	SAMPLES	RQD, SPT N (% RECOVERY) (Blows per 6")	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0	6 (1-5-5-3)	(75%)	moist, moderate reddish brown, loose	SILTY SAND with Gravel, coarse to fine, angular to subrounded, roots	
	8 (5-3-5)	(78%)			
			moist, medium gray, dense	SAND with Gravel, coarse to fine, angular to subangular	
5	26 (16-14-12)	(67%)		5.5 to 7.5 FT: Cobbles and Boulders encountered	
			light gray	Granodiorite, coarse-grained, fresh, very strong rock	
10	R	(0%)		SPT refused after 50 blows drove it 3 inches 10 to 11 FT: 120 seconds/foot 12.5 to 13.5 FT: 225 seconds/foot	
			no free groundwater observed	End of Boring @ 14 ft	
15					

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○
STANDARD PEN TEST, N-VALUE (OBSERVED) ◪
APPROX. SPT N-VALUE USING 3" SAMPLER ■

10 20 30 40 50 60 70 80 90

+100

LOGS WITHOUT WELL WITH TESTS S21368 GINT.GPJ GINT STD US.GDT 6/16/21

Budinger & Associates
1101 North Fancher Road
Spokane Valley, WA 99212

BORING LOGS **FIGURE 4-1**

Project: Active West/Millie's Site
Location: Lamb Creek, ID
Number: S21368

TEST BORING 2

Date of Boring: 6-3-21
Driller: Budinger & Assoc., Inc.
Type of Drill: Geoprobe 7822DT Drill, Automatic SPT Hammer
Location: Proposed STA 22+75
Surface: slash and logs

Elevation: 2669 ft
Logged by: J. Pappas
Size of hole: air rotary overburden system, 4.5 in O.D. casing

DEPTH	SAMPLES	RQD, SPT N (% RECOVERY) (Blows per 6")	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0	12 *(5-8-14-11)* (92%)		moist, moderate reddish brown, medium dense	SILTY SAND with Gravel, coarse to fine, angular to subrounded, roots	
			light gray	Granodiorite, coarse-grained, moderately to slightly weathered, strong rock	
	R *(22-52-50)* (89%)				
5	R (100%)			SPT refused after 50 blows drove it 4 inches fresh, very strong rock 5.5 to 6.5 FT: 75 seconds/foot 8.5 to 9.5 FT: 135 seconds/foot	
10			no free groundwater observed	End of Boring @ 9.5 ft	
15					

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○
STANDARD PEN TEST, N-VALUE (OBSERVED) ◪
APPROX. SPT N-VALUE USING 3" SAMPLER ■

10 20 30 40 50 60 70 80 90

+100 ◪

+100 ◪

LOGS WITHOUT WELL WITH TESTS S21368 GINT.GPJ GINT STD US.GDT 6/16/21

Budinger & Associates
1101 North Fancher Road
Spokane Valley, WA 99212

BORING LOGS **FIGURE 4-2**

Project: Active West/Millie's Site
Location: Lamb Creek, ID
Number: S21368

TEST BORING 3

Date of Boring: 6-3-21
Driller: Budinger & Assoc., Inc.
Type of Drill: Geoprobe 7822DT Drill, Automatic SPT Hammer
Location: Proposed STA 25+75
Surface: slash and logs

Elevation: 2687 ft
Logged by: J. Pappas
Size of hole: air rotary overburden system, 4.5 in O.D. casing

DEPTH	SAMPLES	RQD, SPT N (% RECOVERY) (Blows per 6")	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0	2 (2-2-2-3)	(92%)	moist, moderate reddish brown, very loose	SANDY SILT with Gravel, small roots	
	5 (1-2-3)	(72%)	moist, medium gray, loose	SAND with Gravel, coarse to fine, angular to subangular	
5	95 (43-50)	(100%)	light gray	Granodiorite, coarse-grained, moderately to slightly weathered, strong rock SPT refused in second 6 inches as 50 blows drove it 3 inches 6 to 7 FT: 40 seconds/foot	
10	50	(100%)	fresh, very strong rock	8.5 to 9.5 FT: 90 seconds/foot SPT refused after 50 blows drove it 1 inch 10.5 to 11.5 FT: 60 seconds/foot	
15			no free groundwater observed	13.5 to 14.5 FT: 110 seconds/foot End of Boring @ 14.5 ft	

TEST RESULTS

ATTERBERG LIMITS
PL — LL
WATER CONTENT ○
STANDARD PEN TEST, N-VALUE (OBSERVED) ◪
APPROX. SPT N-VALUE USING 3" SAMPLER ■

10 20 30 40 50 60 70 80 90

LOGS WITHOUT WELL WITH TESTS S21368 GINT.GPJ GINT STD US.GDT 6/16/21

Budinger & Associates
1101 North Fancher Road
Spokane Valley, WA 99212

BORING LOGS **FIGURE 4-3**

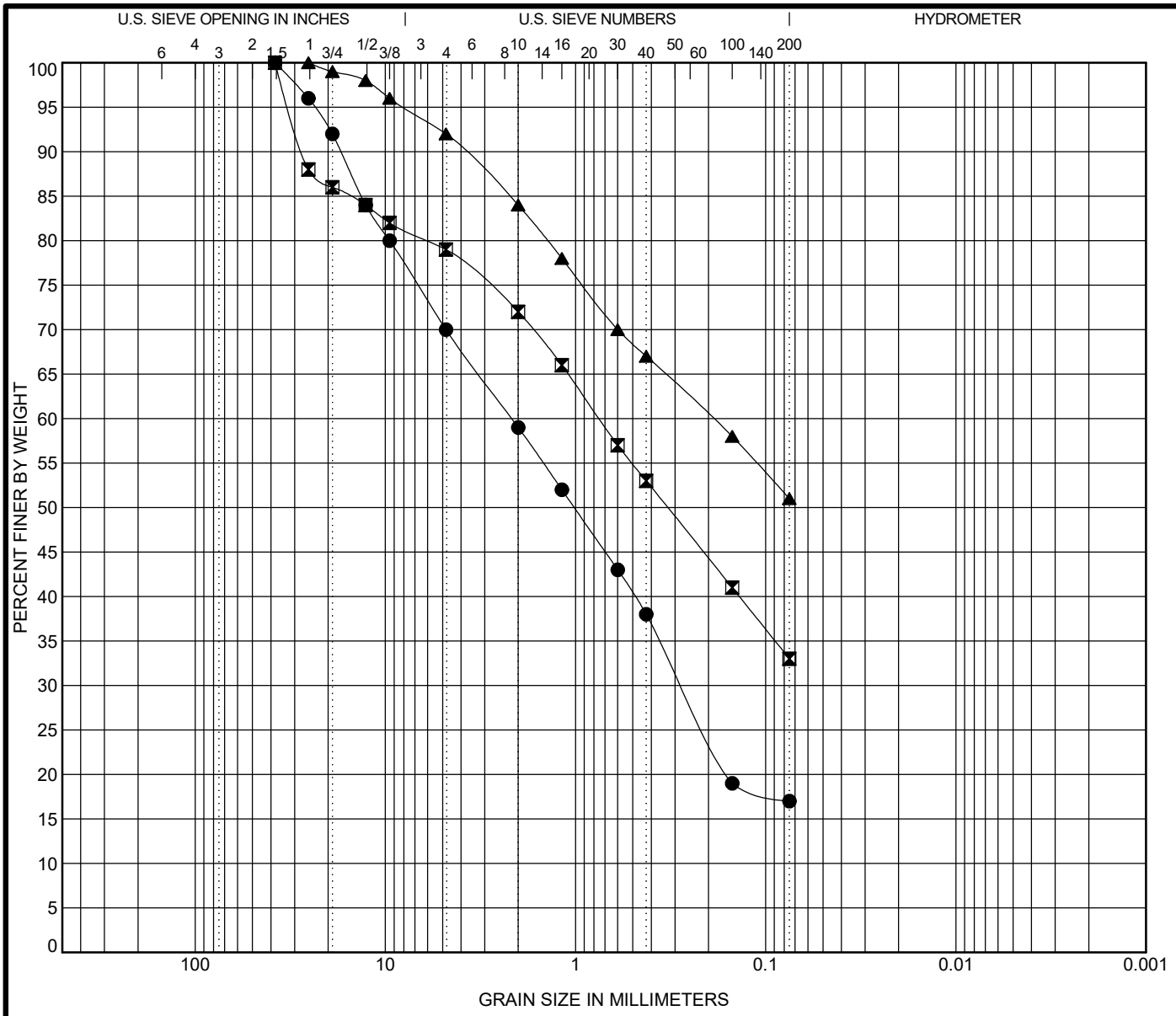
Project: Active West/Millie's Site
Location: Lamb Creek, ID
Number: S21368

SOIL MECHANICS
LABORATORY SUMMARY

LABORATORY NUMBER		Units	Test Methods	21-5392	21-5390	21-5391
TEST PIT NUMBER				B-1	B-1	B-3
DEPTH	TOP	feet		0	2	0
	BOTTOM	feet		2	3.5	2
MOISTURE CONTENT		%	ASTM D2216	6.8	16.6	32.2
pH			AASHTO T289		5.8	5.9
PLASTICITY INDEX		%	ASTM D4318		*NP	*NP
UNIFIED CLASSIFICATION			ASTM D2487		SM	ML
SIEVE ANALYSIS			ASTM D6913			
	3"					
	1 1/2"			100	100	
S	1"	%		96	88	100
I	3/4"			92	86	99
E	1/2"	P		84	84	98
V	3/8"	A		80	82	96
E	#4	S		70	79	92
	#10	S		59	72	84
S	#16	I		52	66	78
I	#30	N		43	57	70
Z	#40	G		38	53	67
E	#100			19	41	58
	#200			17	33	51

*NP= Non Plastic

Figure 5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	1	0.0						
⊠	1	2.0	**SILTY SAND with GRAVEL(SM)**	**NP**	**NP**	**NP**		
▲	3	0.0	**SANDY SILT(ML)**	**NP**	**NP**	**NP**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	1	0.0	**38**	**2.166**	**0.274**		**30.1**	**52.9**	**17.0**	
⊠	1	2.0	**38**	**0.752**			**21.1**	**45.9**	**33.0**	
▲	3	0.0	**25.4**	**0.189**			**8.1**	**40.9**	**51.0**	

Budinger & Associates
1101 North Fancher Road
Spokane Valley, WA 99212

GRAIN SIZE DISTRIBUTION

Project: Active West/Millie's Site

Location: Lamb Creek, ID

Number: S21368

Figure 6

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

DIVISION 09

Lot Density and Design Deviations

		Area Required	Total Area		
Block 1 - S. of Luby Bay	Units	per unit	Required	Acreage	
Single Family	**68**	12,000	816,000	18.73	
Townhome - 4-plex	**6**	21,000	126,000	2.89	
				21.63	
Minimum Single Family Lot Size			3,950		
Maximum Single Family Lot Size			21,252		
Average Single Family Lot Size			8,307		
Minimum Multi Family Lot Size			1,060		
Maximum Multi Family Lot Size			3,196		
Average Multi Family Lot Size			1,817		
Open Space			580,531	13.33	
Total Block 1 Area			1,211,087	27.80	
Block 2 - Luby Bay					
Single Family	**10**	12,000	120,000	2.75	
Minimum Single Family Lot Size			3,422		
Maximum Single Family Lot Size			12,013		
Average Single Family Lot Size			6,295		
Open Space			25,943	0.60	
Total Block 2 Area			126,057	2.89	
Block 3 - Public ROW					
Total Block 3 Area			247,277	5.68	
Block 4 - Commercial					
Open Space			6,937	0.16	
Total Block 4 Area			41,365	0.95	
Block 5 - Golf Course Lots					
Single Family	**8**	12,000	96,000	2.20	
Minimum Single Family Lot Size			9,450		
Maximum Single Family Lot Size			17,168		
Average Single Family Lot Size			12,727		
Total Block 5 Area			101,814	2.34	
OVERALL SUMMARY					
Total Residential Lots	110				
Total PUD Area	1,727,600	square feet	39.66	acres	
Density per current layout	15,705	SF / lot			
Open Space Provided	614,888	square feet	14.12	acres	35.6%
Minimum Common/open area	10%	172,760	3.97	acres	
Permitted Max. Density @ 12,000 sf/	143.97	lots			

James A. Sewell & Associates, LLC
600 4th Street West
Newport, WA 99156

Client: Millie's 40 Brenburk, LLC
Date: 2/13/2024
Project: PUD Lot Accounting
Ref: Eagle PUD Subdivision

Item	Area	Lot #	Lot Type SF/TH	Lot Size (sf)	acres
1	Block 1	1	SF	5468	0.126
2		2	SF	6617	0.152
3		3	SF	6181	0.142
4		4	SF	7547	0.173
5		5	SF	6487	0.149
6		6	SF	7311	0.168
7		7	SF	5337	0.123
8		8	SF	6114	0.140
9		9	SF	6242	0.143
10		10	SF	6088	0.140
11		11	SF	8470	0.194
12		12	SF	9324	0.214
13		13	SF	5746	0.132
14		14	SF	6973	0.160
15		15	SF	8141	0.187
16		16	SF	8993	0.206
17		17	SF	9607	0.221
18		18	SF	10033	0.230
19		19	SF	10295	0.236
20		20	SF	17871	0.410
21		21	SF	5667	0.130
22		22	SF	6264	0.144
23		23	SF	10256	0.235
24		24	SF	4554	0.105
25		25	SF	9836	0.226
26		26	SF	7452	0.171
27		27	SF	17272	0.397
28		28	SF	7723	0.177
29		29	SF	5131	0.118
30		30	SF	11569	0.266
31		31	SF	8889	0.204
32		32	SF	6349	0.146
33		33	SF	4295	0.099
34		34	SF	3989	0.092
35		35	SF	13165	0.302
36		36	SF	12492	0.287
37		37	SF	15413	0.354
38		38	SF	5535	0.127
39		39	SF	7116	0.163

40	40	SF	4068	0.093
41	41	SF	5198	0.119
42	42	SF	6758	0.155
43	43	SF	6369	0.146
44	44	SF	6113	0.140
45	45	SF	5271	0.121
46	46	SF	5321	0.122
47	47	SF	9291	0.213
48	48	SF	9109	0.209
49	49	SF	9573	0.220
50	50	SF	3950	0.091
51	51	SF	4279	0.098
52	52	SF	4940	0.113
53	53	SF	4268	0.098
54	54	SF	4692	0.108
55	55	SF	4763	0.109
56	56	SF	6592	0.151
57	57	SF	12000	0.275
58	58	SF	8864	0.203
59	59	SF	8038	0.185
60	60	SF	10567	0.243
61	61	SF	20234	0.465
62	62	SF	7229	0.166
63	63	SF	7029	0.161
64	64	SF	10792	0.248
65	65	SF	10839	0.249
66	66	SF	11052	0.254
67	67	SF	14631	0.336
68	68	SF	21252	0.488
PH	PH	PH	3925	0.090
S	K	Storage	16647	0.382
69	E1	TH	1590	0.037
70	E2	TH	1590	0.037
71	E3	TH	1590	0.037
72	E4	TH	1586	0.036
73	F1	TH	1550	0.036
74	F2	TH	1060	0.024
75	F3	TH	1060	0.024
76	F4	TH	1590	0.037
77	G1	TH	1590	0.037
78	G2	TH	1590	0.037
79	G3	TH	1590	0.037
80	G4	TH	1590	0.037
81	H1	TH	1500	0.034
82	H2	TH	1500	0.034
83	H3	TH	1500	0.034
84	H4	TH	1500	0.034
85	I1	TH	3196	0.073
86	I2	TH	2193	0.050
87	I3	TH	2186	0.050
88	I4	TH	2541	0.058
89	J1	TH	2585	0.059
90	J2	TH	2191	0.050

91		J3	TH	2190	0.050
92		J4	TH	2555	0.059
	Subtotal			629,079	14.442
	Open Space			582,008	**13.361**
	Total			1,211,087	27.803
93	Block 2	1	SF	8147	0.187
94		2	SF	8687	0.199
95		3	SF	9428	0.216
96		4	SF	12013	0.276
97		5	SF	5163	0.119
98		6	SF	3422	0.079
99		7	SF	3540	0.081
100		8	SF	3540	0.081
101		9	SF	4143	0.095
102		10	SF	4865	0.112
	Subtotal			62,948	1.445
	Private Road Easement			37,166	0.853
	Open Space			25,943	0.596
	Total			126,057	2.894
	Block 3		Public ROW	247,277	5.677
	Block 4		Commercial		
103		1		11,451	0.263
104		2		22,977	0.527
	Subtotal			34,428	0.790
	Open Space			6,937	0.159
	Total			41,365	0.950
105	Block 5	1	SF	12,746	0.293
106		2	SF	10,098	0.232
107		3	SF	12,488	0.287
108		4	SF	17,168	0.394
109		5	SF	13,697	0.314
110		6	SF	12,013	0.276
111		7	SF	9,450	0.217
114		8	SF	14,154	0.325
	Subtotal			101,814	2.34
	Total Area			1,727,600	39.66
	Total Open Space			614,888	14.12

Project: Eagle PUD
Date: 12/5/2023
Subj: Design Deviations
Jurisdication: Bonner County

Item	BCC Section	Code Requirement	Proposed Deviation	Mitigation
1	12-412	Minimum Lot Size 12,000 sqaure feet	>12,000 square feet	Overall project density meets the underlying zoning requriement. Approximately 13+ acres of common open space are provided.
2	12-412	Minumum Street Setback = 25-ft.		
		Public Roads - Residential Development		
		Front Yard Setback	10-ft from back of curb	
		Front Yard Setback to Garage	20-ft from back of sidewalk, or if no sidewalk, 20-ft from back of curb	This will provide room for one parking space between the garage and back of curb or sidewalk without impacting the sidewalk or street.
		Covered Porches & Patios	Can encroach 4-ft into setback.	
		Public Roads - Commercial Development		
		Front Yard Setback	15-ft.	
		Private Roads - Residential Development		
		Front Yard Setback	10-ft from back of curb	
		Front Yard Setback to Garage	20-ft from back of sidewalk, or if no sidewalk, 20-ft from back of curb	This will provide room for one parking space between the garage and back of curb or sidewalk without impacting the sidewalk or street.
		Covered Porches & Patios	Can encroach 4-ft into setback.	
		Courtyards serving Townhomes (Residential)		
		Front Yard Setback	2-ft	
		Courtyards serving Cluster Homes (Residential)		
		Front Yard, Setback	15-ft.	
		Stepback from Courtyard Easement	2-ft.	
3	12-412	Minimum Property Line Setback = 5-ft.		
		Public Roads - Residential Development		
		Side Yard Setback	5-ft.	
		Rear Yard Setback	5-ft.	
		Public Roads - Commercial Development		
		Side Yard Setback	10-ft.	
		Rear Yard Setback	10-ft.	
		Private Roads - Residential Development		
		Side Yard Setback	5-ft, unless abutting a public road, then the setback is 10-ft.	
		Rear Yard Setback	10-ft.	
		Courtyards serving Townhomes - Residential Dev.		
		Sideyard	0-ft.	
		Rear Yard Setback	8-ft.	
		Rear Yard Setback for Coveredporch	0-ft.	
		Courtyards serving Cluster Homes - Residential Dev.		
		Sideyard Setback	5-ft.	
		Rearyard Setback	10-ft.	
		Covered Porches & Patios	Can encroach 4-ft into setback	
4	12-412	Maximum Lot Coverage = 35%	100%	Several Zero Lot Line Townhomes are proposed. These lots are roughly the size of the unit. Overall open space is provided within the PUD that reflects an overall density less than 35% lot coverage.
5	12-412	Sign Setback from Property Line = 25-ft.	5-ft. to Property Line	Consistent with CUP Modification MOD0005-22 approval
6	12-453	Sidewalk minimum width = 6-ft.	5-ft wide sidewalk meeting the ADA requirements	5-ft sidewalks are consistent with ADA requirements, where shared use pathways are proposed they are shown at 8-ft in width.
7	12-465.A	Buffer Width Adjacent to State Highway 25-ft	15-ft	Highway Right-of way is 100+ feet in width, with widening of the highway there will be 15-ft between the edge of the road and the R/W, This will proivide another 15-ft.
8	12-623.D.1	Minimum Fire Flow 1,000 gpm for 2 hours	Minimum Fire Flow as Required by the Local Fire Chief	
9		**Road Width Requirements**		
		Public Roads		
		Regent Square Dr.	60-ft. right-of-way, 40-ft. Curb to Curb	Meets BCRB - Local Access High Density Road
		Sterling Lakes Dr., 0+00 though 10+30	60-ft. right-of-way, 40-ft. Curb to Curb	Meets BCRB - Local Access High Density Road
		Sterling Lakes Dr. 10+30 though 16+00	60-ft. right-of-way, 25-ft. Curb to Curb	Meets BCRB - Local Access Standard Road
		St. James Dr. 0+00 through 5+00	60-ft. right-of-way, 40-ft. Curb to Curb	Meets BCRB - Local Access High Density Road
		St. James Dr. 5+00 through 12+00	60-ft. right-of-way, 32-ft. Curb to Curb	Meets BCRB - Local Access Standard Road
		Crested Cove Dr.	60-ft. right-of-way, 40-ft. Curb to Curb	Meets BCRB - Local Access High Density Road
		Coral Ridge	60-ft. right-of-way, 28-ft. Curb to Curb	Meets BCRB - Local Access Standard Road
		Private Roads		
		Glen Lakes Drive	30-ft. min. easement, 24-ft .Curb to Curb	High Density Private Road - BCRB
		Plumb Brook Court	30-ft. min. easement, 24-ft. Curb to Curb	High Density Private Road - BCRB
		Songwood Court	34-ft. min. easement, 24-ft. Curb to Curb	High Density Private Road - BCRB
		Fairbanks Court	34-ft. min. easement, 24-ft. Curb to Curb	High Density Private Road - BCRB
		Upper St. James	30-ft. min. easement, 24-ft. Curb to Curb	High Density Private Road - BCRB
		April Sound	30-ft. min. easement, 24-ft. Curb to Curb	High Density Private Road - BCRB
		Phantom Ridge	30-ft. min. easement, 24-ft. Curb to Curb	High Density Private Road - BCRB