City of Longview

1525 Broadway
Longview, WA 98632
www.ci.longview.wa.us

Agenda

Planning Commission

Wednesday, July 2, 2025 **7:00 PM** **City Hall**

The City Hall is accessible for persons with disabilities. Special equipment to assist the hearing impaired is also available. Please contact the City Executive Offices at 360.442.5004 48 hours in advance if you require special accommodations to attend the meeting.

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1. **ROLL CALL**
2. **APPROVAL OF MINUTES**

   25-00631 Minutes of the June 4, 2025 regular Planning Commission meeting
3. **AUDIENCE PARTICIPATION OF CORRESPONDENCE**
4. **DECLARATION OF EX-PARTE COMMUNICATIONS AND APPEARANCE OF FAIRNESS**
5. **PUBLIC HEARINGS**

   25-00630 PC 2025-4 Sires Lane Subdivision
6. **NON-PUBLIC HEARING ITEMS**
7. **OTHER BUSINESS**
8. **PLANNER'S REPORT**
9. **DIRECTOR'S REPORT**
10. **ADJOURNMENT**

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Minutes

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1. ROLL CALL

Chairman Collins called the meeting to order at 7:00 p.m.

***Present**: Member Craig Collins, Member Jeff Rauth, Member Ramona Leber, Member Randy Knox, Member Jerry Stinger, Member Alison Moss*
***Excused:** Member Trey Davis*

***Staff Present**: Nick Little, Community Development Director; Irene Rutikanga, Planner; Sam Barham, City Engineer; Lisa Vertrees, Administrative Assistant*

2. APPROVAL OF MINUTES

25-00521 Planning Commission minutes of May 7, 2025

A motion was made by Member Jeff Rauth, seconded by Member Jerry Stinger, to approve the minutes of the May 7, 2025 regular Planning Commission meeting. The motion passed unanimously.

3. AUDIENCE PARTICIPATION OR CORRESPONDENCE

Correspondence received was added to the record and distributed to the Planning Commission members.

4. DECLARATION OF EX-PARTE COMMUNICATIONS AND APPEARANCE OF FAIRNESS

Read in to the record.

5. PUBLIC HEARINGS

25-00522 PC 2025-2 3505 and 3503 Oak Street Binding Site Plan

Staff report and PowerPoint presentation presented by Mr. Rutikanga.
Two variances have been requested - one for the ingress and egress; one for reduced frontage on 14 of

the lots.
Staff recommends approval of the variances; and approval of the binding site plan.
Discussion from Planning Commission members included:

- *Lot width - shared driveways*
- *Frontage variance - shared driveways*
- *CDID ditches are not critical areas*
- *Notices to homeowners were sent out*
- *Walking safety*
- *Fire sprinklers instead of on-street parking*
- *Emergency vehicle access/turn arounds*
- *Park rules/enforcement*
- *Utility maintenance*
- *CDID access surface*

Chairman Collins opened the public hearing. The following citizens spoke:
James Kessi - applicant. He discussed:

- *Gravel access road*
- *Private street that is Fire Marshal approved*
- *Utilities meet City requirements*
- *Widening Oak St.*

Julia VanSteenburg - Oak St. resident

- *22' easement (on plans) would go through her house*
- *Noted the property taxes are delinquent on the proposed site, along with the applicant not having possession of the property*

Olivia Burella - Oak St. resident

- *Noted the traffic issue and the condition of Oak St.*

Richard Burella - Oak St. resident

- *Kids use Pine St. to walk to school*
- *Traffic concern - Oak St. is not safe*
- *Road conditions*
- *Noted that at least one of the houses is historical - under the 1934 Homestead Act/Eleanor Roosevelt*
- *Soil stability of proposed site*

Rayann Swanson - Oak St. resident

- *Road safety - disagrees with the Traffic Study.*
- *No crosswalk on Oak St. to go to the park at 34th and Oak*
- *Variances appear detrimental to public welfare; noted wheelchair ramps*
- *Impact on existing utilities*

Monty Fulbright - Champ Pl. resident

- *Access road, but fenced?*

Hearing no further speakers, Chairman Collins closed the public hearing.

A motion was made by Member Jeff Rauth, seconded by Member Ramona Leber, to recommend approval of the Mint Valley Manufactured Mobile Home Park Type B Preliminary Binding Site Plan for the development of 72 manufactured home lots on approximately 10.38 acres located at 3505 Oak Street, subject to the findings and conclusions in the staff report; and to approve the requested variances to lot width and right-of-way width, also subject to findings and conclusions in the staff report.

The motion failed 5 to 1.

Discussion:
Member Alison Moss is concerned with safety. She also would like the CDID easement at the first speaker's property to be addressed. Mr. Litlle responded that the easement expansion would not affect that property.
Member Jerry Stinger is concerned with the infrastructure.
Member Randy Knox asked about the fence placement. Applicant Mr. Kessi replied the fence is within the easement, then the gravel access road. He also addressed walking safety as an off -site impact.
Member Ramona Leber felt there were many unanswered questions and noted it is historically difficult to improve streets.

25-00523 PC 2025-3 5431 Mt. Solo Rd. Planned Unit Development

Mr. Rutikanga presented the staff report and PowerPoint presentation.
Member Alison Moss mentioned safety of getting to bus stops.She sald a street subdivision requires safety to bus stops and that needs to be in the findings for approval.
There are sidewalks on Mt. Solo Road already.

Chairman Collins opened the public hearing. The following people spoke:
Scott Taylor - SGA; applicant. He is willing to coordinate with the school district to confirm bus stops and safe walking conditions. He noted there is a second access for fire fights and the corners allow equipment to turn.
Hearing no other speakers, Chairman Collins closed the public hearing.

A motion was made by Member Alison Moss, seconded by Member Ramona Leber, to approve the Taylor Island Estates Planned Unit Development (PUD) Subdivision based on the findings and conclusions in the staff report and subject to the conditions attached to the report, with the added condition of coordinating with the school district for safety concerns.
The motion passed unanimously.

6. NON-PUBLIC HEARING ITEMS

Mr. Little provided a handout of upcoming bills that will impact the City.
The short subdivision and the MUZO will go to Council June 12th.
Planning Commission will be looking at:
** the Shared Driveway ordinance*
** Mobile vendors and food trucks*
** Fishers Lane zoning map amendments*

7. OTHER BUSINESS

None at this time.

8. PLANNER'S REPORT

There are subdivision projects currently in review.
** The public hearing for Sires Lane will be at the July meeting*
** 46th/48th PUD is under review before coming to the Planning Commission.*

Public Works
** Wrapping up work on the 42nd Ave. pump station*
** Cloney Park storm pipe replacement*
** Fishers Lane pipe demo*
** Tennant Way - replacing signal controllers*
** Columbia Heights design work*

Chairman Collins mentioned timing of the lights on 15th Ave. needs review.

9. ADJOURNMENT

The next regular Planning Commission meeting is scheduled for July 2, 2025, 7 p.m.

With no further business to discuss, Chairman Collins adjourned the meeting at 9:37 p.m.

_____
Lisa Vertrees, Recorder

P.O. Box 128
Longview, WA 98632-7080
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Sires Crossing Subdivision Staff Report

Staff Report Date:	June 24th, 2025
Property Owner:	Unique Property solutions
Applicant:	Unique property Solutions
Project Summary:	Proposal for an 18-lot single family Subdivision on 3.3 acres
Project Location:	The site is located on a vacant property at Sires Lane adjacent to new life Church of God.
Current Zoning:	R-1 Low Density Residential
Comprehensive Plan:	Low Density Residential
Existing Land Use:	Vacant
Surrounding Land Use:	Church, Single family residential, Mint Valley Golf Course
Staff Recommendation:	Approval of the Sires Crossing Subdivision, with conditions.

1. PROJECT DESCRIPTION

The applicant, Unique Property Solutions, is proposing an 18-lot single family residential subdivision on a 3.3-acre site located at a vacant undeveloped property at Sires Lane in Longview, WA (Parcel No. 0277901, 02779, 02780). The project site is located in the Low Density Residential R-1 (Single-Family Residential) zoning district and will be developed in pursuant to LMC Chapter 19.80 and LMC 19.20 R-1 development standards. Access to the subdivision will be from Sires Lane a public dead-end street to be extended to city standards and serve the lots in the development through a single point of access. Proposed improvements include, curb/gutter, planter strip, sidewalks and lighting as required. The project will also be developed with a public hammerhead turnaround meeting fire department standard. Water

and sewer will be provided by the city of Longview through utilities extensions from Sires Lane extending to 42nd Ave. Stormwater will be treated via on site bioretention facility with treated flows discharging to the existing Consolidated Diking District Improvement District (CDID) ditch located to the Northwest end of the property. Parking will be provided via garages proposed with the homes and limited on street parking between driveways available.

The site is an undeveloped infill lot mostly flat with grades running from the east to the west directed towards the existing CDID ditch to west. Vegetation onsite is dominated by pasture ground cover and is adjacent to New Life Church of God.

2. CRITICAL AREAS

No mapped critical areas appear to be on the site.

3. SEPA AND PUBLIC NOTICE

SEPA was conducted and noticed as part of the project review. A Determination of Non-Significance (DNS) was issued on June 10th, 2025. The comment period ended on June 24th, 2025. Ecology did not have comments for the proposal.

4. LMC 19.20.030 R-1 DENSITY AND DIMENSIONAL STANDARDS

The zoning code provides development standards for Low Density Residential (R-1) District developments in chapter 19.20 of the Longview Municipal Code. Consistency with the R-1 development standards are demonstrated in the table below:

Standard	**R-1 Requirement**	**Proposed**	**Meets Standard**
Minimum Lot Size	6,000 sq. ft.	6,344 sq.ft. and 4,243 for lot 1 with a variance	✓ Yes & Lot 1 upon approval of variance
Minimum Lot Frontage/Width	50 ft	55 ft, and share driveway for lots 11&12 and lots 7&8, 1&2	✓ Yes
Maximum density	6 units/acre	5.45 units/acre	✓ Yes
Front setback	25 ft	25 ft	✓ Yes
Interior Side Setback	5 ft	5 ft	✓ Yes
Rear Setback	15 ft	15 ft	✓ Yes

Maximum Building Height	35 ft	2 story	✓ Yes (subject to future permit review)
Maximum Impervious Surface	65%	65%	✓ Yes

Staff Findings: The proposed subdivision substantially complies with the standards of the R-1 (Single-Family Residential) zoning district. The project includes an average lot size of 6,344 square feet. Lot 1 proposes a lot size of 4,243, which does not meet the R-1 standards and requesting a variance. The project proposes a minimum lot frontage of 50 feet. For lots that do not meet the minimum frontage requirement, the applicant proposes to utilize the shared driveway provision in accordance with LMC 19.77. The subdivision meets all setback requirements and the rest of the development standards for the Low-Density Residential district. The proposed density of 5.41 dwelling units per acre is within the maximum allowed density of 6 units per acre in the R-1 zone. Parking will be provided through two-car garages for each unit with additional on street parking available, consistent with the code requirement of two off-street parking spaces per dwelling unit.

5. LOT SIZE VARIANCE REQUEST

The applicant is requesting a variance for the required minimum lot size for one of the lots as part of the project proposal. Lot 1 is proposed with a lot size of 4,243 square feet, which is less than the required R-1 standard of 6,000 square feet. A variance may be granted when unique physical or topographical conditions such as steep slopes, wetlands, irregular lot shapes, or surrounding development patterns create a hardship that prevents reasonable use of the property under current standards. The requested variance for subdivisions must be reviewed in accordance the criteria in LMC 19.80.180 and LMC 19.12.140 which are combined and summarized together and discussed below:

1.Necessary due to special circumstances related to the property's size, shape, location, or surroundings, and not the result of actions taken by the applicant.

2.Consistent with the intent and purpose of the standards being modified and with the goals and policies of the Comprehensive Plan;

3. Safe, practical, and efficient, based on sound engineering and planning principles;

4. Does not grant special privileges beyond what is allowed for similar properties in the same zone;

5.Not materially detrimental to public health, safety, welfare, or surrounding properties; and

6.In the case of sidewalk modifications, must still provide for safe pedestrian and bicycle movement.

Staff Findings: The proposed variance to reduce the minimum lot size for Lot 1 from 6,000 square feet to 4,500 square feet is justified by unique physical and locational conditions on the site that are not the result of the applicant's actions. Specifically, the site requires stormwater discharge at the northwest corner adjacent to an existing CDID ditch, necessitating a 3,103 square foot wide tract for bioretention and conveyance improvements. The bioretention tract limits available space for Lot 1, resulting in a narrower configuration, however, the lot still maintains a viable buildable envelope and meets the rest of the applicable R-1 development standards, ensuring it remains functional and developable. The variance is consistent with the purpose of minimum lot size standards and the Low-Density Residential zone to ensure orderly development and adequate site functionality and supports Comprehensive Plan goals related to environmental protection, increasing the housing stock and infrastructure coordination. The design has been reviewed for compliance with sound planning and engineering principles and does not create adverse safety or functional impacts. It does not provide special privileges, as it is a response to site constraints and the need for stormwater infrastructure benefiting the entire subdivision; nor does it provide any additional density beyond what is allowed in the R-1 district. Furthermore, the variance does not impact emergency services response, adversely affect public health, safety, or welfare, and no sidewalks are proposed to be modified as part of this request.

6. SUBDIVISION APPROVAL CRITERIA AND MINIMUM STANDARDS

All proposed subdivisions must be reviewed in accordance with the provisions of LMC 19.80 and RCW 58.17. The City's subdivision code establishes a set of criteria for preliminary approval addressing public health, streets and utilities, physical features of the site, and compliance with state and local codes. The following section evaluates the proposed project's consistency relative to these criteria.

A. Transportation, Water, Stormwater Management, and Utilities

The proposed subdivision will be accessed from Sires Lane, a public dead-end street that will be extended to serve the new lots. The extension will be built to City standards, including a 60-foot right-of-way and 32 feet of paved roadway. A fire department hammerhead turnaround will be provided at the end of the street, designed in accordance with City specifications. Additional improvements include sidewalks on both sides of the street, curb and gutter, planter strips, and street lighting. Street lights will be installed at regular intervals along the internal roadway, with the final design and placement to be reviewed and approved by the City Engineer during construction plan review.

8" Water and Sewer main extensions will be installed along the new street and connect to the existing water and sewer utilities on Sires Lane and 42nd Ave.

Stormwater management for the project will be designed and constructed in compliance with Chapter 17.80 LMC and all other applicable regulations. The project proposes a bioretention facility designated as "Tract A" to treat impervious surface runoff and discharging treaded flows to the existing CDID conveyance ditch at the Northwest of the property. As part of final plat approval this Tract will dedicated to the City of Longview.

Staff Findings: The proposal includes appropriate provisions to address impacts related to transportation, utilities, and stormwater. The proposed streets, utilities, and public

improvements for the subdivision have been designed in accordance with the City's current ordinances, standards, and plans.

A traffic generation letter was provided as part of the submittal and indicated that the project will generate a total of 170 average weekly daily trips and no offsite mitigation is anticipated, the city engineer reviewed the traffic generation letter and expressed no concerns. Public water and sewer will be extended to serve all lots, with adequate capacity confirmed. Stormwater will be managed on-site using bioretention facility in accordance with LMC 17.80, and dedicated to the City for assurance of ongoing maintenance. Appropriate erosion and sediment control measures will be implemented during construction. All systems are consistent with City ordinances, standards, and plans.

The project includes a single point of access from Sires Lane and proposes an additional emergency only access with Knox a locked gate at the Southeast end of the project site. The emergency access is to be marked so that it is always kept free of obstructions. The proposed gate will be reviewed by the fire marshal during construction plan review.

B. Public Health, Safety, and Welfare

Staff Findings: The proposed subdivision will be developed with adequate utilities that meet city of Longview standards to ensure adequate utilities provisions. A secondary emergency only access will be provided to ensure adequate fire access is available within the development which ensures the safety of future residents of the development. The project proposes one new fire hydrant in addition to an existing hydrant on the church property behind lot 13, the number of fire hydrant and spacing has been adequate by the fire marshal.

RCW 58.17 requires that appropriate provisions be made for "planning features that assure safe walking conditions for students who only walk to and from school." The proposed subdivision is located approximately 0.9 miles from Robert Gray Elementary School, the nearest school accessible by foot for future residents of the subdivision. A staff analysis of the walking route indicates that students would walk along Sires Lane, an improved roadway with sidewalks on both sides, then turn right onto Olympic Way and continue to 46th Avenue, which leads directly to the school. Both Olympic Way and 46th Avenue are also improved streets with sidewalks on both sides, providing a continuous, safe pedestrian route for students walking to and from school.

C. Topography and Physical Characteristics

Staff Findings: The site is mostly flat and doesn't include steep slopes, wetlands, or other mapped critical areas. The provided geotechnical report confirms the soils are suitable for residential development, with no major concerns like flooding or unstable soils.

The Sires Lane crossing subdivision has been laid out to work with the site's natural features. The property is mostly flat and bordered by a CDID drainage ditch on the west of the property which will be maintained on site and work in the overall stormwater system proposed for the development. The project is bordered by existing single-family residential development to the north, east, and west, and by a church to the south.

Existing fencing along shared property lines, installed by surrounding developments, provides visual screening and helps minimize potential privacy impacts between the proposed subdivision and adjacent uses. Additional screening will be installed along the southern boundary of the site to provide visual separation between the development and the adjacent church property.

D. Compliance With Local and State Codes

Staff Findings: The proposed subdivision complies with all applicable state, local, and regional requirements. It meets the subdivision regulations under Chapter 58.17 RCW, including SEPA review, public notice and platting procedures. The project is consistent with the R-1 zoning district and the City's Comprehensive Plan, and it doesn't fall within shoreline jurisdiction, so the Cowlitz County Shoreline Master Program does not apply. Stormwater is managed in accordance with LMC 17.80 using on-site bioretention facility. All streets, utilities, and public improvements will be built to City standards under LMC12.50. The project meets fire safety requirements through approved street design. Other adopted city policies and standards have been addressed through the project's design and conditions of approval.

E. Dedication of land

Staff Findings: As part of the final subdivision approval, the applicant will be required to construct all necessary public improvements, including streets, stormwater facility sidewalks, and utilities, in accordance with City standards. All public facilities and stormwater tract(s) will be dedicated to the City of Longview and/or CDID via the final plat. Additional title transfers, if required, will occur at the time of final plat recording.

F. Landscaping

Staff Findings: A landscaping plan has been provided by the applicant showing the proposed location and type of vegetation proposed on the site. Planter strips will be provided between the sidewalk and curb of the new street. The planter strips proposed comprise of fourteen 2-inch caliper Norwegian trees. In addition, Individual lots will also be landscaped with a mix of medium& low ornamental naturalized plants to enhance visual appeal . Prior to planting, all tree species proposed will need to be approved by the Parks and Recreation department.

E. Easements

A number of easements will be required for the project:

- 10' stormwater easements on lot 2,7,14
- A 21-foot-wide utility easement that runs across Lots 11 and 12 to accommodate necessary utility infrastructure.
- A 20-foot-wide utility easement along the southern boundary of Lot 11, extending into the adjacent church property to provide utility access to 42nd Avenue.
- A 20-foot shared driveway easement for lots 1 & 2, 11 & 12, and 7 & 8.

Other easements, as needed, maybe required upon reviewing final construction plans. If required, these easements will be dedicated and/or deeded as necessary prior to or concurrent to final plat approval.

7. COMPREHENSIVE PLAN POLICIES AND GOALS

The proposed Sires Crossing Subdivision is located within the R-1 Residential District, which aligns with the Low-Density Residential designation in the City's Comprehensive Plan. The Low-Density Residential designation supports the development of Single-family development.

Based on the City of Longview's Comprehensive Plan, the proposed Sires crossings subdivision is consistent with several key goals, policies, and objectives related to land use, housing, infrastructure, and open space. The project supports the Low-Density Residential land use designation by providing single-family homes at a gross density of 5.45 units per acre well below the maximum of 6 units per acre allowed in the R-1 zone.

Table 3-16 on page 55 of the Comprehensive Plan identifies a projected need for at least 1,571 new single-family units by the year 2040 to accommodate anticipated population growth. The proposed development directly supports this housing need and aligns with the City's long-term planning goals

Relevant goals, objectives, and policies in the Comprehensive Plan are highlighted in the below section.

Low Density Residential

The low-density residential classification designates areas intended primarily for single-family dwellings. Single family detached development are allowed in this classification. Home occupations may be acceptable. The recommended density is up to six dwelling units per gross acre.

Policy LU-A.1.1	Provide a variety of residential zoning district at different densities to meet the needs of all economic segments of Longview population.
Policy LU-A.1.4	Assure compatibility of new development siting, design, and scale with the surrounding natural and built environment.
Policy LU-A.1.5	Facilitate redevelopment existing developed land when appropriate and encourage infill development on vacant or undeveloped land.
Goal LU-B	Ensure the location and design of new development is appropriate in type, density, and location considering existing land use patters, capacity of public facilities, natural characteristic of the land and community preferences.

Table 3-16. Number of New Housing Units Needed, By Type, 2017 – 2040

Unit type	Census 2010	%	Estimate 2017	%	Projected 2040	# New Units
Single Family	10,856	66.3	10,986	66.2	12,520	1,571
Multi-family	4,863	29.7	4,912	29.6	5,598	703
Manufactured Home	661	4.0	641	4.2	794	100
Total Units	**16,380**	**100.0**	**16,539**	**100.0**	**18,912**	**2,374**

Source: Census 2010, Washington Office of Financial Management, CWCOG

8. CONCLUSION

The proposed 18-lot Sires Crossing subdivision meets the applicable requirements of the Longview Municipal Code (LMC), including zoning, utilities, stormwater management, transportation, and overall site design. The project is consistent with the Comprehensive Plan's Low Density Residential land use designation and supports the City's housing goals by providing additional single-family homes to the housing stock.

All necessary infrastructure will be provided, including public water and sewer service, fire protection and stormwater treatment through on-site bioretention facility consistent with City standards and CDID coordination. The applicant has requested a variance to reduce the lot size of Lot 1 in order to accommodate a stormwater tract. This request is due to site constraints caused by the location of the CDID drainage ditch at the northwest end of the property, and meets the criteria established under LMC 19.8.180 and 19.12.140. The project proposes a secondary emergency-only access to ensure adequate fire/emergency response access and to support the safety and welfare of the future residents.

The project improvements will include providing sidewalks for pedestrian connection and planter strips along with landscaped yards to enhance neighborhood livability and character. The Sires Crossing subdivision is in a fully developed area comprised of improved streets with sidewalks, and connects internal sidewalks to the surrounding pedestrian infrastructure to provide safe walking conditions for future students that will reside in the subdivision. As individual homes are constructed, they will be reviewed under the building permit process to ensure compliance with applicable zoning, setback, utility, and fire access requirements.

9. RECOMMENDATIONS

Approval of Variance Request

Staff recommends approval the proposed variance to allow reduced lot frontage of 4,243 square feet for lot 1.

Approval of the Sires Crossing Subdivision

Staff recommends approval of the Sires Crossing Subdivision, an 18-lot Subdivision, based on the findings and conclusions and subject to the conditions attached to this staff report.

10. EXHIBITS

A. Preliminary Plans et
B. Traffic Generation Letter
C. Geotechnical Report
D. Narrative

11. CONDITIONS OF APPROVAL

1. The applicant shall submit a final plat consistent with the approved preliminary plat and shall address all applicable requirements of the Longview Municipal Code (LMC). All required improvements shall be constructed prior to final plat approval. The final plat will not be accepted for review until final engineer acceptance. Final plat approval shall not be granted until all conditions of approval have been met, construction of required infrastructure is complete, and/or all necessary bonds or assurances have been executed.

2. The plat shall be titled "Sires Crossing." Approval is limited to 18 lots. The new lots shall substantially conform to the lot sizes and dimensions shown on the approved preliminary plat.

3. For each lot submitted for final plat approval, a building envelope shall be delineated on the final plat. No lot shall be final platted that does not contain a building site which can accommodate a reasonably sized house, parking area, building setbacks, and driveway access.

4. The applicant shall work with the Longview Post office to determine the most appropriate location for mailboxes to serve the development.

5. The geotechnical assessment provided from South Sound Geotechnical Consulting dated on November 25, 2024, shall be used to inform the design and review of those elements of the subdivision identified in the assessment, and all future development including grading shall conform to the recommendation and conclusions within the report.

6. Shared driveways serving lots 8-11 shall be constructed prior to final plat approval, and shall conform to the requirements of LMC 19.77, including the establishment of necessary easements.

7. Screening in the form of fences, hedges or landscaping buffer shall be installed along the southern boundary of the project site, excluding the emergency access area, to provide visual screening between the development and the adjacent church property.

8. A Fee-in-Lieu agreement, approved by CDID, shall be submitted prior to final approval to satisfy the flow control requirements for the project.

9. The proposed 8-inch water main shall be constructed using ductile iron (DI) pipe, not PVC, as specified in the plans.

10. The bioretention facility located within Tract A shall be dedicated to the City of Longview prior to final plat approval.

11. The developer shall install landscaping and plant strips within as shown in the submitted landscaping plan, and in accordance with Park and Recreation Department specifications and the standards of LMC 19.80.130(4)(e).

12. Fire hydrants shall be installed at locations approved by the City Fire Marshal and in accordance with applicable fire code standards.

13. Designated emergency vehicle only access is to be marked so that it is kept free of obstructions at all times. Approved notices or markings that include the words "NO PARKING – FIRE LANE" shall be provided for fire apparatus access roads to identify such roads or to prohibit the obstruction thereof. The means by which fire lanes are designated shall be always maintained in a clean and legible condition and shall be replaced or repaired when necessary to provide adequate visibility.

14. The applicant shall submit documentation verifying that the required fire flow of 1,000 gallons per minute at a minimum residual pressure of 20 pounds per square inch for a duration of 60 minutes is available to the hydrants prior to final plat approval.

15. Building construction occurring subsequent to this application shall be in accordance with the city's adopted codes and referenced standards. Additional specific requirements may be made during the city's building permit review process.

16. Permit to Construct: Prior to construction, an application shall be made to the Community Development Department and/or Public Works Department as appropriate. The application shall include a complete set of engineered plans to include: road and utility plans, grading and filling, drainage/stormwater facilities, and erosion/sedimentation controls for review and approval prior to construction and any improvements made thereafter. No grading, excavation, or construction shall be conducted until all construction plans have been approved and applicable permit(s) issued. All engineered plans shall be prepared and stamped by a licensed professional engineer registered in the State of Washington.

17. All utilities shall be installed underground and constructed in accordance with the City of Longview public works standards and approved by the city engineer. All power and cable service lines shall be installed underground. Utility easements shall be provided as required by the standards and installation requirements of the purveyors. All utility easements and restrictions shall be shown on the face of the final plat. Power shall be installed as approved by the appropriate purveyor prior to final subdivision approval. Written verification and acceptance of the improvements shall be submitted with the final plat.

18. Street lighting shall be installed by the developer along all improved public streets. The location, type, and specifications for all streetlights shall be included in the Final Engineering Plans and lighting plan and are subject to approval by the City Engineer.

19. The developer shall provide all required street name and traffic control signs along improved public streets. Sign types, placement, and specifications shall be included in the Final Engineering Plans and approved by the City Engineer.

20. All necessary utility, drainage, access, and maintenance easements shall be recorded with the final plat, in locations approved by the City Engineer and utility providers.

21. Stormwater treatment facility shall be constructed in compliance comply with LMC 17.80 and be designed in according to the provisions of the preliminary stormwater report. A National Pollutant Discharge Elimination System (NPDES) permit or Construction Stormwater General Permit shall be obtained prior to any construction activities; it will be the responsibility of the applicant to obtain the NPDES permit, and the responsibility of Ecology to enforce said permit.

22. Relevant CDID#1 Standard Details shall be included in the construction plan set.

23. The following notes and restrictions shall be placed on the face of the final plat:

    - All future development shall conform to the conclusions and recommendations contained in the geotechnical assessment performed by South Sound Geotechnical consulting, dated November 25th , 2024.
    - The shared driveway and Fire Lane between Lots 10, 11, and 12 shall be kept open, free, and clear and accessible to emergency vehicles, No obstructions, including structures, landscaping, fencing, or parking of vehicles shall be allowed within this Fire Lane.

Additional plat notes may be required and will be determined during final construction plan and final plat review.

SIRES CROSSING PRELIMINARY PLAT

SECTION 19, TOWNSHIP 08 NORTH, RANGE 02 WEST, W.M.
COWLITZ COUNTY, WASHINGTON

LEGEND

EXISTING	PROPOSED	
W	W	WATER MAIN
SS	SS	SANITARY SEWER MAIN
FM	FM	FORCE MAIN
SD	SD	STORM MAIN
RD	RD	ROOF DRAIN
		FOOTING DRAIN
G	G	GAS LINE
UGP	UGP	POWER LINE
T	T	TELEPHONE LINE
TV	CATV	CABLE TV LINE
		ROADWAY CENTERLINE
		RIGHT-OF-WAY LINE
		EASEMENT LINE
		FRONT/BACK OF CURB
		EDGE OF GRAVEL SHOULDER
		EDGE OF PAVEMENT
		SAWCUT LINE
		TOP/TOE OF SLOPE
		BUILDING ENVELOPE/SETBACK
GB GB	GB GB	GRADE BREAK
XXX	XXX	CONTOUR LINE
		FENCE
		SILT FENCING
		CLEARING LIMITS
		DRAINAGE BASIN BOUNDARY
		SWALE/DITCH CENTERLINE

GEOTECHNICAL NOTE

A GEOTECHNICAL REPORT WAS PREPARED BY SOUTH SOUND GEOTECHNICAL CONSULTING FOR THIS PROJECT. ALL RETAINING WALL CONSTRUCTION, EARTHWORK, SUB-GRADE PREPARATION, AND PAVING ACTIVITIES SHALL COMPLY WITH THE GEOTECHNICAL REPORT AND THE IBC.

WORK IN CITY RIGHT-OF-WAY

CONTRACTOR TO OBTAIN RIGHT OF WAY PERMIT PRIOR TO ANY WORK WITHIN COUNTY RIGHT OF WAY. ALL WORK WITHIN COUNTY RIGHT OF WAY SHALL ADHERE TO COUNTY STANDARDS AS OUTLINED IN THE RIGHT OF WAY PERMIT.

TOPOGRAPHIC NOTE

TOPOGRAPHIC INFORMATION DEPICTED HEREON WAS PROVIDED BY BLUHM AND ASSOCIATES LAND SURVEYORS, INC. TOPOGRAPHIC INFORMATION WAS NOT FIELD VERIFIED BY RB ENGINEERING.

SURVEY INFORMATION

LEGAL DESCRIPTION

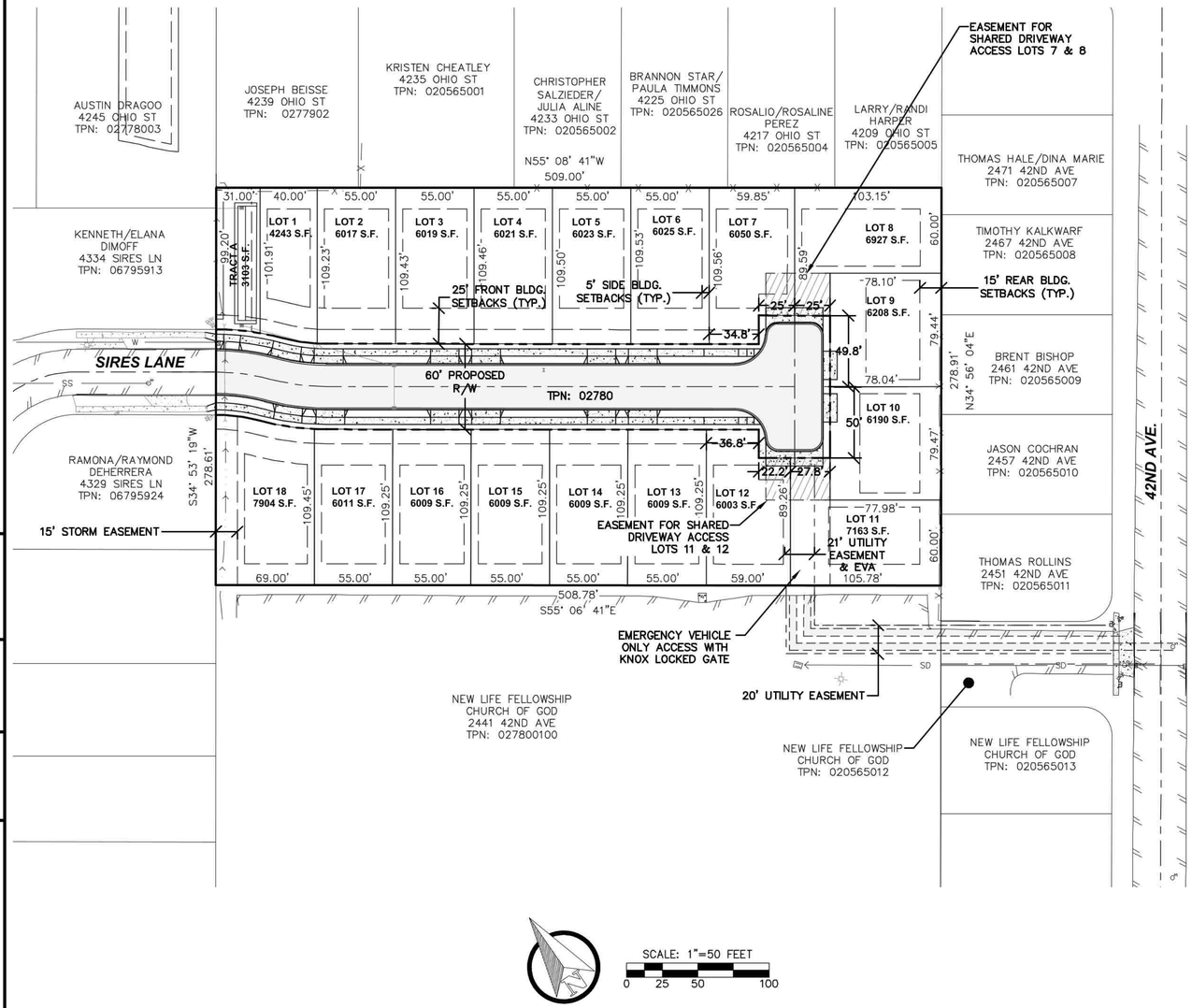
140 (CVG 2) -30 -7 19 -8N -2W EXC LOT 7A EXC 7B OWNERS SEG 267 EXC PLAT OF R A CEDAR ADD #1 EXC; 140 (CVG 2) -30 -8 19 -8N -2W EXC PLAT OF R A CEDAR ADD #1 EXC LOT 8A,9,10 FEE 881122055; 140 (CVG 2) -30 -7A 19 -8N -2W NELY 150 FT OF SELY 100 FT LOT 7 EXC PLAT OF R A CEDAR ADD #1.

VERTICAL DATUM

HELD WSDOT MONUMENT DESIGNATION F 202 RESET ID#5919, NAVD 86 ELEV 7.49'

BASIS OF BEARING

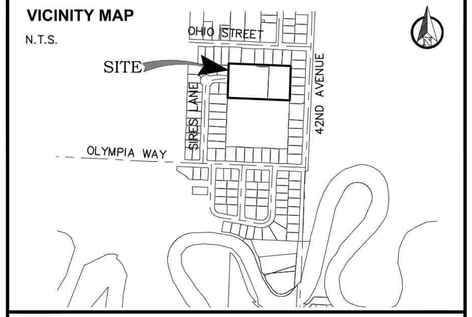
PLAT OF R.A. CEDAR ADD. #1 FILED IN VOL 1 OF PLATS, P.29, RECORDS OF COWLITZ COUNTY WA.



SCALE: 1"=50 FEET
0 25 50 100

VICINITY MAP

N.T.S.



PROJECT INFORMATION

APPLICANT:	JERRY BAKER UNIQUE PROPERTY SOLUTIONS (971) 253-9518 JERRY@UNIQUEPROPSOLUTIONS.COM
ENGINEER:	ROBERT W. BALMELLI 91 S.W. 13TH ST. P.O. BOX 923 CHEHALIS, WA. 98532-0923 (360) 740-8919 PHONE (360) 740-8912 FAX
SURVEYOR:	KEVIN BLUHM, P.L.S. 1068 S. MARKET BLVD. CHEHALIS, WA 98532 (360) 748-1551
PARCEL NOS:	0277901, 02779, 02780
SITE ADDRESS:	'0' SIRES LANE LONGVIEW, WA 98632
LAND USE APPROVAL:	PRELIMINARY PLAT
SEPA CHECKLIST:	YES
CRITICAL AREAS:	NONE
ZONING:	R-1 RESIDENTIAL
SETBACKS:	FRONT 25', BACK 15', SIDE 5', FLANK 15'
MAX. BLDG. HEIGHT:	35 FEET
DENSITY CALCULATION:	6 DU MAX. 3.3AC x 6 = 19.8 DU = 20 DU
OPEN SPACE/TRACTS:	0 SQ. FEET
BUILDING SIZE/USE:	SINGLE FAMILY, DETACHED
BUILDING HEIGHT:	TWO STORY
NUMBER OF LOTS/UNITS:	18
MIN. LOT AREA:	6,000 SF (LOT 1 VARIANCE, AREA=4243 SF)
MAX. LOT COVERAGE:	65%
AVERAGE LOT SIZE:	6,158 SF
TOTAL SITE AREA:	143,748 SF / 3.3 ACRES
EXISTING IMPERVIOUS:	0 SF / 0 ACRES (100%)
NEW IMPERVIOUS:	21,645 SF / 0.50 ACRES
REPLACED IMPERVIOUS:	0 SF / 0 ACRES
NEW+REPLACED IMPERV:	21,645 SF / 0.50 ACRES
DISTURBED PERVIOUS:	26,751 SF / 0.61 ACRES
TOTAL DISTURBED AREA:	26,751 SF / 0.61 ACRES
STREET FRONTAGE:	410 LINEAR FEET
GRADING (CUT/FILL):	±10 CY CUT / ±962 CY FILL
STORMWATER REGS:	2019 WWHM-LID OR LIST METHOD
SOIL CLASSIFICATION	NRCS, NOTE IF GEOTECH REPORT WAS DONE
INFILTRATION:	YES OR NO
TREATMENT:	BASIC
FLOW CONTROL:	EXEMPT WITH FEE IN LIEU W/CDID#1
NPDES STORM PERMIT:	YES
ROAD CLASSIFICATION:	PUBLIC, LOCAL; PVMT= 32' R/W=60'
DRIVEWAY WIDTH:	20' TYP.
PARKING REQUIRED:	2 PER UNIT
ADA REQUIRED:	NONE
PARKING PROVIDED:	2 PER UNIT
WATER SERVICE:	CITY OF LONGVIEW 360-442-5710
SEWER SERVICE:	CITY OF LONGVIEW 360-442-5710
FIRE DISTRICT:	LONGVIEW FIRE DEPT #82 442-5503
SCHOOL DISTRICT:	LONGVIEW PUB SCHOOLS 360-575-7016
POWER SERVICE:	COWLITZ CO PUD 360-423-2210
GAS SERVICE:	COWLITZ CO PUD 360-423-2210

SHEET INDEX

NO.	DATE	REVISION
1	6.24.25	REVISED PRELIMINARY PLAT

DESIGNED BY: CA
DRAWN BY: ALE
CHECKED BY: RWB
DATE: 05/15/2025
SCALE: 1" = 50'

MINT VALLEY ESTATES
CITY OF LONGVIEW WA.

OVERALL SITE PLAN AND PROJECT INFORMATION

ROBERT W. BALMELLI — STATE OF WASHINGTON — 21911 — REGISTERED PROFESSIONAL ENGINEER

RB Engineering
DESIGN → PERMIT → MANAGE
P.O. Box 923
CHEHALIS, WA 98532
OFF: (360) 740-8919
EMAIL: CivilPros@REEngineers.com

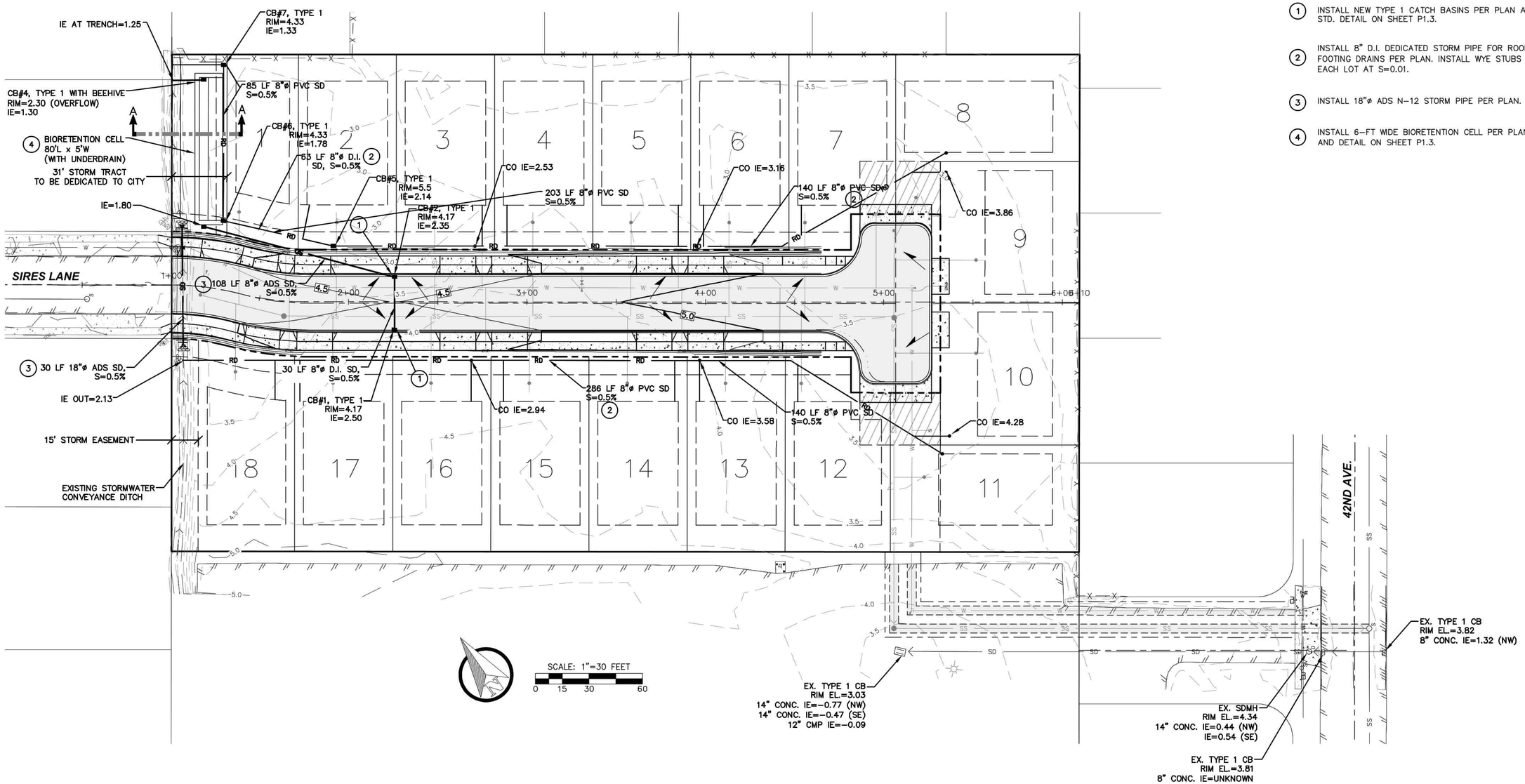
811 Know what's below. Call 811 before you dig.

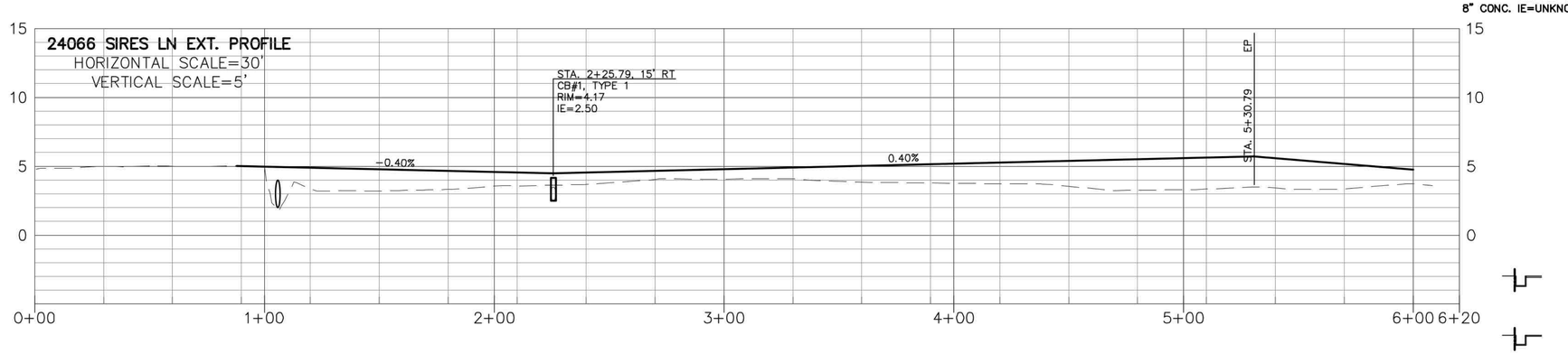
JOB NUMBER 24066
DRAWING NAME 24066_PSP

P0.1
1 OF 5

GRADING AND DRAINAGE CONSTRUCTION NOTES:

1. INSTALL NEW TYPE 1 CATCH BASINS PER PLAN AND STD. DETAIL ON SHEET P1.3.
2. INSTALL 8" D.I. DEDICATED STORM PIPE FOR ROOF AND FOOTING DRAINS PER PLAN. INSTALL WYE STUBS TO EACH LOT AT S=0.01.
3. INSTALL 18"ø ADS N-12 STORM PIPE PER PLAN.
4. INSTALL 6-FT WIDE BIORETENTION CELL PER PLAN AND DETAIL ON SHEET P1.3.





REVISION | NO. | DATE

DESIGNED BY: CA
DRAWN BY: ALE
CHECKED BY: RWB
DATE: 05/15/2025
SCALE: 1" = 30'

MINT VALLEY ESTATES

CITY OF LONGVIEW WA.

PRELIMINARY GRADING AND DRAINAGE PLAN

ROBERT W. BALLEW — STATE OF WASHINGTON — 21911 — REGISTERED PROFESSIONAL ENGINEER

RB Engineering
DESIGN → PERMIT → MANAGE
P.O. Box 123
CHEHALIS, WA 98532
OFF: (360) 740-8815
EMAIL: CivilPros@REEngineers.com

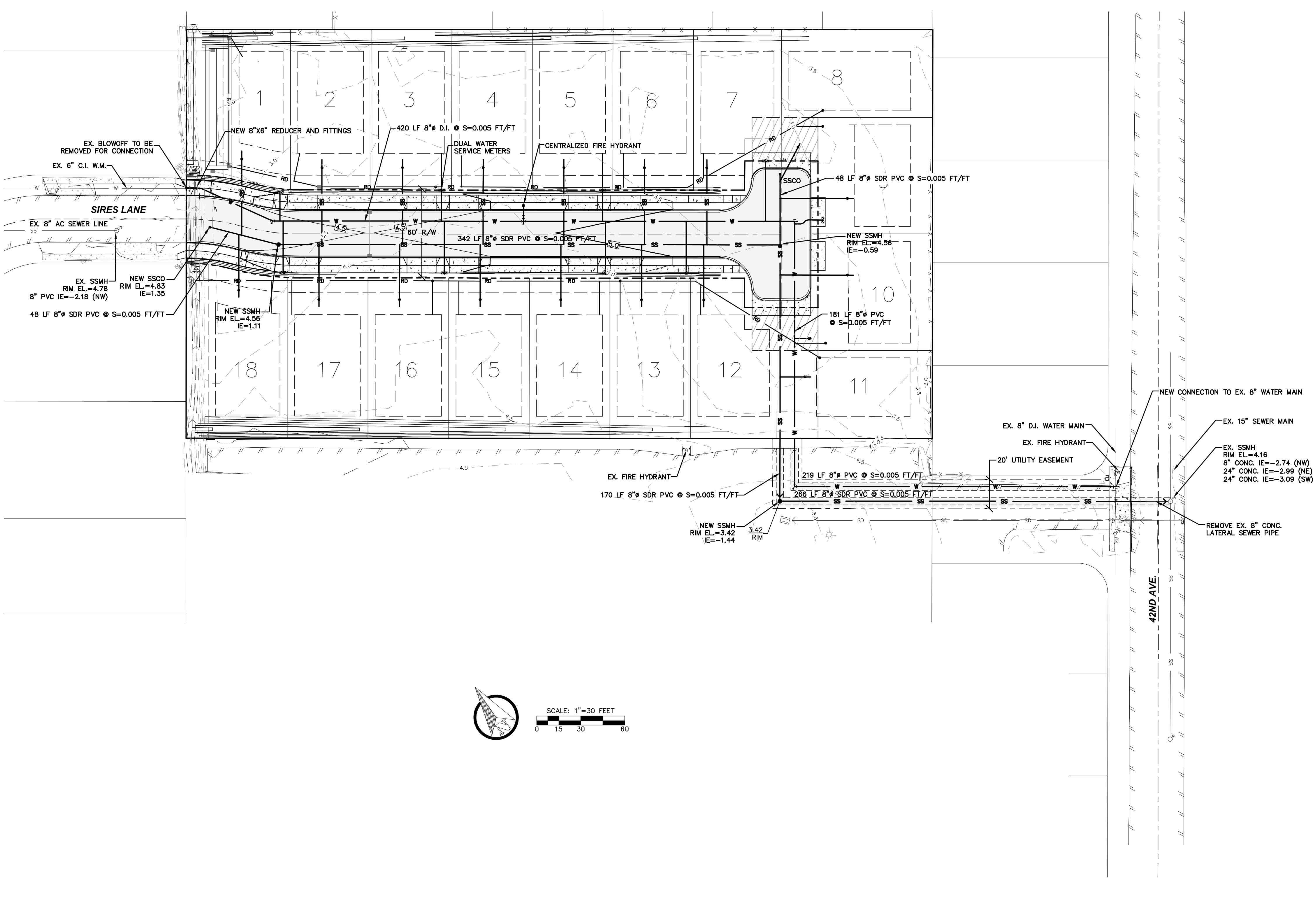
811 Know what's below. Call 811 before you dig.

JOB NUMBER 24066

DRAWING NAME 24066_PGDPL

P1.1

2 OF 5



NO.	DATE	REVISION

DESIGNED BY: CA
DRAWN BY: ALE
CHECKED BY: RWB
DATE: 05/15/2025
SCALE: 1" = 30'

SIRES CROSSING

CITY OF LONGVIEW WA.

PRELIMINARY UTILITY PLAN

ROBERT W. BA... REGISTERED PROFESSIONAL ENGINEER

RB Engineering
DESIGN → PERMIT → MANAGE
P.O. Box 923
CHEHALIS, WA 98532
OFF: (360) 740-8919
EMAIL: CivilPros@RBEngineers.com

811 Know what's below. Call 811 before you dig.

JOB NUMBER 24066
DRAWING NAME 24066_PUTPL

P1.2
3 OF 5

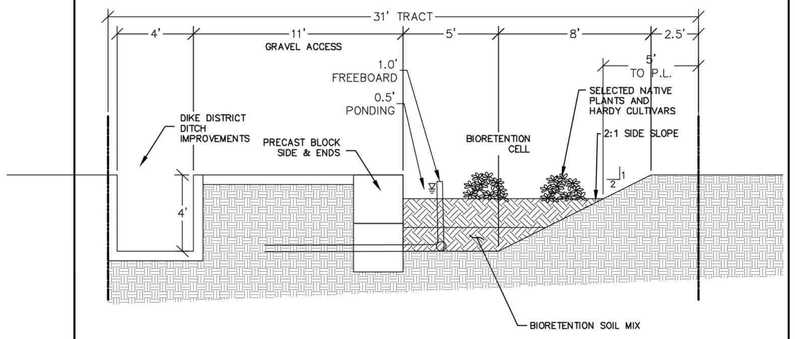
BIORETENTION SOIL MIX:

CONTRACTOR TO PROVIDE SUBMITTAL OF BIO-RETENTION GRADATION SOIL MIX TO CITY AND ENGINEER PRIOR TO CONSTRUCTION.
SOIL MIX:

- 60% TO 65% GRAVELLY SAND AND 35% TO 40% COMPOST (SEE SPECIFICATION BELOW).
- GRAVELLY SAND GRADATION PER ASTM D 422 LESS THAN 5%

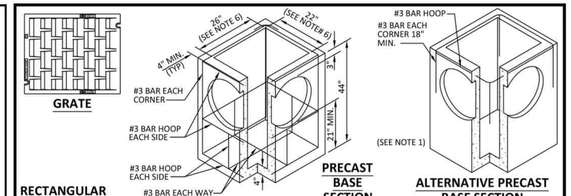
SIEVE SIZE	PERCENT PASSING
US NO. 0.375	100
US NO. 4	100
US NO. 10	75–90
US NO. 40	24–40
US NO. 100	4–10
US NO. 200	2–5

- MAXIMUM CLAY CONTENT SHOULD BE LESS THAN 5%
- SOIL MIXTURE SHOULD BE UNIFORM, FREE OF STONES, ROOTS OR OTHER SIMILAR OBJECTS LARGER THAN 2 INCHES
- ON-SITE SOIL MIXING OR PLACEMETN NOT ALLOWED IF SOIL IS SATURATED OR SUBJECTED TO WATER WITHIN 48 HOURS
- COVER AND STORE SOIL ACCORDINGLY TO PREVENT WETTING OR SATURATION
- TEST SOIL FOR FERTILITY AND MICRONUTRIENTS AND, IF NECESSARY, AMEN MIXTURE TO CREATE OPTIMUM CONDITIONS FOR PLANT ESTABLISHMENT AND EARLY GROWTH AT RATES RECOMMENDED BY AN INDEPENDENT LABORATORY SOIL TEST.
- ORGANIC CONTENT OF THE SOIL MIXTURE SHOULD BE 5% TO 8%
- CATION EXCHANGE CAPACITY (C.E.C) MUST BE LESS THAN 5 MILLIEQUIVALINTS PER 100 GRAMS OF DRY SOIL.

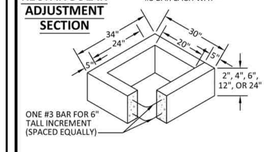


A P1.3 **BIORETENTION CELL TRAPEZOIDAL**
N.T.S.

RB ENGINEERING
BIORTN_CELL_TRPZ_STANDPIPE.dwg



RECTANGULAR ADJUSTMENT SECTION



PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSSP * (STD. SPEC. 9-05.20)	12"
SOLID WALL PVC (STD. SPEC. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. 9-05.12(2))	15"

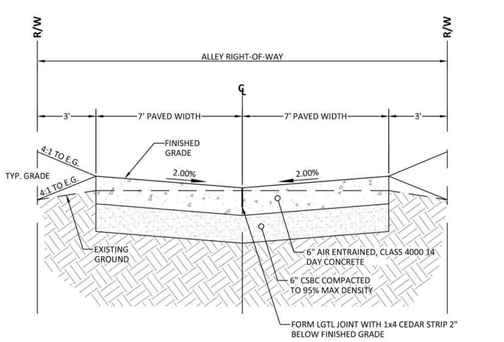
* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES:

1. AS ACCEPTABLE ALTERNATIVES TO THE REBAR SHOWN IN THE PRECAST BASE SECTION, FIBERS (PLACED ACCORDING TO THE STANDARD SPECIFICATIONS), OR WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT SHALL BE USED WITH THE MINIMUM REQUIRED REBAR SHOWN IN THE ALTERNATIVE PRECAST BASE SECTION. WIRE MESH SHALL NOT BE PLACED IN THE KNOCKOUTS.
2. THE KNOCKOUT DIAMETER SHALL NOT BE GREATER THAN 20". KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM TO 2.5" MAXIMUM. PROVIDE A 1.5" MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH STANDARD SPECIFICATION 9-04.3.
3. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE LOWEST PIPE INVERT SHALL BE 5'.
4. THE FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE DOWN, OR INTEGRALLY CAST INTO THE ADJUSTMENT SECTION WITH FLANGE UP.
5. THE PRECAST BASE SECTION MAY HAVE A ROUNDED FLOOR, AND THE WALLS MAY BE SLOPED AT A RATE OF 1:24 OR STEEPER.
6. THE OPENING SHALL BE MEASURED AT THE TOP OF THE PRECAST BASE SECTION.
7. ALL PICKUP HOLES SHALL BE GROUTED FULL AFTER THE BASIN HAS BEEN PLACED.
8. STANDARD CURB INLET BASES SHALL BE PRECAST CONCRETE. CONSTRUCTION OF CAST-IN-PLACE BASES, INCLUDING SLIP-FORM METHOD, ARE NOT PERMITTED WITHOUT APPROVAL FROM THE ENGINEER.
9. PIPE ENDS SHALL BE FLUSH WITH THE INNER WALL OR 1" MAXIMUM INTRUSION.
10. MASONRY, CINDER BLOCKS, OR SIMILIAR MATERIALS MAY BE USED TO ADJUST THE RISERS TO GRADE PRIOR TO GROUTING. WOOD OR OTHER NON-DURABLE MATERIALS SHALL NOT BE USED FOR THIS PURPOSE.
11. GROUTING SHALL BE SUFFICIENT TO PREVENT LEAKS BETWEEN THE PRECAST COMPONENTS OF THE COMPLETED STRUCTURE & SHALL BE PERFORMED INSIDE, BETWEEN, AND OUTSIDE OF ALL RISERS, JOINTS & PIPE PENETRATIONS.
12. POURED IN PLACE CATCH BASINS MAY BE APPROVED. (SUBMIT SHOP DRAWING)
13. USE COMBINATION INLET WHERE CURBS ARE PRESENT UNLESS OTHERWISE APPROVED.

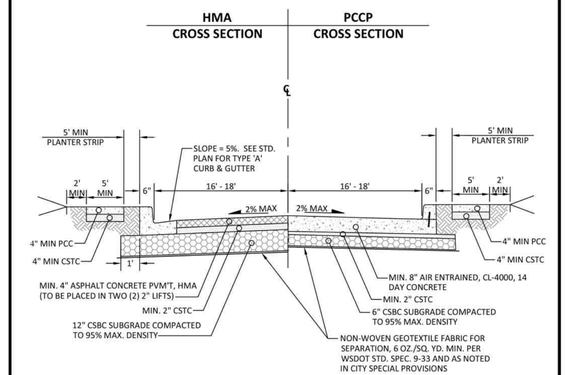
CATCH BASIN TYPE 1

STANDARD PLAN:	CITY ENGINEER APPROVAL:
SD - 010	Samuel B. Barham
DATE: JUNE 2024	DRAWN BY: Camryn LaChaine



TYPICAL SECTION - ALLEY

STANDARD PLAN:	CITY ENGINEER APPROVAL:
ST - 085	Samuel B. Barham
DATE: JUNE 2024	DRAWN BY: Camryn LaChaine

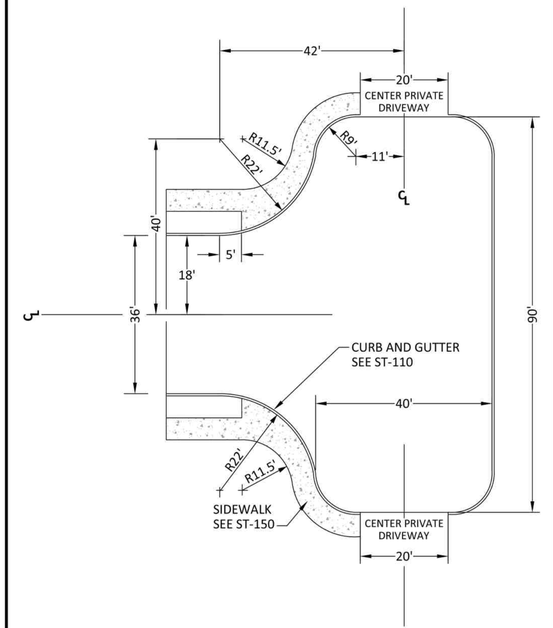


NOTES:

1. 5' SIDEWALK MINIMUM 4" THICK (DRIVEWAY SECTIONS: 6" IN RESIDENTIAL, 8" IN COMMERCIAL) SEE STANDARD PLAN FOR SIDEWALK CONSTRUCTION ST-150.
2. NARROW STREETS MAY BE ALLOWED AS PART OF AN OVERALL LOW IMPACT DEVELOPMENT DESIGN APPROVED ON A CASE-BY-CASE BASIS BY THE CITY PUBLICWORKS DIRECTOR.
3. PAVEMENT THICKNESS MAY VARY BASED ON SOILS, AND AS APPROVED BY THE CITYENGINEER.
4. CURING COMPOUND PER SECTION 5-05.3(13)A CLEAR CONCRETE SEALER TO BE PLACED WITHIN (2) TWO HOURS AFTER FINISHING IS COMPLETE.
5. NEW PANELS FOR PCCP SHALL BE BROOM FINISHED AND MATCH EXISTING JOINT PATTERNS.

LOCAL ACCESS STREET SECTION

STANDARD PLAN:	CITY ENGINEER APPROVAL:
ST - 080	Samuel B. Barham
DATE: JUNE 2024	DRAWN BY: Camryn LaChaine



HAMMERHEAD STREET

STANDARD PLAN:	CITY ENGINEER APPROVAL:
ST - 210	Samuel B. Barham
DATE: JUNE 2024	DRAWN BY: Camryn LaChaine

NO.	DATE	REVISION

DESIGNED BY: CA
DRAWN BY: ALE
CHECKED BY: RWB
DATE: 05/15/2025
SCALE: N.T.S.

SIRES CROSSING

CITY OF LONGVIEW WA.

PRELIMINARY DETAILS AND CROSS SECTIONS

ROBERT W. ELLIS — STATE OF WASHINGTON — 22011 — REGISTERED PROFESSIONAL ENGINEER

RB Engineering
DESIGN → PERMIT → MANAGE
P.O. Box 923
CHEHALIS, WA 98532
OFF: (360) 740-8819
EMAIL: CivilPros@RBEngineers.com

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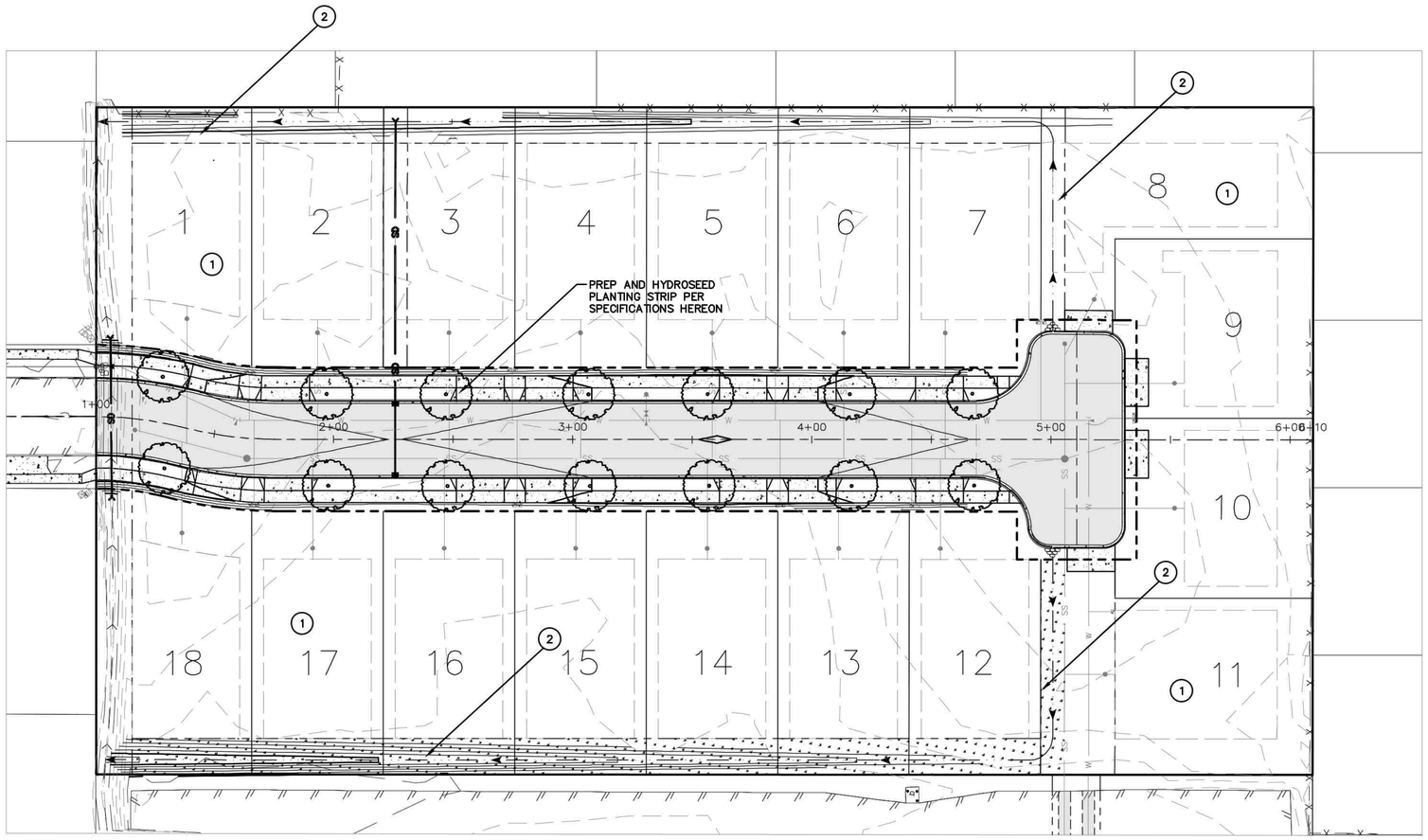
JOB NUMBER 24066
DRAWING NAME 24066_PDRDT

P1.3
4 OF 5



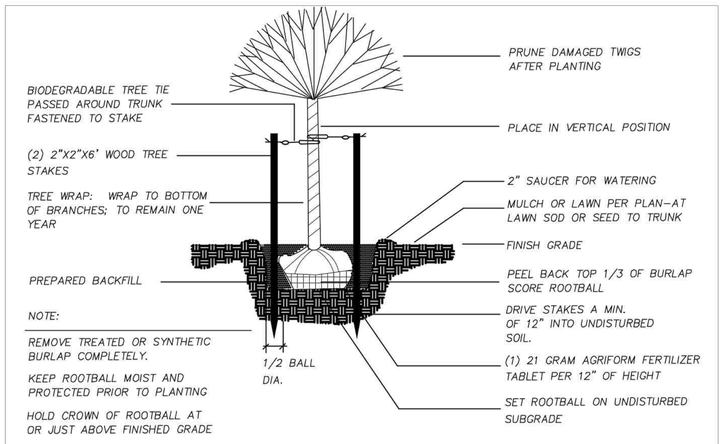
SCALE: 1"=30 FEET
0 15 30 60

OVERALL LANDSCAPE NOTES

1. AREAS CLEARED OR DISTURBED DUE TO GRADING, UTILITY, OR DRIVEWAY CONSTRUCTION SHALL BE PERMANENTLY REVEGETATED TO MEET PUBLIC WORKS STANDARDS AND THE DRAINAGE MANUAL. SEE PLANTING SPECIFICATIONS FOR HATCH AREAS SHOWN. HATCH AREAS SHOWN CONFORM TO PROPOSED GRADING PLAN.
2. DRAINAGE CONVEYANCE SHALL BE STABILIZED AS REQUIRED BY THE STORMWATER MANUAL AND CIVIL PLANS. NO LANDSCAPE WORK IS PROPOSED FOR THE DRAINAGE SWALE UNLESS CALLED FOR ON THE CIVIL SHEETS.

PRELIMINARY PLANT SCHEDULE

SYMBOL	QTY*	BOTANICAL NAME	COMMON NAME	SIZE	SPACING (NOTES)
	6	*Acer truncatum x platanoides 'Keithsform'*	Norwegian Sunset Maple	2" CAL.	B&B/cont. staked
Proposed Ornamental Landscaping					
Landscaping on individual lots not shown.	TBD	MEDIUM & LOW GROWING ORNAMENTAL/NATURALIZED *Nandina domestica* *Prunus laurocerasus* *Rhododendron* *Pieris japonica* *Ilex crenata* *Rhododendron* *Euonymus alata 'Compacta'* *Viburnum davidii* *Fragaria chiloensis* *Archtostaphylos uva–ursi* *Erica* *Spirea japonica* *Azalea*	 Heavenly Bamboo 'Otto Luyken' Laurel Assorted Rhododendron 'Lilly Of The Valley' Shrub Japanese Holly 'P.J.M' Rhododendron Dwarf Burning Bush David's Viburnum Sand Strawberry Kinnickinnick Heather asstd. 'Little Princess' Spirea Azalea spp.	3–7 GAL.	varies
Revegetate and stabilize graded areas					
		See Table 4.1 for Temporary Erosion Control Seed Mix (Area approx 13,200 sq.ft.) *Apply BMP's per Drainage Manual including S417 Maintenance of Stormwater Drainage Systems and Stormwater Manageemnt BMP's. Stormwater swale shall be permanently vegetated and maintained as conveyance connecting to District ditch.*			
Stormwater Swales					
No Sym.		*Stabilize stormwater swales as required by Drainage Manual and Civil Plans* *Include permanent seeding, see Table 4.5 for Wet Area Seed Mix*			



DECIDUOUS TREE PLANTING

NOT TO SCALE

INSTALLATION SPECIFICATIONS

1. SCARIFY OR OTHERWISE REMOVE ALL EXISTING VEGETATION FROM ALL PLANTING AREAS. FINE GRADE ALL LANDSCAPE BEDS PRIOR TO BARK OR GROUNDCOVER PLACEMENT.
2. NO PLANT SUBSTITUTIONS WILL BE ACCEPTED WITHOUT PRIOR APPROVAL FROM THE LANDSCAPE ARCHITECT AND THE OWNER.
3. ALL PLANT MATERIAL AND PLANT LOCATIONS SHALL BE APPROVED, AT THE REQUEST OF THE LANDSCAPE ARCHITECT, PRIOR TO INSTALLATION. ALL PLANTS SHALL BE THOROUGHLY WATERED IMMEDIATELY AFTER PLANTING.
4. SOIL MIX FOR BED PREPARATION AND PLANTING BACKFILL SHALL BE A COMPOST AMENDED SOIL CONSISTING COMPOSTED STEER MANURE, BIOSOLIDS, OR MUSHROOM COMPOST. OTHER SOIL MIX PRODUCTS MUST BE APPROVED BY THE LANDSCAPE ARCHITECT PRIOR TO USE.
5. SOIL PREPARATION FOR SHRUB BEDS AND LAWN AREAS (EXCEPT AS NOTED BELOW *): SPREAD TO A MINIMUM DEPTH OF 6 INCHES (9 CUBIC YARDS PER 1000 S.F.) OF SOIL MIX PER NOTE 4, IN ALL GROUNDCOVER AND PLANTING BEDS. ROTOTILL OR OTHERWISE THOROUGHLY INCORPORATE SOIL MIX TO A 8–10 INCH DEPTH GRADE SMOOTH, AND REMOVE ALL ROCKS AND CLODS OVER 1 INCH DIAMETER.
6. BACKFILL MIX FOR ALL TREES AND SHRUBS TO BE 1/3 EXISTING SITE TOPSOIL AND 2/3 SOIL MIX PER NOTE 4. REFER TO PLANS AND DETAILS REGARDING INSTALLATION OF PLANT MATERIALS.
7. FERTILIZER FOR ALL PLANTS SHALL BE AGRIFORM 20–10–5, 21 GRAM OR 10 GRAM TABLETS DISTRIBUTED AS FOLLOWS: TREES 4–21 GRAM TABLETS, SHRUBS 2 GAL SIZE AND LARGER 3–21 GRAM TABLETS, 1 GAL SIZE SHRUBS 1–21 GRAM TABLET, ALL 4" POTS 1 – 5 GRM TABLET OR EQUIVALENT EACH. SET TABLETS DIRECTLY NEXT TO ROOT BALL. GRANULAR EQUIVALENT FERTILIZER IS ACCEPTABLE WITH PRIOR AUTHORIZATION FROM THE LANDSCAPE ARCHITECT.
8. ALL SHRUB AND GROUNDCOVER BEDS SHALL RECEIVE A 2 INCH MINIMUM DEPTH (6 CUBIC YARDS PER 1000 S.F.) OF HEM–FIR MEDIUM BARK MULCH. PLANT 4" POT GROUNDCOVERS INTO SOIL MIX PER NOTE 5 ABOVE, PLANTS PLANTED IN BARK MULCH ONLY ARE NOT ACCEPTABLE.
9. APPLY A GRANULAR OR SOLUBLE PRE–EMERGENT HERBICIDE AS APPROVED BY THE LANDSCAPE ARCHITECT TO ALL SHRUB AND GROUNDCOVER BEDS PRIOR TO DISTRIBUTION OF BARK MULCH.
10. PLANTER STRIP LAWN AREA SHALL BE SEEDED, FERTILIZED AND MULCHED IN A HYDRAULIC APPLICATION BY CONVENTIONAL SEEDING EQUIPMENT. SEED SHALL BE A MINIMUM FOUR WAY MIXTURE OF PERENNIAL RYEGRASS VARIETIES AT A RATE NOT LESS THAN 5 LBS PER 1000 S.F.. LANDSCAPE ARCHITECT SHALL APPROVE MULCH/FERTILIZER TYPE AND RATES PRIOR TO APPLICATION. WATER TURF AREAS WITHIN 1 HOUR OF APPLICATION.
11. BED EDGING SHALL BE PERFORMED BY CREATING A 2" RAISED MOWING EDGE BETWEEN SHRUB BEDS AND LAWN AREAS (NO EDGING PRODUCT IS HEREIN SPECIFIED.) SHRUB BED EDGE SHALL BE FORMED IN A CONTINUOUS SINUSOIDAL (ARC/TANGENT) FASHION TERMINATING AT A HARD CURFACE OR CURB.
12. ALL WORK SHALL BE PERFORMED TO THE SATISFACTION OF THE LANDSCAPE ARCHITECT AND OWNER. ALL PLANTS SHALL BE GUARANTEED FOR ONE FULL YEAR FROM DATE OF ACCEPTANCE. ALL REPLACEMENTS SHALL BE RE–GUARANTEED FOR ANOTHER FULL YEAR FROM DATE OF INSTALLATION.

TABLE 4.1
TEMPORARY EROSION CONTROL SEED MIX

	% Weight	% Purity	% Germination
Chewings OR annual blue grass *Festuca rubra var. commutata OR Poa anna*	40	98	90
Perennial rye *Lolium perenne*	50	98	90
Redtop OR colonial bentgrass *Agrostis alba OR Agrostis tenuis*	5	92	85
White dutch clover *Trifolium repens*	5	98	90

TABLE 4.5
WET AREA SEED MIX

	% Weight	% Purity	% Germination
Tall OR Meadow fescue *Festuca arundinacea OR Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass *Agrostis palustris*	10-15	98	85
Meadow foxtail *Alepocurus pratensis*	10-15	90	80
Alsike clover *Trifolium hybridum*	1-6	98	90
Redtop bentgrass *Agrostis alba*	1-6	92	85

NO. DATE REVISION

DESIGNED BY: CA
DRAWN BY: ALE
CHECKED BY: RWB
DATE: 01/09/2025
SCALE: 1" = 30'

CHURCH PROPERTY
CITY OF LONGVIEW WA.

PRELIMINARY LANDSCAPE PLAN

STATE OF WASHINGTON LICENSED LANDSCAPE ARCHITECT CHRISTIAN C. KLORICH CERTIFICATE NO. 585 EXPIRES ON 8-5-2026

RB Engineering
DESIGN → PERMIT → MANAGE
OFF: (360) 740-8919
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811 Know what's below. Call 811 before you dig.

JOB NUMBER 24066
DRAWING NAME 24066_L1.1_LSPL

L1.1
5 OF 5

RB Engineering

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December 20, 2024

City of Longview
PO Box 128
Longview WA 98632

Re: Church Property Plat – Sires Lane
RBE NO. 24066

Dear Staff:

This letter summarizes the anticipated trip generation, traffic impacts, and parking summary for the proposed plat at 0 Sires Lane.

Project Description

The project will develop an 18 lot residential plat for single family detached homes. The lots will be 6,000 s.f. minimum. Site is zoned R1-Residential and is currently vacant.

Analysis Summary

Weekday AM/PM peak hour and weekday trip generation for the proposed project was developed using projected trip rates provided in the ITE *Trip Generation Manual, 10th Edition*, for General Office Building. Table 1 summarizes the trip generation and trip rates calculated. ITE code 210 was used for the calculations.

Table 1 VEHICLE TRIP GENERATION – 18 lot residential plat, Sires Lane extension

Time Period	Trip Rate (per DU)	Trips Entering	Trips Exiting	TOTAL
Average Weekday	9.44	85 (50%)	85 (50%)	170
AM Peak Hour	0.74	3 (25%)	10 (75%)	13
PM Peak Hour	0.99	11 (63%)	7 (37%)	18

Traffic Impact Summary

The project will add an estimated 13 and 18 trips to the AM and PM weekday peak hour traffic (respectively), not factoring in existing pass-by trips. Total average weekday trip addition will be 170 average daily trip ends, less a small percentage of pass-by trips. This is current ancillary traffic that would utilize Sires Lane.

Using the same Trip Rate models, existing average weekday trips on Sires Lane is estimated at 226 based on 24 existing residences. The plat would increase trips on Sires Lane by 75%. All traffic on Sires Lane connects to Olympia Way, a local collector. No significant impacts to the local network or nearby intersections are anticipated. Good visibility is provided at the Sires Lane/Olympia Way intersection.

Sincerely,

Chris Aldrich, PLA
Planning Manager

CHURCH PROPERTY

PRELIMINARY TECHNICAL INFORMATON REPORT (TIR)

MAY 2025

RB Engineering

DESIGN → PERMIT → MANAGE

Table of Contents

Project Engineer

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Contact:	Robert W. Balmelli PE
RBE Project:	21070
Prepared for:	Unique Property Solutions Jerry Baker (971) 253-9518 jerry@uniquepropsolutions.com
Reference:	2024 WSDOE Stormwater Manual

Project Engineers Certification

"I hereby certify that this Drainage and Erosion Control Plan for **Church Property Plat** has been prepared by me or under my supervision and meets minimum standards the **Stormwater Management Manual for Western Washington** and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me."

Project Engineers Stamp

SECTION 1 – PROJECT OVERVIEW

Permit Requested:	Preliminary Plat
Other Permits Required:	SEPA Checklist Grading/Earthwork Permit
Agency Permit No.:	Pending
Site Address:	0 Sires Lane Longview, WA 98632
Total Site Area:	3.3 Acres
Zoning:	R-1 Residential
WaterShed:	WRIA 25 – Grays-Elochoman https://waecy.maps.arcgis.com/apps/webappviewer/index.html?id=996e6b21ae394cc3a3b63c6da0c3aa0a

Project Overall Description

The proposal is to subdivide a 3.3 acre site (three existing tax parcels) into 18 single family residential lots averaging roughly 6,400 square feet each. The plat will require street improvements, utility extensions and services, and stormwater infrastructure.

Proposed Flow Control Improvements

The flow control facilities proposed for this project were designed and modeled using the latest edition of the Western Washington Hydrology Manual Continuous Simulation Program. The site will drain into an existing Consolidated Diking Improvement District (CDID) #1 conveyance draining to Cut-off Slough. The project must meet the local flow standards for attenuating the 25-year, 24-hour stormwater event. As such, we have chosen to address these flows with a fee-in-lieu arrangement with CDID #1 and discharge treated runoff directly to the (unnamed) CDID #1 conveyance which is slated for district improvements.

Proposed Water Quality Improvements

The water quality improvements for the project site runoff consist of a Bioretention Cell as part of the development Threshold Discharge Areas (TDA). Only runoff from impervious areas will be routed through the treatment component. See the Basin Map in Appendix 1.

Proposed Conveyance System

The proposed conveyance system consists of overland flow via new integral curb/gutter to the catch basins, and storm pipes to the treatment swale. All pollutant generating surfaces will be treated before continuing through a culvert to the discharge point.

Proposed Discharge Location

The project site will discharge runoff from the developed areas to the existing CDID #1 conveyance ditch (unnamed) at the west end of the property. The District has ongoing plans to

armor this ditch to reduce maintenance and improve flows.

Downstream Condition

The natural drainage leaves the site through the existing CDID #1 ditch, flowing generally north and west into Cut-off Slough and eventually discharges directly to the Columbia River.

Onsite Soils and Geology

An onsite soils report was completed for this project site. A copy is included in Appendix 3.

NRCS Soil Survey

RBE staff reviewed the onsite soils information provided by NRCS. Appendix 3 includes copies of the site map and soil descriptions that make up the property geology.

Hydrologic Soil Group: (199) Snohomish Silty Clay Loam, 0 to 3% Slope – Class C/D Soils

Project Topography

Based on the site topography, the project site is comprised of flat slopes, with grades running from the east to the west directed towards the existing CDID ditch.

Land Use and Ground Cover

The site is undeveloped with predominantly pasture ground cover.

Natural Drainage Patterns

The site does not have a natural drainage path however runoff eventually reaches the existing CDID ditch over very flat slopes.

Tributary and Discharge Points of Flow

The site has minor tributary area from the developed residential properties bordering the north side. This undefined drainage paths will be maintained as overland flows will be routed through conveyance to the CDID ditch at west end of the site.

Historical Drainage Problems

There are no specific drainage problems associated with the project site.

Existing Utilities (Storm, Sewer, Water)

The existing utilities available to the site include sanitary sewer, water, gas, power and phone services. Public and private utility extensions are proposed and new water and sewer connections are proposed for all new lots.

Erosion Potential

The site has a **low** erosion potential based on the NRCS Soil Survey. As part of the development plans a detailed Erosion Control Plan and Storm Water Pollution Prevention Plan will be prepared for use during site construction to minimize erosion and migration of sediment within and off the site. A NPDES Stormwater Construction Permit **is** required by WSDOE for this project.

Critical Areas Onsite

The site is not located within any critical areas.

Existing Fuel Storage Tanks

Review of the onsite parcels resulted in no evidence of existing fuel storage tanks above or below ground for this property.

Groundwater Wells

The property does not include any onsite ground water.

Septic Systems

No existing onsite septic system have been identified on the site.

Aquifer Recharge Area

The site is not located in an aquifer recharge area.

Wellhead Protection Area

The site is not within any wellhead protection areas.

100-Year Flood Plain

The site is not within any flood plains.

Section 2 – APPLICABLE MINIMUM REQUIREMENTS

Manual Exemptions

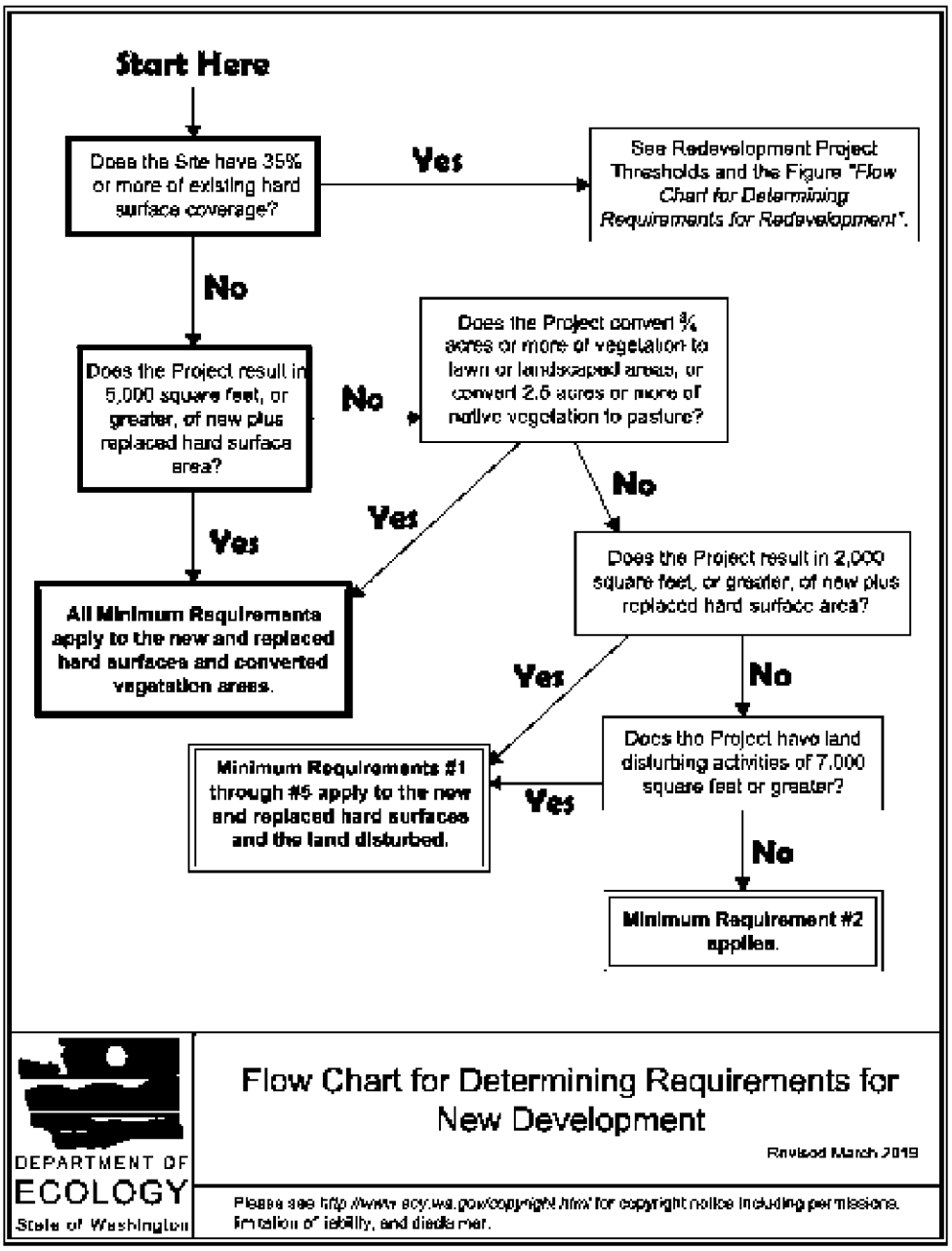
Exemptions	Applicable to Project
Forest Practices (Title 222 WAC)	No
Commercial Agriculture	No
Oil & Gas Field Activities or Operations	No
Pavement Maintenance	No
Underground Utility Projects	No

New Development and Re-Development Review

The minimum requirements for stormwater development and redevelopment sites are listed in Volume I of the SMMWW. Not all minimum requirements of this section apply to all projects. Determination of applicable minimum requirements is also based in part on Section 1-3 of the Manual. See detailed area calculations in Section 5 of this report.

Applicable Criteria	Areas
Existing Site Impervious Coverage	0.00 AC
New Plus Replaced Impervious Surface	0.50 AC
Vegetation Area Converted to Lawn or Landscaped Area	0.11 AC
Land Disturbing Area	0.61 AC
Percent of Existing Impervious Surface	0.0 %

Figure I-3.1: Flow Chart for Determining Requirements for New Development



Section 2.1 – Minimum Requirements

Based on the thresholds given in Figure 1-3.1 of Volume I of the Manual, the proposed project must address or comment on **Minimum Requirements #1 through #9**. These requirements as they apply to the project are discussed in more detail below.

Minimum Requirement (MR) #1 – Stormwater Site Plans:

> All projects meeting the thresholds in I-3.3 Applicability of the Minimum Requirements shall prepare a Stormwater Site Plan for local government review. Stormwater Site Plans shall use site-appropriate development principles, as required and encouraged by local development codes, to retain native vegetation and minimize impervious surfaces to the extent feasible. Stormwater Site Plans shall be prepared in accordance with III-3 Stormwater Site Plans

The proposed project will create over 5,000 square feet of new impervious surfacing, and therefore a Stormwater Site Plan complying with minimum requirements #1 through #9 is required.

MR #2 – Construction Storm Water Pollution Prevention Plan:

> All new development and redevelopment projects are responsible for preventing erosion and discharge of sediment and other pollutants into receiving waters.
>
> Projects which result in 2,000 square feet or more of new plus replaced hard surface area, or which disturb 7,000 square feet or more of land must prepare a Construction Stormwater Pollution Prevention Plan (SWPPP) as part of the Stormwater Site Plan (see I-3.4.1 MR1: Preparation of Stormwater Site Plans).
>
> Projects below those thresholds (listed above) are not required to prepare a Construction SWPPP, but must consider all of the Construction SWPPP Elements (listed below) and develop controls for all Construction SWPPP Elements that pertain to the project site.

The proposed project exceeds the thresholds of Section 2.5 and therefore a Construction Storm Water Pollution Prevention Plan is required for this project. The site does not disturb more than 1 acre of land and discharges to waters of the state. Therefore, a NPDES stormwater construction permit is not required. A SWPPP has been created as a standalone document for this project and included in Appendix 5 of this TIR.

MR #3 – Source Control of Pollution:

> All known, available and reasonable Source Control BMPs must be applied to all projects. Source Control BMPs must be selected, designed, and maintained in accordance with this Manual.

All known, available and reasonable source control BMPs shall be applied to the project to limit

pollutants coming in contact with stormwater. The Source Control BMPs for this project will be incorporated into the project's Final Operation and Maintenance Plan.

MR #4 – Preservation of Natural Drainage Systems/Outfalls:

Natural drainage patterns shall be maintained, and discharges from the Project Site shall occur at the natural location, to the maximum extent practicable. The manner by which runoff is discharged from the Project site must not cause a significant adverse impact to downstream receiving waters and downgradient properties. All outfalls require energy dissipation.

Proposed stormwater discharges from the project site shall be treated and released to the original natural drainage location. The natural site drainage outfall will be maintained.

MR #5 – On-Site Stormwater Management:

Projects shall employ Stormwater Management BMPs in accordance with the following thresholds, standards, and lists to infiltrate, disperse, and retain stormwater runoff on site to the extent feasible without causing flooding or erosion impacts.

A stormwater plan has been developed for this project that will incorporate the following minimum requirements for treatment and flow control if applicable.

MR #6 – Runoff Treatment:

Projects shall employ Runoff Treatment BMPs in accordance with the following thresholds, standards, and requirements to remove pollutants from stormwater runoff.

The following require construction of stormwater treatment facilities:

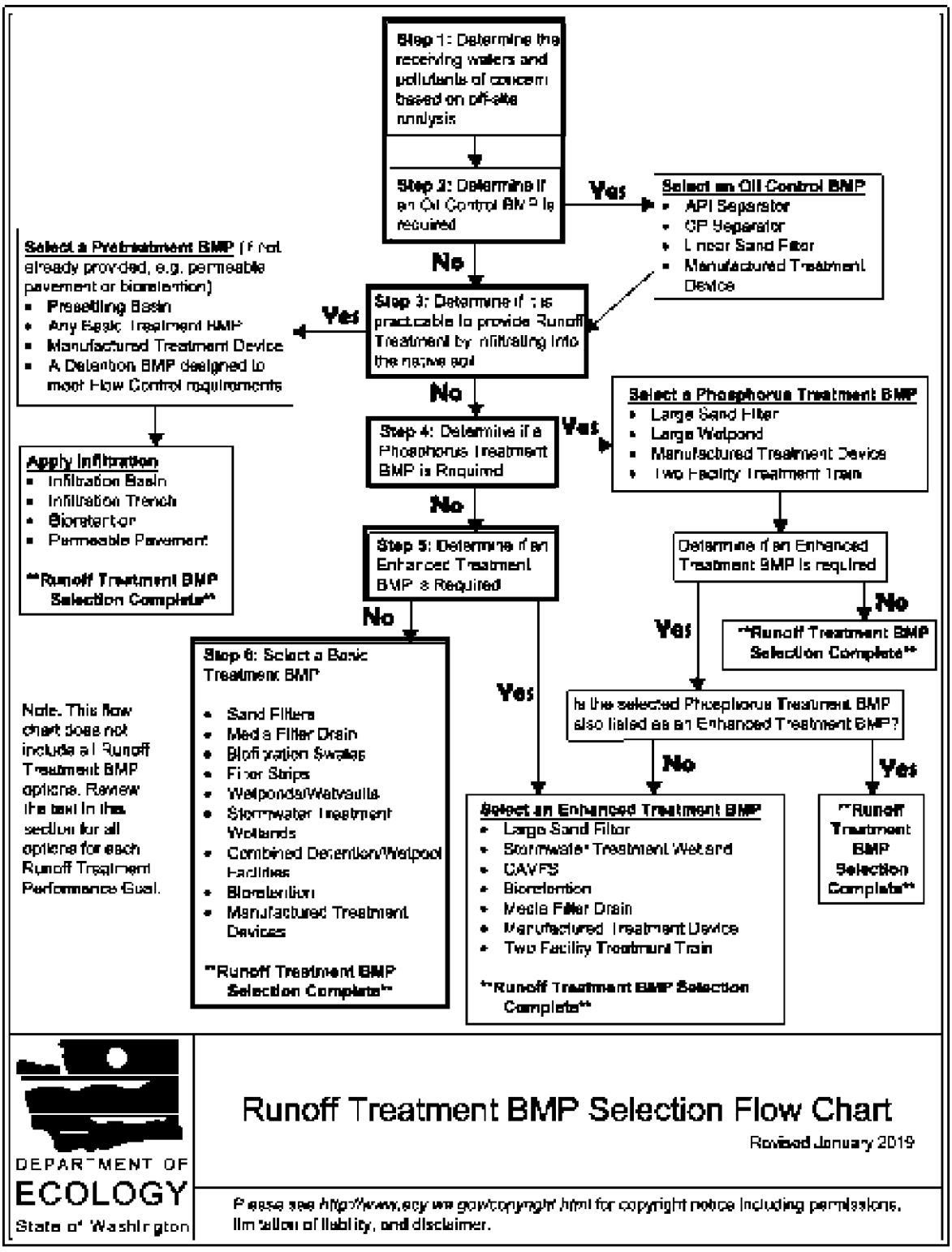
1) **Projects in which the total of, pollution-generating hard surface (PGHS) is 5,000 square feet or more in a threshold discharge area of the project, or**

   The proposed project **will** develop more than 5,000 square feet of openly exposed pollution generating impervious surface and therefore meets the threshold requirements of this section. See Section 5.2 for selected water quality treatment method.

2) **Projects in which the total of pollution-generating pervious surfaces (PGPS) – not including permeable pavements – is three quarters (3/4) of an acre or more in a threshold discharge area, and from which there will be a surface discharge in a natural or manmade conveyance system form the site.**

   The site has a surface discharge to a natural or manmade conveyance.

Figure III-1.1: Runoff Treatment BMP Selection Flow Chart



Water Quality BMP's

The drainage basin delineated for this project will have openly exposed pollution generating hard surfaces. This tributary area will be treated using the BMP technologies identified on Figure III-1.1: Runoff Treatment BMP Selection Flow Chart located on the previous page. A summary of the selected BMP's per the associated TDA is listed below.

Basin ID / TDA	BMP Used	Treatment Level
D1/TDA1	Bioretention	Basic

MR #7 – Flow Control:

Projects shall employ Flow Control BMPs in accordance with the following thresholds, stand ards, and requirements to reduce the impacts of stormwater runoff from hard surfaces and land cover conversions. Flow Control is not required for TDAs that discharge directly to, or indirectly through an MS4 to a water listed in Appendix I-A of the WSDOE Manual: Flow Control Exempt Receiving Waters.

Standard Flow Control Requirement
The project will not provide flow control as the TDA discharges indirectly through an MS4 to the Columbia River, a flow control exempt receiving water. However, local municipalities require flow control so a fee-in-lieu agreement with CDID #1 will be used to meet the requirement of attenuating the 25-year, 24-hour stormwater event.

MR #8 – Wetlands Protection:

Projects shall employ Stormwater Management BMPs in accordance with the following thresholds, standards, and requirements to reduce the impacts of stormwater runoff to wet-lands.

There are no wetlands within the proposed project limits.

MR #9 – Operation & Maintenance:

An operation and maintenance manual that is consistent with the provisions in Volume V shall be provided for proposed Runoff Treatment and Flow Control BMPs. The party (or parties) responsible for maintenance and operation shall be identified in the operation and maintenance manual. At private facilities, a copy of the operation and maintenance manual shall be retained.

A Stormwater Maintenance Agreement and Operation and Maintenance Manual is included in Appendix 4 of this TIR.

Section 2.2 - Additional Protective Measures (APM)

Facility agreements and financial guarantees when required will be reviewed by the applicant and executed at the appropriate time determined by the reviewing agency.

APM1 - Financial Liability

Performance Bonding for this project's stormwater facility improvements is not required by the jurisdiction.

APM2 – Offsite Analysis and Mitigation

Qualitative Analysis

TDA 1 - Basin D1 – Developed Basin

RBE evaluated the off-site drainage and determined the project does not negatively impact the water quality, erosion, slope stability or drainage. The proposed development is being treated prior to being discharged to the existing drainage ditch. The existing site has no real defined paths; however, it does end up draining to a MS4 through the native vegetation and continuing to the Columbia River.

Mitigation Measures

The offsite analysis for this project did not yield any mitigation for this project.

Section 2.3 – Adjustments and Exceptions/Variances to the MRs

Adjustments:

No adjustments have been requested for this project.

Exceptions and Variances:

No exceptions or variances have been requested for this project.

SECTION 3 – SOURCE CONTROL BMPS

The following permanent source control BMPs apply to all sites:

IV – 1 Source Control BMPs Applicable to All Sites:

S545 BMPs for Preventive Maintenance / Good Housekeeping.
S455 BMPs for Spill Prevention and Cleanup.
S457 BMPs for Inspections.
S458 BMPs for Record Keeping – Vol. IV – Page 503.

The following permanent source control BMPs will be utilized for this project and will be included in the final Operation and Maintenance Manual submitted prior to final project acceptance by the Review Agency.

IV-2 – Cleaning or Washing Source Control BMPs

IV-3 – Roads, Ditches, and Parking Lot Source Control BMP's

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems.
S421 BMPs for Parking and Storage of Vehicles and Equipment.

IV-4 – Soil Erosion, Sediment Control and Landscaping

S411 BMPs for Landscaping and Lawn/Vegetation Management.

SECTION 4 – SITE SUITABILITY CRITERIA (SSC)

This section outlines the criteria used to help select the stormwater type of flow control and treatment facility for this project. Based on our review of the criteria below we have selected the following type of facilities for this project. Infiltration is not feasible for this project.

Basin ID / TDA	Flow Control	Water Quality
D1/TDA1	Exempt (Fee-in-lieu)	Bioretention Cell

Infiltration SSC Review if Applicable

SSC – 1 Setback Criteria

Setback requirements for this project for the following stormwater facilities that include retention, treatment and detention facilities are:

Facility Id	Foundation	Property Line	Water Well	Septic Drain Field	Right of Way / Easement
Bioretention Cell	10 ft	5 ft	100 ft	100 ft	10 ft

SSC – 2 Ground Water Protection Areas

The site is not suitable for infiltration BMP if the infiltration BMP will cause a violation of Ecology's Groundwater Quality Standards.

Critical Aquifer Recharge Area

This Project sit is not within a Critical Aquifer Recharge Area

Wellhead Protection Area

The site is not within any wellhead protection areas for public utilities.

SSC – 3 High Vehicle Traffic Areas

This project does not require an oil control facility based on the analysis below.

Oil Control Determination Chart	
ADT 100 Vehicles or Greater per 1000 SF Building Area	No
Site Subject to Petroleum Storage or Transfer Greater than 1500 Gallons per year.	No
Site have Parking, Storage or maintenance of 25 or more vehicles over 25 Tons gross weight. (Trucks, Buses, Trains, Heavy Equipment)	No
Road Intersection with measured ADT of 25000 vehicles or more on main roadway and 15000 vehicles or more on intersection roadway.	No

SSC – 4 Soil Infiltration Rate / Drawdown Time

The native soils are not feasible for infiltration.

SSC – 5 Depth to Bedrock, Water Table, or Impermeable Layer

A geotechnical study was performed for this site. That study provided soil logs that show potential seasonal water table as high as 2' to 4'. A copy of that report can be found is appendix 3.2.

SSC – 6 Soil Physical and Chemical Suitability for Treatment

Because the site soils are not conducive to infiltration onsite, the soil physical suitability for treatment was not pursued for this project.

SSC – 7 Seepage Analysis and Control

Based on the sites required setbacks, there will be no adverse effects caused by seepage zones on nearby building foundations, basement, roads parking lots or sloping sites.

SSC – 8 Cold Climate and Impact of Roadway Deicers

This project is not a public road project that could have possible use of deicers.

PART 5 – PERMANENT STORMWATER CONTROL PLAN

Existing Site Hydrology

Existing site hydrology is based on our site investigation, field topographic survey, aerial topographic mapping and completed soils review for the subject project. The site consists of the basins outlined below.

Pre-developed Basin (P1)

Current Land Use: Undeveloped Pasture
Modeled Land Use: Forested

TDA No. 1 Basin ID	Land Use Assumptions and Site Parameters				
	Land Use Cover	Slope	Acres	Hydrologic Group	Comments
P1	Forested	Flat	0.61	SAT	Snohomish Silty Clay Loam – 0-3% Slopes
Total Area			0.61		

Developed Site Hydrology (D1/D2)

Basin Summary

Proposed and Modeled Land Use: Lawn, Road, Sidewalk, and Driveway

The developed basin includes the impervious surfaces from the extension of Sires Lane (paved roadway, concrete sidewalks, concrete driveway entrances), as well as the bioretention cell and the landscape strips between the sidewalk and curb. Only surfaces routed to the bioretention cell were included in the basin.

TDA No. 1 Basin ID	Land Use Assumptions and Site Parameters				
	Land Use Cover	Slope	Acres	Hydrologic Group	Comments
D1	Lawn	Flat	0.11	SAT	Incl. Bioretention Cell
	Road	Flat	0.35		
	Driveway	Flat	0.02		
	Sidewalk	Flat	0.13		
Total Area			0.61		

Basin Maps

A basin map is included in Appendix 1 of this report.

PART 5.1 – FLOW CONTROL

Flow Control System Design & Analysis

The proposed stormwater facility was designed to treat runoff only as it is flow control exempt withing the state requirements. Longview Municipal Code requires attenuating the 25-year, 24-hour stormwater event or alternate means. Fee-in-lieu arrangements with CDID #1 will be used to satisfy this requirement.

PART 5.2 – WATER QUALITY DESIGN

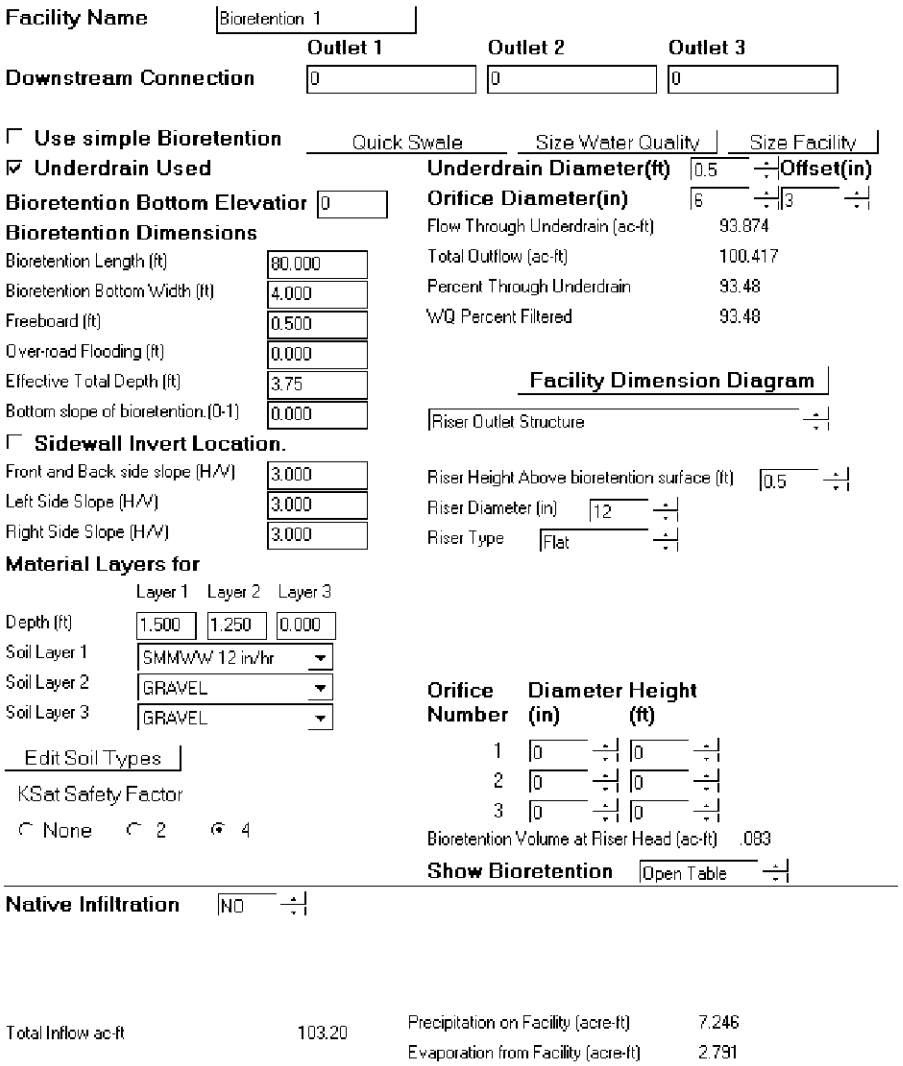
Water Quality System Design & Analysis

The drainage basins delineated for this project will have openly exposed pollution generating impervious surfaces including public local street with bituminous pavement and private concrete driveways. These tributary areas will be treated using the following treatment technologies listed under the associated drainage basins.

TDA No. 1

Basin D1 - BMP T7.30 – Bioretention

RBE has selected this treatment method for water quality control for the new PGIS associated with the project. The Western Washington Hydrologic Modeling program was used to model the Bioretention. Below is a summary of the WWHM Model.



PART 5.3 – CONVEYANCE SYSTEM DESIGN

Pipe Conveyance Design

All onsite storm conveyance systems will be sized to accommodate the 100-year storm flows. All proposed onsite storm drain pipe will be 8 inches in diameter and the minimum slope shall not be less than 0.5%. The minimum required pipe size at 0.5% slope to convey the 100-year event for the onsite developed area is 8-inch pipe per Manning's Equation.

WWHM Un-Mitigated Flow Rates for Basin D1

Listed below are the flow frequency data generated by WWHM for the developed basin D1.

```
Flow Frequency
Flow(cfs)  0701 15m
2 Year   =    0.2715
5 Year   =    0.3936
10 Year  =    0.4819
25 Year  =    0.6018
50 Year  =    0.6971
100 Year =    0.7975
```

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	0.667	ft
Manning Roughness, n ?	0.010	PVC
Pressure slope (possibly equal to pipe slope), S_o	0.005	rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.950	fraction

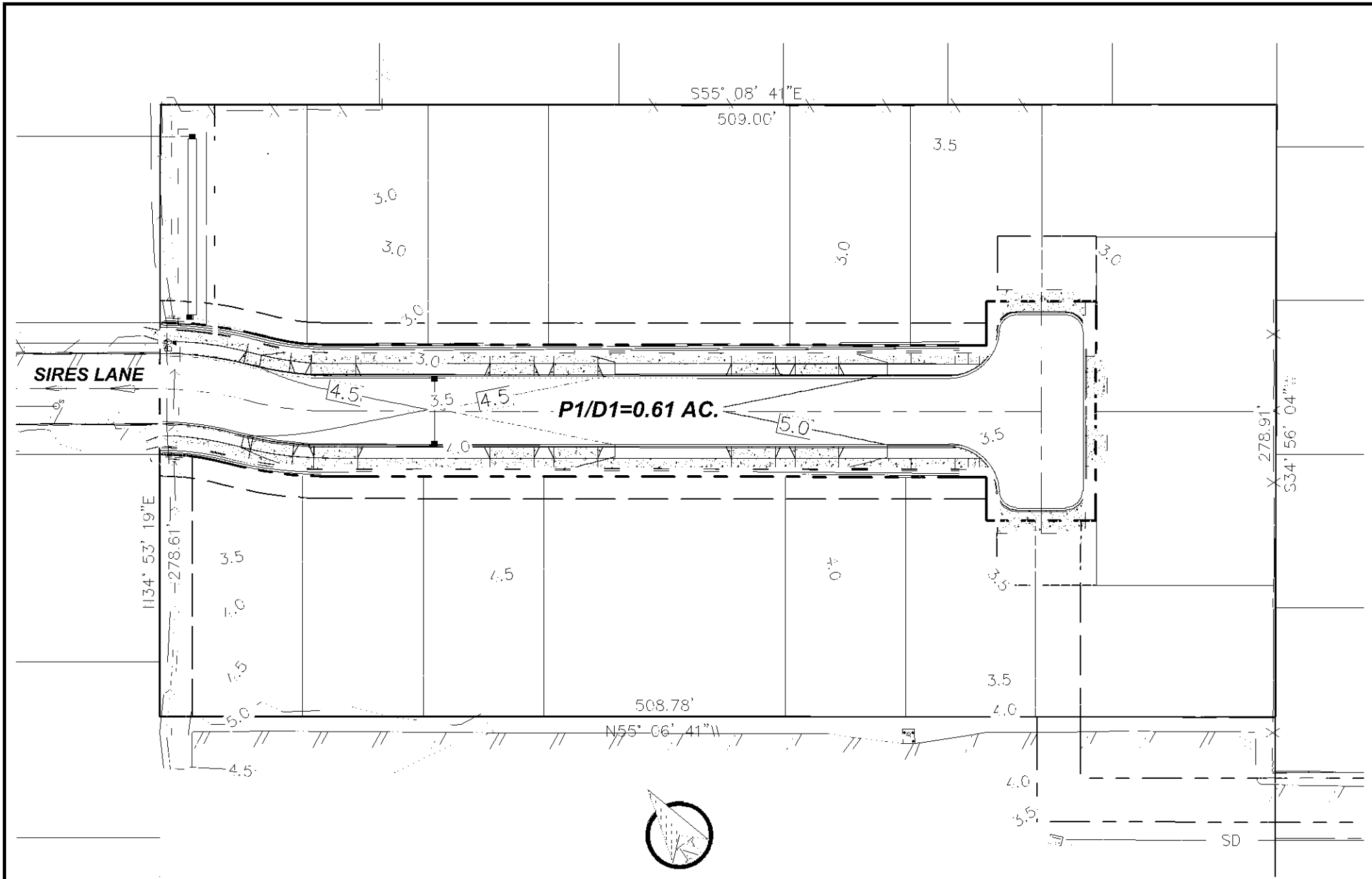
Results:

Flow, Q	1.197	ft^3/s
Velocity, v	3.494	ft/s
Velocity head, hv	0.190	ft
Flow Area, A	0.343	ft^2/s
Wetted Perimeter, P	1.794	ft
Hydraulic Radius	0.191	ft

APPENDIX 1 – MAP SUBMITTALS

TDA No. 1

Post Developed Basin Map



RB Engineering
CIVIL ENGINEERING – LAND PLANNING – UTILITIES
P.O. Box 923
CHEHALIS, WA 98532
OFF: (360) 740-8919
FAX: (360) 740-8912

CHURCH PROPERTY

DRAINAGE BASIN MAP

SCALE: 1"=60'

JOB NUMBER
24066

DRAWING NAME
24066_BMAP

FIGURE
A

APPENDIX 2 – DRAINAGE DESIGN CALCULATIONS AND MODELING

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: 24066 Bioretention
Site Name:
Site Address:
City:

Report Date:	5/14/2025
Gage:	Longview
Data Start:	1955/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.143
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SAT, Forest, Flat	1.2
Pervious Total	1.2
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.2

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
SAT, Lawn, Flat	0.11
Pervious Total	0.11

Impervious Land Use	acre
ROADS FLAT	0.35
DRIVEWAYS FLAT	0.02
SIDEWALKS FLAT	0.13
Impervious Total	0.5
Basin Total	0.61

Mitigated Routing

Bioretention 1

Bottom Length:	80.00 ft.
Bottom Width:	4.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1.25
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	93.874
Total Outflow (ac-ft.):	100.417
Percent Through Underdrain:	93.48
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0454	0.0000	0.0000	0.0000
0.0412	0.0449	0.0001	0.0000	0.0000
0.0824	0.0443	0.0003	0.0000	0.0000
0.1236	0.0436	0.0005	0.0000	0.0000
0.1648	0.0430	0.0006	0.0000	0.0000
0.2060	0.0423	0.0008	0.0000	0.0000
0.2473	0.0417	0.0010	0.0000	0.0000
0.2885	0.0410	0.0012	0.0000	0.0000
0.3297	0.0404	0.0014	0.0000	0.0000
0.3709	0.0397	0.0016	0.0000	0.0000
0.4121	0.0391	0.0018	0.0000	0.0000
0.4533	0.0384	0.0021	0.0000	0.0000
0.4945	0.0378	0.0023	0.0000	0.0000
0.5357	0.0372	0.0026	0.0000	0.0000
0.5769	0.0366	0.0028	0.0000	0.0000
0.6181	0.0359	0.0031	0.0000	0.0000
0.6593	0.0353	0.0034	0.0009	0.0000
0.7005	0.0347	0.0037	0.0010	0.0000
0.7418	0.0341	0.0040	0.0013	0.0000
0.7830	0.0335	0.0043	0.0015	0.0000
0.8242	0.0329	0.0046	0.0019	0.0000
0.8654	0.0322	0.0050	0.0022	0.0000
0.9066	0.0316	0.0053	0.0026	0.0000
0.9478	0.0310	0.0057	0.0030	0.0000
0.9890	0.0304	0.0060	0.0035	0.0000
1.0302	0.0298	0.0064	0.0040	0.0000
1.0714	0.0293	0.0068	0.0046	0.0000
1.1126	0.0287	0.0072	0.0052	0.0000
1.1538	0.0281	0.0076	0.0059	0.0000

1.1951	0.0275	0.0080	0.0066	0.0000
1.2363	0.0269	0.0084	0.0073	0.0000
1.2775	0.0263	0.0089	0.0081	0.0000
1.3187	0.0258	0.0093	0.0089	0.0000
1.3599	0.0252	0.0098	0.0098	0.0000
1.4011	0.0246	0.0102	0.0108	0.0000
1.4423	0.0240	0.0107	0.0118	0.0000
1.4835	0.0235	0.0112	0.0128	0.0000
1.5247	0.0229	0.0117	0.0140	0.0000
1.5659	0.0224	0.0121	0.0151	0.0000
1.6071	0.0218	0.0126	0.0163	0.0000
1.6484	0.0212	0.0131	0.0176	0.0000
1.6896	0.0207	0.0136	0.0189	0.0000
1.7308	0.0201	0.0141	0.0203	0.0000
1.7720	0.0196	0.0146	0.0217	0.0000
1.8132	0.0191	0.0151	0.0255	0.0000
1.8544	0.0185	0.0157	0.0296	0.0000
1.8956	0.0180	0.0162	0.0296	0.0000
1.9368	0.0174	0.0168	0.0296	0.0000
1.9780	0.0169	0.0173	0.0296	0.0000
2.0192	0.0164	0.0179	0.0296	0.0000
2.0604	0.0159	0.0185	0.0296	0.0000
2.1016	0.0153	0.0191	0.0296	0.0000
2.1429	0.0148	0.0197	0.0296	0.0000
2.1841	0.0143	0.0203	0.0296	0.0000
2.2253	0.0138	0.0210	0.0296	0.0000
2.2665	0.0133	0.0216	0.0296	0.0000
2.3077	0.0128	0.0223	0.0296	0.0000
2.3489	0.0123	0.0229	0.0296	0.0000
2.3901	0.0118	0.0236	0.0296	0.0000
2.4313	0.0113	0.0243	0.0296	0.0000
2.4725	0.0108	0.0250	0.0296	0.0000
2.5137	0.0103	0.0257	0.0296	0.0000
2.5549	0.0098	0.0264	0.0296	0.0000
2.5962	0.0093	0.0271	0.0296	0.0000
2.6374	0.0088	0.0279	0.0296	0.0000
2.6786	0.0083	0.0286	0.0296	0.0000
2.7198	0.0078	0.0294	0.0296	0.0000
2.7500	0.0073	0.0300	0.0296	0.0000

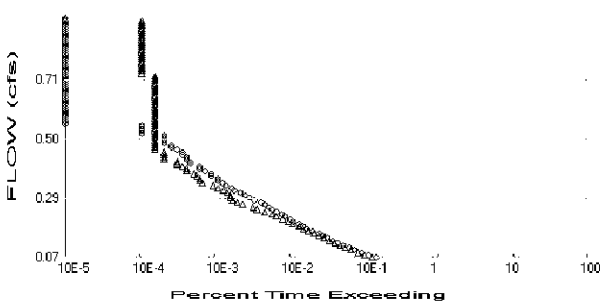
Bioretention Hydraulic Table

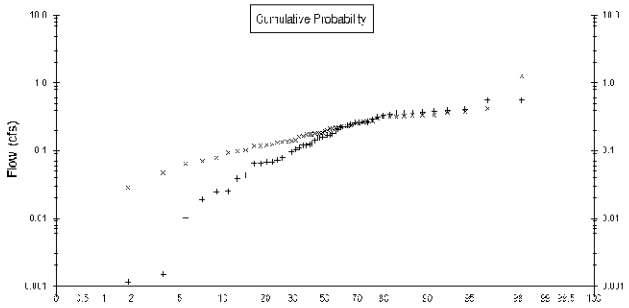
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.7500	0.0454	0.0300	0.0000	0.0222	0.0000
2.7912	0.0461	0.0318	0.0000	0.0222	0.0000
2.8324	0.0467	0.0338	0.0000	0.0234	0.0000
2.8736	0.0474	0.0357	0.0000	0.0241	0.0000
2.9148	0.0481	0.0377	0.0000	0.0247	0.0000
2.9560	0.0488	0.0397	0.0000	0.0253	0.0000
2.9973	0.0494	0.0417	0.0000	0.0259	0.0000
3.0385	0.0501	0.0437	0.0000	0.0265	0.0000
3.0797	0.0508	0.0458	0.0000	0.0271	0.0000
3.1209	0.0515	0.0479	0.0000	0.0277	0.0000
3.1621	0.0522	0.0501	0.0000	0.0283	0.0000
3.2033	0.0529	0.0522	0.0000	0.0289	0.0000
3.2445	0.0536	0.0544	0.0000	0.0295	0.0000
3.2857	0.0543	0.0566	0.0716	0.0302	0.0000
3.3269	0.0550	0.0589	0.2257	0.0308	0.0000
3.3681	0.0557	0.0612	0.4267	0.0314	0.0000

3.4093	0.0564	0.0635	0.6597	0.0320	0.0000
3.4505	0.0571	0.0658	0.9111	0.0326	0.0000
3.4918	0.0578	0.0682	1.1671	0.0332	0.0000
3.5330	0.0585	0.0706	1.4136	0.0338	0.0000
3.5742	0.0593	0.0730	1.6378	0.0344	0.0000
3.6154	0.0600	0.0755	1.8292	0.0350	0.0000
3.6566	0.0607	0.0780	1.9818	0.0357	0.0000
3.6978	0.0614	0.0805	2.0963	0.0363	0.0000
3.7390	0.0622	0.0830	2.1826	0.0369	0.0000
3.7500	0.0624	0.0837	2.2934	0.0370	0.0000

Surface retention 1

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.2
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.11
Total Impervious Area: 0.5

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.142815
5 year	0.376097
10 year	0.554746
25 year	0.775849
50 year	0.926524
100 year	1.061381

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.186723
5 year	0.313897
10 year	0.402131
25 year	0.514673
50 year	0.598024
100 year	0.680314

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.360	0.315
1957	0.389	0.317
1958	0.359	0.276
1959	0.223	0.194
1960	0.360	0.330
1961	0.345	0.250
1962	0.315	0.263
1963	0.552	0.422
1964	0.240	0.222
1965	0.170	0.162

1966	0.080	0.079
1967	0.105	0.143
1968	0.064	0.130
1969	0.122	0.101
1970	0.141	0.116
1971	0.157	0.162
1972	0.226	0.178
1973	0.126	0.177
1974	0.339	0.198
1975	0.400	0.367
1976	0.044	0.137
1977	0.097	0.124
1978	0.373	0.302
1979	0.198	0.176
1980	0.161	0.092
1981	0.159	0.184
1982	0.291	0.237
1983	0.157	0.231
1984	0.267	0.220
1985	0.068	0.098
1986	0.403	0.335
1987	0.168	0.243
1988	0.026	0.047
1989	0.069	0.028
1990	0.208	0.211
1991	0.128	0.121
1992	0.024	0.064
1993	0.112	0.135
1994	0.039	0.117
1995	0.065	0.336
1996	0.268	0.380
1997	0.259	0.183
1998	0.551	0.324
1999	0.072	0.140
2000	0.079	0.216
2001	0.001	0.028
2002	0.010	0.229
2003	0.019	0.173
2004	0.001	0.069
2005	0.001	1.269
2006	0.119	0.185
2007	0.261	0.314
2008	0.180	0.211
2009	0.248	0.270

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.5517	1.2688
2	0.5511	0.4223
3	0.4027	0.3797
4	0.3998	0.3668
5	0.3893	0.3363
6	0.3732	0.3355
7	0.3603	0.3304
8	0.3599	0.3235
9	0.3594	0.3171
10	0.3448	0.3150

11	0.3390	0.3143
12	0.3150	0.3021
13	0.2909	0.2758
14	0.2676	0.2696
15	0.2666	0.2633
16	0.2610	0.2500
17	0.2595	0.2431
18	0.2482	0.2373
19	0.2398	0.2310
20	0.2265	0.2285
21	0.2230	0.2220
22	0.2085	0.2196
23	0.1978	0.2157
24	0.1796	0.2113
25	0.1702	0.2110
26	0.1676	0.1984
27	0.1615	0.1942
28	0.1593	0.1847
29	0.1573	0.1840
30	0.1573	0.1835
31	0.1409	0.1777
32	0.1281	0.1766
33	0.1257	0.1757
34	0.1217	0.1734
35	0.1193	0.1625
36	0.1117	0.1620
37	0.1047	0.1427
38	0.0968	0.1398
39	0.0801	0.1366
40	0.0791	0.1348
41	0.0720	0.1304
42	0.0688	0.1237
43	0.0677	0.1214
44	0.0651	0.1166
45	0.0643	0.1165
46	0.0437	0.1007
47	0.0391	0.0979
48	0.0256	0.0923
49	0.0243	0.0785
50	0.0193	0.0695
51	0.0103	0.0642
52	0.0015	0.0473
53	0.0012	0.0279
54	0.0011	0.0279

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0714	2806	2427	86	Pass
0.0800	2193	1912	87	Pass
0.0887	1786	1597	89	Pass
0.0973	1424	1262	88	Pass
0.1060	1213	1068	88	Pass
0.1146	1009	916	90	Pass
0.1232	842	775	92	Pass
0.1319	725	664	91	Pass
0.1405	620	554	89	Pass
0.1491	542	474	87	Pass
0.1578	476	411	86	Pass
0.1664	391	340	86	Pass
0.1751	327	292	89	Pass
0.1837	291	259	89	Pass
0.1923	256	209	81	Pass
0.2010	213	182	85	Pass
0.2096	193	156	80	Pass
0.2182	166	126	75	Pass
0.2269	150	111	74	Pass
0.2355	128	89	69	Pass
0.2442	113	70	61	Pass
0.2528	102	62	60	Pass
0.2614	90	45	50	Pass
0.2701	80	38	47	Pass
0.2787	64	33	51	Pass
0.2873	55	31	56	Pass
0.2960	49	31	63	Pass
0.3046	42	28	66	Pass
0.3133	35	25	71	Pass
0.3219	32	21	65	Pass
0.3305	27	18	66	Pass
0.3392	24	13	54	Pass
0.3478	21	12	57	Pass
0.3564	21	12	57	Pass
0.3651	17	11	64	Pass
0.3737	17	10	58	Pass
0.3824	14	8	57	Pass
0.3910	12	8	66	Pass
0.3996	12	7	58	Pass
0.4083	9	6	66	Pass
0.4169	9	6	66	Pass
0.4255	8	4	50	Pass
0.4342	8	4	50	Pass
0.4428	7	4	57	Pass
0.4515	7	4	57	Pass
0.4601	6	3	50	Pass
0.4687	5	3	60	Pass
0.4774	5	3	60	Pass
0.4860	4	3	75	Pass
0.4946	4	3	75	Pass
0.5033	4	3	75	Pass
0.5119	4	3	75	Pass
0.5206	2	3	150	Fail
0.5292	2	3	150	Fail

0.5378	2	3	150	Fail
0.5465	2	3	150	Fail
0.5551	0	3	n/a	Fail
0.5637	0	3	n/a	Fail
0.5724	0	3	n/a	Fail
0.5810	0	3	n/a	Fail
0.5897	0	3	n/a	Fail
0.5983	0	3	n/a	Fail
0.6069	0	3	n/a	Fail
0.6156	0	3	n/a	Fail
0.6242	0	3	n/a	Fail
0.6328	0	3	n/a	Fail
0.6415	0	3	n/a	Fail
0.6501	0	3	n/a	Fail
0.6588	0	3	n/a	Fail
0.6674	0	3	n/a	Fail
0.6760	0	3	n/a	Fail
0.6847	0	3	n/a	Fail
0.6933	0	3	n/a	Fail
0.7019	0	3	n/a	Fail
0.7106	0	3	n/a	Fail
0.7192	0	3	n/a	Fail
0.7279	0	3	n/a	Fail
0.7365	0	2	n/a	Fail
0.7451	0	2	n/a	Fail
0.7538	0	2	n/a	Fail
0.7624	0	2	n/a	Fail
0.7710	0	2	n/a	Fail
0.7797	0	2	n/a	Fail
0.7883	0	2	n/a	Fail
0.7970	0	2	n/a	Fail
0.8056	0	2	n/a	Fail
0.8142	0	2	n/a	Fail
0.8229	0	2	n/a	Fail
0.8315	0	2	n/a	Fail
0.8401	0	2	n/a	Fail
0.8488	0	2	n/a	Fail
0.8574	0	2	n/a	Fail
0.8661	0	2	n/a	Fail
0.8747	0	2	n/a	Fail
0.8833	0	2	n/a	Fail
0.8920	0	2	n/a	Fail
0.9006	0	2	n/a	Fail
0.9092	0	2	n/a	Fail
0.9179	0	2	n/a	Fail
0.9265	0	2	n/a	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.0597 acre-feet
On-line facility target flow:	0.0824 cfs.
Adjusted for 15 min:	0.0824 cfs.
Off-line facility target flow:	0.0452 cfs.
Adjusted for 15 min:	0.0452 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
retention 1 POC	☐	91.38			☐	0.00			
Total Volume Infiltrated		91.38	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

POC 2

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Basin 1
1.20ac

Basin 1
0.61ac

S I

Bioretention
1

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                             ***
WDM         26   24066 Bioretention.wdm
MESSU       25   Pre24066 Bioretention.MES
            27   Pre24066 Bioretention.L61
            28   Pre24066 Bioretention.L62
            30   POC24066 Bioretention1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      19
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
   19     SAT, Forest, Flat       1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   19         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   19         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   19         0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR      KVARY      AGWRC
   19              0         4         2       100     0.001        0.5      0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   19             0         0        10         2         0         0       0.7
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   19          0.2         3       0.5         1       0.7       0.8
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS       GWVS
   19             0         0         0         0       4.2         1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                  in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK    ***
<Name>   #                  <-factor->     <Name>   #   Tbl#    ***
Basin  1***
PERLND  19                        1.2     COPY   501     12
PERLND  19                        1.2     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR        KS       DB50       ***
  <------><--------><--------><--------><--------><--------><--------><------>  ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---><---><---><---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.143          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.143          IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                             ***
WDM         26   24066 Bioretention.wdm
MESSU       25   Mit24066 Bioretention.MES
            27   Mit24066 Bioretention.L61
            28   Mit24066 Bioretention.L62
            30   POC24066 Bioretention1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      25
      IMPLND       1
      IMPLND       5
      IMPLND       8
      GENER        2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface retention  1        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out              ***
   25     SAT, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

```
  25         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   25         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -   # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   25         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2          ***
    # -   # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   25              0         4         1       100     0.001       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3          ***
    # -   # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   25              0         0        10         2         0         0      0.35
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -   #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   25           0.1         3       0.5         1       0.7       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -   # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS       GWVS
   25              0         0         0         0       4.2         1          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -   #                     User  t-series Engl Metr ***
                                    in  out           ***
    1      ROADS/FLAT             1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    5         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    4    1    9
    5         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
```

```
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1          0    0    0    0    0
    5          0    0    0    0    0
    8          0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >       IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    5            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >       IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    5              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
    5             0         0
    8             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  25                       0.11     RCHRES   1      2
PERLND  25                       0.11     RCHRES   1      3
IMPLND   1                       0.35     RCHRES   1      5
IMPLND   5                       0.02     RCHRES   1      5
IMPLND   8                       0.13     RCHRES   1      5

******Routing******
PERLND  25                       0.11     COPY     1     12
IMPLND   1                       0.35     COPY     1     15
IMPLND   5                       0.02     COPY     1     15
IMPLND   8                       0.13     COPY     1     15
PERLND  25                       0.11     COPY     1     13
RCHRES   1                          1     RCHRES   2      8
RCHRES   2                          1     COPY   501     16
RCHRES   1                          1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER       .0011111    RCHRES   1     EXTNL  OUTDGT 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
```

```
    1     Surface retentio-010    2    1    1    1   28    0    1
    2     Bioretention  1         1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR   *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                        ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  5  0  0  0       0  1  0  0  0        2  1  2  2  2
    2        0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50        ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1             1      0.01       0.0       0.0       0.0       0.0
    2             2      0.02       0.0       0.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                           ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1          0           4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2          0           4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                        <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Target Variable Names
***                addr or                        addr or
***               <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER    2                              v2m2              =  1331.53
*** Compute remaining available pore space
  GENER    2                              vpo2              =  v2m2
  GENER    2                              vpo2             -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
```

```
  GENER   2                                     vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                                     v2d2            =  vpo2
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   68    4
     Depth      Area     Volume  Outflow1 Velocity  Travel Time***
      (ft)    (acres) (acre-ft)    (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.045414  0.000000  0.000000
  0.041209  0.044928  0.000143  0.000000
  0.082418  0.044267  0.000295  0.000000
  0.123626  0.043610  0.000456  0.000000
  0.164835  0.042955  0.000626  0.000000
  0.206044  0.042302  0.000806  0.000000
  0.247253  0.041653  0.000994  0.000000
  0.288462  0.041006  0.001192  0.000000
  0.329670  0.040363  0.001400  0.000000
  0.370879  0.039722  0.001616  0.000000
  0.412088  0.039083  0.001842  0.000000
  0.453297  0.038448  0.002078  0.000000
  0.494505  0.037815  0.002323  0.000000
  0.535714  0.037186  0.002578  0.000000
  0.576923  0.036559  0.002843  0.000000
  0.618132  0.035934  0.003117  0.000000
  0.659341  0.035313  0.003401  0.000907
  0.700549  0.034695  0.003695  0.001018
  0.741758  0.034079  0.003999  0.001266
  0.782967  0.033466  0.004313  0.001548
  0.824176  0.032856  0.004636  0.001866
  0.865385  0.032248  0.004970  0.002221
  0.906593  0.031644  0.005314  0.002615
  0.947802  0.031042  0.005668  0.003048
  0.989011  0.030443  0.006032  0.003523
  1.030220  0.029847  0.006407  0.004040
  1.071429  0.029254  0.006791  0.004600
  1.112637  0.028664  0.007187  0.005206
  1.153846  0.028076  0.007592  0.005857
  1.195055  0.027491  0.008008  0.006555
  1.236264  0.026909  0.008435  0.007302
  1.277473  0.026330  0.008872  0.008097
  1.318681  0.025753  0.009319  0.008943
  1.359890  0.025180  0.009778  0.009840
  1.401099  0.024609  0.010247  0.010788
  1.442308  0.024041  0.010727  0.011789
  1.483516  0.023476  0.011218  0.012844
  1.524725  0.022913  0.011673  0.013953
  1.565934  0.022354  0.012138  0.015117
  1.607143  0.021797  0.012613  0.016336
  1.648352  0.021243  0.013098  0.017609
  1.689560  0.020692  0.013594  0.018937
  1.730769  0.020143  0.014099  0.020315
  1.771978  0.019598  0.014614  0.021727
  1.813187  0.019055  0.015140  0.025499
  1.854396  0.018515  0.015676  0.029630
  1.895604  0.017978  0.016223  0.029630
  1.936813  0.017443  0.016779  0.029630
  1.978022  0.016912  0.017346  0.029630
  2.019231  0.016383  0.017924  0.029630
  2.060440  0.015857  0.018512  0.029630
  2.101648  0.015334  0.019111  0.029630
  2.142857  0.014814  0.019720  0.029630
  2.184066  0.014296  0.020340  0.029630
  2.225275  0.013782  0.020970  0.029630
  2.266484  0.013270  0.021612  0.029630
  2.307692  0.012761  0.022264  0.029630
  2.348901  0.012254  0.022927  0.029630
  2.390110  0.011751  0.023600  0.029630
  2.431319  0.011250  0.024285  0.029630
```

```
  2.472527  0.010753  0.024981  0.029630
  2.513736  0.010257  0.025688  0.029630
  2.554945  0.009765  0.026406  0.029630
  2.596154  0.009276  0.027135  0.029630
  2.637363  0.008789  0.027875  0.029630
  2.678571  0.008305  0.028626  0.029630
  2.719780  0.007824  0.029389  0.029630
  2.750000  0.007346  0.030568  0.029630
  END FTABLE  2
  FTABLE      1
   26    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)    (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.007346  0.000000  0.000000  0.000000
  0.041209  0.046080  0.001885  0.000000  0.022222
  0.082418  0.046748  0.003798  0.000000  0.023443
  0.123626  0.047419  0.005738  0.000000  0.024054
  0.164835  0.048093  0.007706  0.000000  0.024664
  0.206044  0.048770  0.009702  0.000000  0.025275
  0.247253  0.049450  0.011726  0.000000  0.025885
  0.288462  0.050132  0.013777  0.000000  0.026496
  0.329670  0.050817  0.015857  0.000000  0.027106
  0.370879  0.051505  0.017966  0.000000  0.027717
  0.412088  0.052196  0.020102  0.000000  0.028327
  0.453297  0.052889  0.022268  0.000000  0.028938
  0.494505  0.053586  0.024462  0.000000  0.029548
  0.535714  0.054285  0.026684  0.071570  0.030159
  0.576923  0.054987  0.028936  0.225672  0.030769
  0.618132  0.055692  0.031216  0.426722  0.031380
  0.659341  0.056399  0.033526  0.659695  0.031990
  0.700549  0.057110  0.035864  0.911089  0.032601
  0.741758  0.057823  0.038233  1.167052  0.033211
  0.782967  0.058539  0.040630  1.413620  0.033822
  0.824176  0.059258  0.043057  1.637810  0.034432
  0.865385  0.059980  0.045514  1.829184  0.035043
  0.906593  0.060704  0.048001  1.981777  0.035653
  0.947802  0.061431  0.050517  2.096308  0.036264
  0.989011  0.062161  0.053064  2.182633  0.036874
  1.000000  0.062357  0.053748  2.293441  0.037037
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.143          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.143          IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1.143          RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1         1      WDM   1000 FLOW     ENGL       REPL
RCHRES   2 HYDR   STAGE  1 1         1      WDM   1001 STAG     ENGL       REPL
RCHRES   1 HYDR   STAGE  1 1         1      WDM   1002 STAG     ENGL       REPL
RCHRES   1 HYDR   O      1 1         1      WDM   1003 FLOW     ENGL       REPL
COPY     1 OUTPUT MEAN   1 1      48.4      WDM    701 FLOW     ENGL       REPL
COPY   501 OUTPUT MEAN   1 1      48.4      WDM    801 FLOW     ENGL       REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>              <Name> # #***
  MASS-LINK        2
```

```
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Disclaimer

Legal Notice

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Local (360)943-0304

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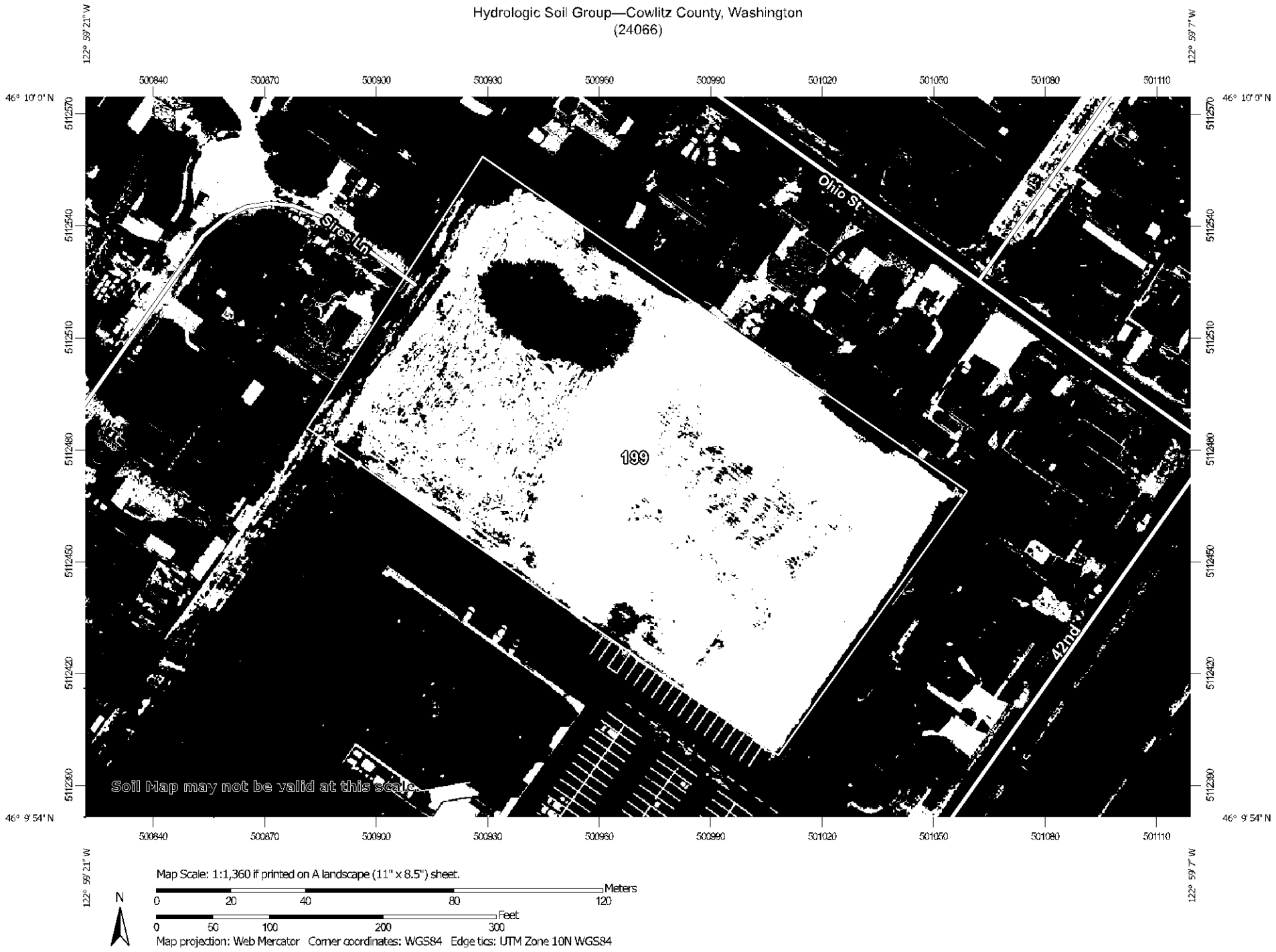
APPENDIX 3 – SPECIAL REPORTS AND STUDIES

1. NRCS Soil Survey Data
2. Geotech Report – South Sound Soils



Map Scale: 1:1,360 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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: Cowlitz County, Washington
Survey Area Data: Version 24, Aug 28, 2023

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

Date(s) aerial images were photographed: May 26, 2023—Aug 14, 2023

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
199	Snohomish silty clay loam, 0 to 1 percent slopes	C/D	3.4	100.0%
Totals for Area of Interest			**3.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Cowlitz County, Washington

199—Snohomish silty clay loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2f63
Elevation: 10 to 300 feet
Mean annual precipitation: 22 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 160 to 220 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Snohomish, drained, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Snohomish, Drained

Setting

Landform: Flood plains
Parent material: Herbaceous organic material and/or alluvium

Typical profile

H1 - 0 to 7 inches: silty clay loam
H2 - 7 to 18 inches: silty clay loam
Oa - 18 to 60 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly 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 6 to 24 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 22.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Ecological site: F002XB007WA - Portland Basin Wet Forest, F002XA007WA - Puget Lowlands Wet Forest
Forage suitability group: Seasonally Wet Soils (G002XV202WA)
Other vegetative classification: Seasonally Wet Soils (G002XV202WA)
Hydric soil rating: Yes

Minor Components

Unnamed, somewhat poorly drained
Percent of map unit: 10 percent
Hydric soil rating: No

Snohomish, undrained
Percent of map unit: 10 percent
Other vegetative classification: Wet Soils (G002XV102WA)
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Cowlitz County, Washington
Survey Area Data: Version 24, Aug 28, 2023

November 25, 2024

RB Engineering
91 SW 13th Street
Chehalis, WA 98532

Attention: Mr. Chris Aldrich

Subject: Geotechnical Engineering Report
Sires Lane Cottages
Sires Lane
Longview, Washington
SSGC Project No. 24067

Mr. Aldrich,

South Sound Geotechnical Consulting (SSGC) has completed a geotechnical assessment for the planned Sires Lane Cottages site in Chehalis, Washington. Our services have been completed in general conformance with our proposal P24102 (dated October 15, 2024) and authorized per signature of our agreement for services. Our scope of services included completion of ten test pits on the site, engineering analyses, and preparation of this report.

PROJECT INFORMATION

Up to twenty lots for cottages are planned on the site, located east of the current terminus of Sires Lane. We anticipate conventional spread footings will be used to support the new buildings. Conventional asphalt access ways and driveways are anticipated.

The site is currently undeveloped and covered principally with field grasses and some isolated trees. It is generally level with an estimated elevation change of around 3 (+/-) feet.

SUBSURFACE CONDITIONS

Subsurface conditions were characterized by completing ten test pits on the site on October 31, 2024. Test pits were advanced to depths between about 3 and 6 feet. Approximate locations of the test pits are shown in Figure 1, Exploration Plan. A summary description of observed subgrade conditions is provided below. Logs of the test pits are provided in Appendix A.

Soil Conditions

Topsoil was at the surface of the test pits and extended to depths between about 9 inches to 1 foot. Soil below the topsoil consisted of clayey silt to silty clay with trace fine sand. This soil was in a soft condition and extended to the termination depth of these test pits.

Groundwater Conditions

Groundwater was observed in the test pits at depths between 2 to 4 feet at the time of excavation. Groundwater levels will vary throughout the year based on seasonal precipitation and on- and off-site drainage patterns.

Geologic Setting

The principal native soil on the site is mapped as Snohomish silty clay loam per the USDA Soil Conservation Service map of Cowlitz County. This soil reportedly formed in herbaceous organic material and/or alluvium on flood plains. Native soil in the test pits appear to conform to the mapped soil type.

GEOTECHNICAL DESIGN CONSIDERATIONS

Planned development of the site is considered feasible based on observed soil conditions in the test pits and our understanding of current development plans. However, native soil is fine grained and soft, with a high groundwater table. Building foundations and pavements should be supported on a zone of structural fill above undistrubed native soil. A structural fill pad with a thickened edge mat-type foundation could be considered for support of individual homes, if the client is willing to accept the increased risk of some future settlement. The purpose of the structural fill pad and mat foundation is to limit differential settlement across the footprint of the buildings. We recommend the structural fill pad is at least 2 feet thick.

Recommendations presented in the following sections should be considered general and may require modifications when earthwork and grading occur. They consider that reinforced mat foundations will be used for support of the storage buildings. They are based upon the subsurface conditions observed in the test pits and the assumption that finish site grades will be similar or higher than existing grades. It should be noted that subsurface conditions across the site may vary from those depicted on the test pit logs and can change with time. Therefore, proper site preparation will depend upon the weather and soil conditions encountered at the time of construction. We recommend that SSGC review final plans and further assess subgrade conditions at the time of construction, as warranted.

General Site Preparation

Site grading and earthwork should include procedures to control surface water runoff. Grading the site without adequate drainage control measures may negatively impact site soils, resulting in increased export of impacted soil and import of fill materials, potentially increasing the cost of the earthwork and subgrade preparation phases of the project.

Site grading should include removal (stripping) of topsoil and any fill encountered in building and pavement areas. Stripping depth will average about 12 inches based on observed conditions in the test pits, but may vary across the site. Final stripping depths can only be determined at the time of construction.

General Subgrade Preparation

Subgrades in building and driveway areas should consist of undisturbed native soil. Vehicle/equipment traffic should be avoided on exposed subgrades following stripping.

We recommend a separation fabric (such as Mirafi 160N) is placed above native subgrades in pavement areas prior to placement of structural fill. The purpose of the fabric is to provide segregation between new granular structural fill and the finer grained native soil. Without the fabric, new granular fill will have the tendency to migrate into the softer subgrade soil over time, which can compromise the structural integrity of the structural fill zone leading to premature distress of the fill section.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Allowing surface water into cut or fill areas, utility trenches, and building footprints should be prevented.

Structural Fill Materials

The suitability of soil for use as structural fill will depend on the gradation and moisture content of the soil when it is placed. Soils with higher fines content (soil fraction passing the U.S. No. 200 sieve) will become sensitive with higher moisture content. It is often difficult to achieve adequate compaction if soil moisture is outside of optimum ranges for soils that contain more than about 5 percent fines.

Site Soils: The upper tilled layer is not considered suitable for structural fil and should be wasted from the site or can be used in landscape areas. Native soils are fine grained (principally silt) making them moisture sensitive and difficult to use as structural fill unless conditioned to optimum moisture content. Optimum moisture is considered within about +/- 2 percent of the moisture content required to achieve the maximum density per the ASTM D-1557 test method. If moisture content is higher or lower than optimum, soils would need to be dried or wetted prior to placement as structural fill.

Import Fill Materials: We recommend import structural fill placed during dry weather periods consist of material which meets the specifications for *Gravel Borrow* as described in Section 9-03.14(1) of the Washington State Department of Transportation (WSDOT) Specifications for Road, Bridge, and Municipal Construction (Publication M41-10). Gravel Borrow should be protected from disturbance if exposed to wet conditions after placement.

During wet weather, or for backfill on wet subgrades, import soil suitable for compaction in wetter conditions should be provided. Imported fill for use in wet conditions should generally

conform to specifications for *Select Borrow* as described in Section 9-03.14(2), or *Crushed Surfacing* per Section 9-03.9(3) of the WSDOT M41-10 manual, with the modification that a maximum of 5 percent by weight shall pass the U.S. No. 200 sieve.

It should be noted that structural fill placement and compaction is weather-dependent. Delays due to inclement weather are common, even when using select granular fill. We recommend site grading and earthwork be scheduled for the drier months of the year. Structural fill should not consist of frozen material.

Structural Fill Placement

We recommend structural fill is placed in lifts not exceeding about 10 inches in loose measure. It may be necessary to adjust lift thickness based on site and fill conditions during placement and compaction. Finer grained soil used as structural fill and/or lighter weight compaction equipment may require significantly thinner lifts to attain required compaction levels. Granular soil with lower fines contents could potentially be placed in thicker lifts if they can be adequately compacted. Structural fill should be compacted to attain the recommended levels presented in Table 1, Compaction Criteria.

Table 1. Compaction Criteria

Fill Application	Compaction Criteria*
Footing areas (below structures and retaining walls)	95 %
Upper 2 feet in pavement areas, slabs and sidewalks, and utility trenches	95 %
Below 2 feet in pavement areas, slabs and sidewalks, and utility trenches	92 %
Utility trenches or general fill in non-paved or -building areas	90 %

*Per the ASTM D 1557 test method.

Trench backfill within about 2 feet of utility lines should not be over-compacted to reduce the risk of damage to the line. In some instances, the top of the utility line may be within 2 feet of the surface. Backfill in these circumstances should be compacted to a firm and unyielding condition.

We recommend fill procedures include maintaining grades that promote drainage and do not allow ponding of water within the fill area. The contractor should protect compacted fill subgrades from disturbance during wet weather. In the event of rain during structural fill placement, the exposed fill surface should be allowed to dry prior to placement of additional fill. Alternatively, the wet soil can be removed. We recommend consideration be given to protecting haul routes and other high traffic areas with free-draining granular fill material (i.e. sand and gravel containing less than 5 percent fines) or quarry spalls to reduce the potential for disturbance to the subgrade during inclement weather.

Earthwork Procedures

Conventional earthmoving equipment should be suitable for earthwork at this site. However, native soils will be susceptible to disturbance under heavy wheeled equipment loads. Earthwork may be difficult during periods of wet weather or if elevated soil moisture is present. Excavated site soils may not be suitable as structural fill depending on the soil moisture content and weather conditions at the time of earthwork. If soil is stockpiled and wet weather is anticipated, the stockpile should be protected with securely anchored plastic sheeting. If stockpiled soils become unusable, it may become necessary to import clean, granular soils to complete wet weather site work.

Wet or disturbed subgrade soils should be over-excavated to expose firm, non-yielding, non-organic soils and backfilled with compacted structural fill. We recommend the earthwork portion of this project be completed during extended periods of dry weather. If earthwork is completed during the wet season (typically late October through May) it may be necessary to take extra measures to protect subgrade soils.

If earthwork takes place during freezing conditions, we recommend exposed subgrades are allowed to thaw and re-compacted prior to placing subsequent lifts of structural fill. Alternatively, the frozen soil can be removed to unfrozen soil and replaced with structural fill.

The contractor is responsible for designing and constructing stable, temporary excavations (including utility trenches) as required to maintain stability of excavation sides and bottoms. Excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards. Temporary excavation cuts should be sloped at inclinations of 1H:1.5V (Horizontal:Vertical) or flatter, unless the contractor can demonstrate the safety of steeper inclinations. Shoring may be required in deeper excavations (below 4 feet) as soft wet soils may cave into open excavations.

A geotechnical engineer and accredited material testing laboratory should be retained during the construction phase of the project to observe earthwork operations and perform necessary tests and observations during subgrade preparation, placement and compaction of structural fill, and backfilling of excavations.

Foundations

We recommend foundations are placed on minimum 24-inch-thick zone of granular structural fill above subgrade soil prepared as described in this report. The purpose of the structural fill zone is to limit disturbance to the fine-grained native soil. A separation fabric (such as Mirafi 160N) should be placed on the native subgrade prior to structural fill placement. The following recommendations are for conventional spread footing foundations:

Bearing Capacity (net allowable):	800 pounds per square foot (psf) for foundations supported on a zone of compacted granular fill over native soils prepared as described in this report.
Footing Width (Minimum):	18 inches (Strip) 24 inches (Column)
Embedment Depth (Minimum):	18 inches (Exterior) 12 inches (Interior)
Settlement:	Total: < 1.5 inch Differential: < 3/4 inch (over 40 feet)
Allowable Lateral Passive Resistance:	225 psf/ft* (below 18 inches)
Allowable Coefficient of Friction:	0.35*

*These values include a factor of safety of approximately 1.5.

The net allowable bearing pressures presented above may be increased by one-third to resist transient, dynamic loads such as wind or seismic forces. Lateral resistance to footings should be ignored in the upper 12-inches from exterior finish grade.

Foundation Construction Considerations

All foundation subgrades should be free of water and loose soil prior to placing concrete and should be prepared as recommended in this report. Concrete should be placed soon after excavating and compaction to reduce disturbance to bearing soils. Should soils at foundation level become excessively dry, disturbed, saturated, or frozen, the affected soil should be removed prior to placing concrete. We recommend SSGC observe all foundation subgrades prior to placement of concrete.

Foundation Drainage

Ground surface adjacent foundations should be sloped away from buildings. We recommend footing drains are installed around perimeter footings. Footing drains should include a minimum 4-inch diameter perforated rigid plastic drain line installed at the base of the footing. The perforated drain lines should be connected to a tight line pipe that discharges to an approved storm drain receptor. The drain line should be surrounded by a zone of clean, free-draining granular material having less than 5 percent passing the No. 200 sieve or meeting the requirements of section 9-03.12(2) "Gravel Backfill for Walls" in the WSDOT (M41-10) manual. The free-draining aggregate zone should be at least 12 inches wide and wrapped in filter fabric. The granular fill should extend to within 6 inches of final grade where it should be capped with compacted fill containing sufficient fines to reduce infiltration of surface water into the footing drains. Cleanouts are recommended for maintenance of the drain system.

On-Grade Floor Slabs

On-grade floor slabs should be placed on prepared subgrades as described in this report. We recommend a modulus subgrade reaction of 130 pounds per square inch per inch (psi/in) for floor slabs on subgrade soils.

We recommend a capillary break is provided between the prepared subgrade and bottom of slab. Capillary break material should be a minimum of 4 inches thick and consist of compacted clean, free-draining, well graded coarse sand and gravel. The capillary break material should contain less than 5 percent fines, based on that soil fraction passing the U.S. No. 4 sieve. Alternatively, clean angular gravel such as No. 7 aggregate per Section 9-03.1(4)C of the WSDOT (M41-10) manual could be used for this purpose.

Seismic Considerations

Seismic parameters and values in Table 2 are recommended based on the International Building Code (IBC).

Table 2. Seismic Parameters

PARAMETER	VALUE
International Building Code (IBC) Site Classification[1]	DE
S_s Spectral Acceleration for a Short Period	1.32
S_1 Spectral Acceleration for a 1-Second Period	0.45g

[1] Note: In general accordance with the *International Building Code* for risk categories I,II,III. IBC Site Class is based on the estimated characteristics of the upper 100 feet of the subsurface profile. Spectral accelerations based on ASCE 7-22 from the ASCE 7 Hazard Tool website.

Liquefaction

Soil liquefaction is a condition where loose, typically granular soils located below the groundwater surface lose strength during ground shaking and is often associated with earthquakes. The risk of liquefaction at this site is considered low to moderate due to the overall fine-grained nature of native site soils. However, some deformation of underlying soft soils should be expected. Although structural failure of foundations is not anticipated, some limited structural and cosmetic damage could occur during a design level seismic event.

Conventional Asphalt Pavement Sections

Subgrades for conventional pavement areas should be prepared as described in the "*Subgrade Preparation*" section of this report. Subgrades below pavement sections should be graded or crowned to promote drainage and not allow for ponding of water beneath the section. If drainage is not provided and ponding occurs, subgrade soils could become saturated, lose strength, and result in premature distress or failure of the section. In addition, the pavement surfacing should also be graded to promote drainage and reduce the potential for ponding of water on the pavement surface.

We recommend a separation fabric (such as Mirafi 160N) is placed in pavement areas underlain by native soil prior to placement of pavement section fill. The purpose of the fabric is to provide segregation between new granular structural fill and the finer grained native soil. Without the fabric, new granular fill will have the tendency to migrate into the softer subgrade soil over time, which can compromise the structural integrity of the structural fill zone leading to premature distress of the fill section.

Minimum recommended pavement sections for conventional asphalt pavements are presented in Table 3. New pavement sections in public right-of-ways should conform to City of Longview (or Cowlitz County) standards.

Table 3. Minimum Pavement Sections

Traffic Area	Minimum Recommended Pavement Section Thickness (inches)			
	Asphalt Concrete Surface[1]	Portland Cement Concrete[2]	Aggregate Base Course[3,4]	Subbase Aggregate[5]
Main Access	3	6	4	12
Driveways	2	5	4	12

[1] 1/2 –inch nominal aggregate hot-mix asphalt (HMA) per WSDOT 9-03.8(1)

[2] A 28-day minimum compressive strength of 4,000 psi and an allowable flexural strength of at least 250 psi

[3] Crushed Surfacing Base Course per WSDOT 9-03.9(3)

[4] Although not required for structural support under concrete pavements, a minimum four-inch-thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade "pumping" through joints

[5] 95% compacted native subgrade or Gravel Borrow per WSDOT 9-03.14(1) or Crushed Surfacing Base Course WSDOT 9-03.9(3)

Conventional Pavement Maintenance

The performance and lifespan of pavements can be significantly impacted by future maintenance. The above pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be completed. Proper maintenance will slow the rate of pavement deterioration and will improve pavement performance and life. Preventive maintenance consists of both localized maintenance (crack and joint sealing and patching) and global maintenance (surface

sealing). Added maintenance measures should be anticipated over the lifetime of the pavement section if any fill or topsoil is left in-place beneath pavement sections.

REPORT CONDITIONS

This report has been prepared for the exclusive use of RB Engineering for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No warranties, either express or implied, are intended or made. The analysis and recommendations presented in this report are based on observed soil conditions and test results at the indicated locations, and from other geologic information discussed. This report does not reflect variations that may occur across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

This report was prepared for the planned type of development of the site as discussed herein. It is not valid for third party entities or alternate types of development on the site without the express written consent of SSGC. If development plans change, we should be notified to review those changes and modify our recommendations as necessary.

The scope of services for this project does not include any environmental or biological assessment of the site including identification or prevention of pollutants, hazardous materials, or conditions. Other studies should be completed if the owner is concerned about the potential for contamination or pollution.

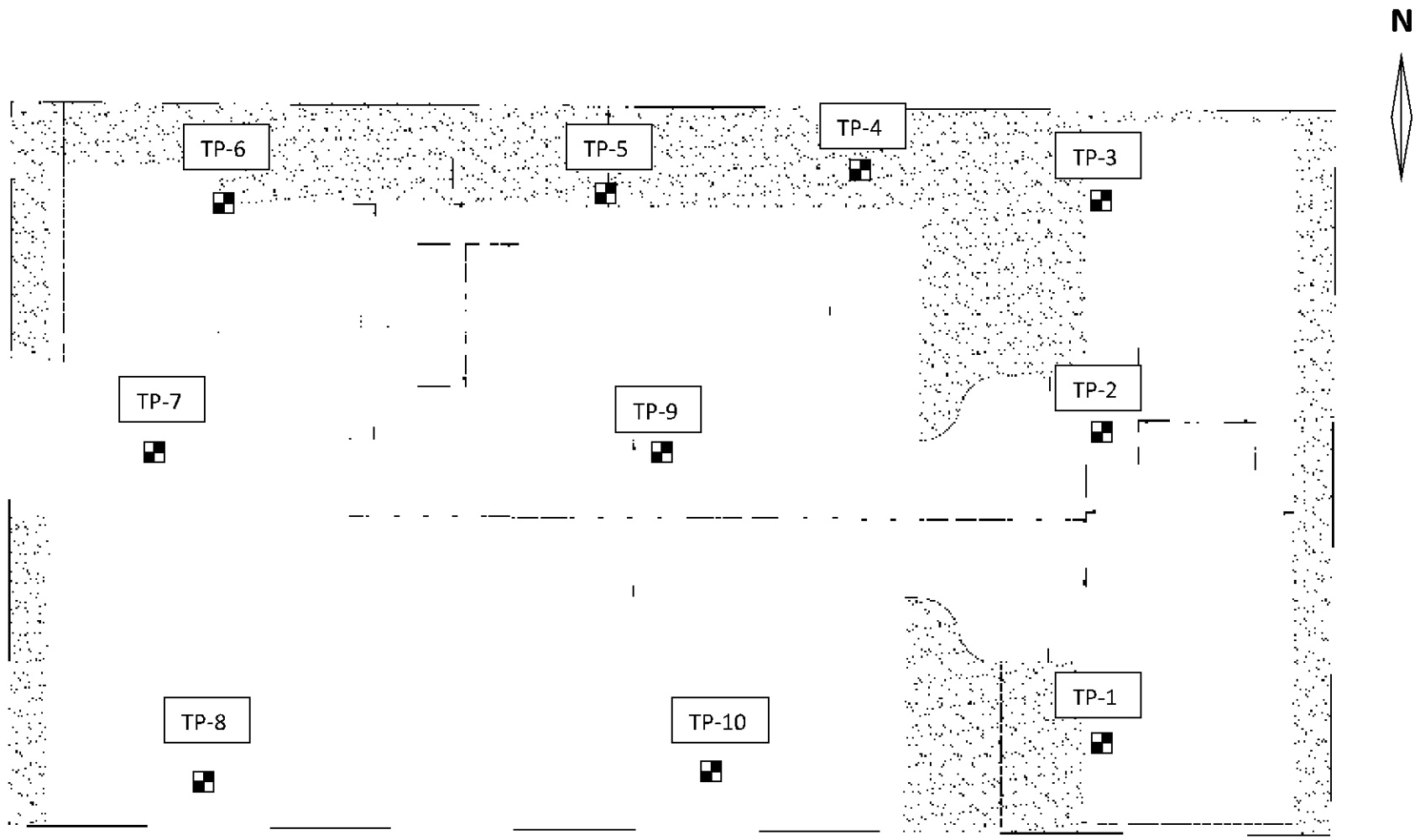
We appreciate the opportunity to work with you on this project. Please contact us if additional information is required or we can be of further assistance.

Respectfully,

South Sound Geotechnical Consulting

Timothy H. Roberts, P.E.
Member/Geotechnical Engineer

Attachments: Figure 1 – Exploration Plan
Appendix A – Field Exploration Procedures and Test Pit Logs
Unified Soil Classification System



Legend

TP - 1

Approximate Test Pit Location

Base map from client provided plan

No Scale

South Sound Geotechnical Consulting
P.O. Box 39500
Lakewood, WA 98496
(253) 973-0515

Figure 1 – Exploration Plan

Sires Lane Cottages
Longview, Washington
SSGC Project #24067

Appendix A

Field Exploration Procedures and Test Pit Logs

Field Exploration Procedures

Our field exploration for this project included five test pits completed on April 18, 2024. The approximate locations of the explorations are shown in Figure 1, Exploration Plan. Exploration locations were determined by pacing from site features. Approximate elevations were interpolated from Google Earth satellite imagery. Test pit locations and elevations should be considered accurate only to the degree implied by the means and methods used.

A private excavation contractor dug the test pits. Select soil samples were collected and stored in moisture tight containers for further assessment and laboratory testing. Explorations were backfilled with excavated soil and tamped when completed. Please note that backfill in the explorations may settle with time. Backfill material located in building or pavement areas should be re-excavated and recompacted, or replaced with structural fill.

The following logs indicate the observed lithology of soils and other materials observed in the explorations at the time of excavation. Where a soil contact was observed to be gradational, our log indicates the average contact depth. Our logs also indicate the approximate depth to groundwater (where observed at the time of excavation), along with sample numbers and approximate sample depths. Soil descriptions on the logs are based on the Unified Soil Classification System.

Test Pit TP-1

Depth (feet)	Material Description
0 – 1	**Topsoil**
1 – 5	Clayey SILT/Silty CLAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)
	Test pit completed at approximately 5 feet on 10/31/24. Groundwater observed at 2.5 feet at time of excavation.

Test Pit TP-2

Depth (feet)	Material Description
0 – 0.75	**Topsoil**
0.75 – 4	Clayey SILT/Silty CLAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)
	Test pit completed at approximately 4 feet on 10/31/24. Groundwater observed at 2.5 feet at time of excavation.

Test Pit TP-3

Depth (feet)	Material Description
0 – 0.75	**Topsoil**
0.75– 3	Clayey SILT/Silty LCAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)
	Test pit completed at approximately 3 feet on 10/31/24. Groundwater observed at 2 feet at time of excavation.

Test Pit TP-4

Depth (feet)	Material Description
0 – 1	**Topsoil**
1 – 4	Clayey SILT/Silty CLAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)
	Test pit completed at approximately 4 feet on 10/31/24. Groundwater observed at 2 feet at time of excavation.

Test Pit TP-5

Depth (feet)	Material Description
0 – 1	**Topsoil**
1 – 4	Clayey SILT/Silty CLAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)
	Test pit completed at approximately 4 feet on 10/31/24. Groundwater observed at 2.5 feet at time of excavation.

Test Pit TP-6

Depth (feet)	Material Description
0 – 0.75	**Topsoil**
0.75 – 4	Clayey SILT/Silty CLAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)
	Test pit completed at approximately 4 feet on 10/31/24. Groundwater observed at 2.5 feet at time of excavation.

Test Pit TP-7

Depth (feet)	Material Description
0 – 1	**Topsoil**
1 – 4	Clayey SILT/Silty CLAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)
	Test pit completed at approximately 4 feet on 10/31/24. Groundwater observed at 2.5 feet at time of excavation.

Test Pit TP-8

Depth (feet)	Material Description
0 – 0.75	**Topsoil**
0.75 – 4	Clayey SILT/Silty CLAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)
	Test pit completed at approximately 4 feet on 10/31/24. Groundwater observed at 4 feet at time of excavation.

Test Pit TP-9

Depth (feet)	Material Description
0 – 2	**Topsoil**
2 – 6	Clayey SILT/Silty CLAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)

Test pit completed at approximately 5 feet on 10/31/24.
Groundwater observed at 2.5 feet at time of excavation.

Test Pit TP-10

Depth (feet)	Material Description
0 – 1	**Topsoil**
1 – 4	Clayey SILT/Silty CLAY, trace fine sand: Soft, moist to wet, brown grading gray. (ML/CL)

Test pit completed at approximately feet on 10/31/24.
Groundwater observed at 3 feet at time of excavation.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification	
					Group Symbol	Group Name[B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	Cu > 4 and 1 < Cc < 3[E]		GW	Well-graded gravel[F]
			Cu < 4 and/or 1 > Cc > 3[E]		GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel[F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3[E]		SW	Well-graded sand[I]
			Cu < 6 and/or 1 > Cc > 3[E]		SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand[G,H,I]
			Fines Classify as CL or CH		SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]		CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]		ML	Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line		CH	Fat clay[K,L,M]
			PI plots below "A" line		MH	Elastic Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

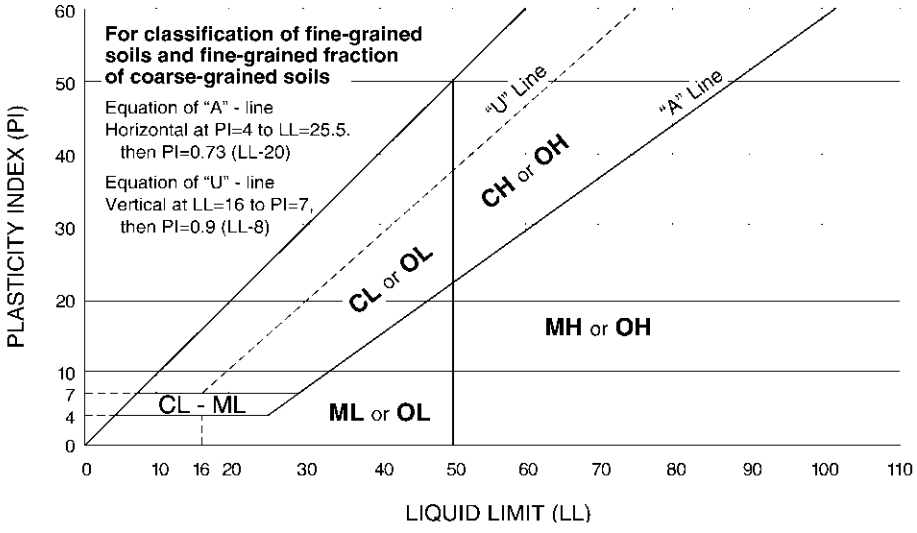
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



APPENDIX 4 – OPERATION AND MAINTENANCE MANUAL

A maintenance agreement has been drafted and is included following this page. Inspection and maintenance for existing CDID#1 ditch is a part of the Canal District's responsibility and not included in the maintenance agreement.

STORMWATER MAINTENANCE AGREEMENT

This Agreement to maintain stormwater facilities is entered into this___day of _____, 20___, by and between City of Longview (hereinafter "City") and Bud Clary Auto Group, its heirs, successors, and assigns (hereinafter "Landowner") (collectively "Parties").

City of Longview Permit No: _____

Project Name: Longview Clary Ford

Parcel No: 1002902

Parcel Abbreviated Legal Description (hereinafter "Property"):

819 (LONGVIEW OUTLOT)-LVOL -24A-1 3-7N-2W NATHANIEL STONE DLC. EXC LVOL 24A-1A FEE

WITNESSETH

WHEREAS, Landowner has submitted for approval by City a permit application and Site Plan for the construction and installation of stormwater management facilities pursuant to City of Longview Code ("City Code") Chapter 15.45; and

WHEREAS, the City Code requires, as a condition of permit approval, a maintenance agreement between the City and the Landowner ensuring the Landowner constructs and continuously maintains the stormwater facilities identified in the Site Plan; and

WHEREAS, the City and the Landowner, its heirs, successors and assigns, including but not limited to any homeowner association, agree that the health, safety and welfare of the residents of the City require that on-site stormwater management facilities be constructed and continuously maintained on the Property; and

WHEREAS, the City Code, Chapter 15.45, requires that private stormwater facilities be continuously maintained by the landowner and that a maintenance agreement be executed to achieve that end before the development plan is approved.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants stated herein, and the following terms and conditions, the Parties agree, as follows:

1. Landowner shall construct and install stormwater management facilities as depicted and shown on the Record Drawings for the above referenced county project number, hereto and incorporated herein by this reference, and in accordance with the plans and specifications.

2. Landowner shall continuously maintain the stormwater management facilities as shown on the Site Plan in good working order and as specified in the maintenance schedule attached hereto and incorporated herein by reference.

3. Landowner hereby grants City of Longview, its authorized agents and employees, to enter onto the Property to inspect the stormwater facilities pursuant to Chapter 15.45 of the City Code, as amended from time to time.

4. In the event Landowner fails to maintain the stormwater management facilities as shown on the Site Plan in good working order acceptable to the City, the City may enter the Property and take whatever steps it deems necessary and appropriate to maintain (including repair or replace) said stormwater facilities. It is expressly understood and agreed that the City is under no obligation to maintain or repair or replace said facilities, and in no event shall this Agreement be construed to impose such an obligation on the City.

5. In the event that the City performs work of any nature pursuant to section 4 of this Agreement, or expends any funds in performance of such work for labor, equipment, supplies or materials, Landowner shall reimburse City for all costs incurred. Landowner, its executors, administrators, assigns, heirs, and any other successors in interest, shall reimburse City for all costs within thirty (30) days of Landowner's receipt of written demand by the City for costs incurred, including but not limited to attorney fees, collection costs, and interest at the statutory rate. Overdue payment will require payment of interest at the current legal rate for liquidated judgments. If legal action ensues, any costs or fees incurred by the City will be borne by the parties responsible for said reimbursements.

6. It is the intent of this Agreement to ensure the continuous and proper maintenance of stormwater management facilities by the Landowner, its heirs, successors and assigns; provided, however, that this Agreement shall not be deemed to create or affect any additional liability of any party for damage alleged to result from or caused by stormwater management.

7. Landowner, its executors, administrators, assigns, and any other successors in interest, shall indemnify and hold the City, its agents and employees harmless from any and all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against City, its agents or employees, from the construction, presence, existence, or maintenance, of the stormwater management facilities by Landowner or City.

8. In the event a claim is asserted against the City, its agents or employees, the City shall notify the Landowner and the Landowner shall defend, at its own expense, any suit based on such claim. If any judgment or claim against the City, its agents or employees shall be allowed, the Landowner shall pay all costs and expenses in connection therewith.

9. This Agreement shall be recorded among the land records of Longview, Washington, and shall constitute a covenant running with the land, and shall be binding upon Landowner, its administrators, executors, assigns, heirs, and any other successor in interest.

IN WITNESS WHEREOF, the Parties hereto acting through their duly authorized agents have caused this Agreement to be signed, sealed and delivered:

_____	_____
Name/Title	Name/Title
_____	_____
_____	_____
Address	Address

State of Washington)

) ss.

City of Longview)

I certify that I know or have satisfactory evidence that _____

_____ is/are the persons who appeared before me, and said person(s) acknowledged that he/she/they signed this instrument and acknowledged it to be his/her/their free and voluntary act for the uses and purposes mentioned in the instrument.

Witness my hand and official seal hereto affixed the day and year first above written.

_____

Notary Public in and for the State of Washington

Residing in _____.

Dated at Longview, Washington, this ____ day of _____, 202_.

Approved by:

_____

City of Longview Engineer

APPENDIX 5 – CONSTRUCTION SWPPP

Construction Stormwater General Permit

Stormwater Pollution Prevention Plan (SWPPP)

for

Project Name

Prepared for:
The Washington State Department of Ecology
SW Regional Office

Permittee / Owner	Developer	Operator / Contractor
Jerry Baker	Pending	Pending

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
Pending	Pending	Pending

SWPPP Prepared By

Name	Organization	Contact Phone Number
Christian Loose, EIT	RB Engineering	(360) 740-8919

SWPPP Preparation Date

5/14/25

Project Construction Dates

Activity	Start Date	End Date
Fill and Grade	Pending	Pending

PROJECT OVERVIEW

WAR No. : Pending

Site Address: 0 Sires Lane
Longview WA 98632

Applicable Criteria	Areas
Total Site Area	3.3 AC
Land Disturbing Area	0.61 AC

Existing vegetation: Pasture

Drainage Patterns: None (drains toward CDID ditch)

Critical Areas: None

Steep Slopes: None

Receiving Water Body: CDID #1 ditch (unnamed), thence to Cut-off Slough

WaterShed: WRIA 25 – Grays-Elochoman
https://waecy.maps.arcgis.com/apps/webappviewer/index.html?id=996e6b21ae394cc3a3b63c6da0c3aa0a

Description of Construction Activities (example: site preparation, demolition, excavation):

Project includes constructing a 410 ft paved public street extension, together with utilities serving a 18 lot single family residential plat.

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Drainage and Erosion Control Plan:

Runoff from the road extension will be routed to the bioretention cell, and discharged to an existing Consolidated Diking Improvement District (CDID) #1 conveyance ditch draining to Cut-off Slough.

Description of Final Stabilization (example: extent of revegetation, paving, landscaping):

Project final stabilization will include installation of new impervious hard surfaces and landscaping.

Contaminated Site Information:

Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):

CONSTRUCTION SWPPP

All new development and redevelopment shall comply with Construction SWPPP Elements #1 through #12 listed below. The suggested BMPs underlined and in **bold** are proposed for use in all phases of construction. Copies of the details for each of the recommended BMPs are included.

Element 1: Mark Clearing Limits

- Prior to beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area. These shall be clearly marked, both in the field and on the plans, to prevent damage and offsite impacts.
- Plastic, metal, or stake wire fence may be used to mark the clearing limits.
- Suggested BMPs:

  BMP C101: Preserving Natural Vegetation
  BMP C102: Buffer Zones
  BMP C103: High-Visibility Fence
  BMP C233: Silt Fence

Element 2: Establish Construction Access

- Construction vehicle access and exit shall be limited to one route if possible, or two for linear projects such as roadways where one access is necessary for large equipment maneuvering.
- Access points shall be stabilized with quarry spall or crushed rock to minimize the tracking of sediment onto public roads.
- Wheel wash or tire baths should be located onsite, if applicable.
- Roads shall be cleaned thoroughly at the end of each day. Sediment shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area. Street washing will be allowed only after sediment is removed in this manner.
- Street wash wastewater shall be controlled by pumping back onsite or otherwise be prevented from discharging into systems tributary to state surface waters.
- Construction access restoration shall be equal to or better than the pre-construction condition.
- Suggested BMPs:

  BMP C105: Stabilized Construction Access
  BMP C106: Wheel Wash
  BMP C107: Construction Road/Parking Area Stabilization

Element 3: Control Flow Rates

- Properties and waterways downstream from development sites shall be protected from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site, as required by local plan approval authority.
- Downstream analysis is necessary if changes in offsite flows could impair or alter conveyance systems, streambanks, bed sediment, or aquatic habitat.
- Where necessary to comply with Minimum Requirement #7, stormwater detention facilities shall be constructed as one of the first steps in grading. Detention facilities shall be functional prior to construction of site improvements (e.g. impervious surfaces).
- Suggested BMPs:

  BMP C203: Water Bars
  BMP C207: Check Dams
  BMP C209: Outlet Protection
  BMP C235: Wattles
  BMP C240: Sediment Trap
  BMP C241: Sediment Pond (Temporary)
  See also, V-12 Detention BMPs

Element 4: Install Sediment Controls

- The duff layer, native top soil, and natural vegetation shall be retained in an undisturbed state to the maximum extent practicable.
- Prior to leaving a construction site or prior to discharge to an infiltration facility, stormwater runoff from disturbed areas shall pass through a sediment pond or other appropriate sediment removal BMP. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard of Element #3, bullet #1. Full stabilization means concrete or asphalt paving; quarry spalls used as ditch lining; or the use of rolled erosion products, a bonded fiber matrix product, or vegetative cover in a manner that will fully prevent soil erosion. The local permitting authority shall inspect and approve areas fully stabilized by means other than pavement or quarry spalls.
- BMPs intended to trap sediment on site shall be constructed as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.
- Earthen structures such as dams, dikes, and diversions shall be seeded and mulched according to the timing indicated in Element #5.
- BMPs intended to trap sediment on site must be located in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages, often during non-storm events, in response to rain event changes in stream elevation or wetted area.
- Suggested BMPs

  BMP C231: Brush Barrier
  BMP C232: Gravel Filter Berm

BMP C233: Silt Fence
BMP C234: Vegetated Strip
BMP C235: Wattles
BMP C240: Sediment Trap
BMP C241: Sediment Pond (Temporary)
BMP C250: Construction Stormwater Chemical Treatment
BMP C251: Construction Stormwater Filtration

Element 5: Stabilize Soils

- Exposed and unworked soils shall be stabilized by application of effective BMPs that protect the soil from the erosive forces of raindrops, flowing water, and wind.
- From October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. This stabilization requirement applies to all soils on site, whether at final grade or not. These time limits may be adjusted by the local permitting authority if it can be shown that the average time between storm events justifies a different standard.
- Soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.
- Applicable practices include, but are not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base on areas to be paved, and dust control.
- Selected soil stabilization measures shall be appropriate for the time of year, site conditions, estimated duration of use, and the water quality impacts that stabilization agents may have on downstream waters or ground water.
- Soil stockpiles must be stabilized and protected with sediment trapping measures.
- Linear construction activities such as right-of-way and easement clearing, roadway development, pipelines, and trenching for utilities, shall be conducted to meet the soil stabilization requirement. Contractors shall install the bedding materials, roadbeds, structures, pipelines, or utilities and re-stabilize the disturbed soils so that:

– from October 1 through April 30 no soils shall remain exposed and unworked for more than 2 days and

– from May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days.

- Suggested BMPs:

BMP C120: Temporary and Permanent Seeding
BMP C121: Mulching
BMP C122: Nets and Blankets
BMP C123: Plastic Covering
BMP C124: Sodding
BMP C125: Topsoiling / Composting

BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection
BMP C130: Surface Roughening
BMP C131: Gradient Terraces
BMP C140: Dust Control

Element 6: Protect Slopes

- Design, construct, and phase cut and fill slopes in a manner that will minimize erosion.
- Consider soil type and its potential for erosion.
- Reduce slope runoff velocities by reducing continuous length of slope with terracing and diversions, reduce slope steepness, and roughen slope surface.
- Divert upslope drainage and run-on waters with interceptors at top of slope. Stormwater from off site should be handled separately from stormwater generated on the site. Diversion of offsite stormwater around the site may be a viable option. Diverted flows shall be redirected to the natural drainage location at or before the property boundary.
- Contain downslope collected flows in pipes, slope drains, or protected channels. Check dams shall be used within channels that are cut down a slope.
- Provide drainage to remove ground water intersecting the slope surface of exposed soil areas.
- Excavated material shall be placed on the uphill side of trenches, consistent with safety and space considerations.
- Stabilize soils on slopes, as specified in Element #5.
- Suggested BMPs

  BMP C120: Temporary and Permanent Seeding
  BMP C121: Mulching
  BMP C122: Nets and Blankets
  BMP C123: Plastic Covering
  BMP C124: Sodding
  BMP C130: Surface Roughening
  BMP C131: Gradient Terraces
  BMP C200: Interceptor Dike and Swale
  BMP C201: Grass-Lined Channels
  BMP C203: Water Bars
  BMP C204: Pipe Slope Drains
  BMP C205: Subsurface Drains
  BMP C206: Level Spreader
  BMP C207: Check Dams
  BMP C208: Triangular Silt Dike (TSD)

Element 7: Protect Drain Inlets

- Storm drain inlets operable during construction shall be protected so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment.

- Approach roads shall be kept clean. Sediment and street wash water shall not be allowed to enter storm drains without prior and adequate treatment unless treatment is provided before the storm drain discharges to waters of the state.

- Inlets should be inspected weekly at a minimum and daily during storm events. Inlet protection devices should be cleaned or removed and replaced before six inches of sediment can accumulate.

- Suggested BMPs:

  BMP C220: Inlet Protection

Element 8: Stabilize Channels and Outlets

- Temporary onsite conveyance channels shall be designed, constructed, and stabilized to prevent erosion from the expected flow velocity of a 2-year, 24-hour frequency storm for the developed condition.
- Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent streambanks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.
- Suggested BMPs:

  BMP C122: Nets and Blankets
  BMP C202: Riprap Channel Lining
  BMP C207: Check Dams
  BMP C209: Outlet Protection

Element 9: Control Pollutants

- All pollutants, including waste materials and demolition debris, that occur on site during construction shall be handled and disposed of in a manner that does not cause contamination of stormwater. Woody debris may be chopped and spread on site.
- Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site (see Chapter 173-304 WAC for the definition of inert waste).
- Maintenance and repair of heavy equipment and vehicles involving oil changes, hydraulic system drain down, solvent and de-greasing cleaning operations, fuel tank drain down and removal, and other activities which may result in discharge or spillage of pollutants to the

ground or into stormwater runoff must be conducted using spill prevention measures, such as drip pans. Contaminated surfaces shall be cleaned immediately following any discharge or spill incident. Emergency repairs may be performed onsite using temporary plastic placed beneath and, if raining, over the vehicle.

- Wheel wash or tire bath wastewater shall be discharged to a separate onsite treatment system or to the sanitary sewer.
- Application of agricultural chemicals including fertilizers and pesticides shall be conducted in a manner and at application rate that will not result in loss of chemicals to stormwater runoff. Manufacturer recommendations for application rates and procedures shall be followed.
- BMPs shall be used to prevent or treat contamination of stormwater runoff by pH modifying sources. These sources include bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters. Stormwater discharges shall not cause a violation of the water quality standard for pH in the receiving water.
- Suggested BMPs:

  BMP C151: Concrete Handling
  BMP C152: Sawcutting and Surfacing Pollution Prevention
  BMP C153: Material Delivery, Storage, and Containment
  BMP C154: Concrete Washout Area
  BMP C250: Construction Stormwater Chemical Treatment
  BMP C251: Construction Stormwater Filtration
  BMP C252: Treating and Disposing of High pH Water
  Also see, the Source Control BMPs detailed in Volume IV

Element 10: Control De-Watering

- Foundation, vault, and trench de-watering water shall be discharged into a controlled conveyance system prior to discharge to a sediment pond. Channels must be stabilized, as specified in Element #8.
- Clean, non-turbid de-watering water, such as well-point ground water, can be discharged to systems tributary to state surface waters, as specified in Element #8, provided the de-watering flow does not cause erosion or flooding of receiving waters. These clean waters should not be routed through stormwater sediment ponds.
- Highly turbid or contaminated dewatering water from construction equipment operation, clamshell digging, concrete tremie pour, or work inside a cofferdam shall be handled separately from stormwater.
- Other disposal options, depending on site constraints, may include:

1. infiltration,
2. transport off site in vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters,
3. onsite treatment using chemical treatment or other suitable treatment technologies,

4. sanitary sewer discharge with local sewer district approval, or

5. use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering.

- Suggested BMPs:

  BMP C203: Water Bars
  BMP C236: Vegetative Filtration

Element 11: Maintain BMPs

- Temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with BMPs.
- Sediment control BMPs shall be inspected weekly or after a runoff-producing storm event during the dry season and daily during the wet season. The inspection frequency for stabilized, inactive sites shall be determined by the local permitting authority based on the level of soil stability and potential for adverse environmental impacts.
- Temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

- Suggested BMPs:

  BMP C150: Materials on Hand
  BMP C160: Certified Erosion and Sediment Control Lead

Element 12: Manage the Project

- Phasing of Construction

  Development projects shall be phased where feasible in order to prevent, to the maximum extent practicable, the transport of sediment from the development site during construction. Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities for any phase.

  Clearing and grading activities for development shall be permitted only if conducted pursuant to an approved site development plan (e.g., subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling. When establishing these permitted clearing and grading areas, consideration should be given to minimizing removal of existing trees and minimizing disturbance and compaction of native soils except as needed for building purposes. These permitted clearing and grading areas and any other areas required to preserve critical or sensitive areas, buffers, native growth protection easements, or tree retention areas as may be required by local jurisdictions, shall be delineated on the site plans and the development site.

- Seasonal Work Limitations

From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that the transport of sediment from the construction site to receiving waters will be prevented through a combination of the following:

1. Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters; and
2. Limitations on activities and the extent of disturbed areas; and
3. Proposed erosion and sediment control measures.

Based on the information provided and local weather conditions, the local permitting authority may expand or restrict the seasonal limitation on site disturbance. The local permitting authority shall take enforcement action - such as a notice of violation, administrative order, penalty, or stop-work order under the following circumstances:

- If, during the course of any construction activity or soil disturbance during the seasonal limitation period, sediment leaves the construction site causing a violation of the surface water quality standard; or
- If clearing and grading limits or erosion and sediment control measures shown in the approved plan are not maintained.

Local governments may restrict clearing and grading activities where site conditions may present a significant risk of impact to property or critical areas. Contact the local government permitting authority for information on specific site restrictions.

The following activities are exempt from the seasonal clearing and grading limitations:

1. Routine maintenance and necessary repair of erosion and sediment control BMPs,
2. Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil, and
3. Activities where there is one hundred percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

- Coordination with Utilities and Other Contractors

  The primary project proponent shall evaluate, with input from utilities and other contractors, the stormwater management requirements for the entire project, including the utilities, when preparing the Construction SWPPP.

- Inspection and Monitoring

  All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function.

  A certified professional in erosion and sediment control shall be identified in the Construction SWPPP and shall be onsite or on-call at all times.

  Sampling and analysis of the stormwater discharges from a construction site may be necessary on a case-by-case basis to ensure compliance with standards. The local permitting authority may establish monitoring and reporting requirements when necessary.

Whenever inspection and/or monitoring reveals that the BMPs identified in the Construction SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, the SWPPP shall be modified, as appropriate, in a timely manner.

- Maintenance of the Construction SWPPP

  The Construction SWPPP shall be retained onsite or within reasonable access to the site. The Construction SWPPP shall be modified whenever there is a significant change in the design, construction, operation, or maintenance of any BMP.

- Suggested BMPs:

  BMP C150: Materials on Hand
  BMP C160: Certified Erosion and Sediment Control Lead
  BMP C162: Scheduling

Element #13: Protect Low Impact Development BMPs

Municipal Stormwater Permits Requirements

Protect all Bioretention and Rain Garden BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden BMPs. Restore the BMP so their fully functioning condition if they accumulate sediment during construction. Re-storing the BMP must include removal of sediment and any sediment-laden Bioretention/rain garden soils, and replacing the removed soils with soils meeting the design specification.

Prevent compacting Bioretention and rain garden BMPs by excluding construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.

Control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements.

Pavements fouled with sediments or no longer passing an initial infiltration test must be cleaned using procedures from the local stormwater manual or the manufacturer's procedures.

Keep all heavy equipment off existing soils under LID facilities that have been excavated to final grade to retain the infiltration rate of the soils.

Additional Guidance

See Chapter 5: Precision Site Preparation, Construction & Inspection of LID Facilities in the

LID Technical Guidance Manual for Puget Sound (2012) for more detail on protecting LID integrated management practices.

Note that the LID Technical Guidance Manual for Puget Sound (2012) is for additional informational purposes only. You must follow the guidance within this manual if there are any discrepancies between this manual and the LID Technical Guidance Manual for Puget Sound 2012).

- Suggested BMPs:

  BMP C102: Buffer Zones
  BMP C103: High-Visibility Fence
  BMP C200: Interceptor Dike and Swale
  BMP C201: Grass-Lined Channels
  BMP C207: Check Dams
  BMP C208: Triangular Silt Dike (TSD)
  BMP C231: Brush Barrier
  BMP C233: Silt Fence
  BMP C234: Vegetated Strip

Project Specific Construction BMPs

BMP C105: Stabilized Construction Access
BMP C120: Temporary and Permanent Seeding
BMP C140: Dust Control
BMP C209: Outlet Protection
BMP C233: Silt Fence

BMP C105: Stabilized Construction Access

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See Figure II-3.1: Stabilized Construction Access for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in Table II-3.2: Stabilized Construction Access Geotextile Standards.

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.
Grab Tensile Elongation (ASTM D4632)	30% max.

Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will be paved; this can be used as a stabilized access. Also consider the installation of excess concrete as a stabilized access. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see BMP C103: High-Visibility Fence) shall be installed as necessary to restrict traffic to the construction access.
- Whenever possible, the access shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction accesses should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction access must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

Alternative Material Specification

WSDOT has raised safety concerns about the Quarry Spall rock specified above. WSDOT observes that the 4-inch to 8-inch rock sizes can become trapped between Dually truck tires, and then released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the Stabilized Construction Access remains effective. To remain effective, the BMP must prevent sediment from migrating off site. To date, there has been no performance testing to verify operation of this new specification. Jurisdictions may use the alternative specification, but must perform increased off-site inspection if they use, or allow others to use, it.

Stabilized Construction Accesses may use material that meets the requirements of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Section 9-03.9(1) (WSDOT, 2016) for ballast except for the following special requirements.

The grading and quality requirements are listed in Table II-3.3: Stabilized Construction Access Alternative Material Requirements.

Table II-3.3: Stabilized Construction Access Alternative Material Requirements

Sieve Size	Percent Passing
2½"	99-100
2"	65-100
¾"	40-80
No. 4	5 max.
No. 100	0-2
% Fracture	75 min.

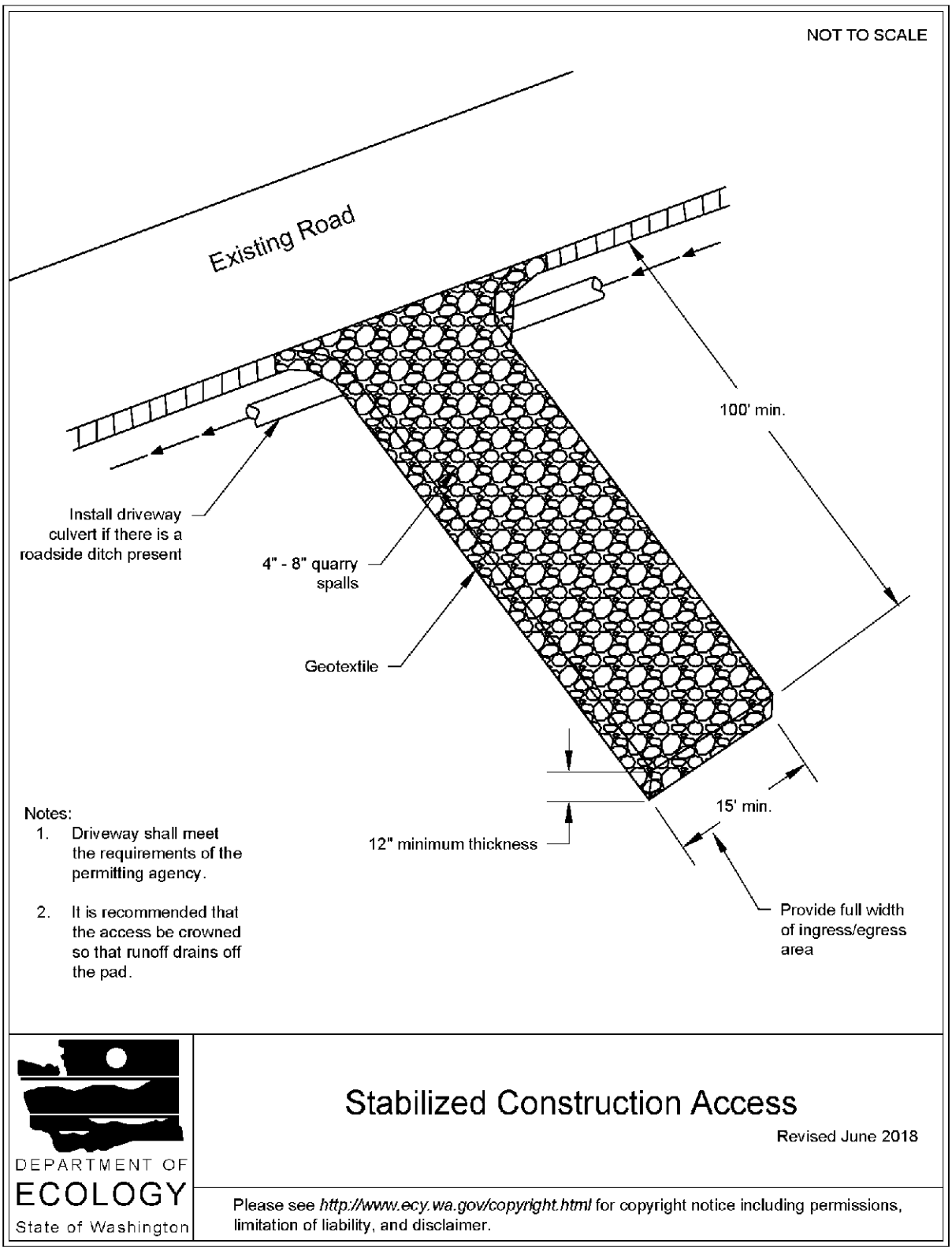
- All percentages are by weight.
- The sand equivalent value and dust ratio requirements do not apply.
- The fracture requirement shall be at least one fractured face and will apply the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.

Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the access is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the access, or the installation of BMP C106: Wheel Wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when high efficiency sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the wash water shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction access(es), BMP C103: High-Visibility Fence shall be installed to control traffic.
- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

Figure II-3.1: Stabilized Construction Access



Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See BMP C121: Mulching for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See BMP T5.13: Post-Construction Soil Quality and Depth.

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed before water flow; install sod in the channel bottom — over top of hydromulch and erosion con- trol blankets.
- Confirm the installation of all required surface water control measures to prevent seed from washing away.

- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See BMP C121: Mulching for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See BMP T5.13: Post-Construction Soil Quality and Depth.
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
    - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
    - Phase 2- Install the rest of the mulch and tackifier over the first lift.

  Or, enhance vegetation by:
    - Installing the mulch, seed, fertilizer, and tackifier in one lift.
    - Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
    - Hold straw in place with a standard tackifier.

Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:

- Irrigation.
- Reapplication of mulch.
- Repair of failed slope surfaces.

This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bon- ded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).

- Seed may be installed by hand if:
    - Temporary and covered by straw, mulch, or topsoil.
    - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in Table II-3.4: Temporary and Permanent Seed Mixes include recommended mixes for both temporary and permanent seeding.
- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.

- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	*Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye	*Lolium perenne*	50	98	90
Redtop or colonial bentgrass	*Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover	*Trifolium repens*	5	98	90
Landscaping Seed Mix A recommended mix for landscaping seed.				
Perennial rye blend	*Lolium perenne*	70	98	90
Chewings and red fescue blend	*Festuca rubra var. commutata* or *Festuca rubra*	30	98	90
Low-Growing Turf Seed Mix A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	*Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay)	*Lolium perenne var. barclay*	30	98	90
Red fescue	*Festuca rubra*	20	98	90
Colonial bentgrass	*Agrostis tenuis*	5	98	90
Bioswale Seed Mix A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fescue	*Festuca arundinacea* or *Festuca elatior*	75-80	98	90

Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	92	85
Redtop bentgrass	*Agrostis alba or Agrostis gigantea*	5-10	90	80
Wet Area Seed Mix A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
Tall or meadow fescue	*Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	98	85
Meadow foxtail	*Alepocurus pratensis*	10-15	90	80
Alsike clover	*Trifolium hybridum*	1-6	98	90
Redtop bentgrass	*Agrostis alba*	1-6	92	85
Meadow Seed Mix A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	*Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue	*Festuca rubra*	70	98	90
White dutch clover	*Trifolium repens*	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum, permanent areas shall use soil amendments to achieve organic matter and

permeability per- formance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
    - BFM and MBFMs do not require surface preparation.
    - Helicopters can assist in installing BFM and MBFMs in remote areas.
    - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
    - Installing BFM and MBFMs can save at least $1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such

as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to BMP C105: Stabilized Construction Access and BMP C106: Wheel Wash.
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM (BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection, but the downstream protections still apply.

Refer to BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

- Contact your local Air Pollution Control Authority for guidance and training on other dust con-

trol measures. Compliance with the local Air Pollution Control Authority constitutes compliance with this BMP.

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Techniques that can be used for unpaved roads and lots include:
    - Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
    - Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
    - Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
    - Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
    - Encourage the use of alternate, paved routes, if available.
    - Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
    - Limit dust-causing work on windy days.
    - Pave unpaved permanent roads and other trafficked areas.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C209: Outlet Protection

Purpose

Outlet protection prevents scour at conveyance outlets and minimizes the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Conditions of Use

Use outlet protection at the outlets of all ponds, pipes, ditches, or other conveyances that discharge to a natural or manmade drainage feature such as a stream, wetland, lake, or ditch.

Design and Installation Specifications

- The receiving channel at the outlet of a pipe shall be protected from erosion by lining a minimum of 6 feet downstream and extending up the channel sides a minimum of 1–foot above the maximum tailwater elevation, or 1-foot above the crown, whichever is higher. For pipes larger than 18 inches in diameter, the outlet protection lining of the channel shall be four times the diameter of the outlet pipe.
- Standard wingwalls, tapered outlets, and paved channels should also be considered when appropriate for permanent culvert outlet protection (WSDOT, 2015).
- BMP C122: Nets and Blankets or BMP C202: Riprap Channel Lining provide suitable options for lining materials.
- With low flows, BMP C201: Grass-Lined Channels can be an effective alternative for lining material.
- The following guidelines shall be used for outlet protection with riprap:
    - If the discharge velocity at the outlet is less than 5 fps, use 2-inch to 8-inch riprap. Minimum thickness is 1-foot.
    - For 5 to 10 fps discharge velocity at the outlet, use 24-inch to 48-inch riprap. Minimum thickness is 2 feet.
    - For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), use an engineered energy dissipator.
    - Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See BMP C122: Nets and Blankets.
- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife. See I-2.11 Hydraulic Project Approvals.

Maintenance Standards

- Inspect and repair as needed.

- Add rock as needed to maintain the intended function.
- Clean energy dissipator if sediment builds up.

BMP C233: Silt Fence

Purpose

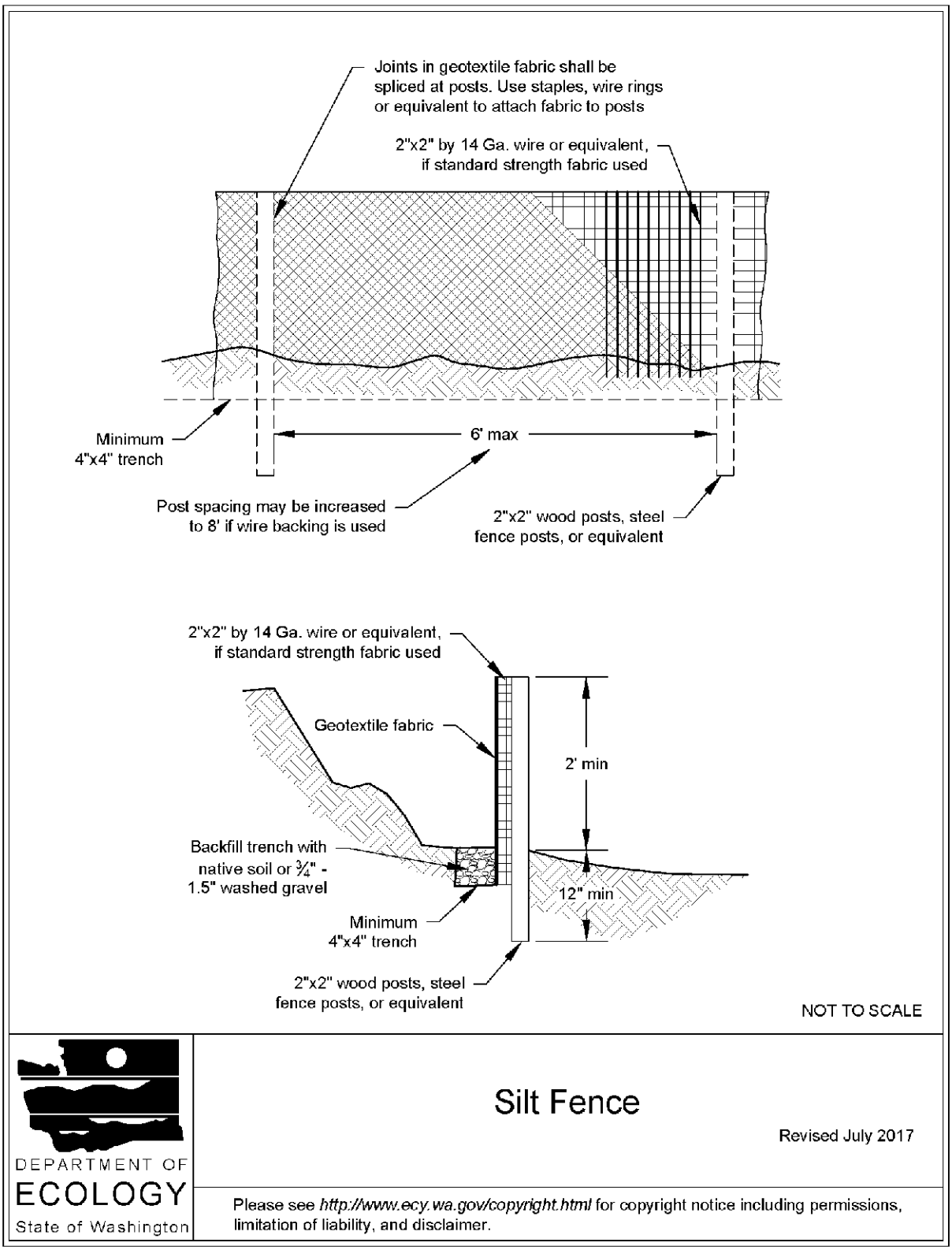
Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment trapping BMP.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

Figure II-3.22: Silt Fence



Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table II-3.11: Geotextile Fabric Standards for Silt Fence):

Table II-3.11: Geotextile Fabric Standards for Silt Fence

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength geotextiles with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile. Silt fence materials are available that have synthetic mesh backing attached.
- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.
- One-hundred percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- Refer to Figure II-3.22: Silt Fence for standard silt fence details. Include the following Standard Notes for silt fence on construction plans and specifications:

    1. The Contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
    2. Construct silt fences in areas of clearing, grading, or drainage prior to starting those

activities.

3. The silt fence shall have a 2-feet min. and a 2½-feet max. height above the original ground surface.
4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
5. Attach the geotextile fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
6. Support the geotextile fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the geotextile fabric up-slope of the mesh.
7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.
8. Bury the bottom of the geotextile fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
9. Drive or place the silt fence posts into the ground 18-inches min. A 12–inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:
    - Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
    - No. 6 steel rebar or larger.
    - ASTM A 120 steel pipe with a minimum diameter of 1-inch.
    - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
    - Other steel posts having equivalent strength and bending resistance to the post sizes listed above.

11. Locate silt fences on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.

    - Check dams shall be approximately 1-foot deep at the back of the fence. Check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
    - Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Check dams shall be located every 10 feet along the fence where the fence must cross contours.

- Refer to Figure II-3.23: Silt Fence Installation by Slicing Method for slicing method details. The following are specifications for silt fence installation using the slicing method:

1. The base of both end posts must be at least 2- to 4-inches above the top of the geo-textile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.

2. Install posts 3- to 4-feet apart in critical retention areas and 6- to 7-feet apart in standard applications.

3. Install posts 24-inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.

4. Install posts with the nipples facing away from the geotextile fabric.

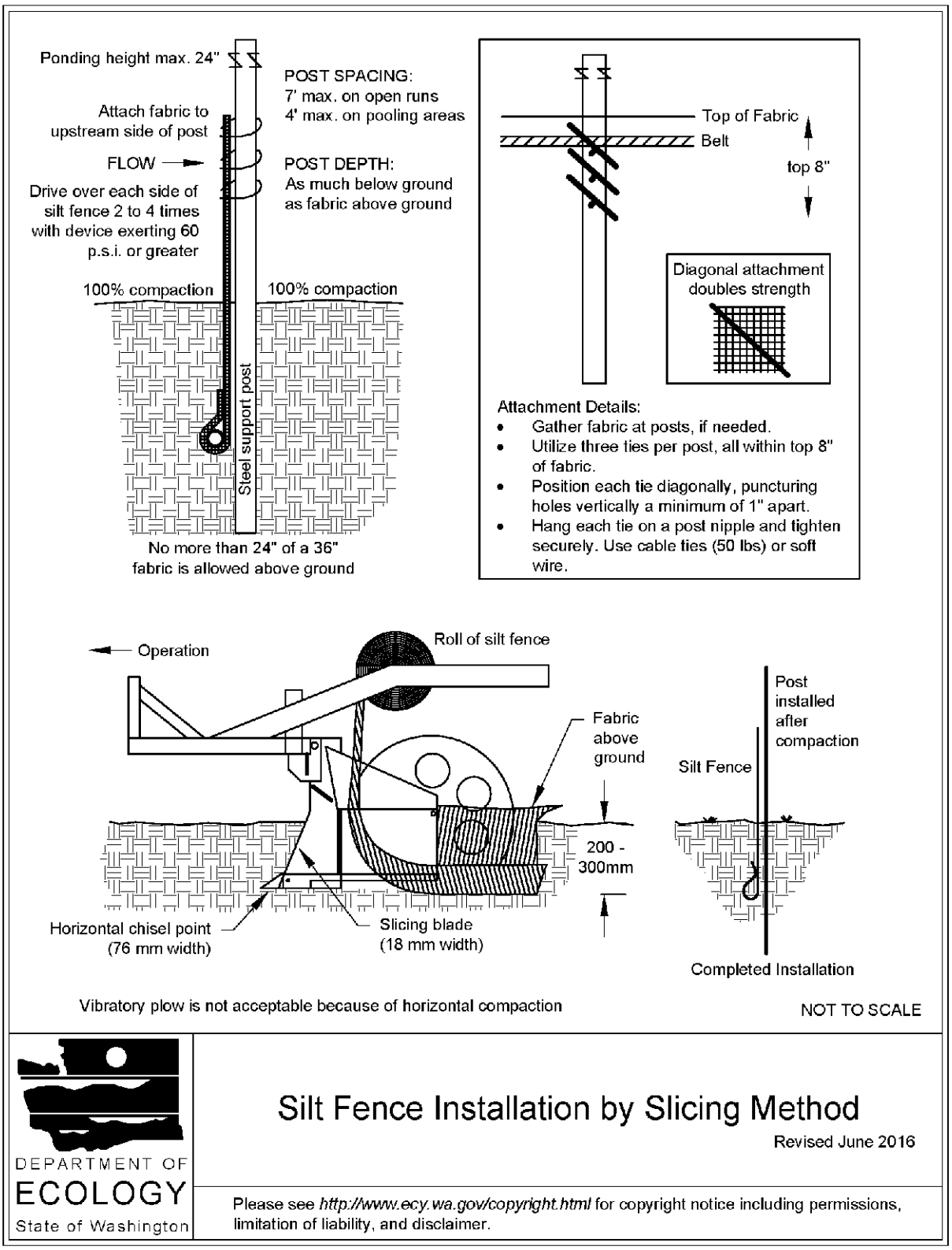
5. Attach the geotextile fabric to each post with three ties, all spaced within the top 8-inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1-inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.

6. Wrap approximately 6-inches of the geotextile fabric around the end posts and secure with 3 ties.

7. No more than 24-inches of a 36-inch geotextile fabric is allowed above ground level.

8. Compact the soil immediately next to the geotextile fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

Figure II-3.23: Silt Fence Installation by Slicing Method



Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- Check the uphill side of the silt fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

APPENDIX 6 – DRAINAGE AND TESC PLANS

RB Engineering

DESIGN → PERMIT → MANAGE

December 20, 2024

City of Longview
PO Box 128
Longview WA 98632

Re: Church Property Plat
RBE NO. 24066

Church Property Plat, Sires Lane Extension - Project Narrative

Project Description:

The project will consist of an 18 lot subdivision including extensions of Sires Lane (public r/w) with new water and sewer services looping to 42nd Ave. Street improvements will include pavement, curb/gutter, planter strip, conc. sidewalk, with lighting as required. A public hammerhead for turn-around will be developed. Filling/grading will be required; stormwater will be treated and drained to existing ditch maintained by CDID#1. Lots will be developed as R1 single family homes with landscaping.

The site includes three tax parcels numbered 0277901, 02779 and 02780, totaling 3.30 acres.

Zoning, Density & Setbacks:

Parcels are all zoned R1 Residential. Surrounding zoning is R1, with existing residential development to west, north and east. The site is immediately adjacent to the New Life Fellowship Church on it's south side. The proposed residential density would be 5.45 units per acre. All setbacks would be per zoning standards (20' front, 15' rear, 5' side and 15' flanking lots). The lots would be developed with two story single family detached homes with heights less than 35' maximum height.

Public Utilities:

The project will require the extension of City of Longview water and sewer lines from Sires Lane, extending to 42nd Ave SW. All water and sewer would be dedicated public mains. An easement for public utilities will be granted across the Church parcel where lines extend to 42nd Ave. Electrical services will be extended within the plat from Sires Lane. Other utilities will include communications.

Traffic and Access:

The site will be accessed off Sires Lane (a public dead end street). A standard hammerhead turn around will be developed at the extent of the new street. The project would generate roughly 20 pm peak hour trips on Sires Lane, see Trip Generation letter. Parking will be provided by garages developed with the homes, and limited on-street parking between driveways. Public sidewalks will extend from existing walks on Sires Lane.

Stormwater:

The project will require stormwater improvements as required by City of Longview Stormwater program, in conjunction with Cowlitz Drainage Improvement District #1.. Stormwater from new street and impervious lot surfaces, and routed to an existing CDID ditch located at the west limit of the site. This ditch is maintained by CDID and improvements are proposed by the District. Treatment of runoff is proposed via shallow bioswales as

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a part of the conveyance. Flow control (retention) is exempt with the development's participation in CDID's regional improvement project with fee-in-lieu.

Critical Areas:

No critical areas have been identified on or near the site.

Landscaping and Open Space:

All disturbed portions of the site will be landscaped and/or seeded for permanent erosion control. The lots will be landscaped in conjunction with development of single family homes.

Sincerely,

Chris Aldrich, RLA
Planning Manager

cc: Project file