City of Longview

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

Agenda

Planning Commission

Wednesday, September 3, 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.

Please click the link below to join the webinar:
https://us02web.zoom.us/j/82348037864
Webinar ID: 823 4803 7864
Telephone Options (dial any of the following numbers):

1-253-215-8782	1-346-248-7799	1-408-638-0968
1-669-900-6833	1-301-715-8592	1-312-626-6799
1-646-876-9923		

International numbers available: https://us02web.zoom.us/u/kBm9OU6w1

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

   25-00779 PC Minutes of August 6, 2025

3. **AUDIENCE PARTICIPATION OR CORRESPONDENCE**
4. **DECLARATION OF EX-PARTE COMMUNICATIONS AND APPEARANCE OF FAIRNESS**
5. **PUBLIC HEARINGS**

   25-00780 PC 2025-5 48th Ave. Planned Unit Development (PUD)

6. **NON-PUBLIC HEARING ITEMS**
7. **OTHER BUSINESS**
8. **PLANNER'S REPORT**
9. **DIRECTOR'S REPORT**
10. **ADJOURNMENT**

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

City of Longview

Minutes

Agenda

Planning Commission

Wednesday, August 6, 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.

1. ROLL CALL

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

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

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

2. APPROVAL OF MINUTES

25-00708 PC minutes of July 2, 2025

A motion was made by Member Jeff Rauth, seconded by Member Ramona Leber, to approve the regular meeting minutes of July 2, 2025. The motion passed unanimously.

3. AUDIENCE PARTICIPATION OR CORRESPONDENCE

25-00711 Rick Parrish and Hunter Maltais - Longview School District - Safe Route to School discussion

Rick Parrish and Hunter Maltais of the Longview School District gave a presentation of the District's student transportation program.
2800 kids walk, bike, drive or are dropped off to Longview schools. 3200 students ride the buses. There are 102 large bus daily routes and 132 small bus daily routes. The District has a 1-mile guideline for the walk-to-school zone. They work closely with the City and rely on applicants to provide information to Building and Planning during a building/subdivision application process.

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

Waived

5. PUBLIC HEARINGS

25-00709 Fishers Lane Zoning Comp Plan Amendment

Mr. Little presented the staff report and presentation. Two comments were received on the SEPA noting easements.
R4 zoning allow for many of the "preferred" uses noted at the community round table.
Chairman Collins opened the public hearing.
Hearing no speakers, Chairman Collins closed the public hearing.

A motion was made by Member Ramona Leber, seconded by Member Alison Moss, to forward a recommendation to amend the City's official zoning map from Mixed Use Commerical/Industrial to R-4 Residential; and amend the City of Longview Comprehensive Plan Map from Public/Quasi-Public/Institutional to High Density Residential; for parcels 10397, 10401, and 10613, to City Council for final deliberation and decision.
The motion passed unanimously.

6. NON-PUBLIC HEARING ITEMS

None at this time.

7. OTHER BUSINESS

Member Ramona Leber reminded the Commission the cannabis retailer advertising bill goes in to effect January 2026. This may prompt a review of our current sign code.

8. PLANNER'S REPORT

Mr. Rutikanga provided a map/PowerPoint presentation showing projects currently in review, including:
** 46th/48th Ave. 72 lot PUD is in the second comment period*
** 33rd Ave. 42 lots, attached mobile home cottages is in the early review stage*
** 2262 46th Ave. - in review for 9 lots mixed single family/duplexes*

9. DIRECTOR'S REPORT

** Proposed solid waste rate increase of 15% going to Council. The fund balance is dropping and rates are not keeping up.*
** Beginning to update the mobile vendor ordinance. Trying for one code that will address it all - pods, trucks, concessions, farmers' markets.*
** Reviewing shared driveway ordinance*

10. ADJOURNMENT

The next regular Planning Commission meeting is scheduled for September 3, 2025, 7 p.m.

With no further business to discuss, Chairman Collins adjourned the meeting at 8:07 p.m.

____
Lisa Vertrees, Recorder

P.O. Box 128
Longview, WA 98632-7080
www.mylongview.com

48th Avenue PUD Subdivision Staff Report

Staff Report Date:	August 25th, 2025,
Property Owner:	Brenda Courser
Applicant:	Hinton Development
Project Summary:	Proposal for a Planned Unit Development (PUD) Zero Lot Line Subdivision to divide approximately 8.26 acres total site, into 75 single-family detached lots in one phase.
Project Location:	The project site is comprised of six parcels undeveloped parcels between 46th Ave and 48th Ave. The project includes the following parcels numbers: 108990100/109000100/109010100/109020100/109230100 and 109240100
Current Zoning:	TNR- Traditional Neighborhood Residential
Comprehensive Plan:	Traditional Neighborhood Residential
Existing Land Use:	Undeveloped
Surrounding Land Use:	Single family residential
Staff Recommendation:	Approval of 48th Ave Planned Unit Development (PUD) Subdivision, with conditions.

1. PROJECT DESCRIPTION

The applicant, Hinton Development Corporation, is proposing a Planned Unit Development (PUD) Zero Lot Line subdivision development to divide an approximately 8.26 acre site into 75 single-family detached lots, to be developed in one phase. The project site is located on undeveloped properties between 46th Ave and 48th Ave across parcel numbers 108990100, 109000100, 109010100, 109020100, 109230100, and 109240100. The site is located in the Traditional Neighborhood Residential (TNR) zoning district and will be developed as a PUD pursuant to LMC Chapter 19.66, allowing for reduced lot sizes and modified dimensional standards. The project proposes to utilize the zero lot lines standards allowed for properties in the TNR district. The base density permitted in the TNR zoning district for areas located outside of the Columbia Valley Gardens neighborhood is up to 12 dwelling units per acre. The subject site is located outside of the Columbia Valley Gardens neighborhood and is therefore eligible for the increased density allowance. The proposed project has a gross density of 9.08 dwelling units per acre, which is consistent with the applicable density standards.

Access to the subdivision will be provided from the existing public paved roads, 46th Avenue and 48th Avenue and proposes frontage improvements by the project site on both roads. A new internal public road is proposed to serve the development and connects to both 46th Avenue and 48th. The proposed public road will be constructed with 50 feet of right-of-way and 30 feet of paved width, including detached 5-foot sidewalks and planter strips. The development includes public water and sewer service provided by the City of Longview, and stormwater will be managed and treated via on-site stormwater wet pond in compliance with LMC 17.80 stormwater standards.

The subdivision is designed to preserve open space and provide recreational amenities in accordance with the requirements of LMC 19.66.060. . This project proposes to have approximately 20.7% of the site dedicated to open space with 10.87% suitable for recreational use in the form of a playground, a walking trail and a bicycle pump track. Adequate parking will be provided for each home in the development as each home will be constructed with a minimum two car garages and additional 37 parallel parking spaces provided on the internal public road.

The site is mostly flat with a very gentle slope down towards the central-eastern boundary of the site. There is a historical drainage ditch that runs through the northwestern portion of the site along 48th Ave and an additional roadside ditch of 46th Ave. Both 46th & 48th Avenue are Cowlitz County Right -of -Ways (ROW) and will be improved along the project area in accordance with county public road and the city of Longview standards. The dominant vegetation onsite consists of pasture grasses, weedy herbs and forbs, and Himalayan blackberry.

A critical area is present on the project site. An emergent forested wetland exists along the central-western boundary of the site and continues offsite to the south and southwest.

The site is currently accessed via a gravel driveway from 48th Avenue to the north and from a gravel driveway off 46th Avenue to south. There is a cement foundation from a demolished home in the northwest corner of the site which will be removed as part of future development

2. SEPA AND PUBLIC NOTICE

SEPA was conducted and noticed as part of the project review. A Determination of Non-Significance (DNS) was issued on August 14th, 2025. The comment period ended on Auguust 27th, 2025. The following comments were received during the SEPA comment period:

- Department of Ecology comment regarding fill material requirements

The applicant has satisfactory addressed the comments received during the SEPA review process.

3. CRITICAL AREAS

Based on the city of Longview GIS map and review of the site, a potential wetland area was identified. As part of the application materials, the applicant provided a critical areas report conducted by Ecological Land Services, which indicated that a regulated wetland is present on the site. According to the critical areas report there is an emergent depressional category III wetland along the central-western boundary of the site that continues offsite to the south and southwest of the site. The wetland encompasses a total area of approximately 0.94 acres, of which 0.18 acres are located on the project site.

In accordance with LMC 17.10.110 a mitigation plan prepared by Ecological Land services dated March 31st , 2025 was provided and identified that the project will indirectly impact 0.25 acres of the wetland primarily due to buffer encroachment associated with site development. No direct impact of the wetland itself is proposed. To mitigate these impacts, the applicant has submitted a Wetland Mitigation Plan prepared by Ecological Land Services, which proposes the following measures:

- Establishment of an 80-foot protective buffer adjacent to the wetland to reduce development related impacts.
- Purchase of wetland mitigation bank credits to offset the nominal habitat functions affected by the proposed buffer encroachment.

The mitigation plan has been reviewed for consistency with Longview's Critical Areas Ordinance requirements, and the combination of on-site buffer protection and off-site mitigation credits provides appropriate and compensation for the identified impacts in accordance with LMC 17.10.110(6) and (7).

The full critical areas report and mitigation plan are included as Exhibits E and F. Appropriate conditions have been added to the project to reflect mitigation requirements and timing.

4. LMC 19.20.030 TNR DENSITY AND DIMENSIONAL STANDARDS

The traditional neighborhood residential (TNR) zone allows for the construction of residences/neighborhoods that consist of smaller lots and homes, pedestrian circulation, alleys and other traditional neighborhood elements. In exchange for reductions in lot sizes, setbacks, street frontage and other requirements (when compared to the R-1 zone), design standards are applied to ensure compatible development. The zoning code provides development standards for Traditional Neighborhood District (TNR) developments in chapter 19.20 of the Longview Municipal Code. The proposed project's consistency with the TNR development standards are demonstrated in the table below:

Standard	**TNR Requirement**	**PUD Modification Allowed?**	**Proposed**	**Meets Standard?**
Minimum Lot Size	5,000 sq. ft.	Yes (via LMC 19.66.050)	2,649 – 3,864 sq.	✓ Yes (PUD)
Minimum Lot Frontage/Width	35 ft	Yes	25 ft	✓ Yes (PUD)
Maximum density	8 units/acre (12 units if outside CVG)	No	9 units/acre	✓ Yes, site is outside of CVG neighborhood.
Front setback	20 ft	Yes	20 ft	✓ Yes
Interior Side Setback	5 ft	Yes	0 & 4 ft (Zero Lot Line Standard)	✓ Yes
Rear Setback	10 ft	Yes	10 ft	✓ Yes
Maximum Building Height	35 ft	No	25 ft	✓ Yes (subject to future permit review)
Maximum Impervious Surface	75%	Yes	63%	✓ Yes

Staff Findings: The proposed PUD subdivision complies with the underlying TNR zoning district standards through the use of Planned Unit Development (PUD) discretionary provisions authorized under LMC 19.66. The project proposes reductions in the minimum lot size and lot width, including a minimum lot width of 25 feet. Lot sizes range from 2,649 square feet to 3,864 square feet. These modifications are expressly allowed under the Planned Unit Development (PUD) ordinance to support innovative site design and promote efficient land use. The overall density of 9 dwelling units per acre is below the maximum 12 units per acre allowed in the TNR district for properties outside the Columbia Valley Gardens (CVG).

The project also proposes to utilize the zero lot line standards allowed within the TNR zoning district. Zero lot line detached houses proposals are subject to the same standards as nonattached single-family housing, except that a side yard setback is not required on one side of the lot. The project proposes a zero-foot setback on one side of each lot and a four-foot setback on the opposite side, which yields approximately 4' of total setback area between structures. To allow the reduction of setbacks between structures, fire resistive materials will be required for exterior walls of the homes and will be required to be reviewed and approved by the building official during the permit review process prior to the issuance of building permits.

Appropriate conditions regarding allowed reduced setbacks, fire-resistive construction, and compliance with the other provisions of LMC 19.20.030 have been included in the recommended conditions of approval.

5. <u>LMC 19.66 PLANNED UNIT DEVELOPMENT</u>

The planned unit development (PUD) process provides an alternative to the traditional approach to subdividing property, allowing for variety in plat design and building type in exchange for open space, recreational amenities and better overall design. The PUD process is designed to achieve:

- The preservation of open space, critical areas as defined by Chapter 17.10 LMC, natural vegetation and significant trees, watercourses, historic buildings and places and other features of value to the community;
- Efficient street and utility systems through the clustering of structures;
- Use of innovative methods and concepts not readily available under traditional subdivision and zoning methods; and
- Flexibility to encourage a more creative development approach that will result in a more efficient, aesthetically pleasing and desirable use of land.

A. 19.66.050 Discretionary Standards

Upon compliance with LMC 19.66.050, a project may comply with the provisions in this section in lieu of some of the provisions of the zone where the property is located and applicable subdivision standards. In approving a PUD, the city may grant modifications to standards that would otherwise apply under a conventional subdivision. This discretion is only extended to certain standards, including dimensional requirements, setbacks, and street and right of way improvements. Because f the flexibility inherent in the TNR district, the applicant has only two standards that would be modified through the PUD provisions.

a) Minimum lot size and building site dimensions (LMC 19.66.050(a)).
<u>**Staff Findings:**</u> The TNR residential district typically requires a minimum lot size of 5,000 square feet and a minimum lot width of 35 feet. The project proposes modifications to

these standards, including a minimum lot width of 25 feet and lot sizes that range from 2,649 – 3,864 square feet. The proposed modifications allow for a higher use of the available land, and aid in reducing the final cost of the lots to the consumer. It also allows for a more efficient use of land by avoiding impacts to the wetland present on site and transferring the lost density to the developable areas of the property. The proposed reduction has the potential to increase fire risk, however this can be mitigated through increased fire protection development standards – typically fire resistive construction, fire sprinklers, or both.

Appropriate conditions regarding fire-resistive construction have been included in the recommended conditions of approval to mitigate potential fire risks.

a) Minimum development standards for street right-of-way improvements (LMC 19.66.050(4)

Staff Findings: The applicant is proposing a modification to reduce the required right-of-way width from 60 feet to 50 feet for the new road. Pursuant to LMC 19.66.050(4), this modification may be approved by the City Engineer, provided certain criteria are met. The City Engineer, in consultation with the Fire Marshal, has approved the requested modification based on the following criteria:

(a) *Presence of topographical or physical conditions*
The subject site is constrained by the presence of a wetland and its associated buffer, which limits the developable area. This environmental condition reduces the available land for the subdivision and justifies flexibility from strict application of the standard right-of-way requirement. Allowing a narrower right-of-way provides for reasonable use of the property while still accommodating necessary roadway improvements.

(b) *Consistency with sound engineering principles; safe, practical, and efficient*
The proposed roadway design maintains a safe and functional cross-section consistent with sound engineering practices. The 50-foot right-of-way accommodates a 30-foot driving surface where on-street parking is allowed and a 24-foot surface where parking is prohibited. Adequate pavement width is maintained to ensure safe travel, while sidewalks, planter strips, and proper sight distance are provided throughout. Utilities can be accommodated within the reduced right-of-way through the addition of a 5-foot utility easement on each side, ensuring compliance with applicable engineering standards.

(c) *Consistency with the intent and purpose of the standard being modified*
The purpose of the right-of-way standard is to ensure safe, practical, and efficient roadway design that accommodates vehicles, pedestrians, and utilities. The proposed modification meets this intent by maintaining travel lane capacity, providing pedestrian facilities on both sides of the street, and ensuring sufficient space for utilities through easements.

(d) *<u>Consistency with the goals and policies of the Comprehensive Plan</u>*

The modification request is consistent with the City's Comprehensive Plan goals and policies, particularly those related to infill development and housing. The reduced right-of-way allows the subdivision to achieve higher lot yields while still providing complete street features. This contributes to meeting the City's housing goals without compromising safety or functionality.

B. 19.66.070 Minimum open space requirements.

"A minimum of 20 percent of the total area of the PUD shall be devoted to open space, which may include recreation amenities and community area. At least half of the required open space (e.g., 10 percent of the overall site) must be suitable for recreational use…"

<u>Staff Findings:</u> The applicant proposes to dedicate approximately 20.7% of the total 8.26-acre site to open space with 10.87 % of the total site designated for active recreational use in the form of a playground, a 4-foot-wide walking trail and a pump track for use by bikes, scooters, skateboards and other wheeled recreation. These proposed open space areas will be fully accessible to the public and designed for recreational enjoyment, thereby qualifying as usable recreation space per PUD standards. The open space will be maintained by the homeowner's association. Public easement, as necessary, will be developed and recorded concurrent with the final plat. The proposal satisfies the intent and requirements of LMC 19.66.070.

C. 19.66.090 PUD PRELIMINARY APPROVAL CRITERIA

In accordance with LMC 19.66.060, preliminary approval of a Planned Unit Development (PUD) may be granted only upon a determination that the proposal meets a range of criteria related to compliance with applicable city codes and regulations, public health and safety, site suitability, environmental impacts, and overall design quality. These standards address conformance with the development code, protection of natural features, provision and integration of open space, compatibility with surrounding development, and long-term maintenance of common areas. The following section evaluates the proposed PUD's consistency relative to these criteria.

1. Compliance With City's Development Code

<u>Staff Findings:</u> The proposed Planned Unit Development (PUD) subdivision conforms to all applicable provisions of the City of Longview's development code and engineering design standards, with specific modifications requested under LMC 19.66.050 addressed above. In addition, the development meets all other applicable standards related to utilities, stormwater design and open space set forth in the Longview Municipal Code and complies with relevant state and federal regulations.

Therefore, the project satisfies the preliminary approval criteria under LMC 19.66.080(1)

2. Public Use and Interest and Physical Suitability of the Site

Staff Findings: The proposed Planned Unit Development (PUD) subdivision will serve the public use and interest by offering a mix of lot sizes and housing options within the TNR zoning district and supporting efficient land use while preserving significant open space for community benefit. Public infrastructure improvements will include a new public road, extension of city water and sewer services, and installation of stormwater treatment and detention facilities designed to meet applicable City standards. The project proposal includes two points of access from 46th Ave and 48th Ave ensuring adequate ingress and egress for residents and emergency vehicles. According to the geotechnical report prepared by Redmond Geotechnical Services (dated September 6th, 2024), the site's soils are generally stable and suitable for development with conventional shallow foundations and pose no significant geologic hazards such as liquefaction and landslide. Based on these findings, staff concludes that adequate provisions have been made for public health, safety, and general welfare in accordance with LMC 19.66.080(2).

The subject site is physically suitable for the proposed 75-lot single-family residential development in terms of its size, shape, and relatively flat topography. The proposed density of 9 units per acre is well within the allowable limits for the TNR zoning district and is consistent with the surrounding residential context of the neighborhood. The site layout works with the existing physical constraints, including the on-site wetland as the project has been designed to avoid any direct impact to wetland and provides adequate mitigation for the identified indirect impacts. Staff finds that the site is appropriate for the proposed use and will not result in significant adverse environmental impacts.

3. Innovative Development

Staff Findings: The proposed PUD offers a more flexible and innovative design compared to a conventional subdivision by clustering lots in a way that preserves large areas of open space and recreation open space than typically required by a standard subdivision. The proposed development style creates a quality development while maintaining affordability relative to traditional subdivision design.

The layout of the proposed PUD has been designed to minimize disturbance to existing natural features on the site. The property contains a type II wetland on site and has been designed to avoid all indirect impacts while still maintaining the functionality of the wetland.

4. Design, Appearance, Neighborhood Compatibility

Staff Findings: The development adjacent to the project site consists of existing single-family residential neighborhoods and undeveloped areas also zoned for similar residential development. The project incorporates typical urban design elements, including sidewalks and landscaped planter strips creating a similar environment to the adjacent developments.

5. Open Space and Natural Features

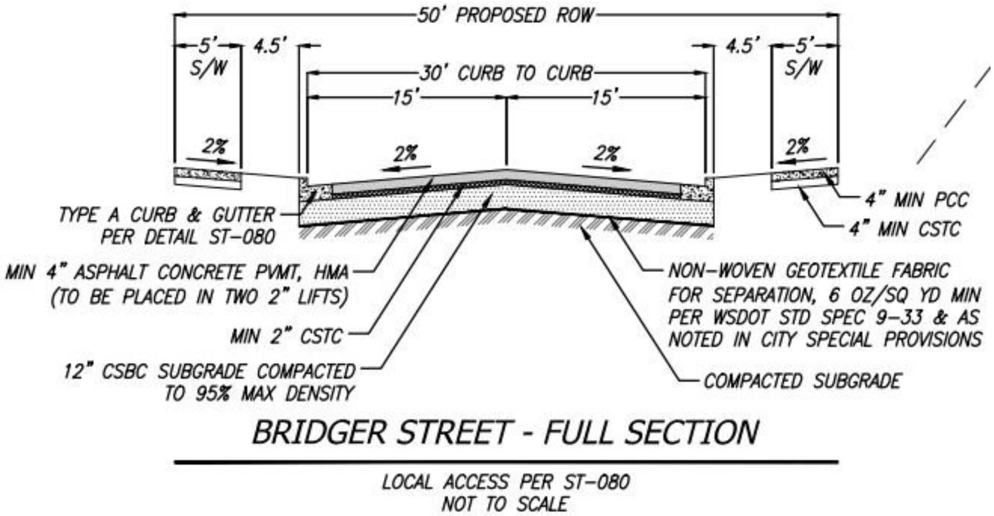
Staff Findings: The proposed PUD clearly identifies open space areas throughout the site for a total of 74,533 square feet (20% of the site) designated as open space. Of the total proposed open space 39,161 square feet (10%) is set aside for active recreational use that comprise of a playground, walking trial and pump track. The subdivision design for open space preserves an on-site Type III wetland. Consistent with LMC 19.72 (Critical Areas), the wetland and the majority its buffer will be maintained in a natural condition to ensure continued functionality for water quality treatment. A split-rail fence will be installed along the buffer boundary to delineate the protected area and to separate it from the proposed pedestrian trail. The identified impacts to the wetland have been minimized to the extent practicable, and appropriate mitigation has been provided by means of mitigation bank credits.

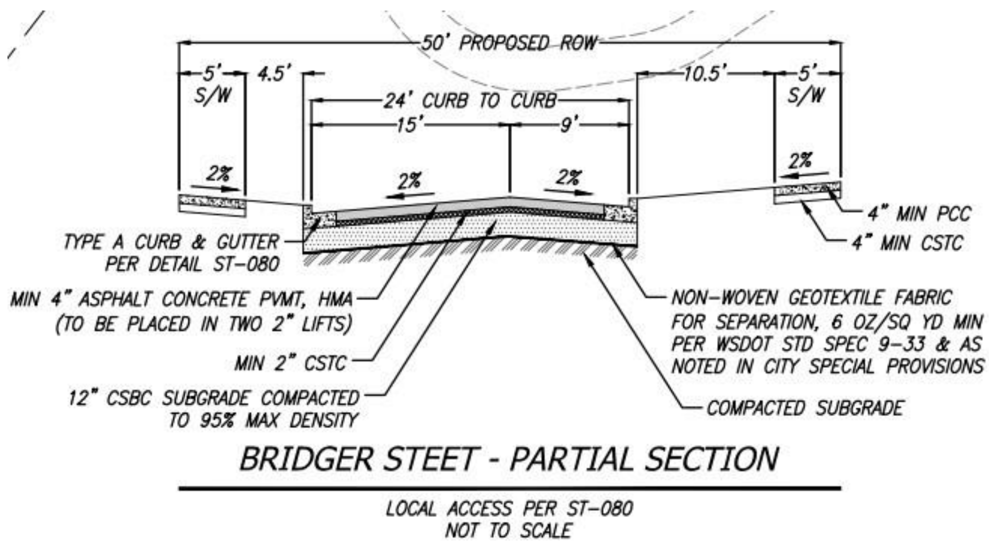
6. SUBDIVISION APPROVAL CRITERIA AND MINIMUM STANDARDS

Because the proposed development is both a PUD and a subdivision, the provisions of LMC 19.80 and RCW 58.17 must also be met. Similar to the PUD ordinance, 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 includes the construction of a new public road to serve the proposed lots. The applicant has requested a modification to the typical street standards outlined in LMC 12.50.040 and -.050 which will be approved via a modification by the city engineer and fire marshal. The proposed roadway section consists of a 50-foot right-of-way with two cross-section variations. Where on-street parking is provided, the roadway will include a 30-foot driving surface to accommodate travel lanes and parking. Where on-street parking is not permitted on one side, the roadway section will be reduced to a 24-foot driving surface. Both cross-sections incorporate a 5-foot detached sidewalk within the right-of-way. Additionally, detached sidewalks will be provided along the project's frontage on 48th Ave and 46th Ave. The proposed cross-sections are shown below:





Streetlights will be installed at regular intervals along the internal roadway, with final location and type to be approved by the City Engineer during construction plan review. All lighting shall be designed and installed per City specifications.

The application included a traffic study completed by Charbonneau Engineering to evaluate traffic impacts from the proposed development. The traffic study included a review of potential traffic produced by the project, an inventory of pertinent traffic information, collection of existing traffic counts, accident data, and review of the 46th, 48th, and 38th intersections with Ocean Beach Hwy. The project is expected to generate approximately 707 daily trips, which include 53 AM peak hour trips and 71 PM peak hour trips. Site distance exceeds minimum requirements, and each intersection will operate at "C" or "D" level of service (LOS) after project completion. Generally, a LOS of "A", "B", "C", or "D" are considered acceptable levels of service. No additional turn lanes or signalization were warranted.

Public water and sewer service will be provided by the City of Longview. A new looped water main will be extended through the subdivision between 48th Ave (12-inch main) and 46th Ave (6-inch main), with shared laterals to each property line and individual meters for all lots. Sewer service will connect to existing 8-inch mains in 48th and 46th Avenues, with 6-inch laterals provided to each lot and a 10-foot separation maintained from water lines.

Stormwater management for the project will be designed and constructed in compliance with Chapter 17.80 LMC and all other applicable regulations. The project incorporates low impact development (LID) best management practices to reduce impervious surface coverage and manage runoff close to its source. These include the use of wet pond and four storm filter catch basins for detention and treatment of stormwater run-off.

<u>Staff Findings:</u> The proposed PUD development includes appropriate provisions to address impacts related to transportation, utilities, and drainage. The proposed streets, design modifications, utilities, and public improvements for the subdivision have been designed in accordance with the City's current ordinances, standards, and plans

A traffic study confirmed that surrounding roads can handle the projected volumes with no off-site improvements needed. Public water and sewer will be extended to serve all lots, with adequate capacity confirmed. Stormwater will be managed on-site using treatment detention facilities per LMC 17.80. Erosion and sediment control measures will be implemented during construction. All systems are consistent with City ordinances, standards, and plans.

Appropriate conditions will be included in the recommended conditions of approval to address these items.

B. Public Health, Safety, and Welfare

<u>Staff Findings:</u> The project proposes two points of access from 46th Ave and 48th Ave ensuring adequate ingress and egress for residents and fire emergency vehicles, as well as increasing traffic circulation for the neighborhood. The project proposes active open space and playground area that promote active living of residences of the subdivision. These amenities will provide recreational opportunities, encourage active living for residents, and contribute to the overall livability and neighborhood character of the development.

RCW 58.17 requires that appropriate provisions are to be made for *"…planning features that assure safe walking conditions for students who only walk to and from school…"* All Elementary, Middle and High Schools are over 1 mile away from the proposed subdivision and will have kids bused to and from school. The nearest current school bus stop is located across 48th Avenue on Ocean Beach Highway. Students walking to this stop would do so by traveling along 46th Avenue and crossing at the intersection of 46th Avenue and Ocean Beach Highway. Location of school bus stops are determined each year based on enrollment and location of students. As the proposed development is built out additional bus stop(s) may be located nearer to or within the development. The design of the proposed development allows for school bus stops to be located at either intersection and multiple points along the new road. Sidewalks have also been provided, allowing for safe routes for students walking to future bus stops. The Longview School District was contacted for review of the proposal and indicated no concerns or requested improvements related to school access or transportation.

C. Topography and Physical Characteristics

Staff Findings: The site is mostly flat and contains a type III wetland discussed in section 3 of this report. The provided geotechnical report confirms the soils are suitable for residential development, with no major concerns such as flooding or unstable soils. The wetland and its buffer have been incorporated into the project design and will maintain its functionality and be protected by appropriate buffers and fencing from the proposed development.

The project landscaping plan has been provided that includes street trees and planting within planter strips consistent with City standards. Fencing of proposed detention pond will be reviewed during construction plan review.

D. Compliance With Local and State Codes

Staff Findings: The proposed PUD complies with 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 TNR 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 wet pond and catch basins . All streets, utilities, and public improvements will be built to City standards under LMC12.50. The project meets fire safety access requirements through approved street design. The project will provide 20% of the site as open space, with 10% being for recreation use that comprise of a playground, walking trail ad pump track. 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, sidewalks, and utilities, in accordance with City standards. All public facilities will be dedicated to the City of Longview 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. A 4 ½ -foot planting strip with a mix of deciduous trees will provided between the sidewalk and curb of the new street, and a mix of grass, wood/rock is proposed for the open space area and around the stormwater pond. 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 along the back of each lot
- 10' stormwater easement through Tract B
- Public easement for use of playground and pump track

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 PUD Subdivision is located within the Traditional Neighborhood Residential District (TNR), which aligns with the Residential designation in the City's Comprehensive Plan. The TNR Residential designation supports the development of zero lot line single-family development. Longview's Comprehensive Plan describes the TNR designation:

> *"The traditional neighborhood residential classification is characterized by predominantly residential uses, by a grid pattern of streets with sidewalks, and may include alleys. This classification allows residential dwellings that are designed to contribute to the harmony and pedestrian orientation of a street or neighborhood. This classification accommodates individual dwelling units located on a single lot in a fashion that may allow reduced lot size, reduced or eliminated setback and street frontage requirements, and zero lot-line or common wall construction in order to provide design flexibility and produce a more desirable living environment in areas where it is desirable to preserve open space, sensitive areas, and difficult terrain.*
>
> *Housing types include single-family houses on small lots, second units, cottage clusters, and courtyard housing. Townhouse development may be allowed with approval of a planned unit development. Design standards will be prepared for each housing type to ensure that development successfully contributes to the street and neighborhood and minimizes potential negative impacts. Residential densities within the Columbia Valley Garden neighborhood should range between six and eight units per gross acre; other areas with this classification will have densities that range up to 12 units per gross acre "(Longview Comprehensive Plan, pg 21).*

The project is consistent with the character of the TNR designation in several areas. The project is predominantly residential, and matches to the extent practicable a "grid pattern" utilizing reduced lot sizes, zero lot-line design, and a cohesive project design to avoid impacts and preserve open space and sensitive areas. The proposed density is also consistent with the recommended density for areas outside the CVG neighborhood.

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

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

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

Policy LU-A.1.1 — *Provide a variety of residential zoning districts at different densities to meet the needs of all economic segments of Longview population.*
By using the flexibility inherent to the TNR district and the PUD standards, the project providing an alternative to the typical lot sizes and residential design found elsewhere in the City.

Policy LU-A.1.4 — *Assure compatibility of new development siting, design, and scale with the surrounding natural and built environment.*
The proposed project meets the density requirements of the TNR zoning district. The development utilizes the flexibility offered through the PUD process to create a cohesive design that avoids impacts to the nearby wetland to the extent practicable while maintaining harmony with the surrounding residential development.

Policy LU-A.1.5 — *Facilitate redevelopment existing developed land when appropriate and encourage infill development on vacant or undeveloped land.*
The proposed project utilizes a tract of currently undeveloped land adjacent to existing residential development to create a project that is consistent with Longview's zoning and comprehensive plan. The proposed density effectively uses the property to its fullest extent without undie impacts to the wetland areas or creating incompatibility with the surrounding area.

<u>Goal LU-B:</u> *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.*

The proposed development follows existing land use patterns in regard to both the nearby residential development and the current zoning designation(s) and density requirements. Existing public facilities are adequate fo the proposed project, and the connection between 46th and 48th Avenues promotes more effective circulation in the neighborhood. As noted in the traffic study, the proposed traffic resulting from the development can be sufficiently handled by the existing road system and does not drop any intersection below recommended levels of service.

Based on the City of Longview's Comprehensive Plan, the proposed PUD subdivision is consistent with several key goals, policies, and objectives related to land use, housing, infrastructure, and open space.

8. CONCLUSION

The proposed 75-unit Planned Unit Development (PUD) subdivision meets the applicable requirements of the Longview Municipal Code (LMC), including zoning, PUD standards, utilities, stormwater management, transportation, open space, and overall site design. The project is consistent with the Comprehensive Plan's Traditional Neighborhood Residential land use designation and supports the City's housing goals by providing a mix of lot sizes and housing options while preserving open space and recreational amenities for residents.

All necessary infrastructure will be provided, including public water and sewer service, fire protection and stormwater treatment through on-site detention facilities consistent with City standards and CDID coordination. The project will have two points of access to the development ensuring adequate ingress & egress for residents and emergency vehicles. Additionally, the homes will be constructed with fire resistive materials in accordance with the international residential building code as part of the requirements for utilizing the zero lot line standards to ensure adequate fire protection.

The project includes pedestrian connections, accessible public street network, approximately 20% of the site dedicated to open space. These features enhance neighborhood character and livability. 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.

The proposed project includes mitigation measures for the onsite wetland in accordance with the requirements of LMC 19.77 (Critical Areas). A critical areas report and mitigation plan were prepared by a qualified consultant and submitted as part of the application materials. The plan identifies the type, location, and extent of the onsite wetland and outlines the potential impacts associated with the development. To ensure no net loss of wetland functions, the applicant proposes to provide compensatory mitigation consistent with city code, including the establishment of buffers and the purchase of mitigation bank credits to mitigate unavoidable impacts. These measures are intended to maintain overall ecological functions, comply with regulatory standards, and ensure long-term protection of the wetland area.

9. **Recommendation**

Staff recommends ***approval*** of the 48th Ave Planned Unit Development (PUD) Subdivision, a 75-lot zero lot line PUD Subdivision based on the findings and conclusions and subject to the conditions attached to this staff report.

10. EXHIBITS

A. Preliminary Planset
B. Traffic Study
C. Geotechnical Report
D. Narrative
E. Critical Areas Report
F. Critical Areas Mitigation Plan
G. SEPA Checklist
H. SEPA Comments
I. Cowlitz County Public Works Comments
J. Preliminary Stormwater Report

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, or at such a time that the City Engineer determines that the construction of the project is substantially complete and allows for and adequate review. 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. Prior to final approval the applicant shall provide a plat name in accordance with LMC 19.80. Approval is limited to 75 lots. The new lots shall substantially conform to the lot sizes, dimensions, and layout shown on the approved preliminary plat. Addresses will be assigned to the lots during final plat review.

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 homes in the development shall be constructed with fire-resistive construction in accordance with the International Residential Code (IRC) and International Building Code (IBC) requirements. Construction details verifying compliance with fire-resistive requirements shall be submitted with building permit plans and are subject to review and approval by the Building Official and Fire Marshal prior to permit issuance.

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

6. Prior to final plat approval, the applicant shall establish a Homeowners' Association (HOA) responsible for the ongoing operation and maintenance of all private systems, including the stormwater transmission facilities and open space tracts. Covenants, Conditions, and Restrictions (CC&Rs) shall be recorded and include provisions assigning maintenance responsibilities to the HOA, subject to review and approval by the City. Refer to RCW 64.90 for HOA requirements under the WUCIOA.

7. Prior to any construction activity, including filling, grading, or vegetation removal, 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.

8. 46th and 48th Avenue(s) – Cowlitz County right-of-way
   - The applicant shall obtain a right-of-way permit for any work (including construction signage) within Cowlitz County right-of-way.

   - The applicant shall construct frontage improvements along 46th Avenue and 48th Avenue that include a 25' ROW half width, a 16' half-width asphalt, 3.5' landscape strip and a 5' sidewalk. The design and construction of streets, pedestrian paths, street trees, storm drainage systems, site grading and erosion control plans for the frontage improvements along 46th and 48th Avenues shall be in accordance with Cowlitz County Code, Cowlitz County Road and Street Design Standards and Cowlitz County Standard Plans and Specifications, unless otherwise specified.

   - The design and construction of streetlights and street trees shall be in accordance with City of Longview code, special provisions, and standard drawings and subject to review and approval by the City Engineer.

- The applicant shall submit a final stormwater report and receive Cowlitz County stormwater approval prior to the start of construction. The stormwater system shall be designed and constructed in accordance with Cowlitz County Code 16.20 and the City of Longview stormwater requirements.

- The applicant shall evaluate the drainage issues associated with the 48th Avenue roadside ditch utilizing the CDID #1 hydraulic model and elevations of key points in the Charles Street neighborhood and 48th Ave. and submit a design memo with the results and possible solutions. The County will coordinate with the applicant on appropriate, proportionate solutions that can be associated with this project

9. Subdivision/internal street construction (Bridger Street)
    - The applicant shall obtain a Public Improvement Permit (PIP) and/or a City of Longview right-of-way permit, as appropriate, prior to any work occurring on the project.

    - Bridger Street shall be constructed in accordance with City of Longview street design standards, with modification(s) as shown in the attached preliminary plans.

    - 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 are subject to approval by the City Engineer.

    - 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.

    - Fire hydrants shall be installed at locations approved by the City Fire Marshal and in accordance with applicable fire code standards prior to final plat approval. 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.

    - The applicant shall post “NO PARKING” signs in areas of Bridger Street where the roadway narrows and parking would reduce the fire access width below twenty (20) feet, specifically from Lot 7 to Lot 16 and from Lot 34 to Lot 47. Signage and placement shall be reviewed and approved by the Fire Marshal prior to final plat approval or issuance of certificates of occupancy.

10. 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.

11. Stormwater treatment and wet pond 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. Landscaping shall be provided around the perimeter of the stormwater facility fencing and shall incorporate a mix of trees and shrubs to provide visual screening and aesthetic enhancement. All necessary stormwater tracts, maintenance and drainage easements shall be identified on the final plat.

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

13. All necessary utility, drainage, access, and maintenance easements shall be recorded with the final plat.

14. Prior to site development or issuance of construction permits, the applicant shall implement the wetland mitigation measures outlined in the Critical Areas Report and Mitigation Plan prepared by Ecological Land Services dated March 31st ,2025. Mitigation shall include establishment of the required wetland buffer and purchase of wetland mitigation bank credits in accordance with LMC 19.77. Documentation of mitigation credit purchase and buffer establishment shall be submitted to the Community Development Department for review.

15. Final wetland buffers, protection areas, or mitigation areas shall be shown on the face of the final plat, along with appropriate plat notes (identified below).

16. The geotechnical assessment provided from Redmond Geotechnical Services dated on September 6th, 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.

17. The applicant shall install screening along the project site boundaries to provide effective screening from adjacent properties. Screening may consist of a solid fence, hedge, or landscaped buffer, subject to review and approval by the Community Development Department.

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

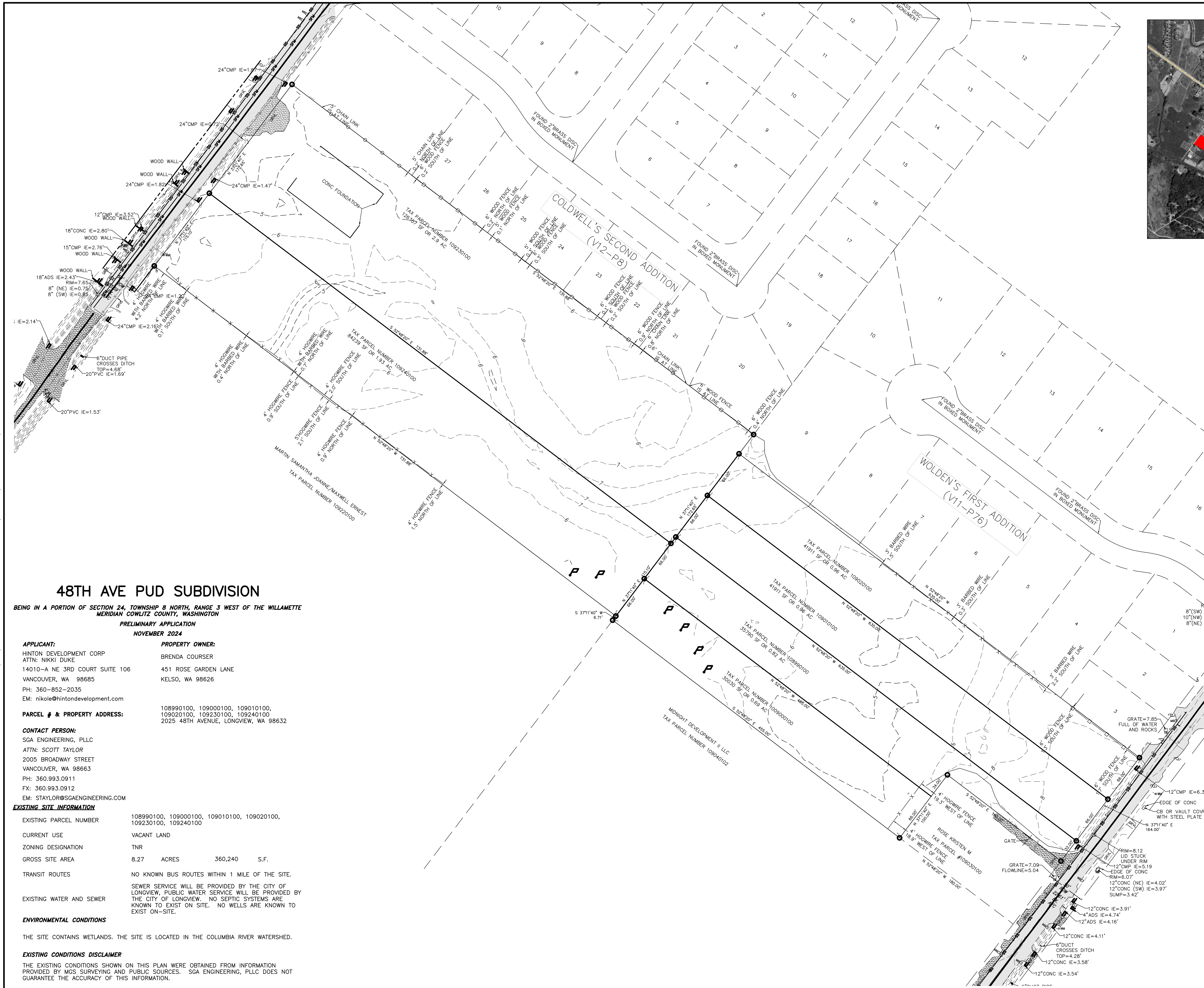
- All future development shall conform to the conclusions and recommendations contained in the geotechnical assessment performed by Redmond Geotechnical Services, September 6th, 2024.

- All future accessory structures shall comply with the standard setback requirements of the underlying zoning district and are not eligible for the reduced zero-lot-line setbacks. Accessory Dwelling Units (ADUs) shall not be allowed.

- All future homes in the development shall be constructed with fire-resistive construction in accordance with the International Residential Code (IRC) and International Building Code, subject to review and approval from the City of Longview Fire Marshal and the Building Official.

- No filling, grading, placement of structures, development, or removal of vegetation shall be allowed within the wetland or wetland buffers shown on the final plat, provided certain activities may be allowed subject to the provisions of LMC 17.10.110(4).

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



48TH AVE PUD SUBDIVISION

BEING IN A PORTION OF SECTION 24, TOWNSHIP 8 NORTH, RANGE 3 WEST OF THE WILLAMETTE MERIDIAN COWLITZ COUNTY, WASHINGTON

PRELIMINARY APPLICATION

NOVEMBER 2024

APPLICANT:

HINTON DEVELOPMENT CORP
ATTN: NIKKI DUKE
14010–A NE 3RD COURT SUITE 106
VANCOUVER, WA 98685
PH: 360–852–2035
EM: nikole@hintondevelopment.com

PROPERTY OWNER:

BRENDA COURSER
451 ROSE GARDEN LANE
KELSO, WA 98626

PARCEL # & PROPERTY ADDRESS: 108990100, 109000100, 109010100, 109020100, 109230100, 109240100
2025 48TH AVENUE, LONGVIEW, WA 98632

CONTACT PERSON:

SGA ENGINEERING, PLLC
ATTN: SCOTT TAYLOR
2005 BROADWAY STREET
VANCOUVER, WA 98663
PH: 360.993.0911
FX: 360.993.0912
EM: STAYLOR@SGAENGINEERING.COM

EXISTING SITE INFORMATION

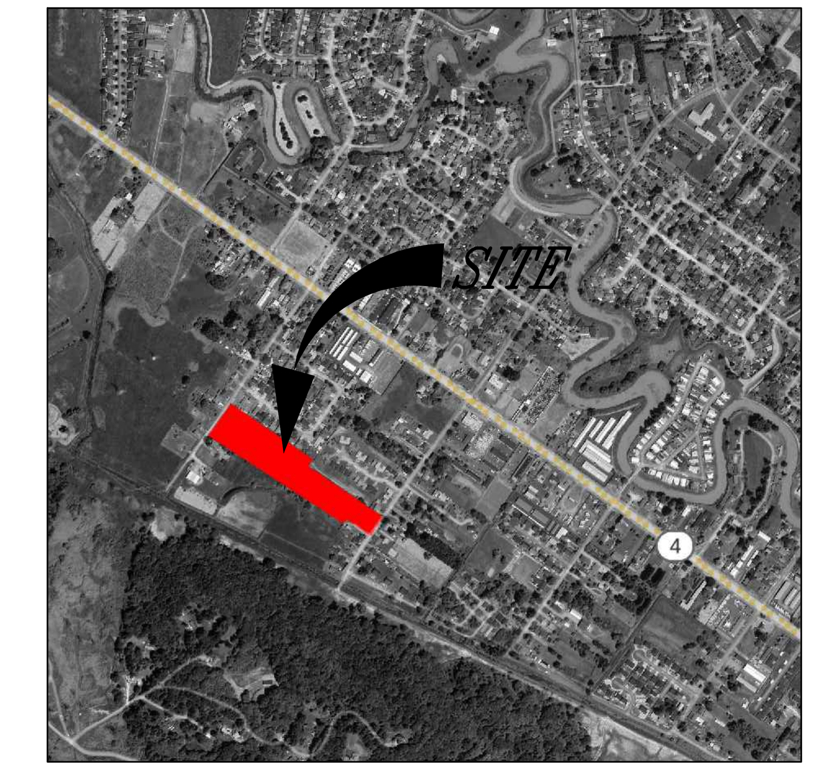
EXISTING PARCEL NUMBER	108990100, 109000100, 109010100, 109020100, 109230100, 109240100			
CURRENT USE	VACANT LAND			
ZONING DESIGNATION	TNR			
GROSS SITE AREA	8.27	ACRES	360,240	S.F.
TRANSIT ROUTES	NO KNOWN BUS ROUTES WITHIN 1 MILE OF THE SITE.			
EXISTING WATER AND SEWER	SEWER SERVICE WILL BE PROVIDED BY THE CITY OF LONGVIEW, PUBLIC WATER SERVICE WILL BE PROVIDED BY THE CITY OF LONGVIEW. NO SEPTIC SYSTEMS ARE KNOWN TO EXIST ON SITE. NO WELLS ARE KNOWN TO EXIST ON–SITE.			

ENVIRONMENTAL CONDITIONS

THE SITE CONTAINS WETLANDS. THE SITE IS LOCATED IN THE COLUMBIA RIVER WATERSHED.

EXISTING CONDITIONS DISCLAIMER

THE EXISTING CONDITIONS SHOWN ON THIS PLAN WERE OBTAINED FROM INFORMATION PROVIDED BY MGS SURVEYING AND PUBLIC SOURCES. SGA ENGINEERING, PLLC DOES NOT GUARANTEE THE ACCURACY OF THIS INFORMATION.



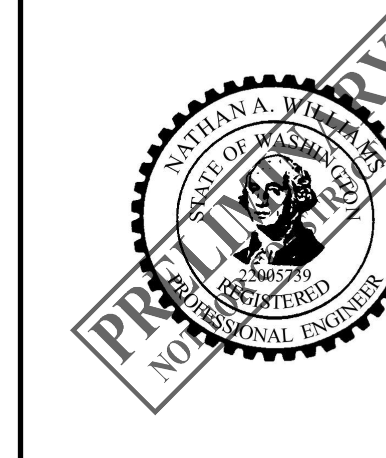
VICINITY MAP
NTS

N

0 60 120 180
Scale: 1" = 60'

SGA ENGINEERING & DESIGN
CIVIL ENGINEERING ~ LAND PLANNING
DEVELOPMENT SERVICES
LANDSCAPE ARCHITECTURE

2005 BROADWAY
VANCOUVER, WA 98663
PHONE (360)993-0911
FAX (360)993-0912



EXISTING CONDITIONS

48TH AVE PUD SUBDIVISION

LONGVIEW *WASHINGTON*

PRELIMINARY

REVISIONS

DESIGNED BY:	*NLH/SAT*
DRAWN BY:	*NLH/SAT*
CHECKED BY:	*NAW*
SCALE:	*1" = 60'*

JOB NUMBER	*SHEET*
2418	*PRE1.0*

VICINITY MAP
NTS

48TH AVE PUD SUBDIVISION

BEING IN A PORTION OF SECTION 24, TOWNSHIP 8 NORTH, RANGE 3 WEST OF THE WILLAMETTE MERIDIAN COWLITZ COUNTY, WASHINGTON

PRELIMINARY APPLICATION

NOVEMBER 2024

APPLICANT:
HINTON DEVELOPMENT CORP
ATTN: NIKKI DUKE
14010-A NE 3RD COURT SUITE 106
VANCOUVER, WA 98685
PH: 360-852-2035
EM: nikole@hintondevelopment.com

PROPERTY OWNER:
BRENDA COURSER
451 ROSE GARDEN LANE
KELSO, WA 98626

PARCEL # & PROPERTY ADDRESS: 108990100, 109000100, 109010100, 109020100, 109230100, 109240100
2025 48TH AVENUE, LONGVIEW, WA 98632

CONTACT PERSON:
SGA ENGINEERING, PLLC
ATTN: SCOTT TAYLOR
2005 BROADWAY STREET
VANCOUVER, WA 98663
PH: 360.993.0911
FX: 360.993.0912
EM: STAYLOR@SGAENGINEERING.COM

EXISTING SITE INFORMATION

EXISTING PARCEL NUMBER	108990100, 109000100, 109010100, 109020100, 109230100, 109240100
CURRENT USE	VACANT LAND
ZONING DESIGNATION	TNR
GROSS SITE AREA	8.27 ACRES 360,240 S.F.
TRANSIT ROUTES	NO KNOWN BUS ROUTES WITHIN 1 MILE OF THE SITE.
EXISTING WATER AND SEWER	SEWER SERVICE WILL BE PROVIDED BY THE CITY OF LONGVIEW, PUBLIC WATER SERVICE WILL BE PROVIDED BY THE CITY OF LONGVIEW. NO SEPTIC SYSTEMS ARE KNOWN TO EXIST ON SITE. NO WELLS ARE KNOWN TO EXIST ON-SITE.

ENVIRONMENTAL CONDITIONS

THE SITE CONTAINS WETLANDS. THE SITE IS LOCATED IN THE COLUMBIA RIVER WATERSHED.

EXISTING CONDITIONS DISCLAIMER

THE EXISTING CONDITIONS SHOWN ON THIS PLAN WERE OBTAINED FROM INFORMATION PROVIDED BY MGS SURVEYING AND PUBLIC SOURCES. SGA ENGINEERING, PLLC DOES NOT GUARANTEE THE ACCURACY OF THIS INFORMATION.

PROPOSED SITE INFORMATION

PROPOSED USE

SINGLE-FAMILY RESIDENTIAL (75 LOT) SUBDIVISION

DEVELOPMENT STANDARDS	
MINIMUM LOT AREA	6,000 SF ALLOWED 2,649 SF LOT SIZE PROPOSED WITH PUD
MINIMUM LOT WIDTH	50' MIN. ALLOWED, 25' MIN. PROPOSED WITH PUD
MINIMUM LOT DEPTH	N/A
FRONT YARD SETBACK	20'
STREET SIDE YARD SETBACK	10' REQUIRED, 8' PROPOSED WITH PUD
INTERIOR SIDE YARD SETBACK	5' & 0' LOT LINE REQUIRED, 4' PROPOSED WITH PUD
REAR YARD SETBACK	10'
MAXIMUM LOT COVERAGE	75%
MAXIMUM BUILDING HEIGHT	35'
UTILITY PROVIDERS	
SEWER	CITY OF LONGVIEW
WATER	CITY OF LONGVIEW
ELECTRICAL	COWLITZ PUD
STORMWATER MANAGEMENT	CITY OF LONGVIEW STANDARDS
TREATMENT	STORMWATER WILL BE TREATED USING A WETPOND
DISPOSAL	STORMWATER WILL BE RELEASED TO THE EXISTING DRAINAGE SYSTEMS SURROUNDING THE SITE. THE PROJECT IS FLOW CONTROL EXEMPT PER THE 2019 SWMMWW, BUT THE WETPOND WILL BE USED TO METER THE 25-YR RELEASE PER CITY OF LONGVIEW REQUIREMENTS.

PROPOSED SITE AREA SUMMARY	ACRES	S.F.
GROSS SITE AREA	8.27	360240
AVERAGE LOT AREA	0.07	2913
PUBLIC RIGHT-OF-WAY DEDICATED	1.58	68848

N

0 60 120 180
Scale: 1" = 60'

SGA ENGINEERING & DESIGN
CIVIL ENGINEERING ~ LAND PLANNING
DEVELOPMENT SERVICES
LANDSCAPE ARCHITECTURE

2005 BROADWAY
VANCOUVER, WA 98663
PHONE (360)993-0911
FAX (360)993-0912

PRELIMINARY

PRELIMINARY PLAT

48TH AVE PUD SUBDIVISION

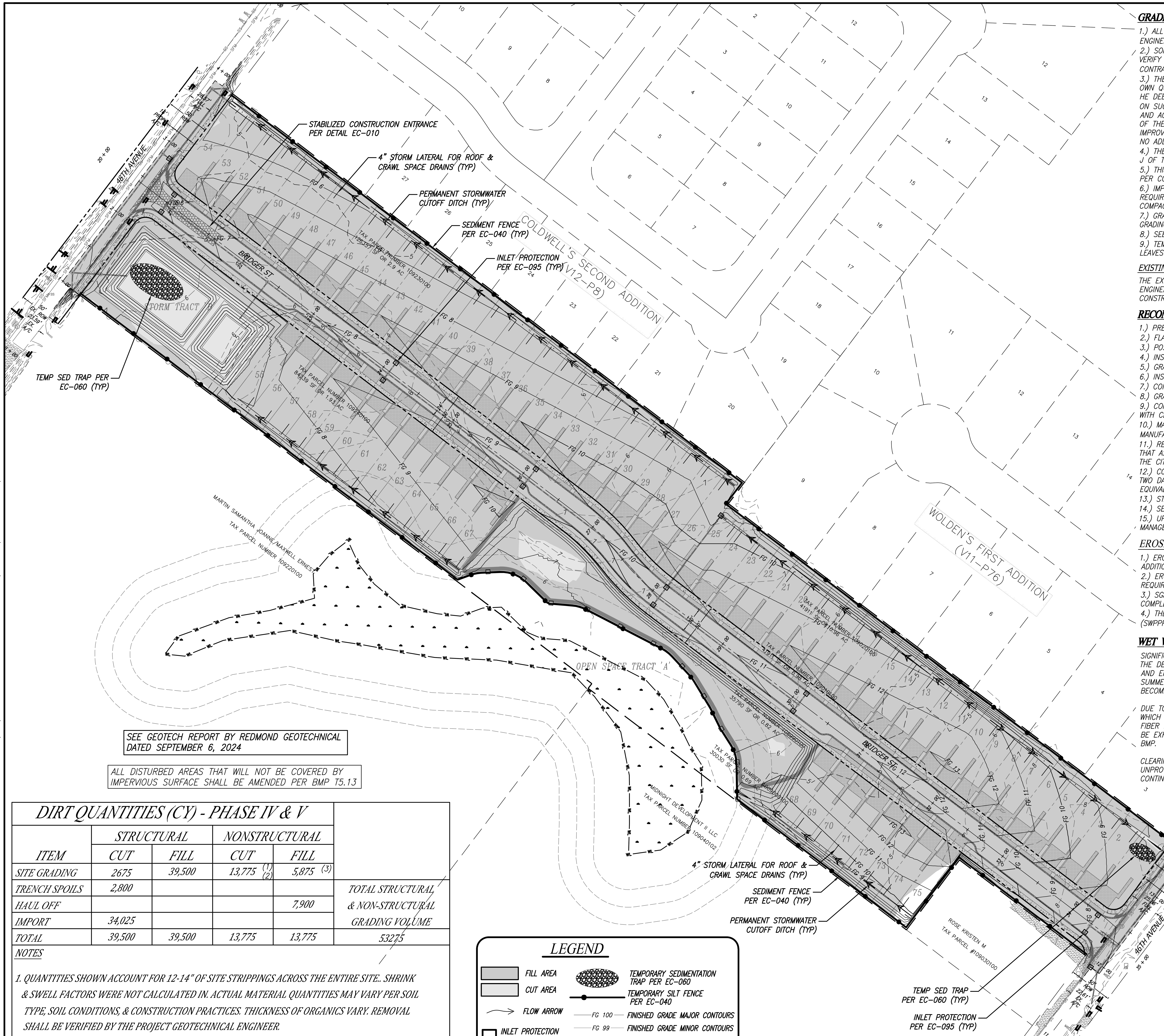
LONGVIEW WASHINGTON

PRELIMINARY

REVISIONS

DESIGNED BY:	NLH/SAT
DRAWN BY:	NLH/SAT
CHECKED BY:	NAW
SCALE:	1" = 60'

JOB NUMBER	SHEET
2418	PRE2.0



SEE GEOTECH REPORT BY REDMOND GEOTECHNICAL DATED SEPTEMBER 6, 2024

ALL DISTURBED AREAS THAT WILL NOT BE COVERED BY IMPERVIOUS SURFACE SHALL BE AMENDED PER BMP T5.13

DIRT QUANTITIES (CY) - PHASE IV & V

ITEM	STRUCTURAL CUT	STRUCTURAL FILL	NONSTRUCTURAL CUT	NONSTRUCTURAL FILL	
SITE GRADING	2675	39,500	13,775 (1) (2)	5,875 (3)	
TRENCH SPOILS	2,800				TOTAL STRUCTURAL & NON-STRUCTURAL GRADING VOLUME
HAUL OFF				7,900	
IMPORT	34,025				
TOTAL	39,500	39,500	13,775	13,775	53275

NOTES

1. QUANTITIES SHOWN ACCOUNT FOR 12-14" OF SITE STRIPPINGS ACROSS THE ENTIRE SITE.. SHRINK & SWELL FACTORS WERE NOT CALCULATED IN. ACTUAL MATERIAL QUANTITIES MAY VARY PER SOIL TYPE, SOIL CONDITIONS, & CONSTRUCTION PRACTICES. THICKNESS OF ORGANICS VARY. REMOVAL SHALL BE VERIFIED BY THE PROJECT GEOTECHNICAL ENGINEER.
2. THIS VOLUME INCLUDES SOME MATERIAL THAT IS NOT SUITABLE TO BE PLACED IN LOT LANDSCAPED AREAS (I.E. DEMOLISHED GRAVEL, CONCRETE, ASPHALT, ETC.)
3. ASSUMED 1' MAX OF STRIPPINGS PLACED BACK ON TO LOT AREAS.
4. HAUL OFF MATERIAL MAY BE HAULED OFF OR PLACED IN LANDSCAPED AREAS

LEGEND

- FILL AREA
- CUT AREA
- FLOW ARROW
- INLET PROTECTION PER EC-095
- TEMPORARY SEDIMENTATION TRAP PER EC-060
- TEMPORARY SILT FENCE PER EC-040
- FG 100 — FINISHED GRADE MAJOR CONTOURS
- FG 99 — FINISHED GRADE MINOR CONTOURS
- 100 — EXISTING MAJOR CONTOURS
- 99 — EXISTING MINOR CONTOURS
- GRAVEL CONSTRUCTION ENTRANCE (PER EC-010)

GRADING AND DRAINAGE NOTES:

1.) ALL STRIPPING, GRUBBING, GRADING, AND COMPACTION ARE TO BE DONE IN ACCORDANCE WITH THE SOIL ENGINEER'S REQUIREMENTS.
2.) SOIL STRIPPING WAS ASSUMED TO BE 12–14" PER THE GEOTECH REPORT. THE CONTRACTOR SHALL VERIFY NECESSARY STRIPPING DEPTHS AND LOCATIONS WITH THE SOIL ENGINEER, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY AND COORDINATE THIS WITH THE SOIL ENGINEER.
3.) THE CONTRACTOR IS ADVISED TO MAKE HIS OWN TAKEOFF OF EARTHWORK QUANTITIES AND DETERMINE HIS OWN QUANTITIES FOR BIDDING. THE CONTRACTOR IS ADVISED TO DIG TEST HOLES OR USE WHATEVER METHOD HE DEEMS NECESSARY TO DETERMINE EARTHWORK QUANTITIES. EARTHWORK QUANTITIES MAY VARY DEPENDING ON SUCH VARIABLES AS COMPACTION, SHRINKAGE, CONTRACTOR'S METHOD OF OPERATION, STRIPPING DEPTHS, AND ACCURACY OF THE EARTHWORK TAKEOFF. WITH THE SIGNING OF THE CONTRACT FOR THE CONSTRUCTION OF THESE IMPROVEMENTS, THE CONTRACTOR AGREES THAT HIS COST FOR CONSTRUCTING THE GRADING IMPROVEMENTS, AND DISPOSAL OF THE EXCESS MATERIAL IF NECESSARY, IS SATISFACTORY AND THERE WILL BE NO ADDITIONAL CHARGE FOR THIS ITEM.
4.) THERE SHOULD BE NO EXCAVATING OR FILLING WITHIN 2 FEET OF THE PROPERTY LINE AS PER CHAPTER J OF THE IBC.
5.) THIS PROJECT WILL NOT INCREASE OR CONCENTRATE STORMWATER RUNOFF ONTO ADJACENT PARCELS AS PER CCC 40. CROSS LOT DRAINAGE WILL NOT BE ALLOWED.
6.) IMPORTED SOIL PLACED DURING EARLY GRADING SHALL ALLOW FOR ACHIEVABLE COMPACTION REQUIREMENTS FOR FINAL CONSTRUCTION INCLUDING 95% COMPACTION UNDER ROADWAY AND 90% COMPACTION IN LOT AREAS.
7.) GRADE FINISHED LOTS WITH POSITIVE GRADIENT TO THE STREET OR AS SHOWN ON INDIVIDUAL LOT GRADING DETAILS.
8.) SEE ADDITIONAL NOTES ON EROSION CONTROL DETAIL SHEET.
9.) TEMPORARY SEDIMENT/INFILTRATION BASIN SHALL BE INSTALLED AS NEEDED TO ENSURE NO DIRTY RUNOFF LEAVES THE SITES CONSTRUCTION LIMITS.

EXISTING CONDITIONS DISCLAIMER:

THE EXISTING CONDITIONS SHOWN ON THIS PLAN WERE OBTAINED FROM A VARIETY OF SOURCES. SGA ENGINEERING, PLLC DOES NOT GUARANTEE THE ACCURACY OF THIS INFORMATION. PHASES I–III HAVE BEGUN CONSTRUCTION, THUS EXISTING GRADE ON THOSE PHASES WILL VARY FROM WHAT IS SHOWN ON THIS SHEET.

RECOMMENDED CONSTRUCTION SEQUENCE FOR EROSION CONTROL:

1.) PRE–CONSTRUCTION MEETING.
2.) FLAG OR FENCE CLEARING LIMITS.
3.) POST NOTICE OF CONSTRUCTION ACTIVITY PHONE NUMBER OF EROSION SEDIMENT CONTROL SUPERVISOR.
4.) INSTALL CATCH BASIN PROTECTION IF REQUIRED.
5.) GRADE AND INSTALL CONSTRUCTION ENTRANCE(S).
6.) INSTALL PERIMETER PROTECTION (SILT FENCE, BRUSH BARRIER, ETC.).
7.) CONSTRUCT SEDIMENT PONDS AND TRAPS.
8.) GRADE AND STABILIZE CONSTRUCTION ROADS.
9.) CONSTRUCT SURFACE WATER CONTROLS (INTERCEPTOR DIKES, PIPE SLOPE DRAINS, ETC.) SIMULTANEOUSLY WITH CLEARING AND GRADING FOR PROJECT DEVELOPMENT.
10.) MAINTAIN EROSION CONTROL MEASURES IN ACCORDANCE WITH CITY OF LONGVIEW STANDARDS AND MANUFACTURER'S RECOMMENDATIONS.
11.) RELOCATE SURFACE WATER CONTROLS AND EROSION CONTROL MEASURES OR INSTALL NEW MEASURES SO THAT AS SITE CONDITIONS CHANGE THE EROSION AND SEDIMENT CONTROL IS ALWAYS IN ACCORDANCE WITH THE CITY OF LONGVIEW EROSION AND SEDIMENT CONTROL STANDARDS.
12.) COVER ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN SEVEN DAYS DURING THE DRY SEASON OR TWO DAYS DURING THE WET SEASON WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING OR EQUIVALENT.
13.) STABILIZE ALL AREAS THAT REACH FINAL GRADE WITHIN SEVEN DAYS.
14.) SEED OR SOD ANY AREAS TO REMAIN UNWORKED FOR MORE THAN 30 DAYS.
15.) UPON COMPLETION OF THE PROJECT, ALL DISTURBED AREAS MUST BE STABILIZED AND BEST MANAGEMENT PRACTICES REMOVED IF APPROPRIATE.

EROSION CONTROL NOTES:

1.) EROSION CONTROL MEASURES SHOWN ON THE EROSION CONTROL PLAN ARE THE MINIMUM REQUIRED. ADDITIONAL MEASURES MAY BE REQUIRED TO CONTROL EROSION AND SEDIMENT.
2.) EROSION CONTROL MEASURES SHOWN ARE FOR DRY WEATHER CONSTRUCTION. ADJUSTMENTS WILL BE REQUIRED IF WET WEATHER CONSTRUCTION IS UNDERTAKEN.
3.) SGA HAS INITIATED THE NPDES PERMITTING PROCESS. THE CONTRACTOR WILL BE RESPONSIBLE FOR COMPLETING THE PROCESS, AND OBTAINING AND MAINTAINING THE FINAL NPDES PERMIT.
4.) THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) BE ONSITE AT ALL TIMES DURING CONSTRUCTION. SGA HAS PREPARED THE SWPPP.

WET WEATHER CONDITIONS & STEEP TERRAIN:

SIGNIFICANT VARIATION AND DEGREE OF EROSION CONTROL EFFORT WILL BE DICTATED BY WEATHER CONDITIONS. THE DEVELOPER AND CONTRACTOR SHOULD BE PREPARED TO PROVIDED EXTRA EROSION CONTROL PROVISIONS AND EFFORT DURING WINTER AND WET WEATHER CONDITIONS BEYOND THAT NORMALLY REQUIRED DURING SUMMER AND DRY WEATHER CONDITIONS. FINE GRAINED AND UNCONSOLIDATED SOILS ON SLOPING SITES MAY BECOME UNSTABLE WHEN SUBJECT TO EXCESSIVE MOISTURE.

DUE TO THE STEEP TERRAIN, ADDTIONAL EROSION CONTROL MEASURES MAY ALSO BE NEEDED. MEASURES WHICH COULD BE USED INCLUDE, BUT ARE NOT LIMITED TO, MULTIPLE SILT FENCE ROWS, SEDIMENT BARRIERS, FIBER ROLLS, OR CUT–OFF DITCHING TO DIVERT POTENTIAL STORM FLOW. LARGE BARREN SLOPES SHALL NOT BE EXPOSED FOR LONG PERIODS OF TIME AND SHOULD BE PROTECTED WITH AN APPROVED EROSION CONTROL BMP.

CLEARING AND GRADING PRACTICES SHOULD BE COMPLETED IN SEVERAL PHASES TO AVOID LARGE AREAS OF UNPROTECTED EXPOSED SOIL. EROSION CONTROL SHALL BE IMPLEMENTED ON EACH PHASE BEFORE CONTINUING GRADING.

SGA ENGINEERING & DESIGN
CIVIL ENGINEERING ~ LAND PLANNING
DEVELOPMENT SERVICES
LANDSCAPE ARCHITECTURE

2005 BROADWAY
VANCOUVER, WA 98663
PHONE (360)993-0911
FAX (360)993-0912

PRELIMINARY
NATHAN A. WILLIAMS
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER
NOT FOR CONSTRUCTION

PRELIMINARY GRADING & EROSION CONTROL

48TH AVE PUD SUBDIVISION

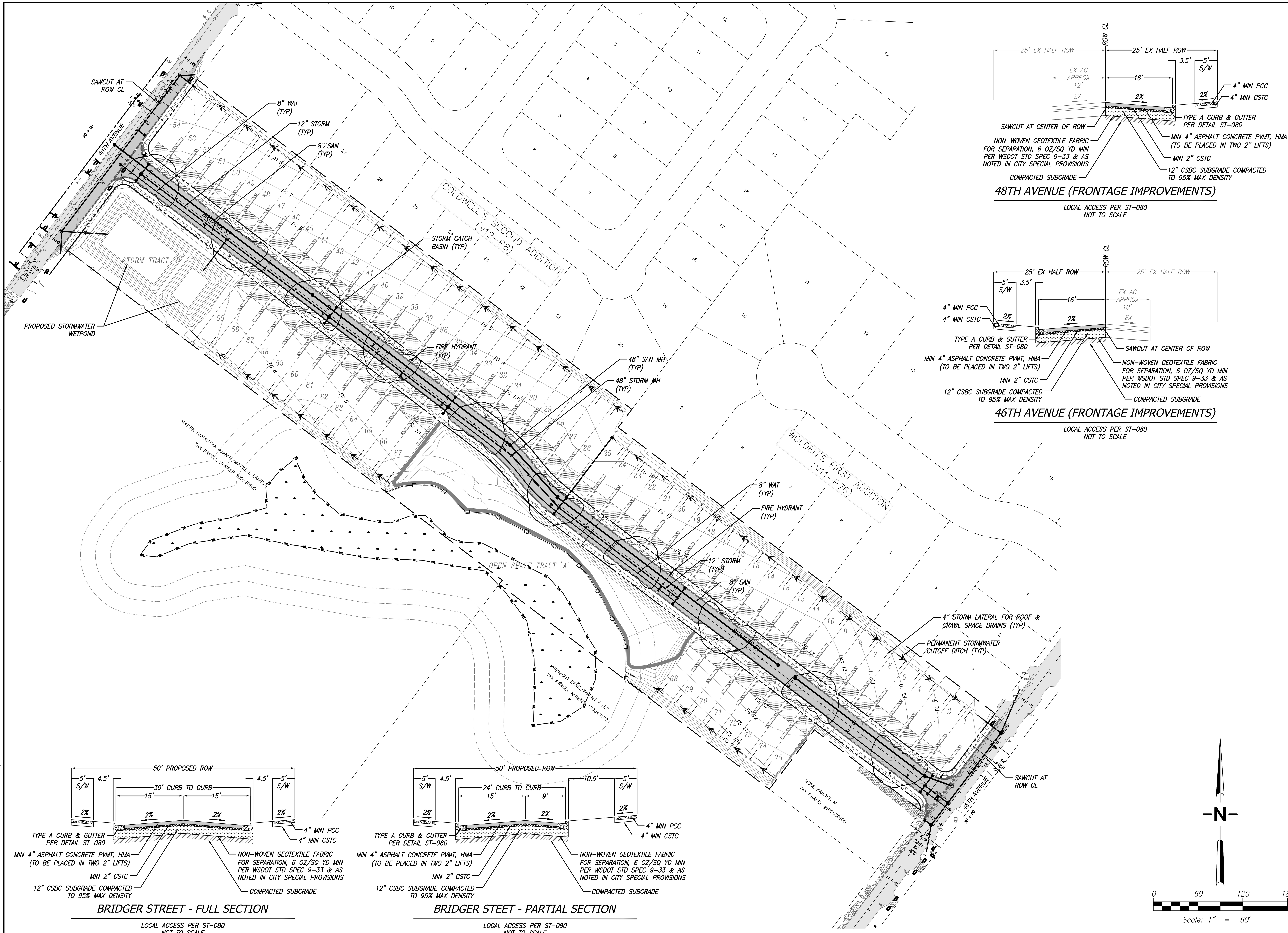
LONGVIEW WASHINGTON

PRELIMINARY

REVISIONS

DESIGNED BY: NLH/SAT
DRAWN BY: NLH/SAT
CHECKED BY: NAW
SCALE: 1" = 60'

JOB NUMBER 2418
SHEET PRE3.0



SGA ENGINEERING & DESIGN
CIVIL ENGINEERING ~ LAND PLANNING
DEVELOPMENT SERVICES
LANDSCAPE ARCHITECTURE

2005 BROADWAY
VANCOUVER, WA 98663
PHONE (360)993-0911
FAX (360)993-0912

PRELIMINARY

48TH AVE PUD SUBDIVISION

PRELIM STREET & UTILITY PLAN

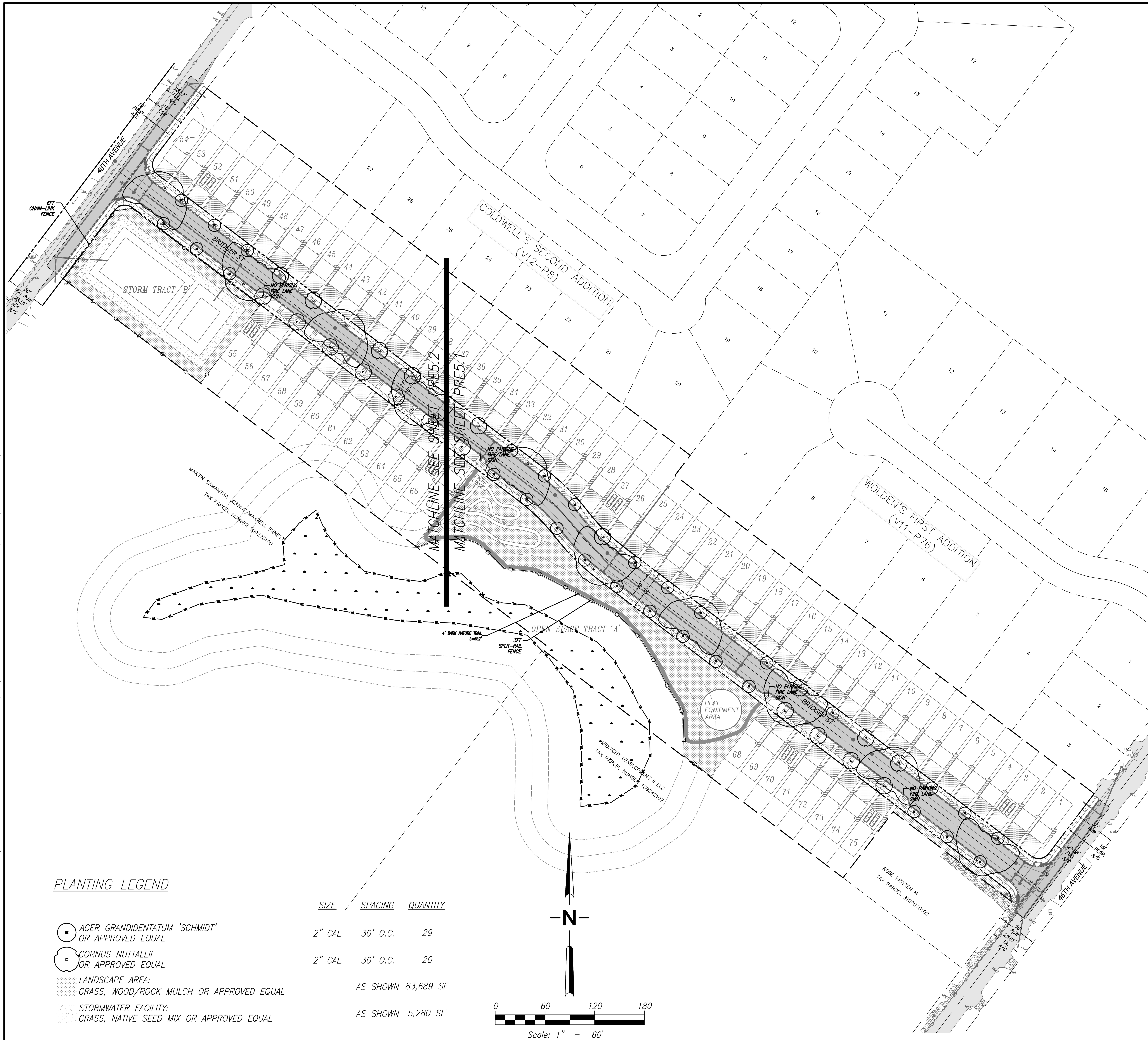
LONGVIEW WASHINGTON

PRELIMINARY

REVISIONS

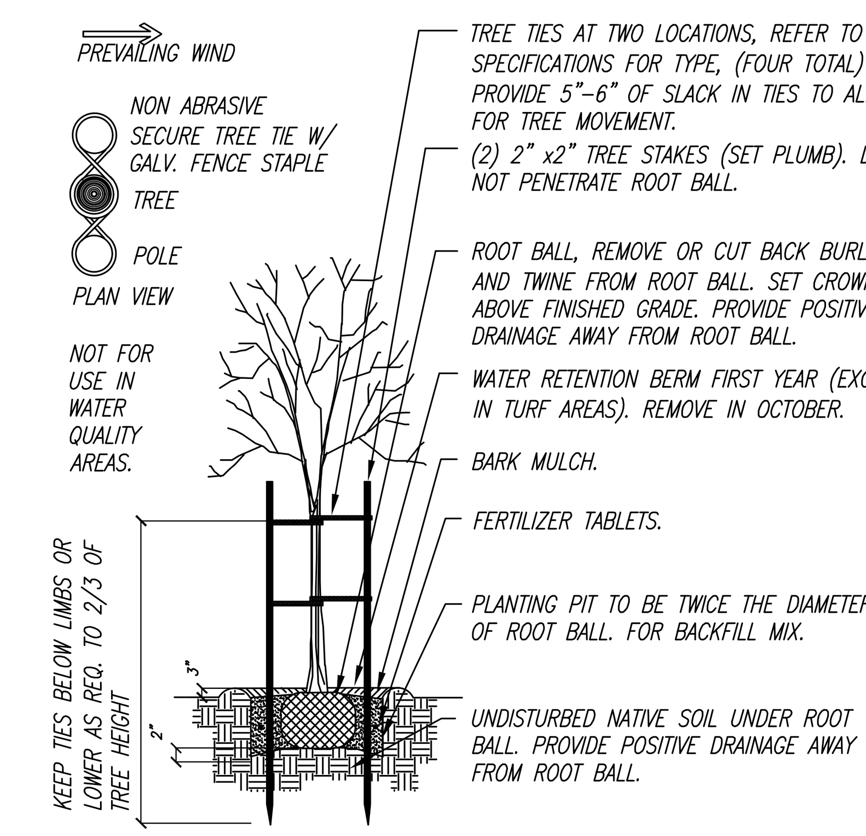
DESIGNED BY:	NLH/SAT
DRAWN BY:	NLH/SAT
CHECKED BY:	NAW
SCALE:	1" = 60'

JOB NUMBER	SHEET
2418	PRE4.0



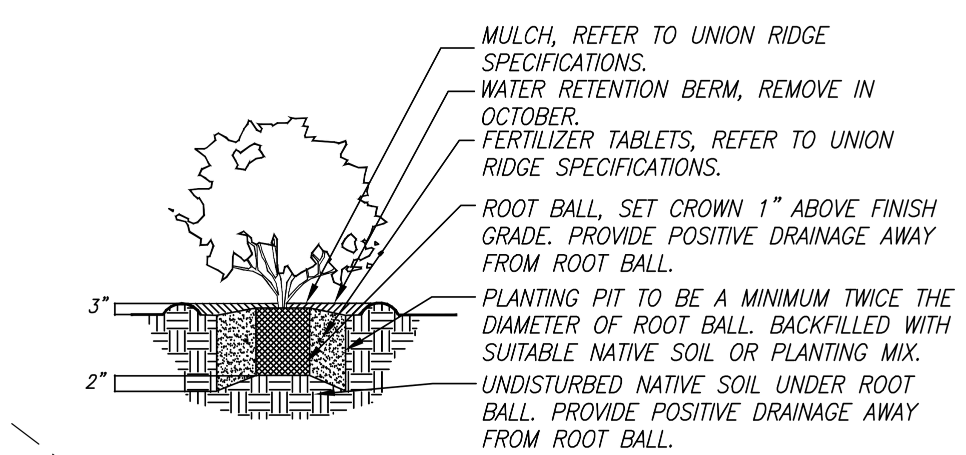
PLANTING LEGEND

	SIZE	SPACING	QUANTITY
ACER GRANDIDENTATUM 'SCHMIDT' OR APPROVED EQUAL	2" CAL.	30' O.C.	29
CORNUS NUTTALLII OR APPROVED EQUAL	2" CAL.	30' O.C.	20
LANDSCAPE AREA: GRASS, WOOD/ROCK MULCH OR APPROVED EQUAL		AS SHOWN	83,689 SF
STORMWATER FACILITY: GRASS, NATIVE SEED MIX OR APPROVED EQUAL		AS SHOWN	5,280 SF



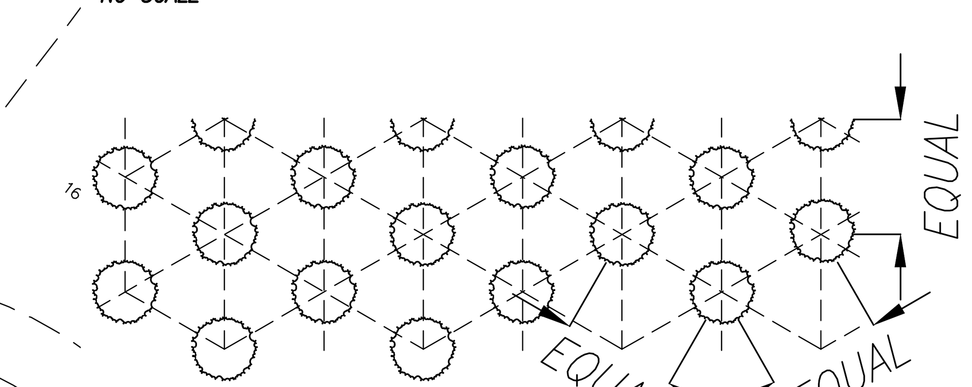
B&B Deciduous Tree Planting Details

NO SCALE



Shrub Planting Details

NO SCALE



NOTES:

ALL GROUND COVER SHALL BE PLANTED AT EQUAL TRIANGULAR SPACING AS SPECIFIED IN PLANTING LEGEND.
GROUND COVER TO BE LOCATED ONE HALF OF SPECIFIED SPACING DISTANCE FROM ANY HARD SURFACE, UNLESS OTHERWISE SPECIFIED.
SPECIFICATIONS ARE INCLUDED WITHIN PLAN SHEETS, LANDSCAPE NOTES AND SPECIFICATIONS. REFER TO ALL PRIOR TO BIDDING AND CONSTRUCTION.

TIMELINE & NARRATIVE

TREES IN THE PUBLIC RIGHT OF WAY SHALL BE INSTALLED BY DEVELOPER OR BUILDER PRIOR TO ISSUING OF OCCUPANCY PERMIT FOR LOT ADJACENT TO RIGHT OF WAY IN QUESTION.

TREES ON INDIVIDUAL LOTS SHALL BE INSTALLED BY DEVELOPER OR BUILDER PRIOR TO ISSUING OF OCCUPANCY PERMIT FOR SAID LOT. TREES ARE EASILY DAMAGED DURING CONSTRUCTION AND SHOULD NOT BE INSTALLED UNTIL AFTER ALL DRIVEWAYS, SIDEWALKS AND HEAVY CONSTRUCTION ACTIVITIES ARE COMPLETED.

TREES SHALL BE WATERED AND MAINTAINED IN A HEALTHY CONDITION YEAR ROUND. EXISTING TREES SHALL BE PROTECTED FROM DAMAGE DURING AND FOLLOWING CONSTRUCTION. PRUNING AND OTHER MAINTENANCE SHALL BE PERFORMED BY INDIVIDUAL HOMEOWNERS OR THE HOMEOWNER'S ASSOCIATION.

LANDSCAPE NOTES

LANDSCAPING SHALL BE WATERED WITH AN IRRIGATION SYSTEM CAPABLE OF SUSTAINING THE PLANTINGS IN A HEALTHY CONDITION YEAR AROUND.

TREES AND OTHER PLANTINGS SHALL BE PRUNED, WATERED, FERTILIZED AND MAINTAINED IN A HEALTHY CONDITION.

APPROXIMATE LOCATIONS FOR TREES ARE SHOWN ON THE PLAN. EXACT LOCATIONS TO BE DETERMINED BY DEVELOPER OR BUILDER AFTER CONSTRUCTION OF DRIVEWAYS, SIDEWALKS AND BUILDINGS.

SGA ENGINEERING & DESIGN
CIVIL ENGINEERING ~ LAND PLANNING
DEVELOPMENT SERVICES
LANDSCAPE ARCHITECTURE

2005 BROADWAY
VANCOUVER, WA 98663
PHONE (360)993-0911
FAX (360)993-0912

PRELIMINARY NOT FOR CONSTRUCTION
STATE OF WASHINGTON LICENSED LANDSCAPE ARCHITECT
SCOTT A. TAYLOR
LICENSE NO. 1247
EXPIRES ON ____________

PRELIMINARY LANDSCAPE PLAN

48TH AVE PUD SUBDIVISION

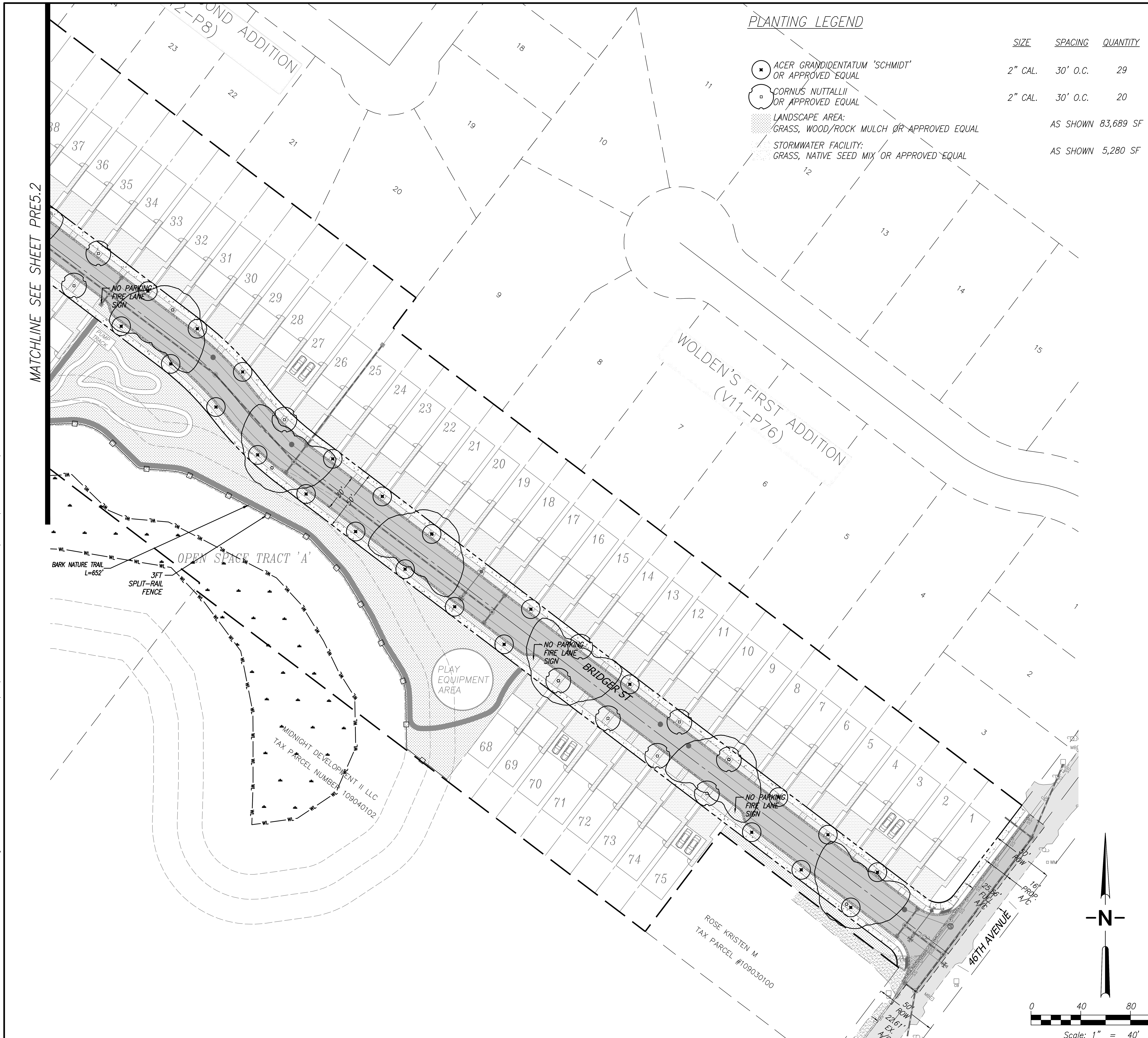
LONGVIEW WASHINGTON

PRELIMINARY

REVISIONS

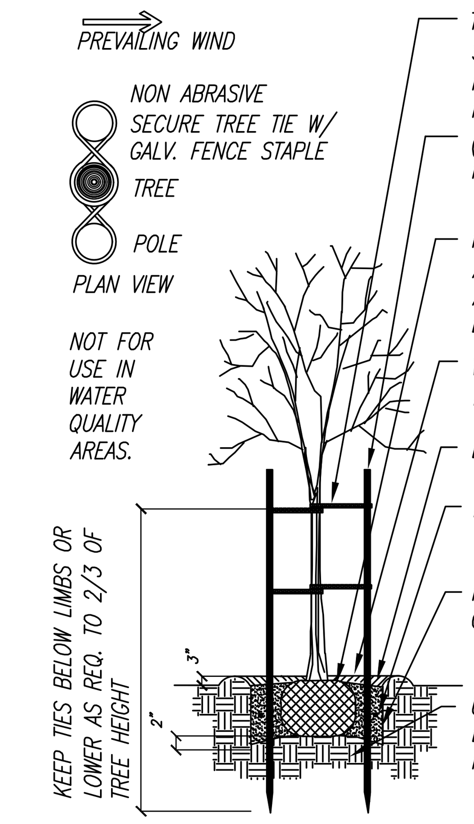
DESIGNED BY:	NLH/SAT
DRAWN BY:	NLH/SAT
CHECKED BY:	NAW/SAT
SCALE:	1" = 60'

JOB NUMBER	SHEET
2418	PRE5.0



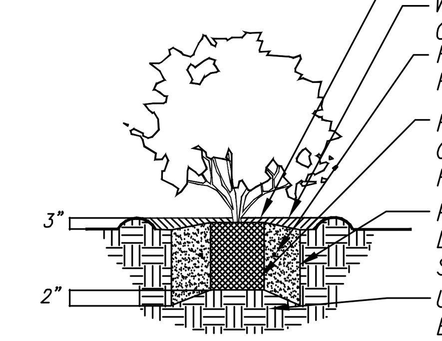
PLANTING LEGEND

	SIZE	SPACING	QUANTITY
ACER GRANDIDENTATUM 'SCHMIDT' OR APPROVED EQUAL	2" CAL.	30' O.C.	29
CORNUS NUTTALLII OR APPROVED EQUAL	2" CAL.	30' O.C.	20
LANDSCAPE AREA: GRASS, WOOD/ROCK MULCH OR APPROVED EQUAL		AS SHOWN	83,689 SF
STORMWATER FACILITY: GRASS, NATIVE SEED MIX OR APPROVED EQUAL		AS SHOWN	5,280 SF



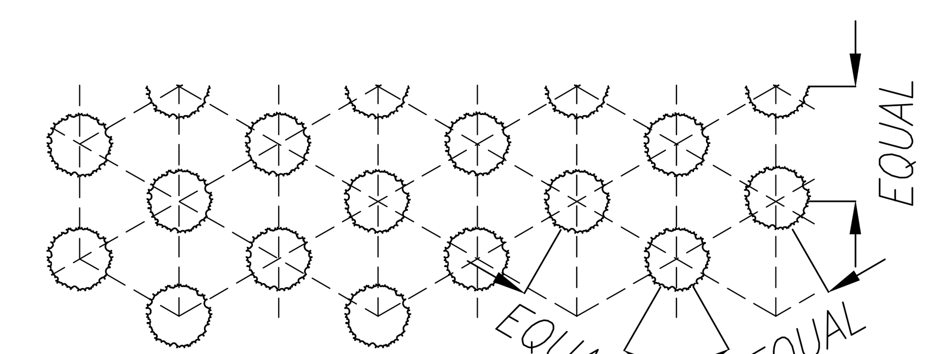
B&B Deciduous Tree Planting Details

NO SCALE



Shrub Planting Details

NO SCALE



NOTES:

ALL GROUND COVER SHALL BE PLANTED AT EQUAL TRIANGULAR SPACING AS SPECIFIED IN PLANTING LEGEND.
GROUND COVER TO BE LOCATED ONE HALF OF SPECIFIED SPACING DISTANCE FROM ANY HARD SURFACE, UNLESS OTHERWISE SPECIFIED.
SPECIFICATIONS ARE INCLUDED WITHIN PLAN SHEETS, LANDSCAPE NOTES AND SPECIFICATIONS. REFER TO ALL PRIOR TO BIDDING AND CONSTRUCTION.

TIMELINE & NARRATIVE

TREES IN THE PUBLIC RIGHT OF WAY SHALL BE INSTALLED BY DEVELOPER OR BUILDER PRIOR TO ISSUING OF OCCUPANCY PERMIT FOR LOT ADJACENT TO RIGHT OF WAY IN QUESTION.

TREES ON INDIVIDUAL LOTS SHALL BE INSTALLED BY DEVELOPER OR BUILDER PRIOR TO ISSUING OF OCCUPANCY PERMIT FOR SAID LOT. TREES ARE EASILY DAMAGED DURING CONSTRUCTION AND SHOULD NOT BE INSTALLED UNTIL AFTER ALL DRIVEWAYS, SIDEWALKS AND HEAVY CONSTRUCTION ACTIVITIES ARE COMPLETED.

TREES SHALL BE WATERED AND MAINTAINED IN A HEALTHY CONDITION YEAR ROUND. EXISTING TREES SHALL BE PROTECTED FROM DAMAGE DURING AND FOLLOWING CONSTRUCTION. PRUNING AND OTHER MAINTENANCE SHALL BE PERFORMED BY INDIVIDUAL HOMEOWNERS OR THE HOMEOWNER'S ASSOCIATION.

LANDSCAPE NOTES

LANDSCAPING SHALL BE WATERED WITH AN IRRIGATION SYSTEM CAPABLE OF SUSTAINING THE PLANTINGS IN A HEALTHY CONDITION YEAR AROUND.

TREES AND OTHER PLANTINGS SHALL BE PRUNED, WATERED, FERTILIZED AND MAINTAINED IN A HEALTHY CONDITION.

APPROXIMATE LOCATIONS FOR TREES ARE SHOWN ON THE PLAN. EXACT LOCATIONS TO BE DETERMINED BY DEVELOPER OR BUILDER AFTER CONSTRUCTION OF DRIVEWAYS, SIDEWALKS AND BUILDINGS.

SGA ENGINEERING & DESIGN
CIVIL ENGINEERING ~ LAND PLANNING
DEVELOPMENT SERVICES
LANDSCAPE ARCHITECTURE

2005 BROADWAY
VANCOUVER, WA 98663
PHONE (360)993-0911
FAX (360)993-0912

PRELIMINARY NOT FOR CONSTRUCTION
STATE OF WASHINGTON LICENSED LANDSCAPE ARCHITECT
SCOTT A. TAYLOR
LICENSE NO. 1247
EXPIRES ON ____________

PRELIMINARY LANDSCAPE PLAN ENLARGED

48TH AVE PUD SUBDIVISION

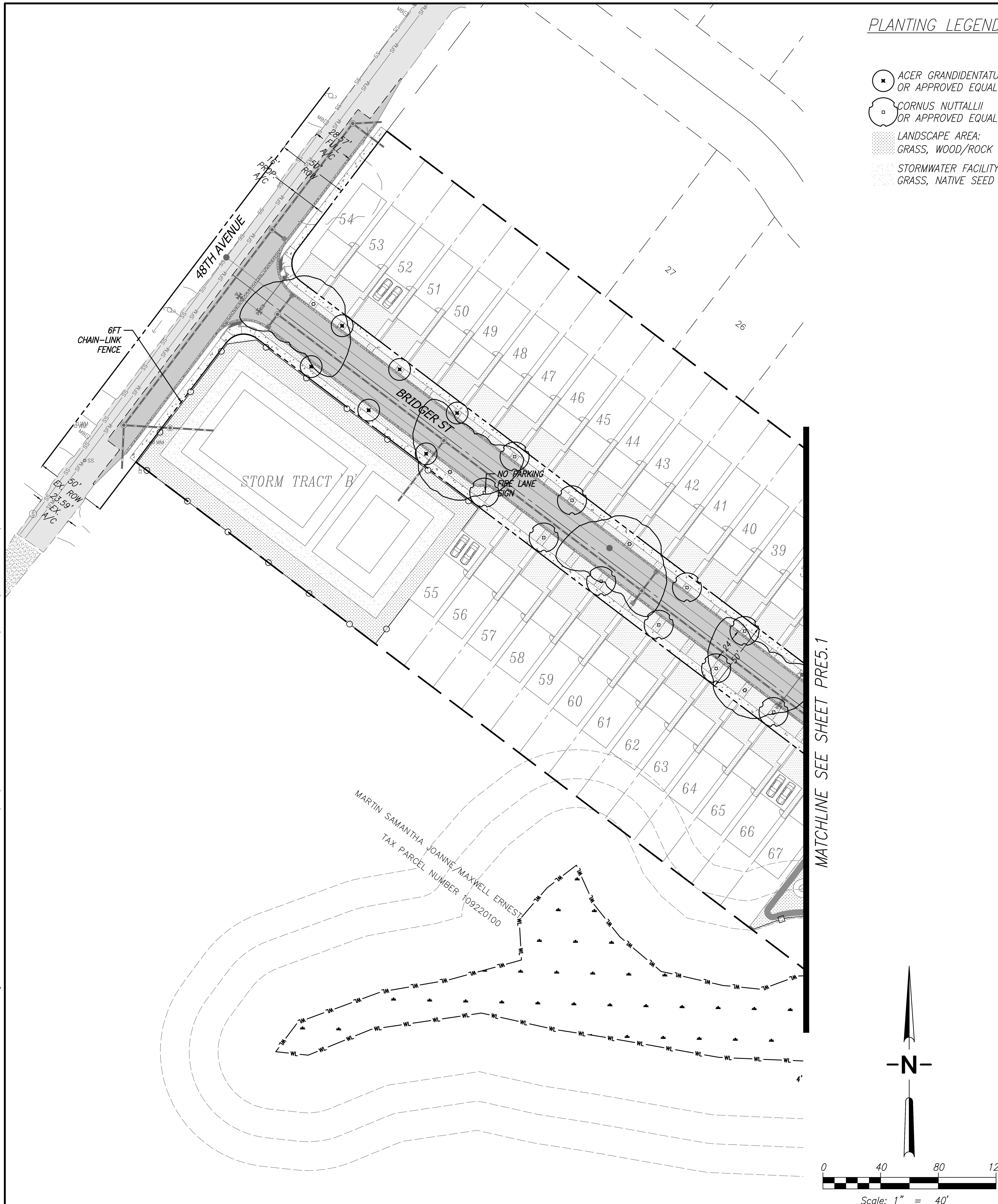
LONGVIEW WASHINGTON

PRELIMINARY

REVISIONS

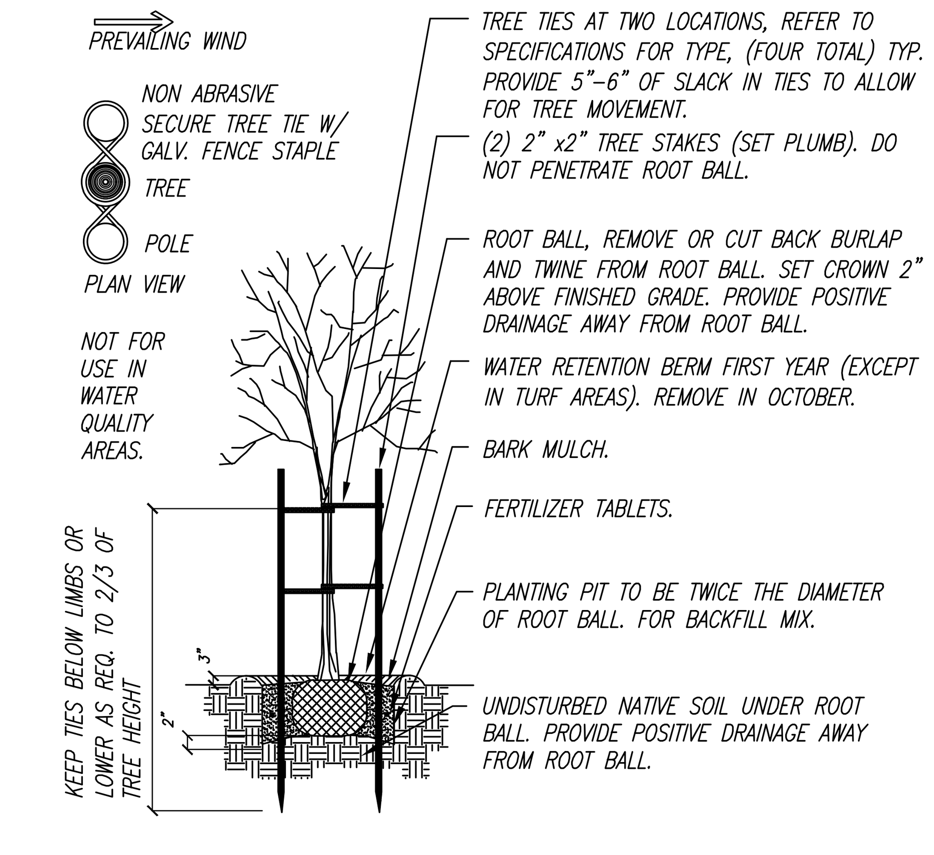
DESIGNED BY:	NLH/SAT
DRAWN BY:	NLH/SAT
CHECKED BY:	NAW/SAT
SCALE:	1" = 40'

JOB NUMBER	SHEET
2418	PRE5.1



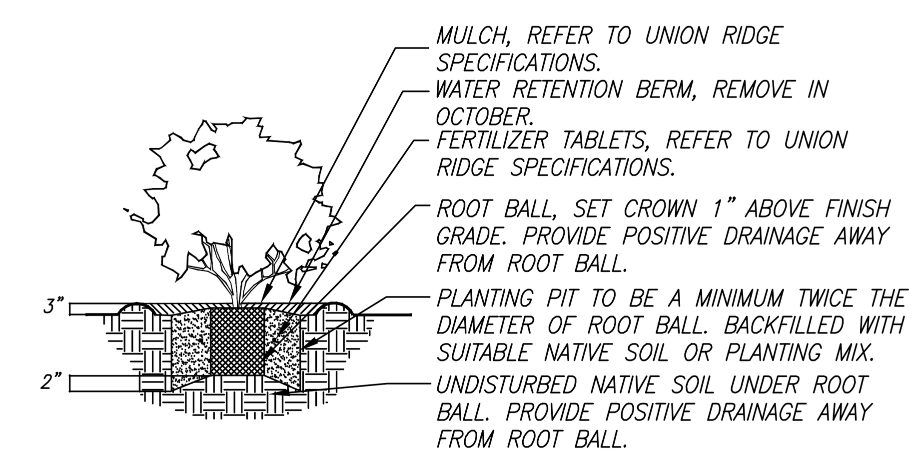
PLANTING LEGEND

	SIZE	SPACING	QUANTITY
ACER GRANDIDENTATUM 'SCHMIDT' OR APPROVED EQUAL	2" CAL.	30' O.C.	29
CORNUS NUTTALLII OR APPROVED EQUAL	2" CAL.	30' O.C.	20
LANDSCAPE AREA: GRASS, WOOD/ROCK MULCH OR APPROVED EQUAL		AS SHOWN	83,689 SF
STORMWATER FACILITY: GRASS, NATIVE SEED MIX OR APPROVED EQUAL		AS SHOWN	5,280 SF



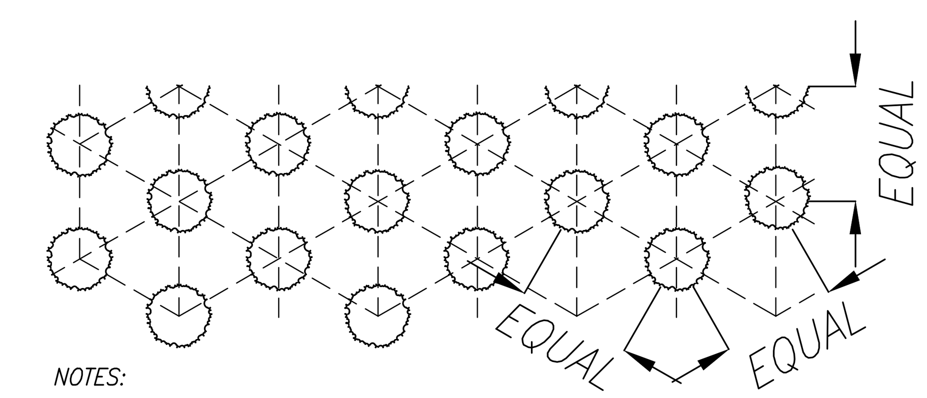
B&B Deciduous Tree Planting Details

NO SCALE



Shrub Planting Details

NO SCALE



NOTES:

ALL GROUND COVER SHALL BE PLANTED AT EQUAL TRIANGULAR SPACING AS SPECIFIED IN PLANTING LEGEND. GROUND COVER TO BE LOCATED ONE HALF OF SPECIFIED SPACING DISTANCE FROM ANY HARD SURFACE, UNLESS OTHERWISE SPECIFIED. SPECIFICATIONS ARE INCLUDED WITHIN PLAN SHEETS, LANDSCAPE NOTES AND SPECIFICATIONS. REFER TO ALL PRIOR TO BIDDING AND CONSTRUCTION.

TIMELINE & NARRATIVE

TREES IN THE PUBLIC RIGHT OF WAY SHALL BE INSTALLED BY DEVELOPER OR BUILDER PRIOR TO ISSUING OF OCCUPANCY PERMIT FOR LOT ADJACENT TO RIGHT OF WAY IN QUESTION.

TREES ON INDIVIDUAL LOTS SHALL BE INSTALLED BY DEVELOPER OR BUILDER PRIOR TO ISSUING OF OCCUPANCY PERMIT FOR SAID LOT. TREES ARE EASILY DAMAGED DURING CONSTRUCTION AND SHOULD NOT BE INSTALLED UNTIL AFTER ALL DRIVEWAYS, SIDEWALKS AND HEAVY CONSTRUCTION ACTIVITIES ARE COMPLETED.

TREES SHALL BE WATERED AND MAINTAINED IN A HEALTHY CONDITION YEAR ROUND. EXISTING TREES SHALL BE PROTECTED FROM DAMAGE DURING AND FOLLOWING CONSTRUCTION. PRUNING AND OTHER MAINTENANCE SHALL BE PERFORMED BY INDIVIDUAL HOMEOWNERS OR THE HOMEOWNER'S ASSOCIATION.

LANDSCAPE NOTES

LANDSCAPING SHALL BE WATERED WITH AN IRRIGATION SYSTEM CAPABLE OF SUSTAINING THE PLANTINGS IN A HEALTHY CONDITION YEAR AROUND.

TREES AND OTHER PLANTINGS SHALL BE PRUNED, WATERED, FERTILIZED AND MAINTAINED IN A HEALTHY CONDITION.

APPROXIMATE LOCATIONS FOR TREES ARE SHOWN ON THE PLAN. EXACT LOCATIONS TO BE DETERMINED BY DEVELOPER OR BUILDER AFTER CONSTRUCTION OF DRIVEWAYS, SIDEWALKS AND BUILDINGS.

SGA ENGINEERING & DESIGN
CIVIL ENGINEERING ~ LAND PLANNING
DEVELOPMENT SERVICES
LANDSCAPE ARCHITECTURE

2005 BROADWAY
VANCOUVER, WA 98663
PHONE (360)993-0911
FAX (360)993-0912

PRELIMINARY NOT FOR CONSTRUCTION
STATE OF WASHINGTON LICENSED LANDSCAPE ARCHITECT
SCOTT A. TAYLOR
LICENSE NO. 1247
EXPIRES ON ________

48TH AVE PUD SUBDIVISION

PRELIMINARY LANDSCAPE PLAN ENLARGED

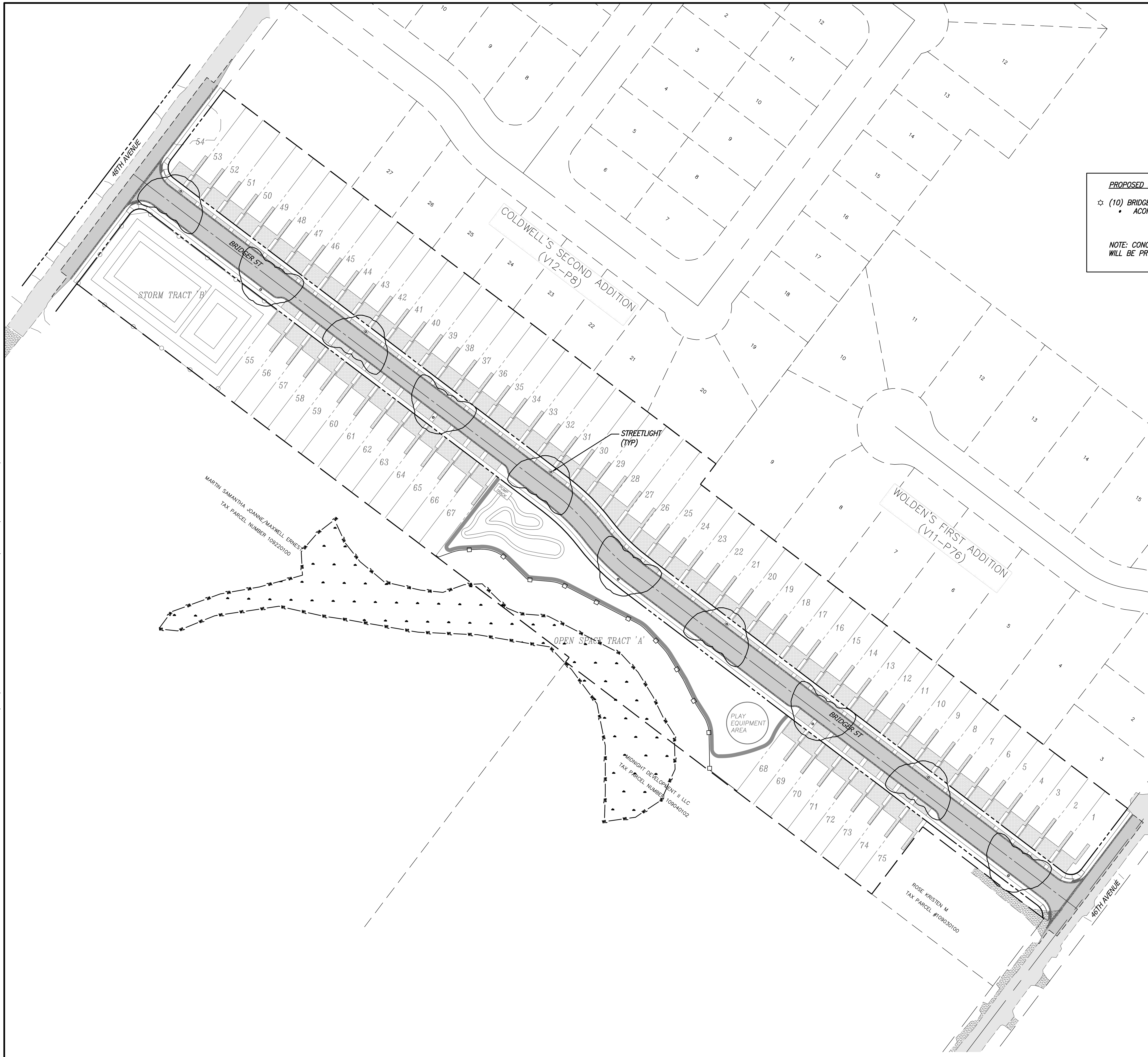
LONGVIEW WASHINGTON

PRELIMINARY

REVISIONS

DESIGNED BY:	NLH/SAT
DRAWN BY:	NLH/SAT
CHECKED BY:	NAW/SAT
SCALE:	1" = 40'

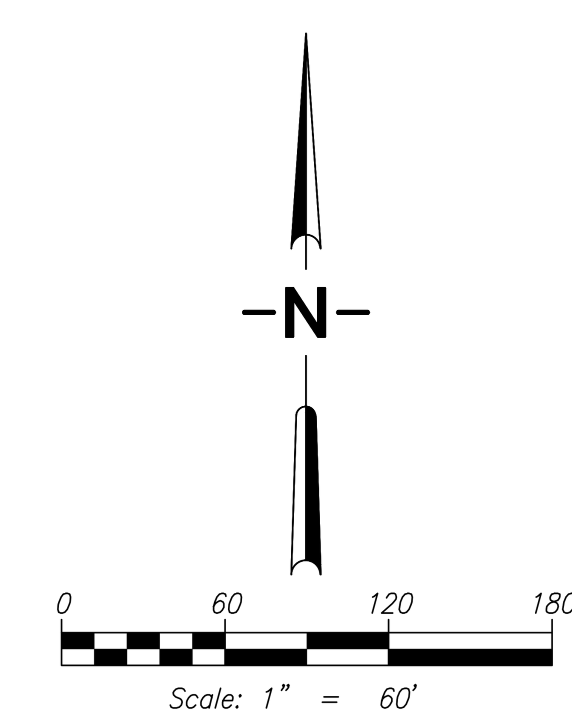
JOB NUMBER	SHEET
2418	PRE5.2



PROPOSED STREET LIGHTS (TYP):

☼ (10) BRIDGER STREET
- ACORN FULL CUTOFF SINGLE FIXTURE

NOTE: CONCEPTUAL LIGHTING PLAN SHOWN. A PHOTOMETRIC PLAN & DETAIL SHEETS WILL BE PROVIDED DURING FINAL ENGINEERING



SGA ENGINEERING & DESIGN
CIVIL ENGINEERING ~ LAND PLANNING
DEVELOPMENT SERVICES
LANDSCAPE ARCHITECTURE

2005 BROADWAY
VANCOUVER, WA 98663
PHONE (360)993-0911
FAX (360)993-0912

PRELIMINARY

PRELIMINARY LIGHTING PLAN

48TH AVE PUD SUBDIVISION

LONGVIEW WASHINGTON

PRELIMINARY

REVISIONS

DESIGNED BY:	NLH/SAT
DRAWN BY:	NLH/SAT
CHECKED BY:	NAW
SCALE:	1" = 60'

JOB NUMBER	SHEET
2418	PRE6.0

TRAFFIC ANALYSIS REPORT

FOR

48TH AVENUE PUD SUBDIVISION

46TH & 48TH AVENUES

LONGVIEW

SUBMITTED BY

CHARBONNEAU
ENGINEERING LLC

February 2025

Project 25-03

TRAFFIC ANALYSIS REPORT

FOR

48TH AVENUE PUD SUBDIVISION

46TH & 48TH AVENUES

LONGVIEW

Prepared By

CHARBONNEAU Engineering LLC

2-21-25

FRANK R CHARBONNEAU
STATE OF WASHINGTON
17586
REGISTERED
PROFESSIONAL ENGINEER

February 2025

Project 25-03

8516 SW 61st Avenue, Portland, OR 97219 Phone: (971) 322-8003

TABLE OF CONTENTS

FL2517

INTRODUCTION.......... 1
TRAFFIC ANALYSIS CONSIDERATIONS.......... 1
SITE DESCRIPTION, STREETS, ACCESS, AND CRITICAL INTERSECTIONS.......... 2
TRAFFIC OPERATIONAL ANALYSIS.......... 2
VEHICULAR TRIP GENERATION.......... 3
CAPACITY ANALYSIS.......... 3
QUEUING ANALYSIS.......... 5
SIGHT DISTANCE.......... 6
LEFT TURN LANE REQUIREMENTS.......... 6
TRAFFIC SIGNAL WARRANTS.......... 6
ACCIDENT HISTORY.......... 6
PEDESTRIANS, BICYCLES, & BUSES.......... 7
SUMMARY AND RECOMMENDATIONS.......... 7
APPENDIX.......... 9

Appendix

- Vicinity Map — Figure \`a\`
- Site Plan — Figure \`b\`
- Lane Configurations &Traffic Control — Figure \`c\`
- Traffic Flow Diagrams
  - Figure 1 — Year 2025 Existing Traffic, AM & PM Peak Hours
  - Figure 2 — In-Process Traffic
  - Figure 3 — Year 2028 Background Traffic
  - Figure 4 — Trip Distribution
  - Figures 5a & 5b — Trip Assignment, AM & PM Peak Hours
  - Figure 6 — Year 2028 Total Traffic, AM & PM Peak Hours
- Traffic Count Data
- In-Process Traffic Projects
- Peak Hour Signal Warrant
- Accident History Summary (furnished by WSDOT)
- Synchro Capacity Analysis Reports

INTRODUCTION

This traffic study has been prepared to evaluate and document the operations and safety conditions for the 48th Avenue PUD Subdivision development being planned in Longview, Washington. The development will construct a total of 75 single-family detached housing units on acreage between 46th Avenue and 48th Avenue approximately a quarter-mile southwesterly of SR4/Ocean Beach Highway. The property site includes several tax lots (#108990100, #109000100, #109010100, #109020100, #109230100 & #109240100). Figure 'a' in the appendix is a vicinity map highlighting the project location.

In accordance with the City's requirements the traffic study area was defined as the surrounding vicinity and several intersections along SR4/Ocean Beach Highway from 38th Avenue to 48th Avenues.

TRAFFIC ANALYSIS CONSIDERATIONS

In the project scope established with Longview's City Engineer, a number of important elements were identified and considered in this study.

- Inventory and record pertinent information such as traffic control devices, circulation patterns, lane conditions, pedestrian & bicycle facilities, transit zones, parking, and street characteristics.
- Record data on typical weekdays during the AM and PM peak traffic hours.
- As confirmed by the City the following study intersections were analyzed.

    - SR4/Ocean Beach Highway at 38th Avenue
    - SR4/Ocean Beach Highway at 46th Avenue
    - SR4/Ocean Beach Highway at 48th Avenue

- New traffic counts were collected in January 2025 at the 46th and 48th Avenue intersections. A historical count from October 2024 was used for the 38th Avenue intersection. The data consisted of intersection turning movement counts for the AM & PM peak hours.
- Three years of traffic growth at 1.0% per year was applied. City staff confirmed that in-process traffic was applicable for this project.
- Level of service (LOS) analysis of the study intersections to measure the approach delays for comparison to WSDOT and City of Longview standards.
- Determination of vehicular queuing at the study intersections.
- Review intersection sight distance at the proposed access locations on 48th Avenue and 46th Avenue.
- Review traffic accident data furnished by WSDOT. Determine the intersection crash rates at the study intersections.

SITE DESCRIPTION, STREETS, ACCESS, AND CRITICAL INTERSECTIONS

Development of the 48th Avenue PUD Subdivision is planned for 75 single-family homes. The property currently is vacant land without any structures. Vehicular access as shown on the site plan will include full-movement street connections to 46th and 48th Avenues. The new accesses will be configured as tee-shaped intersection designs and controlled by stop signing on the driveway approaches.

The project site plan (Figure 'b') illustrates the two access locations.

The existing and proposed lane configurations and traffic control are presented in Figure `c` in the report's appendix.

SR4/Ocean Beach Highway is a state highway configured with a five-lane section (two travel lanes in each direction, and a center left turn lane). There are no bike lanes. Sidewalks are present. The posted travel speed is 35 MPH.

SR4/Ocean Beach Highway at 38th Avenue is a four-way signalized intersection with separate left turn lanes and protected left turn phasing on the highway approaches. Both approaches on 38th Avenue include two lanes (left turn & combination through/right turn lane). All approaches have pedestrian crosswalks with pushbutton actuation.

SR4/Ocean Beach Highway at 46th Avenue is a four-way signalized intersection with separate left turn lanes and protected/permissive left turn phasing on the highway approaches. The 46th Avenue approaches consist of single-lane approaches and operate with concurrent signal phasing. All approaches have pedestrian crosswalks with pushbutton actuation.

SR4/Ocean Beach Highway at 48th Avenue is a stop-controlled intersection with stop signing on the 48th Avenue approaches. The highway includes a center turn lane and two travel lanes in each direction. There are no separate turn lanes on the 48th Avenue approaches. Crosswalks are marked on the side street approaches.

TRAFFIC OPERATIONAL ANALYSIS

The study intersections were analyzed for level of service (LOS) conditions, delay, v/c, and safety. A total of three intersections on SR4/Ocean Beach Highway were evaluated. LOS and queuing analyses were completed in the AM and PM peak hour periods for the following scenarios:

- Year 2025 Traffic
- 2028 Background Traffic
- 2028 Total Traffic

In order to perform the LOS analysis, it was necessary to collect traffic counts. The October 2024 & January 2025 count data is included in the appendix. Figure 1 illustrates the turning movement volumes for each study intersection.

Three years of traffic growth at 1.0% per year has been added to the year 2025 volumes to account for the background traffic volumes. In-Process traffic data from several recent developments was also included in the background traffic. The development projects included the West Brook Apartments, Mount Solo Subdivision, Mount Solo Apartments, and Mount Solo Road Subdivision. The in-process traffic is shown of Figure 2 and the year 2028 background traffic volumes are illustrated in Figure 3.

The year 2028 total traffic (the summation of background traffic volumes and site generated traffic) is presented in Figure 6.

VEHICULAR TRIP GENERATION

Trip rates presented in the Institute of Transportation Engineers (ITE) Trip Generation manual, 11th edition (year 2021) were utilized to estimate the site's trip generation for 75 single-family homes. The trip generation is summarized in Table 1.

Table 1 Trip Generation Summary.

ITE Land Use	Units (#)	Weekday						
		ADT	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
Single-Family (#210)	75							
Generation Rate [1]		9.43	0.70	25%	75%	0.94	63%	37%
Site Trips		**707**	**53**	13	40	**71**	45	26

[1] Source: *Trip Generation*, 11th Edition, ITE, 2021, average rates.

Development of project is expected to generate 707 daily trips, 53 AM peak hour trips, and 71 PM peak hour trips.

The 48th Avenue PUD Subdivision trip distribution was based on input provided by the City Engineer, traffic count data, and engineering judgment. The distribution is illustrated on Figure 4. The corresponding trip assignments are presented in Figures 5a & 5b for the AM & PM peak hours, respectively.

CAPACITY ANALYSIS

Capacity analyses were performed to determine the levels of service for the weekday peak hours. Synchro v11.1 software was used to determine the approach delays, volume/capacity (v/c) and level of service for the study intersections. The program is based on the Highway Capacity Manual (6th edition) methodology. Table 2 summarizes the analysis results. Copies of the capacity analysis summaries are included in the appendix.

Table 2 Capacity Analysis Summary

Intersection	Type of Control	Peak Hour	Traffic Scenario											
			2025 Existing				2028 Background				2028 Total			
			Crit. Mov't	LOS	Delay	v/c	Crit. Mov't	LOS	Delay	v/c	Crit. Mov't	LOS	Delay	v/c
48th Avenue & Ocean Beach Hwy (SR-4)	Two-way Stop	AM	SB	B	14.5	0.06	SB	C	15.3	0.07	NB	C	15.5	0.10
		PM	SB	C	20.2	0.10	SB	C	22.3	0.11	SB	C	22.4	0.11
Site Access & 48th Avenue	Two-way Stop	AM	-	-	-	-	-	-	-	-	WB	A	5.4	0.01
		PM	-	-	-	-	-	-	-	-	WB	A	8.3	0.01
46th Avenue & Ocean Beach Hwy (SR-4)	Signal	AM	-	B	19.1	0.35	-	B	19.3	0.37	-	B	19.1	0.38
		PM	-	C	20.4	0.40	-	C	21.2	0.42	-	C	21.4	0.45
Site Access & 46th Avenue	Two-way Stop	AM	-	-	-	-	-	-	-	-	EB	A	8.7	0.03
		PM	-	-	-	-	-	-	-	-	EB	A	8.7	0.02
38th Avenue & Ocean Beach Hwy (SR-4)	Signal	AM	-	D	41.3	0.56	-	D	43.3	0.61	-	D	47.3	0.62
		PM	-	D	52.1	0.69	-	E	55.2	0.73	-	E	55.7	0.73

Notes: 2016 Highway Capacity Manual methodology used in analysis, Synchro v11. NB - Northbound, SB - Southbound, EB - Eastbound, WB - Westbound, Crit. Mov't - Critical movement or critical approach.

SR4/Ocean Beach Highway is a state highway under the jurisdiction of WSDOT which maintains and controls the route. It is classified as a highway of statewide significance (HSS) based on Revised Code of Washington (RCW) 47.80.030(1)(c). According to the Comprehensive Plan (Chapter 8 – Transportation & Circulation, Table 8-3) the City's standard for intersection operations is LOS `D` (or better) with a volume to capacity ratio (v/c) of 0.89 or less.

The analysis of the study intersection determined the following;

SR4/Ocean Beach Highway at 48th Avenue
Acceptable LOS `C` or better will be maintained in the AM & PM peak hours for the year 2025 existing traffic, year 2028 background traffic, and year 2028 total traffic scenarios for this stop-controlled intersection. No improvements are necessary in conjunction with the proposed development.

SR4/Ocean Beach Highway at 46th Avenue
The signalized intersection will maintain LOS `C` or better through the year 2028 total traffic scenario. The v/c will not exceed 0.45 in any of the scenarios and meets the standard through the year 2028 total traffic scenario. No improvements are necessary.

SR4/Ocean Beach Highway at 38th Avenue
Acceptable LOS `D` will be maintained in the AM peak hour for the year 2025 existing traffic, year 2028 background traffic, and year 2028 total traffic scenarios and the v/c will not exceed 0.62 for this signalized intersection. In the PM peak hour the LOS currently equates to LOS `D` and LOS `E` in the year 2028 background and year 2028 total traffic scenarios and the v/c will not exceed a value of 0.73. Since the v/c values meet the standard and essentially the average vehicle delay does not change between the year 2028 background and total traffic scenarios, no mitigation is recommended.

The proposed site access approaches on 48th Avenue and 46th Avenue will experience acceptable LOS `A` conditions through the year 2028 total traffic scenario.

Generally, LOS `A`, `B`, `C`, and `D` are desirable service levels ranging from no vehicle delays to average or longer than average delays in the peak hours. Level `E` represents long delays indicating signalization warrants need to be reviewed and signals considered only if warrants are met. Level `F` indicates that intersection improvements, such as widening and signalization, may be required. According to the Highway Capacity Manual (HCM*)*, the following delay times are associated with the LOS at stop controlled unsignalized and signalized intersections.

Level of Service criteria defined in Highway Capacity Manual

Level of Service (LOS)	Unsignalized Control Stopped Delay (sec/veh)	Signalized Control Stopped Delay (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

QUEUING ANALYSIS
Queue lengths based on the 95th percentile demand values for the study intersections were established in the Synchro analysis. Copies of the reports are included in the appendix.

At one intersection the queue was projected to extend beyond the length of the marked turn lane. At SR4/Ocean Beach Highway and 38th Avenue the northwest-bound left turn movement experiences the longest queues in the PM peak hour. For the year 2024 existing traffic the PM peak hour queue is 400 feet. For the year 2028 background and total traffic scenarios the projected queue is 450 feet in the PM peak hour. The existing storage distance is marked for 175 feet, however, the turn lane can be extended to 450 feet by restriping the median and channelization. No street widening will be needed and no public intersections will be blocked due to the long queue demand.

SIGHT DISTANCE

Intersection sight distance (ISD) at the proposed site access intersections at 48th Avenue and 46th Avenue was reviewed in accordance with AASHTO standards. The existing streets have posted travel speeds of 25 MPH. According to Table 9-7 of the AASHTO Policy on Geometric Design of Highways and Streets, for 25 MPH the required ISD equates to 280 feet. The existing street grades have nearly flat grades with tangent alignments. On 46th Avenue the ISD exceeds 500 feet in both directions from the site access point. On 48th Avenue the ISD exceeds 500 feet in both directions from the site access point. Therefore, the ISD standard is met at both locations.

When the development is constructed, it will be necessary to maintain the required sight distance. Placement of any objects such as building structures, walls, signing, parking, above ground utilities, or landscaping materials that obstruct the sightlines is not permitted for safety purposes.

LEFT TURN LANE REQUIREMENTS

Left turn lanes are currently available on SR4/Ocean Beach Highway at the study intersections. Left turn lanes are not warranted at the site access points on 48th and 46th Avenues due to the extremely low traffic volumes (less than 50 totaling entering vehicles in the AM peak hour & less than 65 total entering vehicles in the PM peak hour) . Therefore, it was not necessary to prepare a left turn lane warrant analysis.

TRAFFIC SIGNAL WARRANTS

The peak hour signal warrant was evaluated for the intersection at SR4/Ocean Beach Highway and 48th Avenue. It was determined that the warrant was not met through the year 2028 total traffic scenario. The warrant results are included in the appendix.

ACCIDENT HISTORY

Crash data for the study intersections was obtained from WSDOT staff and reviewed to help identify any traffic safety problems. The study period covered five years from January 2019 through December 2023.

The crash rates presented in Table 3 are based on the number of accidents per million entering vehicles (MEV) per year. Typically, an intersection is not considered unsafe unless its accident rate exceeds the threshold value of 1.0 accidents per MEV.

Table 3 Crash Rate Results

Intersection	Crash History (Years)	Number of Crashes	Crashes per year	Annual Traffic Entering (veh/yr)	Crash rate per M.E.V.*
48th Avenue and Ocean Beach Hwy (SR 4)	5	2	0.4	4097993	**0.10**
46th Avenue and Ocean Beach Hwy (SR 4)	5	12	2.4	4981874	**0.48**
38th Avenue and Ocean Beach Hwy (SR 4)	5	28	5.6	9715384	**0.58**

* M.E.V. - million entering vehicles.

None of the study intersections experienced a rate greater 0.58 MEV/year and therefore no safety improvements are recommended.

PEDESTRIANS, BICYCLES, & BUSES

Sidewalk is not available on 48th Avenue or on 46th Avenue in vicinity of the project site. Sidewalk will be constructed on the property's street frontage along both streets. Sidewalk will also be constructed within the development site to provide connectivity as illustrated on the site plan (Figure `b`).

Bicycle lanes are not available along 48th Avenue or 46th Avenue. No new bike lanes will be constructed with the development project.

River-Cities Transit provides service along SR4/Ocean Beach Highway with Route 44 on weekdays. No service is provided on the weekend.

SUMMARY AND RECOMMENDATIONS

The traffic study for the 48th Avenue PUD Subdivision development containing 75 housing units has been prepared to determine the potential impacts at the study intersections along SR4/Ocean Beach Highway. Development of the site is projected to generate 707 daily trips, 53 AM peak hour trips, and 71 PM peak hour trips.

Vehicular access as shown on the site plan will include street connections to 48th Avenue and 46th Avenue on the property's northwest and southeast sides, respectively. The new accesses will be controlled by stop signing on the approaches to 48th Avenue and 46th Avenue.

Intersection sight distance (ISD) at the proposed site access intersections with 48th Avenue and 46th Avenue was reviewed in accordance with AASHTO standards. The existing streets have posted travel speeds of 25 MPH, requiring a minimum of 280 feet of ISD in both directions. With over 500 feet of ISD available at both accesses the standard is met. When the development is constructed, it will be necessary to maintain the required sight distance.

Placement of any objects such as building structures, walls, signing, parking, above ground utilities, or landscaping materials that obstruct the sightlines is not permitted for safety purposes.

The analysis of the study intersection determined the following;

SR4/Ocean Beach Highway at 48th Avenue
Acceptable LOS `C` or better will be maintained in the AM & PM peak hours for the year 2025 existing traffic, year 2028 background traffic, and year 2028 total traffic scenarios for this stop-controlled intersection. No improvements are necessary in conjunction with the proposed development.

SR4/Ocean Beach Highway at 46th Avenue
The signalized intersection will maintain LOS `C` or better through the year 2028 total traffic scenario. The v/c will not exceed 0.45 in any of the scenarios and meets the standard through the year 2028 total traffic scenario. No improvements are necessary.

SR4/Ocean Beach Highway at 38th Avenue
Acceptable LOS `D` will be maintained in the AM peak hour for the year 2025 existing traffic, year 2028 background traffic, and year 2028 total traffic scenarios and the v/c will not exceed 0.62 for this signalized intersection. In the PM peak hour the LOS currently equates to LOS `D` and LOS `E` in the year 2028 background and year 2028 total traffic scenario and the v/c will not exceed a value of 0.73. Since the v/c values meet the standard and essentially the average vehicle delay does not change between the year 2028 background and total traffic scenarios, no mitigation is recommended.

The proposed site access approaches on 48th Avenue and 46th Avenue will experience acceptable LOS `A` conditions through the year 2028 total traffic scenario.

No additional turn lanes are required in conjunction with the development.

The peak hour signal warrant was evaluated for the intersection at SR4/Ocean Beach Highway and 48th Avenue. It was determined that the warrant was not met through the year 2028 total traffic scenario.

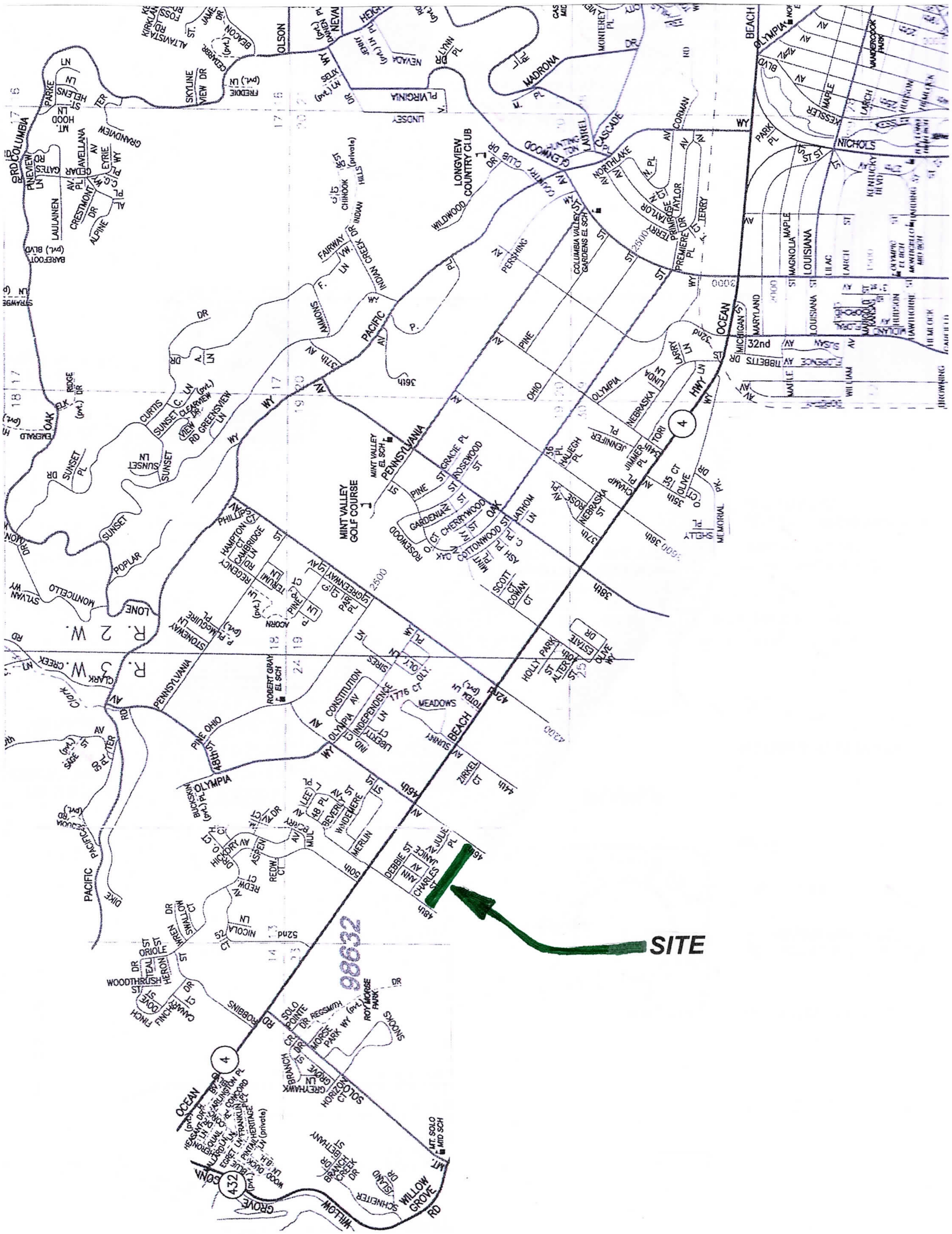
Crash data for the study intersections was obtained from WSDOT staff and reviewed to help identify any traffic safety problems. The study period covered five years from January 2019 through December 2028. Typically, an intersection is not considered unsafe unless its accident rate exceeds the threshold value of 1.0 accidents per MEV. It has been documented that none of the study intersections experienced a rate greater 0.58 MEV/year and therefore no safety improvements are recommended.

Stop signing with stop bar pavement markings are recommended on the site's access approaches to 48th Avenue and 46th Avenue.

One off-site intersection improvement is recommended in conjunction with the proposed development. To meet the existing, year 2028 background, and year 2028 total traffic conditions the northbound left turn lane at SR4/Ocean Beach Highway at 38th Avenue needs to be extended to provide for 450 feet by restriping the median. No street widening will be needed and no public intersections will be blocked due to the projected queue.

Appendix

- Vicinity Map — Figure \`a\`
- Site Plan — Figure \`b\`
- Lane Configurations &Traffic Control — Figure \`c\`
- Traffic Flow Diagrams
  - Figure 1 — Year 2025 Existing Traffic, AM & PM Peak Hours
  - Figure 2 — In-Process Traffic
  - Figure 3 — Year 2028 Background Traffic
  - Figure 4 — Trip Distribution
  - Figures 5a & 5b — Trip Assignment, AM & PM Peak Hours
  - Figure 6 — Year 2028 Total Traffic, AM & PM Peak Hours
- Traffic Count Data
- In-Process Traffic Projects
- Peak Hour Signal Warrant
- Accident History Summary (furnished by WSDOT)
- Synchro Capacity Analysis Reports



FILE NAME: 2503flow.dwg

PLOT DATE: 02.15.25

CHARBONNEAU ENGINEERING LLC

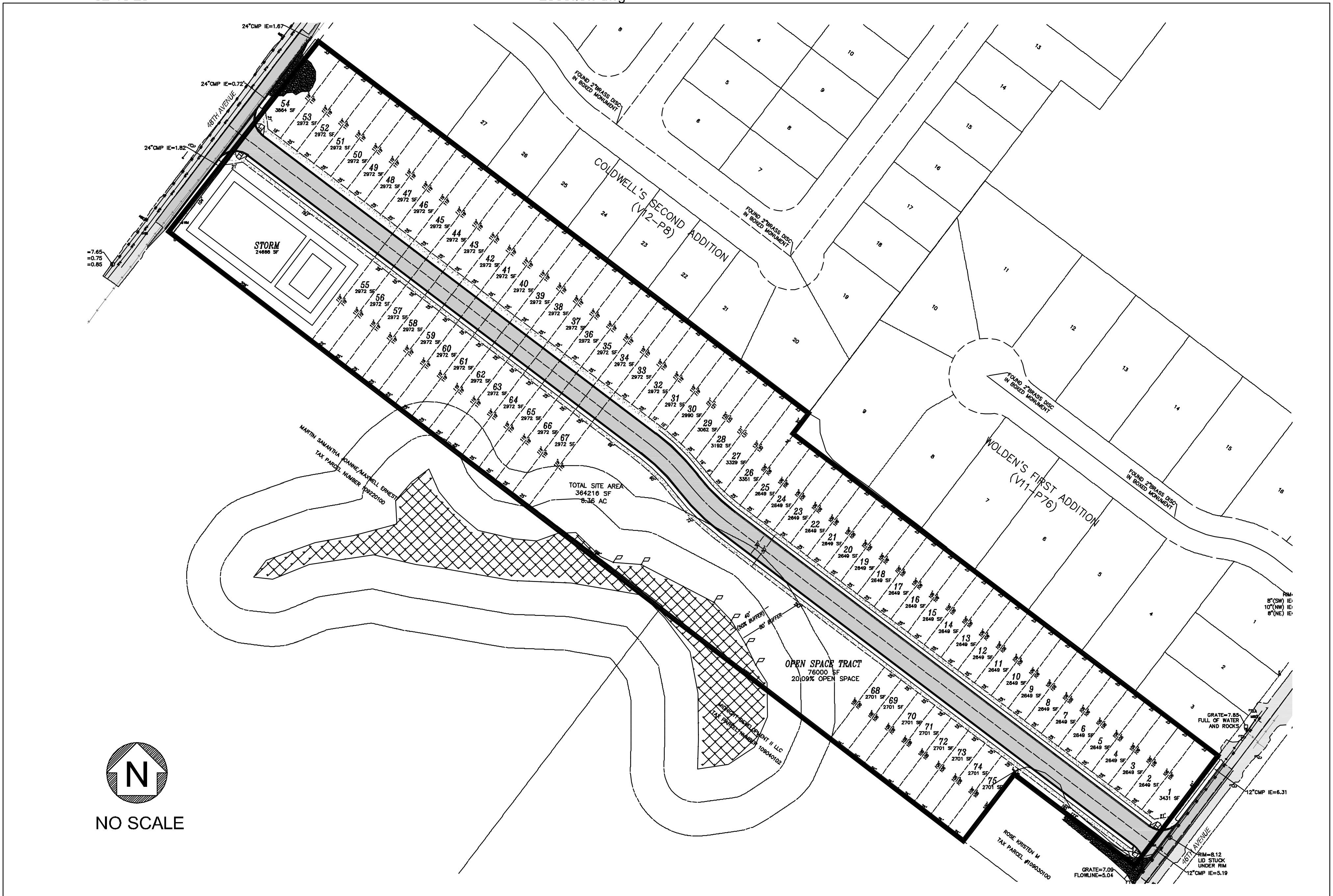
PROJECT: 25-03

NOTES:
NO SCALE

N

VICINITY MAP
48TH AVE PUD SUBDIVISION

FIGURE
a



CHARBONNEAU ENGINEERING LLC

PROJECT: 25-03

NOTES: Site plan designed by SGA Engineering & Design.

SITE PLAN

48TH AVE PUD SUBDIVISION

FIGURE

b

PLOT DATE: 02.15.25

FILE: 2503flow.dwg

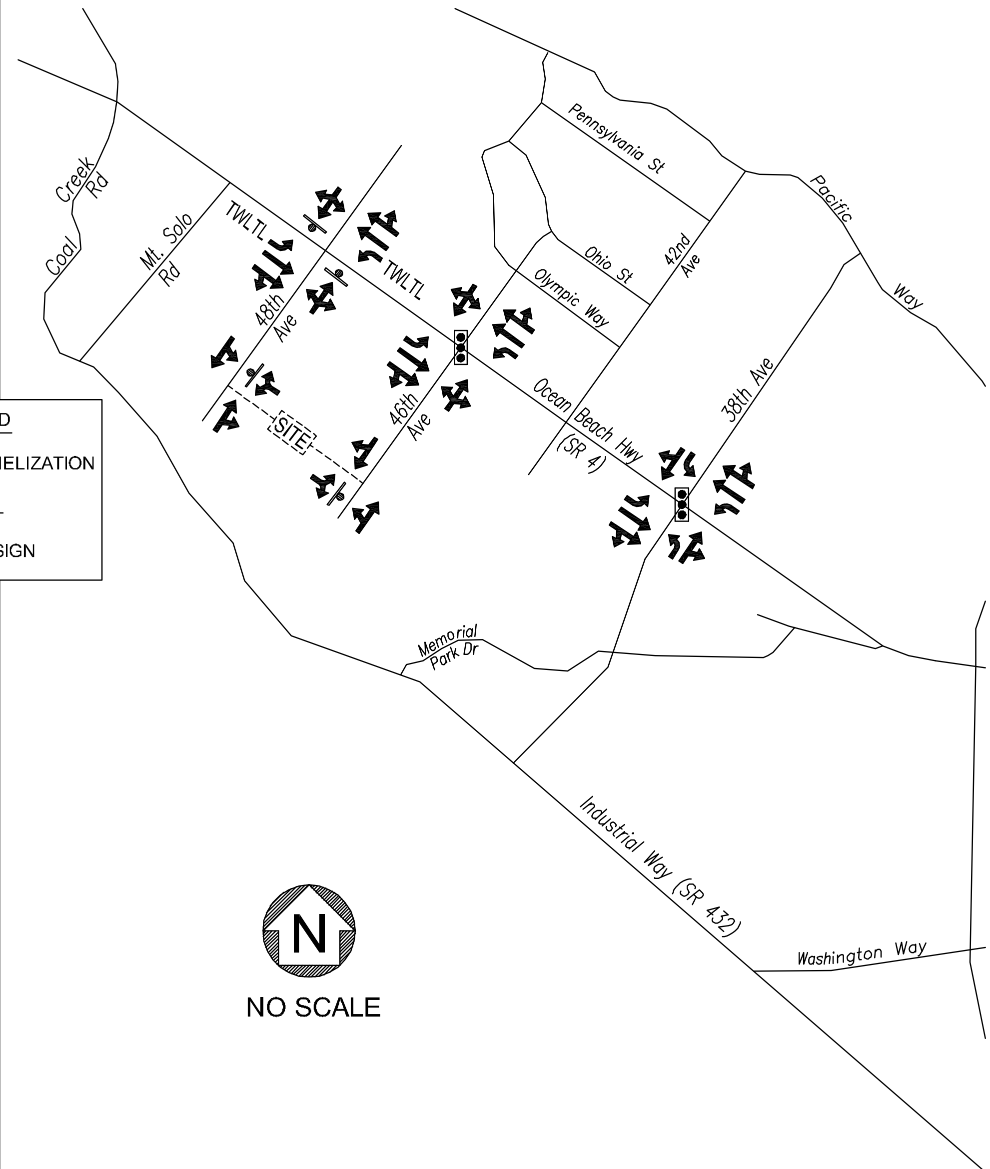
EXISTING

LEGEND

CHANNELIZATION

SIGNAL

STOP SIGN



PROPOSED

CHARBONNEAU ENGINEERING LLC

PROJECT: 25-03

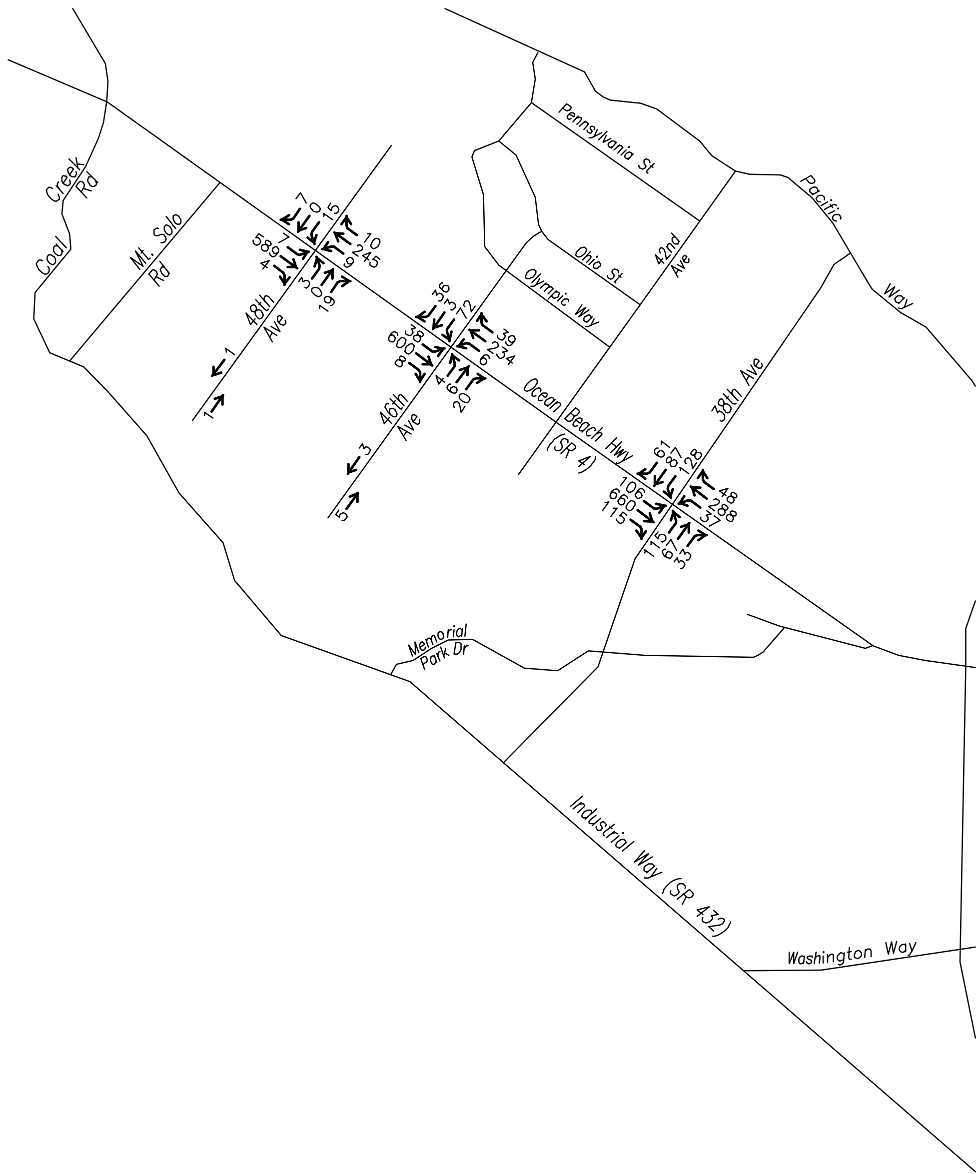
NOTES:

LANE CONFIGURATIONS AND TRAFFIC CONTROL

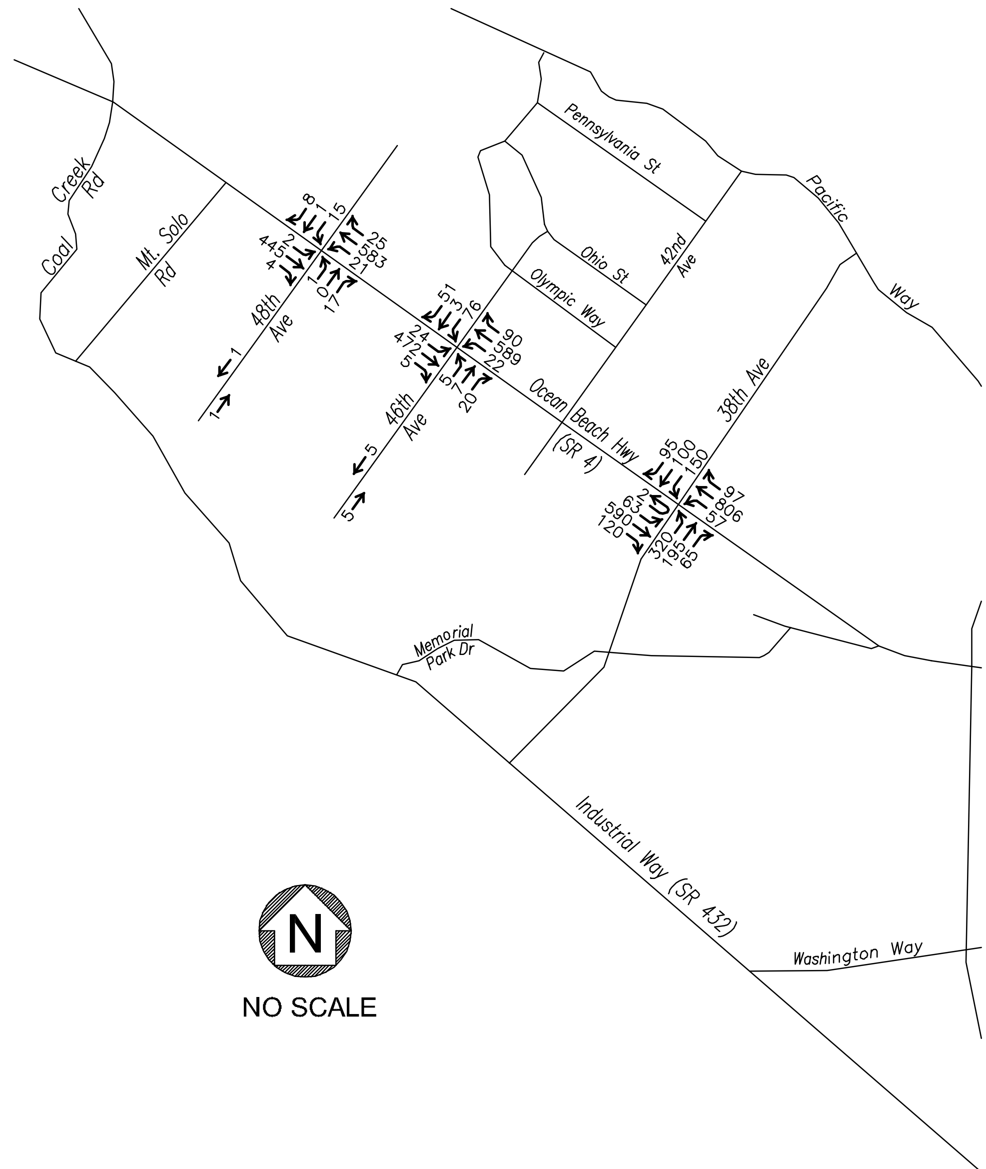
48TH AVE PUD SUBDIVISION

FIGURE

C



AM PEAK HOUR



PM PEAK HOUR

CHARBONNEAU ENGINEERING LLC

PROJECT: 25-03

NOTES:

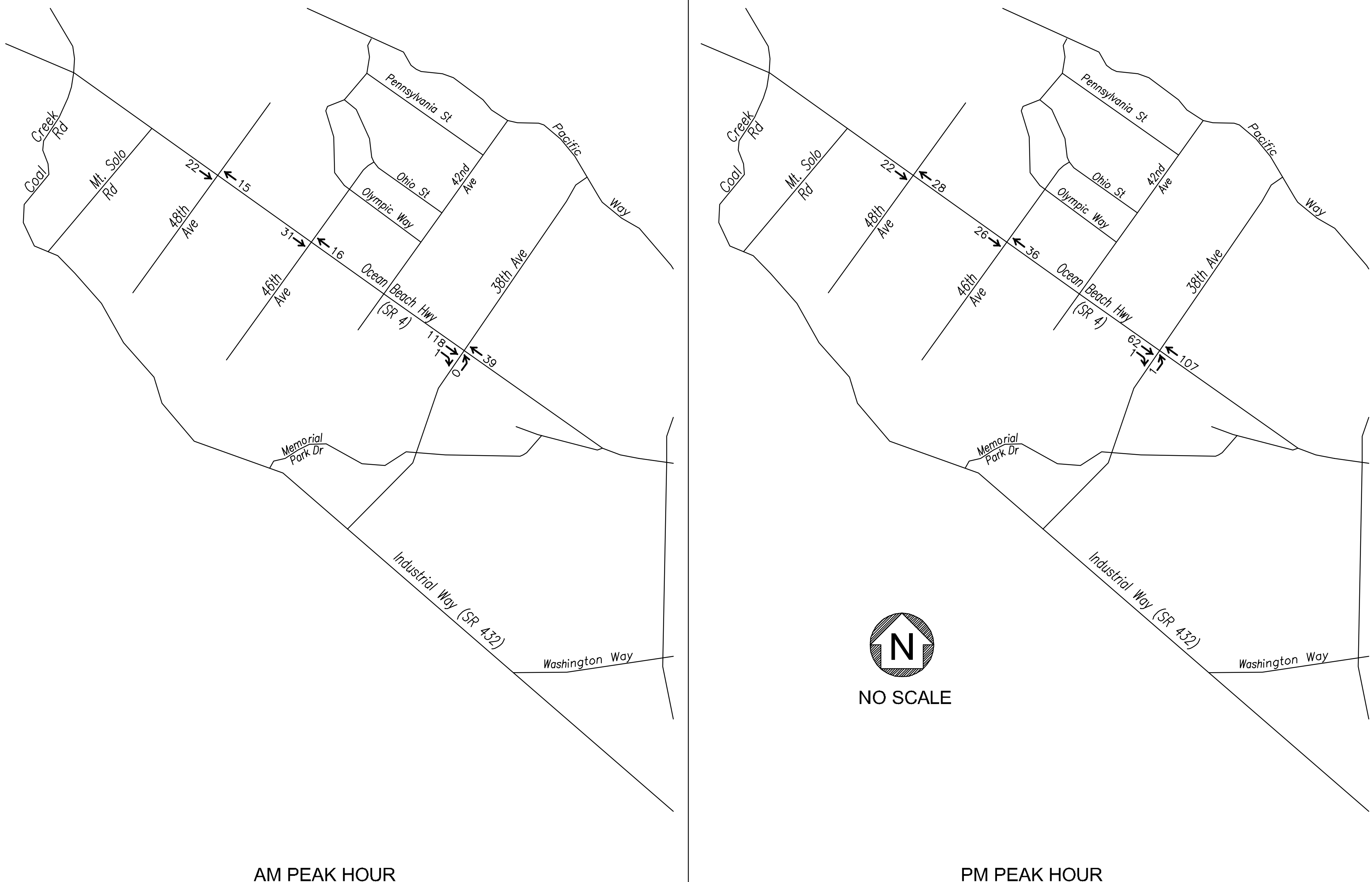
2025 EXISTING TRAFFIC

48TH AVE PUD SUBDIVISION

FIGURE

1

PLOT DATE: 02.15.25 FILE: 2503flow.dwg



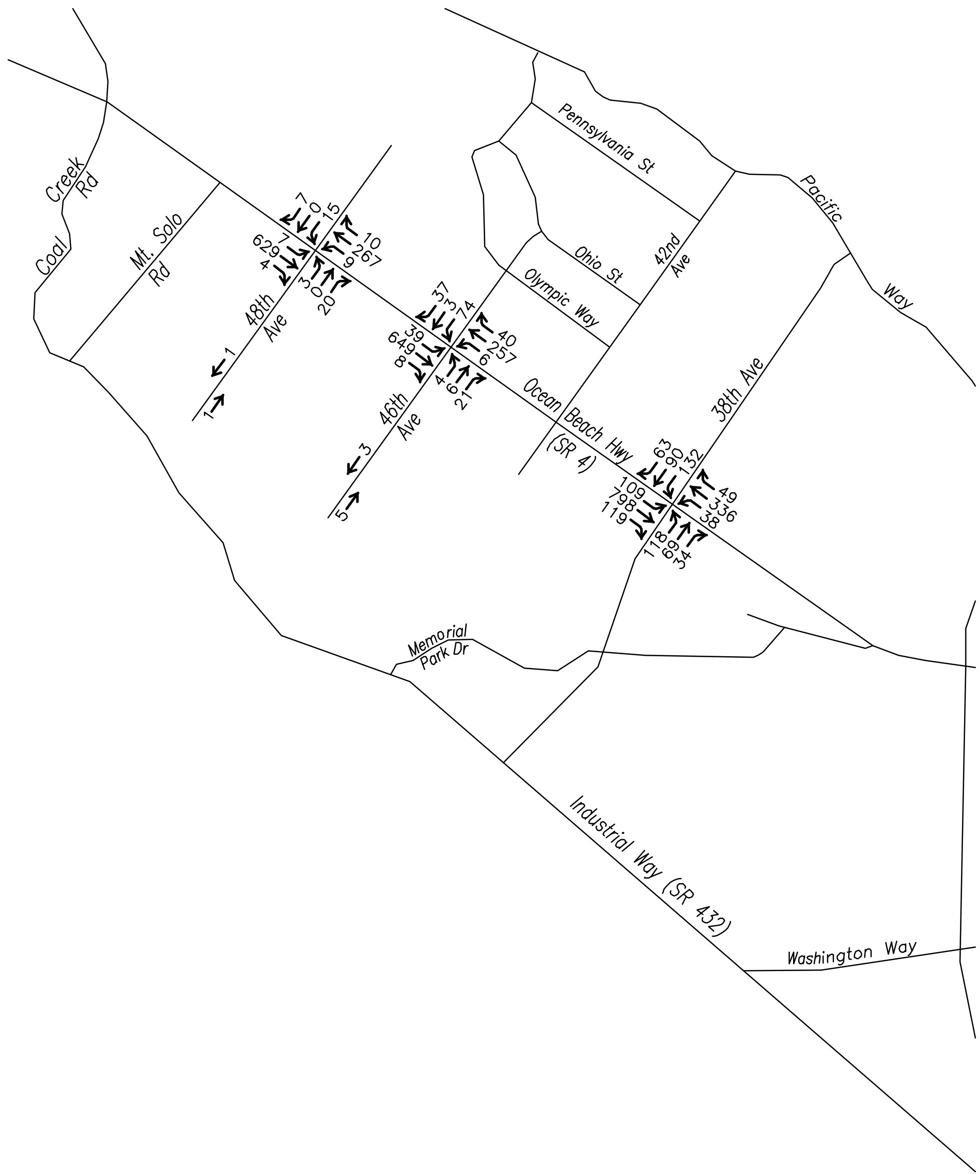
CHARBONNEAU ENGINEERING LLC

PROJECT: 25-03

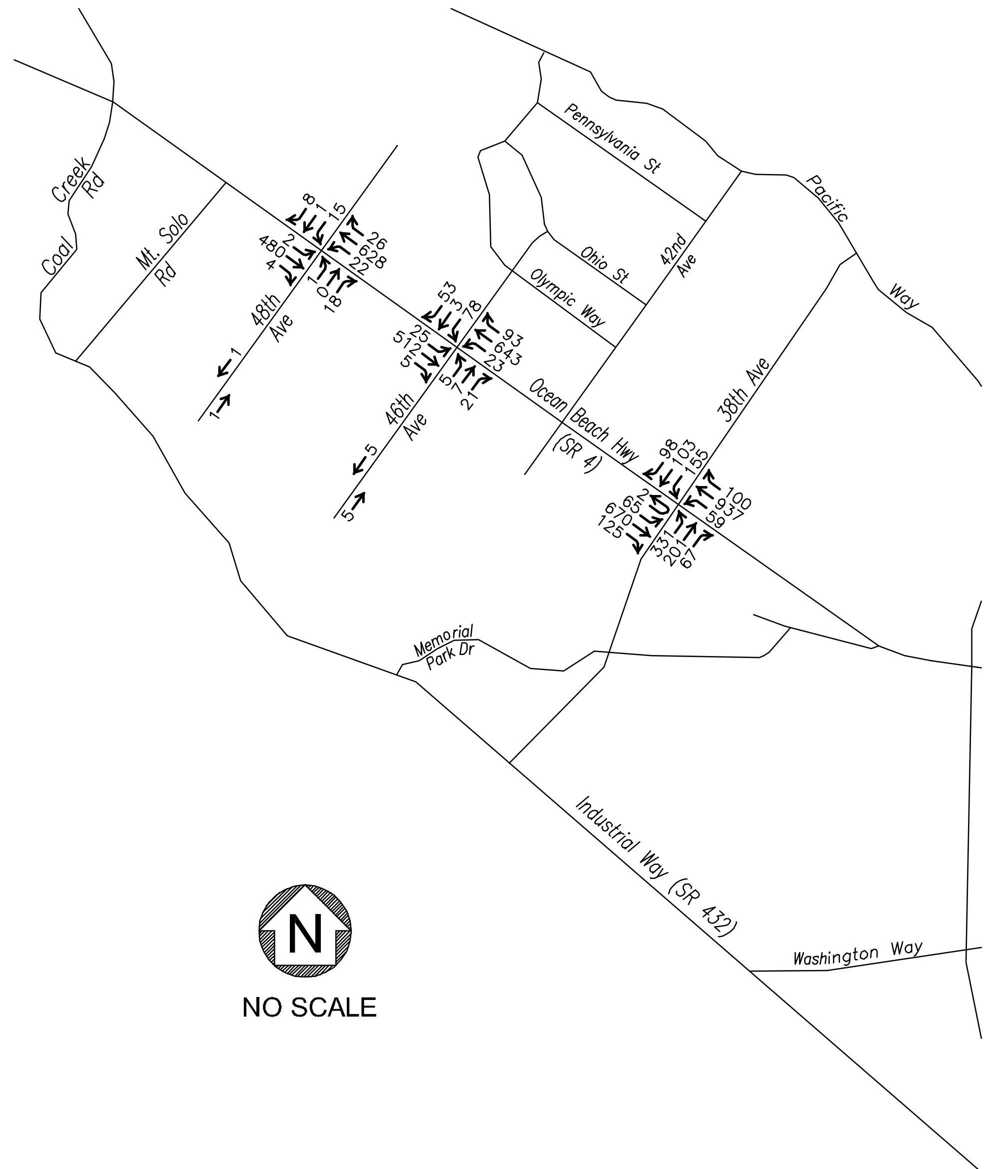
NOTES: In-process Traffic includes West Brook Apts, Mt. Solo Subdivision, Mt. Solo Apts, and Mt. Solo Rd Subdivision.

IN-PROCESS TRAFFIC
48TH AVE PUD SUBDIVISION

FIGURE 2



AM PEAK HOUR



PM PEAK HOUR

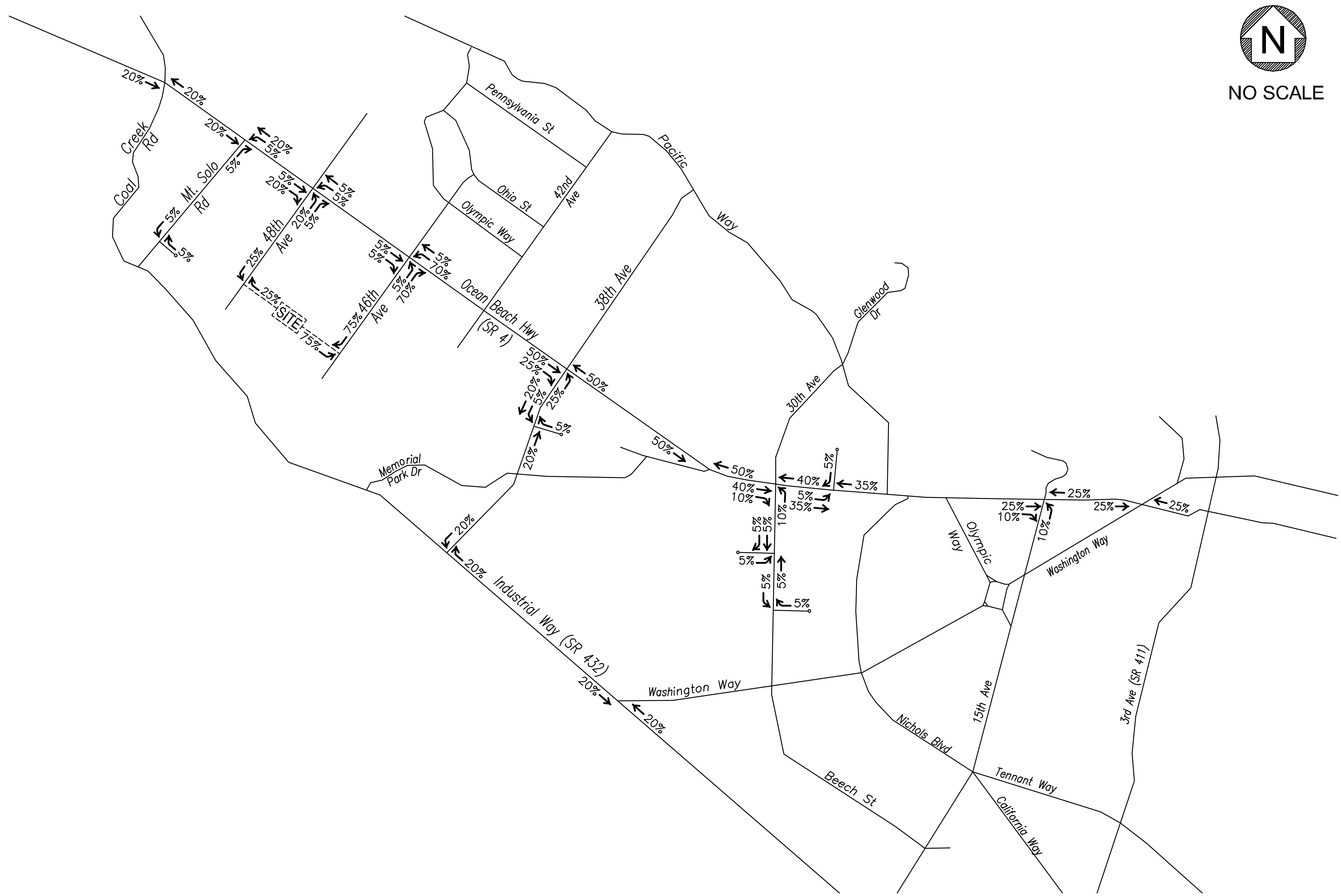
CHARBONNEAU ENGINEERING LLC

PROJECT: 25-03

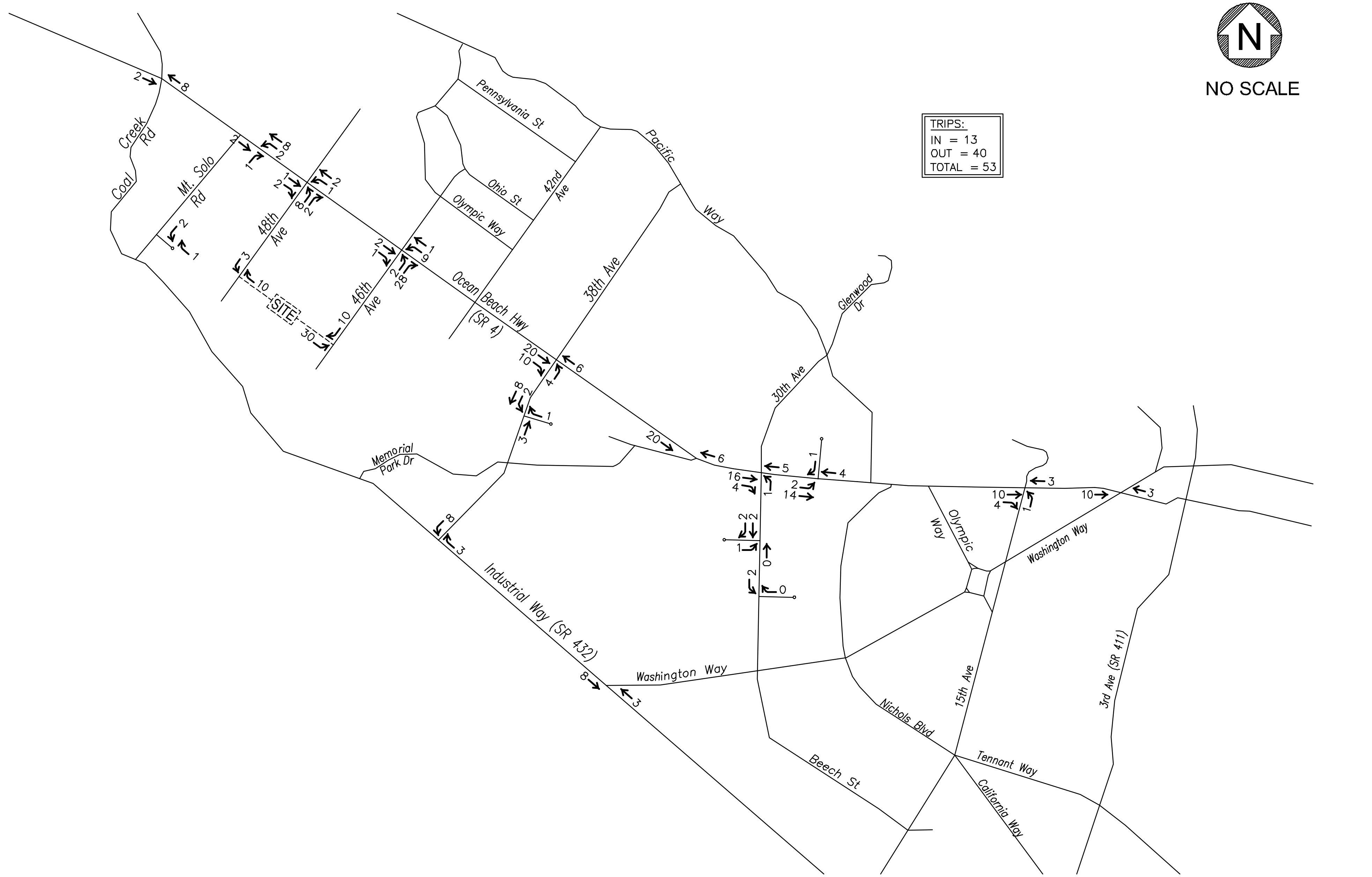
NOTES: 2028 Background Traffic = 2025 Existing Traffic + growth (1%/yr for 3 yrs) + In-Process.

2028 BACKGROUND TRAFFIC
48TH AVE PUD SUBDIVISION

FIGURE 3



CHARBONNEAU ENGINEERING LLC PROJECT: 25-03	NOTES: Trip distribution based on feedback from the City's engineer and engineering judgment.	TRIP DISTRIBUTION AM PEAK HOUR AND PM PEAK HOUR 48TH AVE PUD SUBDIVISION	FIGURE 4



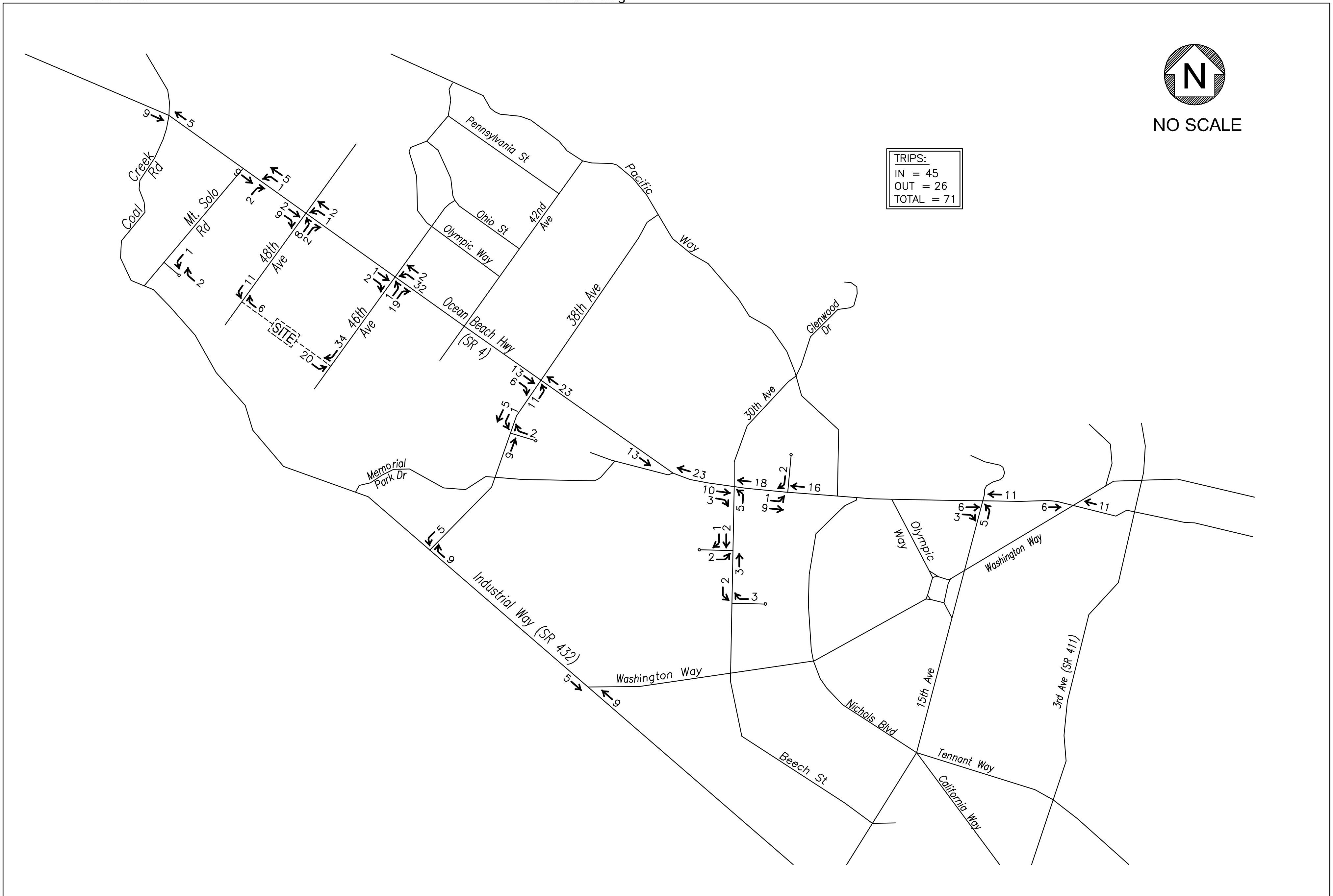
CHARBONNEAU ENGINEERING LLC

PROJECT: 25-03

NOTES: Trip generation for the proposed site is based on Single-Family Residential (ITE 210) trip rates.

TRIP ASSIGNMENT
AM PEAK HOUR
48TH AVE PUD SUBDIVISION

FIGURE 5a



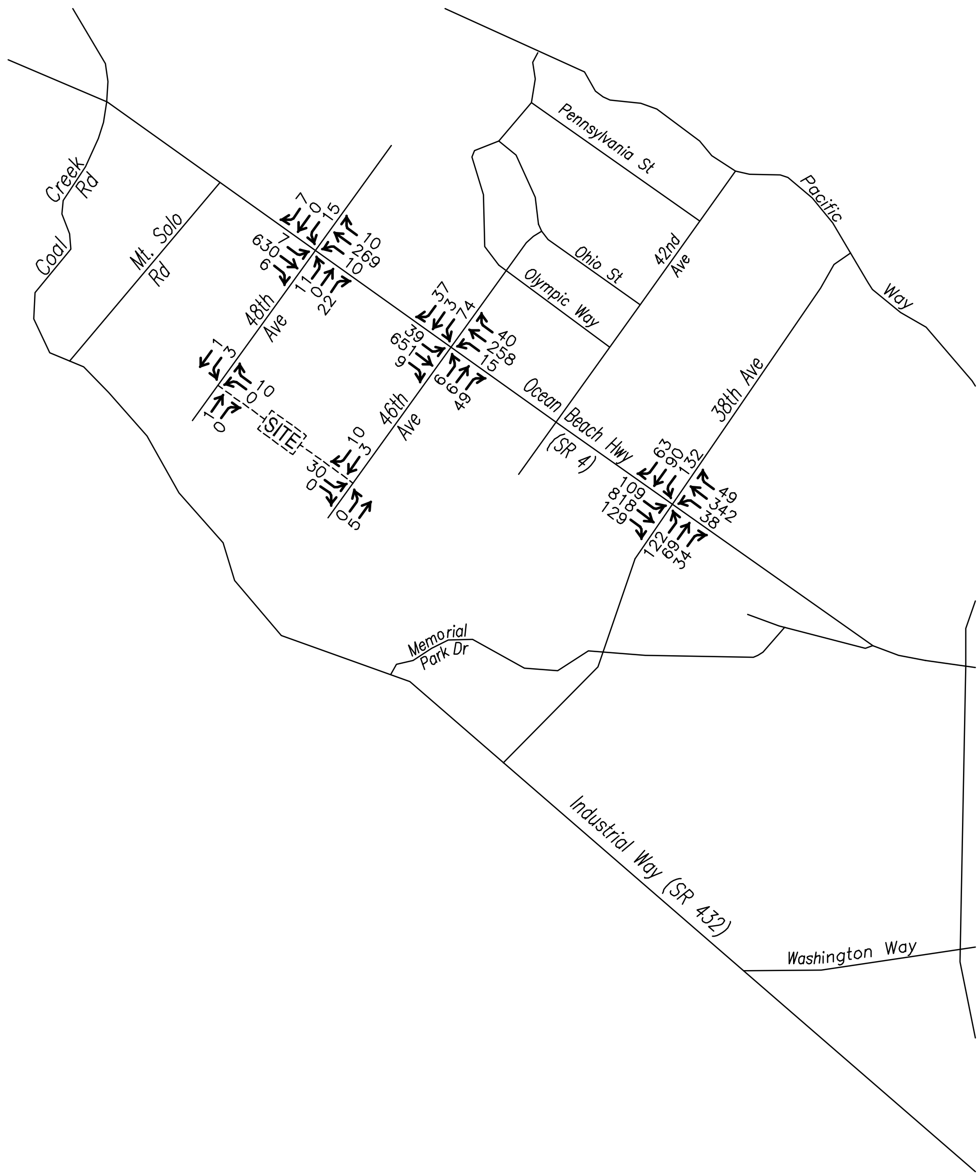
CHARBONNEAU ENGINEERING LLC

PROJECT: 25-03

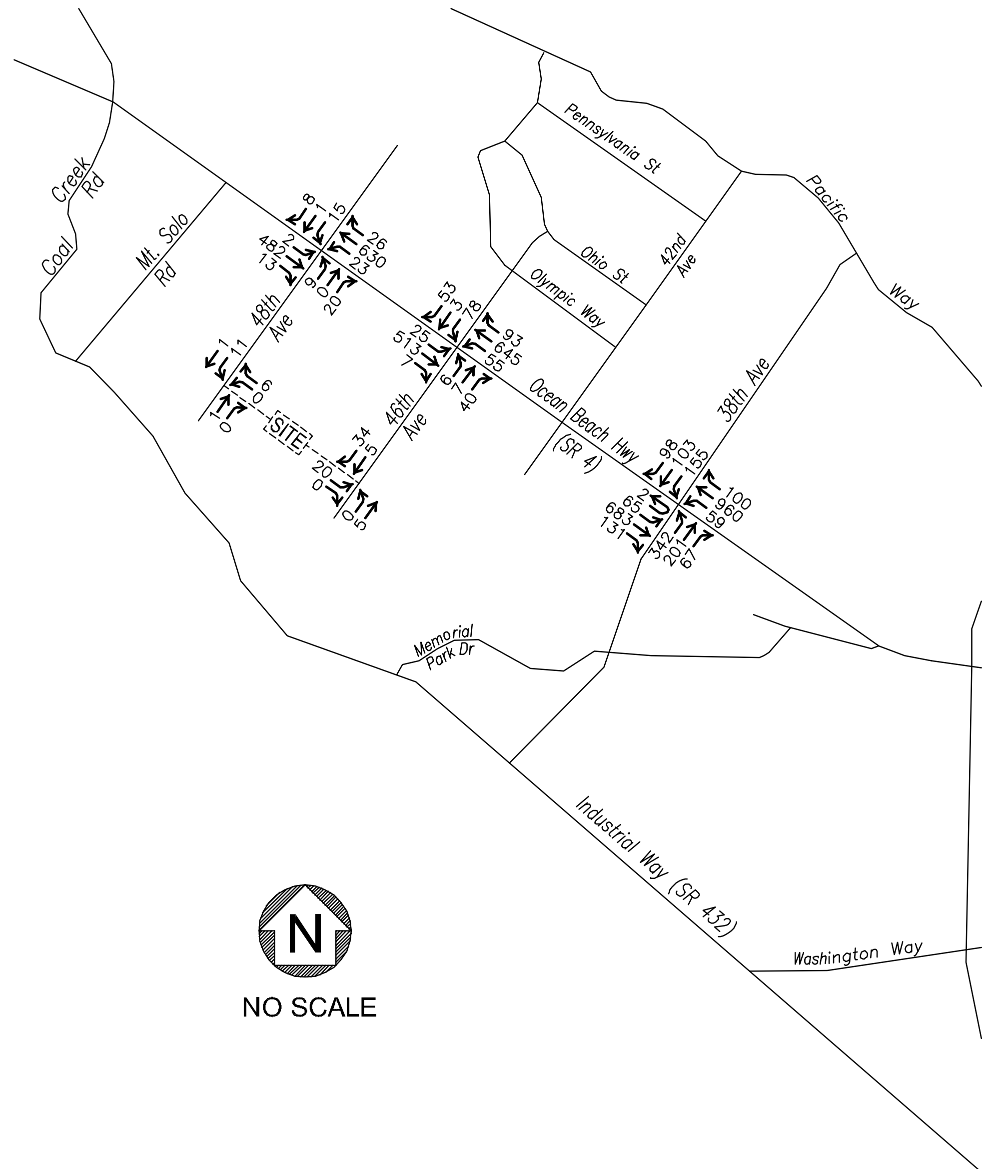
NOTES: Trip generation for the proposed site is based on Single-Family Residential (ITE 210) trip rates.

TRIP ASSIGNMENT
PM PEAK HOUR
48TH AVE PUD SUBDIVISION

FIGURE 5b



AM PEAK HOUR



PM PEAK HOUR

CHARBONNEAU ENGINEERING LLC

PROJECT: 25-03

NOTES: 2028 Total Traffic = 2028 Background Traffic + Trip Assignment.

2028 TOTAL TRAFFIC
48TH AVE PUD SUBDIVISION

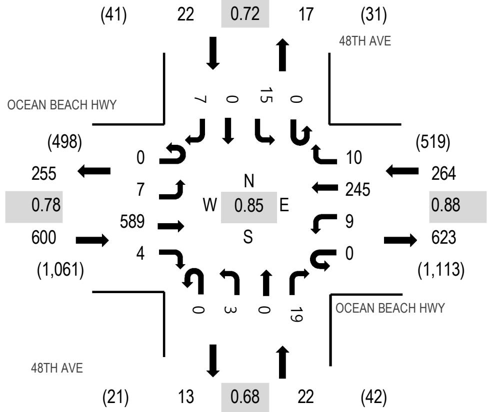
FIGURE 6

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

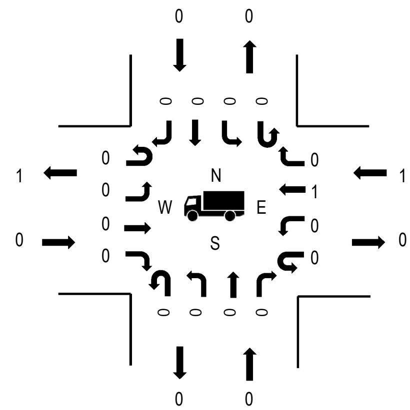
Location: 1 48TH AVE & OCEAN BEACH HWY AM
Date: Tuesday, January 28, 2025
Peak Hour: 07:05 AM - 08:05 AM
Peak 15-Minutes: 07:25 AM - 07:40 AM

Peak Hour

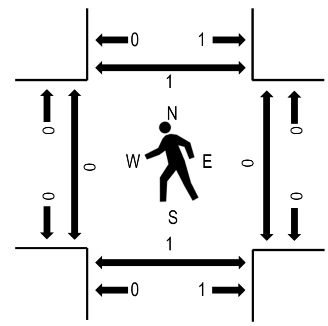
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.78
WB	0.4%	0.88
NB	0.0%	0.68
SB	0.0%	0.72
All	0.1%	0.85

Traffic Counts - Motorized Vehicles

Interval Start Time	OCEAN BEACH HWY Eastbound				OCEAN BEACH HWY Westbound				48TH AVE Northbound				48TH AVE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	0	38	0	0	0	13	0	0	0	0	4	0	2	0	0	57	870
7:05 AM	0	0	39	0	0	0	18	3	0	0	0	0	0	1	0	0	61	908
7:10 AM	0	1	42	0	0	1	17	0	0	0	0	1	0	1	0	0	63	902
7:15 AM	0	0	39	0	0	1	9	0	0	0	0	1	0	1	0	0	51	897
7:20 AM	0	1	43	2	0	0	21	0	0	0	0	1	0	3	0	0	71	895
7:25 AM	0	0	47	0	0	0	26	0	0	1	0	2	0	0	0	1	77	889
7:30 AM	0	1	72	1	0	1	23	1	0	0	0	2	0	0	0	2	103	862
7:35 AM	0	0	69	0	0	1	12	1	0	1	0	0	0	2	0	1	87	832
7:40 AM	0	0	49	1	0	0	19	0	0	1	0	2	0	1	0	0	73	815
7:45 AM	0	1	50	0	0	1	29	2	0	0	0	1	0	3	0	1	88	825
7:50 AM	0	0	38	0	0	2	23	0	0	0	0	2	0	0	0	2	67	803
7:55 AM	0	3	43	0	0	2	17	1	0	0	0	5	0	1	0	0	72	802
8:00 AM	0	0	58	0	0	0	31	2	0	0	0	2	0	2	0	0	95	793
8:05 AM	0	0	30	0	0	0	17	3	0	1	0	2	0	2	0	0	55	
8:10 AM	0	0	39	0	0	0	17	0	0	0	0	1	0	1	0	0	58	
8:15 AM	0	0	33	0	0	0	15	0	0	0	0	1	0	0	0	0	49	
8:20 AM	0	0	41	0	0	1	17	2	0	1	0	2	0	1	0	0	65	
8:25 AM	0	0	26	0	0	0	20	1	0	0	0	2	0	0	0	1	50	
8:30 AM	0	1	39	0	0	3	20	2	0	0	0	3	0	4	0	1	73	
8:35 AM	0	1	48	0	0	1	19	0	0	0	0	1	0	0	0	0	70	
8:40 AM	0	0	55	0	0	1	26	0	0	0	0	1	0	0	0	0	83	
8:45 AM	0	1	47	0	0	0	16	0	0	0	0	0	0	0	0	2	66	
8:50 AM	0	0	34	0	0	2	28	1	0	0	0	0	0	1	0	0	66	
8:55 AM	0	0	28	0	0	0	28	2	0	0	0	1	0	3	0	1	63	
Count Total	0	10	1,047	4	0	17	481	21	0	5	0	37	0	29	0	12	1,663	
Peak Hour	0	7	589	4	0	9	245	10	0	3	0	19	0	15	0	7	908	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles EB	NB	WB	SB	Total	Interval Start Time	Bicycles on Roadway EB	NB	WB	SB	Total	Interval Start Time	Pedestrians/Bicycles on Crosswalk EB	NB	WB	SB	Total
7:00 AM	1	0	0	0	1	7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	0	0
7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0
7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	1	1
7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	0	0
7:20 AM	0	0	1	0	1	7:20 AM	0	0	0	0	0	7:20 AM	0	0	0	0	0
7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	0	0
7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0
7:40 AM	0	0	0	0	0	7:40 AM	0	0	0	0	0	7:40 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0	7:45 AM	0	0	0	0	0	7:45 AM	0	0	0	0	0
7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	0	0
7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0	7:55 AM	0	1	0	0	1
8:00 AM	0	0	0	0	0	8:00 AM	0	0	0	0	0	8:00 AM	0	0	0	0	0
8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	0	0	8:05 AM	0	1	0	0	1
8:10 AM	0	0	0	0	0	8:10 AM	0	0	0	0	0	8:10 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0	8:15 AM	0	0	0	0	0	8:15 AM	0	0	0	1	1
8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	0	0	8:20 AM	0	2	0	0	2
8:25 AM	0	0	1	0	1	8:25 AM	0	0	0	0	0	8:25 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0	8:30 AM	0	0	0	0	0	8:30 AM	0	0	0	0	0
8:35 AM	1	0	0	0	1	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0
8:40 AM	0	0	1	0	1	8:40 AM	0	0	0	0	0	8:40 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0	8:45 AM	0	0	0	0	0	8:45 AM	0	0	0	0	0
8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0
8:55 AM	0	0	0	0	0	8:55 AM	0	0	0	0	0	8:55 AM	0	0	0	0	0
Count Total	2	0	3	0	5	Count Total	0	0	0	0	0	Count Total	0	4	0	2	6
Peak Hour	0	0	1	0	1	Peak Hour	0	0	0	0	0	Peak Hour	0	1	0	1	2

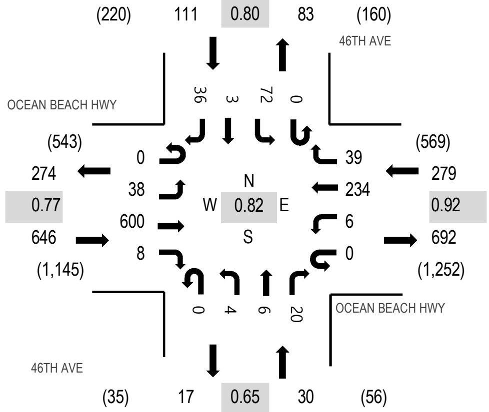
ALL TRAFFIC DATA SERVICES

(303) 216-2439
www.alltrafficdata.net

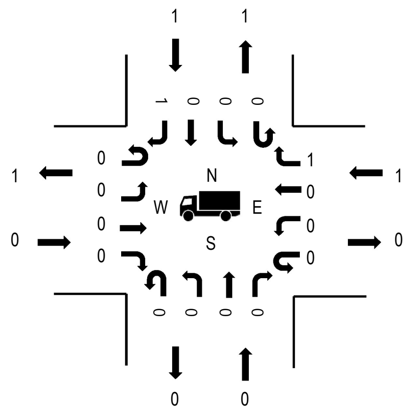
Location: 2 46TH AVE & OCEAN BEACH HWY AM
Date: Tuesday, January 28, 2025
Peak Hour: 07:10 AM - 08:10 AM
Peak 15-Minutes: 07:25 AM - 07:40 AM

Peak Hour

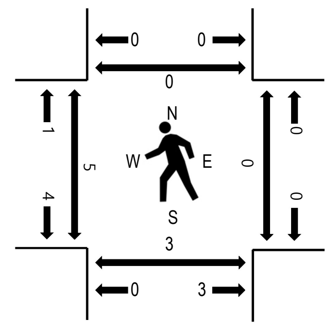
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.77
WB	0.4%	0.92
NB	0.0%	0.65
SB	0.9%	0.80
All	0.2%	0.82

Traffic Counts - Motorized Vehicles

Interval	OCEAN BEACH HWY Eastbound				OCEAN BEACH HWY Westbound				46TH AVE Northbound				46TH AVE Southbound					Rolling
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	Hour
7:00 AM	0	1	34	0	0	0	12	1	0	0	0	4	0	7	0	1	60	1,009
7:05 AM	0	1	37	0	0	1	18	0	0	0	0	1	0	5	1	1	65	1,057
7:10 AM	0	1	42	2	0	0	16	1	0	0	0	3	0	10	0	2	77	1,066
7:15 AM	0	4	42	0	0	0	8	0	0	1	0	2	0	2	1	3	63	1,058
7:20 AM	0	1	37	1	0	1	15	5	0	0	2	1	0	3	0	7	73	1,052
7:25 AM	0	4	50	1	0	0	25	5	0	0	0	1	0	9	0	4	99	1,056
7:30 AM	0	4	79	0	0	0	20	7	0	0	0	1	0	7	0	3	121	1,028
7:35 AM	0	3	68	0	0	1	14	5	0	0	0	2	0	11	0	1	105	996
7:40 AM	0	1	53	0	0	0	15	2	0	0	0	3	0	6	0	5	85	971
7:45 AM	0	4	52	0	0	0	24	2	0	1	1	3	0	3	0	5	95	989
7:50 AM	0	2	34	0	0	1	22	2	0	2	1	1	0	8	0	1	74	975
7:55 AM	0	6	45	3	0	2	23	3	0	0	2	2	0	5	1	0	92	986
8:00 AM	0	6	57	1	0	1	32	4	0	0	0	0	0	4	0	3	108	981
8:05 AM	0	2	41	0	0	0	20	3	0	0	0	1	0	4	1	2	74	
8:10 AM	0	2	41	0	0	0	18	1	0	0	0	4	0	2	0	1	69	
8:15 AM	0	1	33	0	0	0	16	1	0	0	0	2	0	3	0	1	57	
8:20 AM	0	2	44	0	0	1	21	2	0	0	0	3	0	2	0	2	77	
8:25 AM	0	0	32	1	0	2	21	5	0	0	0	1	0	7	1	1	71	
8:30 AM	0	5	40	0	0	2	27	4	0	1	0	2	0	7	1	0	89	
8:35 AM	0	7	45	0	0	0	13	7	0	0	0	1	0	3	1	3	80	
8:40 AM	0	4	49	2	0	1	26	4	0	0	0	2	0	13	0	2	103	
8:45 AM	0	9	38	0	0	0	11	3	0	0	0	1	0	13	0	6	81	
8:50 AM	0	4	31	0	0	2	27	3	0	0	0	2	0	12	1	3	85	
8:55 AM	0	4	32	0	0	1	33	6	0	0	0	2	0	5	0	4	87	
Count Total	0	78	1,056	11	0	16	477	76	0	5	6	45	0	151	8	61	1,990	
Peak Hour	0	38	600	8	0	6	234	39	0	4	6	20	0	72	3	36	1,066	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

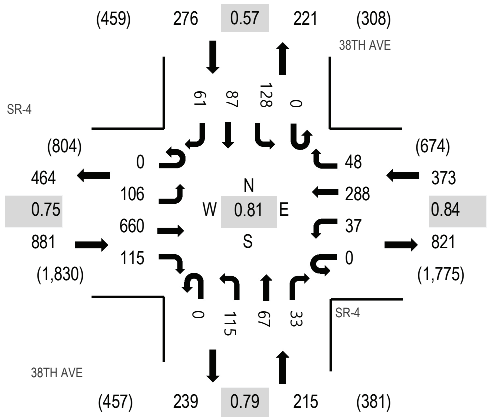
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	1	0	0	0	1	7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	0	0
7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0	7:05 AM	1	0	0	0	1
7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0	7:10 AM	1	0	0	0	1
7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	0	0	7:15 AM	2	2	0	0	4
7:20 AM	0	0	0	1	1	7:20 AM	0	0	0	0	0	7:20 AM	0	0	0	0	0
7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0
7:30 AM	0	0	1	0	1	7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	0	0
7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0
7:40 AM	0	0	0	0	0	7:40 AM	0	0	0	0	0	7:40 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0	7:45 AM	0	0	0	0	0	7:45 AM	1	1	0	0	2
7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	0	0
7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0	8:00 AM	0	0	0	0	0	8:00 AM	1	0	0	0	1
8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	0	0
8:10 AM	0	0	1	0	1	8:10 AM	0	0	0	0	0	8:10 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0	8:15 AM	0	0	0	0	0	8:15 AM	0	0	1	0	1
8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	0	0
8:25 AM	0	0	1	0	1	8:25 AM	0	0	0	0	0	8:25 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0	8:30 AM	0	0	0	0	0	8:30 AM	0	0	0	0	0
8:35 AM	1	0	0	0	1	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0
8:40 AM	0	0	1	0	1	8:40 AM	0	0	0	0	0	8:40 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0	8:45 AM	0	0	0	0	0	8:45 AM	0	0	0	0	0
8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0
8:55 AM	0	0	0	0	0	8:55 AM	0	0	0	0	0	8:55 AM	0	0	0	0	0
Count Total	2	0	4	1	7	Count Total	0	0	0	0	0	Count Total	6	3	1	0	10
Peak Hour	0	0	1	1	2	Peak Hour	0	0	0	0	0	Peak Hour	5	3	0	0	8

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

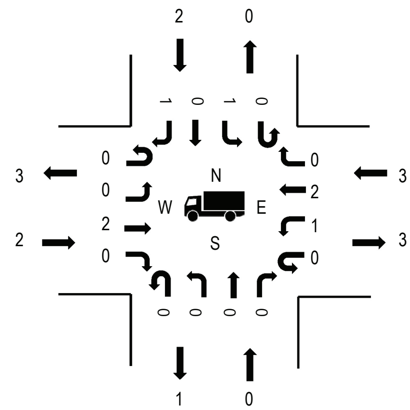
Location: 1 38TH AVE & SR-4 AM
Date: Tuesday, October 1, 2024
Peak Hour: 08:00 AM - 09:00 AM
Peak 15-Minutes: 08:35 AM - 08:50 AM

Peak Hour

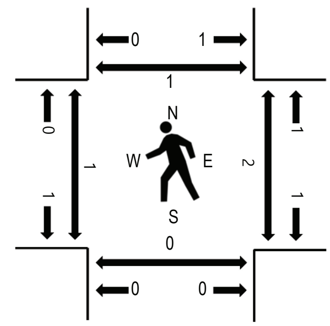
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.2%	0.75
WB	0.8%	0.84
NB	0.0%	0.79
SB	0.7%	0.57
All	0.4%	0.81

Traffic Counts - Motorized Vehicles

Interval Start Time	SR-4 Eastbound U-Turn	Left	Thru	Right	SR-4 Westbound U-Turn	Left	Thru	Right	38TH AVE Northbound U-Turn	Left	Thru	Right	38TH AVE Southbound U-Turn	Left	Thru	Right	Total	Rolling Hour
7:00 AM	0	4	49	13	0	2	6	5	0	6	3	7	0	3	1	1	100	1,599
7:05 AM	0	1	59	9	0	2	11	2	0	6	0	2	0	4	1	0	97	1,625
7:10 AM	0	3	58	9	0	0	21	4	0	3	3	5	0	7	6	3	122	1,665
7:15 AM	0	0	61	5	0	4	19	4	0	7	5	5	0	6	4	1	121	1,669
7:20 AM	0	0	72	12	0	3	22	0	0	8	3	0	0	4	3	1	128	1,683
7:25 AM	0	2	54	9	0	1	11	2	0	4	4	4	0	8	7	2	108	1,706
7:30 AM	0	0	60	9	0	4	16	1	0	1	7	3	0	13	10	2	126	1,713
7:35 AM	0	0	105	10	0	1	21	4	0	9	2	8	0	19	11	3	193	1,705
7:40 AM	0	3	108	6	0	1	21	1	0	8	1	0	0	15	8	1	173	1,675
7:45 AM	0	1	64	20	0	6	34	1	0	10	0	6	0	2	5	1	150	1,673
7:50 AM	0	3	57	14	0	3	29	1	0	8	4	5	0	11	3	2	140	1,727
7:55 AM	0	3	57	9	0	3	32	3	0	8	7	4	0	9	4	2	141	1,734
8:00 AM	0	2	51	6	0	5	20	2	0	9	5	1	0	15	10	0	126	1,745
8:05 AM	0	2	61	8	0	4	37	2	0	9	4	2	0	5	3	0	137	
8:10 AM	0	5	52	6	0	5	21	5	0	9	6	5	0	8	2	2	126	
8:15 AM	0	12	66	7	0	3	20	0	0	6	5	4	0	5	5	2	135	
8:20 AM	0	11	54	12	0	3	28	6	0	12	6	4	0	9	2	4	151	
8:25 AM	0	19	44	5	0	5	15	2	0	7	9	0	0	3	4	2	115	
8:30 AM	0	13	39	4	0	1	17	8	0	8	1	1	0	13	7	6	118	
8:35 AM	0	14	66	8	0	1	19	4	0	8	4	2	0	22	9	6	163	
8:40 AM	0	4	45	13	0	1	27	3	0	12	9	3	0	24	13	17	171	
8:45 AM	0	11	81	20	0	1	35	5	0	7	8	6	0	9	13	8	204	
8:50 AM	0	9	44	10	0	5	23	5	0	16	5	2	0	9	13	6	147	
8:55 AM	0	4	57	16	0	3	26	6	0	12	5	3	0	6	6	8	152	
Count Total	0	126	1,464	240	0	67	531	76	0	193	106	82	0	229	150	80	3,344	
Peak Hour	0	106	660	115	0	37	288	48	0	115	67	33	0	128	87	61	1,745	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

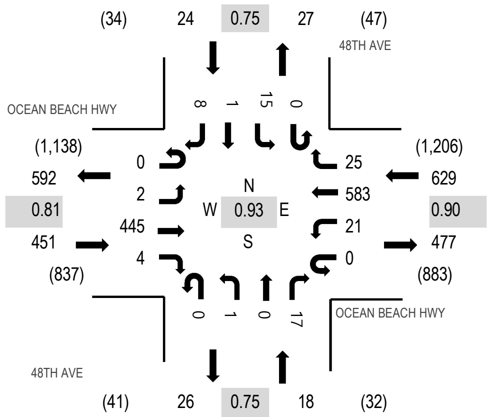
Interval Start Time	Heavy Vehicles EB	NB	WB	SB	Total	Interval Start Time	Bicycles on Roadway EB	NB	WB	SB	Total	Interval Start Time	Pedestrians/Bicycles on Crosswalk EB	NB	WB	SB	Total
7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	0	0	7:00 AM	0	1	0	0	1
7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	2	2
7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	0	0	7:15 AM	0	1	0	0	1
7:20 AM	0	0	0	0	0	7:20 AM	0	0	0	0	0	7:20 AM	1	0	0	0	1
7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	0	0	7:30 AM	0	1	0	0	1
7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0
7:40 AM	0	0	1	0	1	7:40 AM	0	0	0	0	0	7:40 AM	2	0	0	0	2
7:45 AM	0	0	0	0	0	7:45 AM	0	0	0	0	0	7:45 AM	0	0	0	0	0
7:50 AM	0	0	1	0	1	7:50 AM	0	0	0	0	0	7:50 AM	1	0	0	0	1
7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	1	1
8:00 AM	0	0	0	1	1	8:00 AM	0	0	0	0	0	8:00 AM	0	0	0	0	0
8:05 AM	1	0	0	0	1	8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	1	1
8:10 AM	0	0	0	0	0	8:10 AM	0	0	0	0	0	8:10 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0	8:15 AM	0	0	0	0	0	8:15 AM	0	0	0	0	0
8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	1	1
8:25 AM	1	0	0	0	1	8:25 AM	0	0	0	0	0	8:25 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0	8:30 AM	0	0	0	0	0	8:30 AM	0	0	1	0	1
8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0	8:35 AM	1	0	0	0	1
8:40 AM	0	0	0	0	0	8:40 AM	0	0	0	0	0	8:40 AM	0	0	1	0	1
8:45 AM	0	0	1	0	1	8:45 AM	0	0	0	0	0	8:45 AM	0	0	0	0	0
8:50 AM	0	0	2	1	3	8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0
8:55 AM	0	0	0	0	0	8:55 AM	0	0	0	0	0	8:55 AM	0	0	0	0	0
Count Total	2	0	5	2	9	Count Total	0	0	0	0	0	Count Total	5	3	2	5	15
Peak Hour	2	0	3	2	7	Peak Hour	0	0	0	0	0	Peak Hour	1	0	2	2	5

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 1 48TH AVE & OCEAN BEACH HWY PM
Date: Tuesday, January 28, 2025
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:00 PM - 04:15 PM

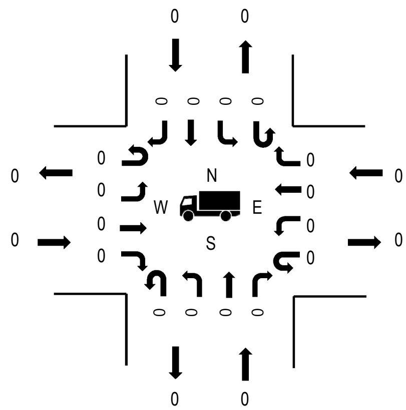
Peak Hour

Motorized Vehicles

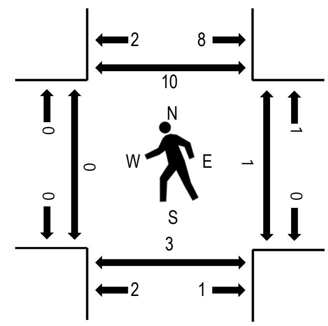


Note: Total study counts contained in parentheses.

Heavy Vehicles



Pedestrians



	HV%	PHF
EB	0.0%	0.81
WB	0.0%	0.90
NB	0.0%	0.75
SB	0.0%	0.75
All	0.0%	0.93

Traffic Counts - Motorized Vehicles

Interval Start Time	OCEAN BEACH HWY Eastbound				OCEAN BEACH HWY Westbound				48TH AVE Northbound				48TH AVE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	0	52	4	0	2	41	1	0	0	0	2	0	0	0	1	103	1,122
4:05 PM	0	0	47	0	0	3	60	1	0	0	0	3	0	2	0	0	116	1,099
4:10 PM	0	0	36	0	0	2	39	1	0	0	0	1	0	1	1	1	82	1,070
4:15 PM	0	0	27	0	0	3	52	0	0	0	0	1	0	1	0	1	85	1,065
4:20 PM	0	0	31	0	0	4	45	5	0	0	0	1	0	1	0	1	88	1,069
4:25 PM	0	0	36	0	0	0	62	3	0	0	0	1	0	1	0	1	104	1,076
4:30 PM	0	0	37	0	0	1	45	1	0	0	0	2	0	0	0	0	86	1,061
4:35 PM	0	0	34	0	0	0	49	1	0	0	0	2	0	2	0	0	88	1,060
4:40 PM	0	0	34	0	0	2	41	1	0	0	0	0	0	1	0	1	80	1,045
4:45 PM	0	1	41	0	0	2	54	5	0	1	0	1	0	3	0	1	109	1,045
4:50 PM	0	1	35	0	0	2	58	2	0	0	0	2	0	1	0	1	102	1,020
4:55 PM	0	0	35	0	0	0	37	4	0	0	0	1	0	2	0	0	79	998
5:00 PM	0	0	41	0	0	1	33	2	0	0	0	2	0	1	0	0	80	987
5:05 PM	0	0	37	0	0	2	45	1	0	0	0	2	0	0	0	0	87	
5:10 PM	0	0	33	0	0	3	39	2	0	0	0	0	0	0	0	0	77	
5:15 PM	0	0	23	1	0	0	59	3	0	0	0	2	0	1	0	0	89	
5:20 PM	0	0	37	0	0	3	49	3	0	0	0	2	0	0	0	1	95	
5:25 PM	0	1	25	0	0	0	59	2	0	0	0	0	0	2	0	0	89	
5:30 PM	0	0	36	0	0	0	46	0	0	0	0	3	0	0	0	0	85	
5:35 PM	0	0	30	0	0	1	42	0	0	0	0	0	0	0	0	0	73	
5:40 PM	0	0	29	0	0	0	48	2	0	0	0	0	0	1	0	0	80	
5:45 PM	0	0	29	0	0	1	49	1	0	0	0	2	0	1	0	1	84	
5:50 PM	0	0	33	0	0	1	44	1	0	0	0	0	0	1	0	0	80	
5:55 PM	0	0	31	0	0	2	31	2	0	0	0	1	0	1	0	0	68	
Count Total	0	3	829	5	0	35	1,127	44	0	1	0	31	0	23	1	10	2,109	
Peak Hour	0	2	445	4	0	21	583	25	0	1	0	17	0	15	1	8	1,122	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval Start Time	Heavy Vehicles EB	Heavy Vehicles NB	Heavy Vehicles WB	Heavy Vehicles SB	Heavy Vehicles Total
4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0
5:15 PM	1	0	0	0	1
5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0
Count Total	1	0	0	0	1
Peak Hour	0	0	0	0	0

Interval Start Time	Bicycles on Roadway EB	Bicycles on Roadway NB	Bicycles on Roadway WB	Bicycles on Roadway SB	Bicycles on Roadway Total
4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0
4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0
4:40 PM	1	0	0	0	1
4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	1	1
4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0
Count Total	1	0	0	1	2
Peak Hour	1	0	0	1	2

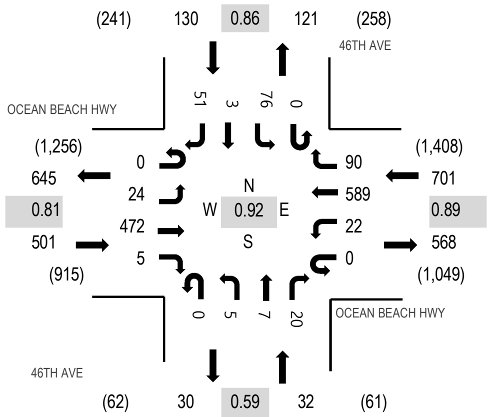
Interval Start Time	Pedestrians/Bicycles on Crosswalk EB	Pedestrians/Bicycles on Crosswalk NB	Pedestrians/Bicycles on Crosswalk WB	Pedestrians/Bicycles on Crosswalk SB	Pedestrians/Bicycles on Crosswalk Total
4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	4	4
4:15 PM	0	0	0	0	0
4:20 PM	0	0	1	0	1
4:25 PM	0	0	0	3	3
4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	1	1
4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
4:50 PM	0	2	0	0	2
4:55 PM	0	1	0	3	4
5:00 PM	0	0	0	0	0
5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	1	1
5:30 PM	0	0	0	1	1
5:35 PM	0	0	0	1	1
5:40 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0
Count Total	0	3	1	14	18
Peak Hour	0	3	1	11	15

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

Location: 2 46TH AVE & OCEAN BEACH HWY PM
Date: Tuesday, January 28, 2025
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:00 PM - 04:15 PM

Peak Hour

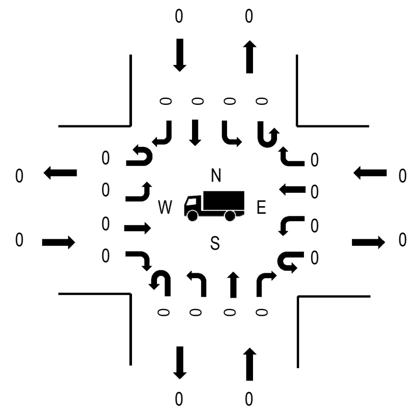
Motorized Vehicles



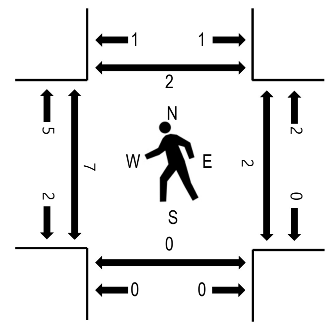
Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.81
WB	0.0%	0.89
NB	0.0%	0.59
SB	0.0%	0.86
All	0.0%	0.92

Heavy Vehicles



Pedestrians



Traffic Counts - Motorized Vehicles

Interval Start Time	OCEAN BEACH HWY Eastbound U-Turn	Left	Thru	Right	OCEAN BEACH HWY Westbound U-Turn	Left	Thru	Right	46TH AVE Northbound U-Turn	Left	Thru	Right	46TH AVE Southbound U-Turn	Left	Thru	Right	Total	Rolling Hour
4:00 PM	0	1	58	2	0	3	42	12	0	0	0	2	0	5	1	5	131	1,364
4:05 PM	0	3	50	1	0	1	57	9	0	1	0	2	0	5	0	3	132	1,340
4:10 PM	0	5	35	0	0	5	41	6	0	0	1	3	0	10	0	2	108	1,320
4:15 PM	0	3	34	0	0	1	49	9	0	0	0	2	0	6	0	11	115	1,315
4:20 PM	0	1	31	0	0	3	49	4	0	0	0	1	0	5	0	6	100	1,313
4:25 PM	0	1	32	0	0	2	60	4	0	1	1	1	0	7	0	4	113	1,326
4:30 PM	0	2	41	1	0	3	43	3	0	1	1	1	0	6	0	3	105	1,321
4:35 PM	0	1	44	0	0	0	51	12	0	0	0	1	0	5	0	2	116	1,327
4:40 PM	0	3	32	0	0	2	38	8	0	0	1	1	0	7	1	4	97	1,306
4:45 PM	0	2	34	1	0	0	55	10	0	0	1	4	0	8	0	6	121	1,306
4:50 PM	0	1	46	0	0	1	65	12	0	2	1	2	0	4	0	3	137	1,298
4:55 PM	0	1	35	0	0	1	39	1	0	0	1	0	0	8	1	2	89	1,262
5:00 PM	0	5	43	0	0	0	36	7	0	0	0	1	0	12	1	2	107	1,261
5:05 PM	0	4	35	0	0	3	49	9	0	1	0	0	0	9	2	0	112	
5:10 PM	0	1	31	0	0	2	53	6	0	0	0	1	0	8	0	1	103	
5:15 PM	0	0	29	0	0	4	57	10	0	1	0	2	0	7	1	2	113	
5:20 PM	0	1	32	1	0	4	55	8	0	0	0	4	0	7	1	0	113	
5:25 PM	0	1	33	0	0	1	54	10	0	0	0	1	0	0	0	8	108	
5:30 PM	0	0	40	0	0	1	46	11	0	0	1	1	0	7	0	4	111	
5:35 PM	0	1	31	0	0	1	41	7	0	1	0	3	0	6	1	3	95	
5:40 PM	0	0	26	0	0	2	42	16	0	1	1	2	0	6	0	1	97	
5:45 PM	0	1	33	1	0	1	52	12	0	0	1	5	0	3	1	3	113	
5:50 PM	0	8	26	0	0	3	49	6	0	1	0	0	0	6	0	2	101	
5:55 PM	1	3	27	0	0	1	41	7	0	0	0	1	0	3	0	4	88	
Count Total	1	49	858	7	0	45	1,164	199	0	10	10	41	0	150	10	81	2,625	
Peak Hour	0	24	472	5	0	22	589	90	0	5	7	20	0	76	3	51	1,364	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

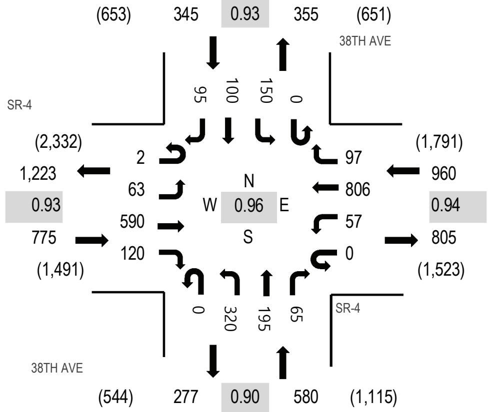
Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0
4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0	4:05 PM	1	0	0	0	1
4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0
4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0	4:20 PM	2	0	0	1	3
4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0	4:25 PM	0	0	2	0	2
4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0
4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0	4:40 PM	1	0	0	1	2
4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0	4:45 PM	3	0	0	0	3
4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	2	0	0	0	2
5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0
5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0	5:10 PM	2	0	0	0	2
5:15 PM	1	0	0	0	1	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0
5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	1	1
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	1	0	1
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	1	0	0	0	1	Count Total	0	0	0	0	0	Count Total	11	0	3	3	17
Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0	Peak Hour	7	0	2	2	11

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

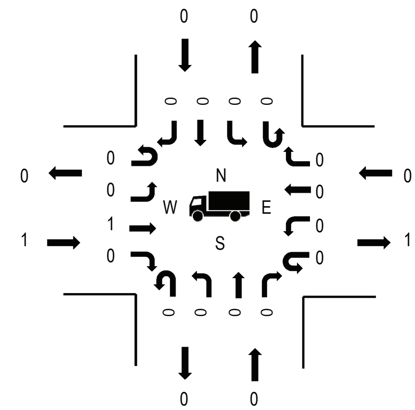
Location: 1 38TH AVE & SR-4 PM
Date: Tuesday, October 1, 2024
Peak Hour: 04:40 PM - 05:40 PM
Peak 15-Minutes: 04:55 PM - 05:10 PM

Peak Hour

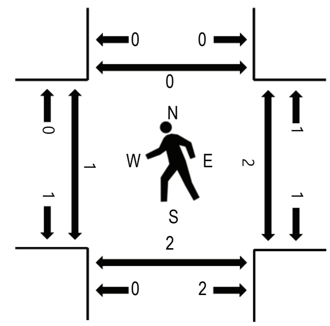
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

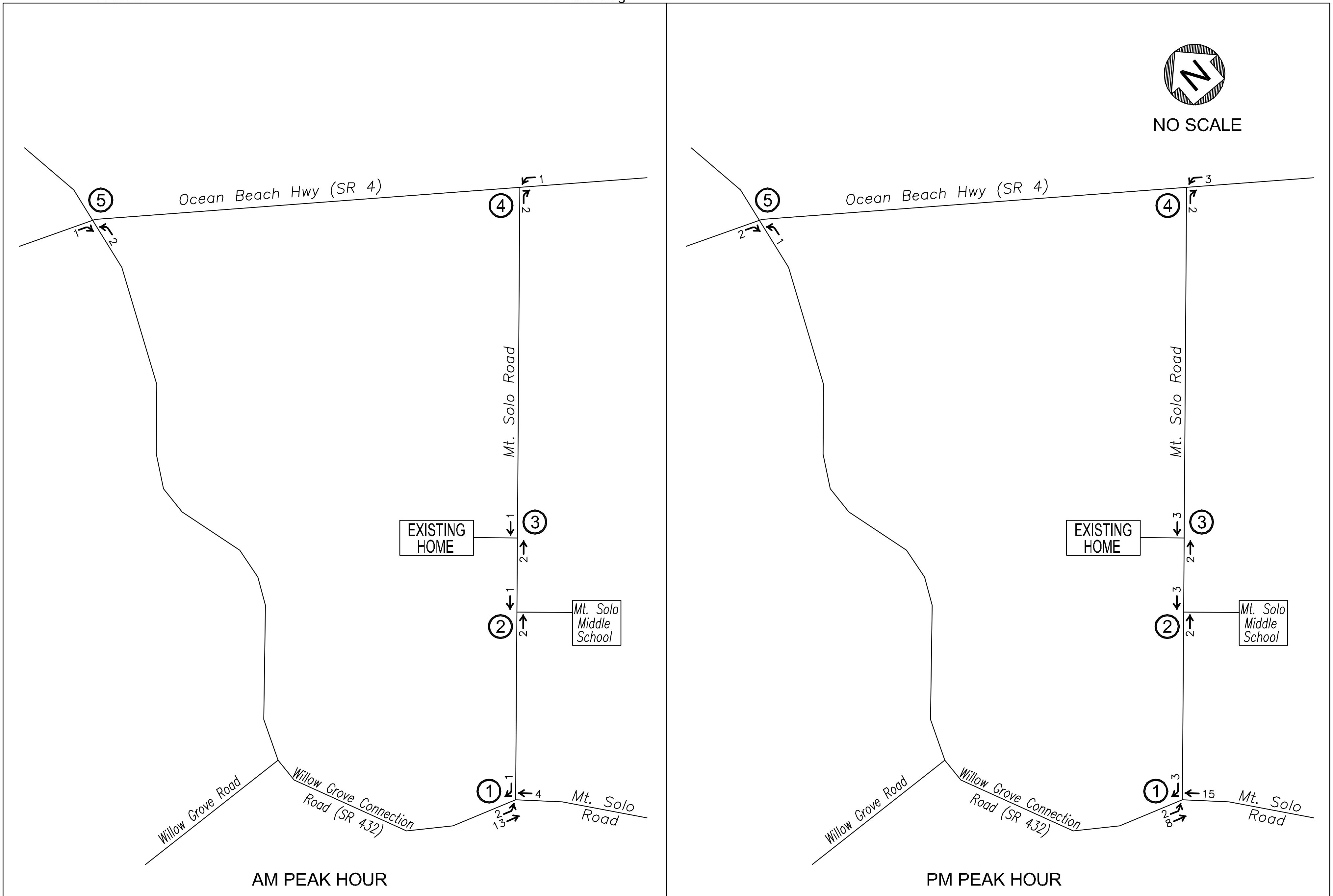
	HV%	PHF
EB	0.1%	0.93
WB	0.0%	0.94
NB	0.0%	0.90
SB	0.0%	0.93
All	0.0%	0.96

Traffic Counts - Motorized Vehicles

Interval Start Time	SR-4 Eastbound				SR-4 Westbound				38TH AVE Northbound				38TH AVE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	8	52	7	0	4	53	7	0	25	14	5	0	7	9	6	197	2,494
4:05 PM	0	13	42	14	0	4	54	3	0	28	20	3	0	7	8	4	200	2,532
4:10 PM	0	1	49	6	0	4	63	9	0	25	6	8	0	11	7	8	197	2,552
4:15 PM	0	1	31	8	0	4	57	2	0	36	11	5	0	13	16	3	187	2,575
4:20 PM	0	7	38	8	0	3	50	9	0	24	15	6	0	9	7	7	183	2,595
4:25 PM	0	4	61	14	0	3	69	6	0	19	14	3	0	14	5	6	218	2,623
4:30 PM	0	2	50	10	0	2	57	4	0	33	16	7	0	16	14	8	219	2,615
4:35 PM	0	7	46	8	0	5	64	5	0	25	14	3	0	6	7	6	196	2,627
4:40 PM	0	6	55	13	0	6	66	11	0	23	15	3	0	14	8	11	231	2,660
4:45 PM	0	8	41	8	0	6	72	3	0	40	14	4	0	14	4	4	218	2,650
4:50 PM	0	6	42	14	0	4	63	7	0	22	16	5	0	17	9	5	210	2,611
4:55 PM	0	8	67	13	0	5	65	6	0	27	13	6	0	12	7	9	238	2,584
5:00 PM	0	0	54	9	0	5	71	9	0	30	20	4	0	20	7	6	235	2,556
5:05 PM	0	8	48	6	0	5	58	13	0	29	17	6	0	15	6	9	220	
5:10 PM	1	5	49	5	0	3	57	8	0	32	15	11	0	9	13	12	220	
5:15 PM	0	4	55	11	0	6	69	12	0	4	15	9	0	11	9	2	207	
5:20 PM	0	4	44	5	0	3	69	4	0	37	19	3	0	7	5	11	211	
5:25 PM	0	2	31	9	0	2	58	7	0	28	24	3	0	13	17	16	210	
5:30 PM	1	6	63	14	0	5	87	5	0	20	10	5	0	9	2	4	231	
5:35 PM	0	6	41	13	0	7	71	12	0	28	17	6	0	9	13	6	229	
5:40 PM	0	7	48	16	0	7	67	8	0	23	14	6	0	12	6	7	221	
5:45 PM	0	7	33	7	1	5	58	5	0	27	10	3	0	15	4	4	179	
5:50 PM	0	6	34	10	0	1	46	9	0	28	17	5	0	10	9	8	183	
5:55 PM	0	4	45	12	0	5	75	3	0	28	8	1	0	13	8	8	210	
Count Total	2	130	1,119	240	1	104	1,519	167	0	641	354	120	0	283	200	170	5,050	
Peak Hour	2	63	590	120	0	57	806	97	0	320	195	65	0	150	100	95	2,660	

Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk

Interval	Heavy Vehicles					Interval	Bicycles on Roadway					Interval	Pedestrians/Bicycles on Crosswalk				
Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total	Start Time	EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0	4:00 PM	0	1	0	0	1
4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0	4:05 PM	2	0	0	2	4
4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	1	1
4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	0	0	4:15 PM	1	0	2	1	4
4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0	4:20 PM	0	3	3	0	6
4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0	4:25 PM	0	0	3	0	3
4:30 PM	1	0	0	0	1	4:30 PM	0	0	0	0	0	4:30 PM	0	1	2	0	3
4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0	4:35 PM	1	0	1	1	3
4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	0	0
4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0	4:50 PM	1	0	0	0	1
4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	1	0	0	0	1
5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	0	0	5:05 PM	0	0	0	2	2
5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0	5:10 PM	0	0	1	0	1
5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0	5:15 PM	0	1	0	0	1
5:20 PM	1	0	0	0	1	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0	5:25 PM	1	0	0	0	1
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	2	0	0	2
5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0	5:35 PM	0	0	1	2	3
5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0	5:40 PM	0	2	0	0	2
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	0	0	3	0	3
5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	2	0	0	0	2	Count Total	0	0	0	0	0	Count Total	7	10	16	9	42
Peak Hour	1	0	0	0	1	Peak Hour	0	0	0	0	0	Peak Hour	3	3	2	4	12



CHARBONNEAU ENGINEERING LLC

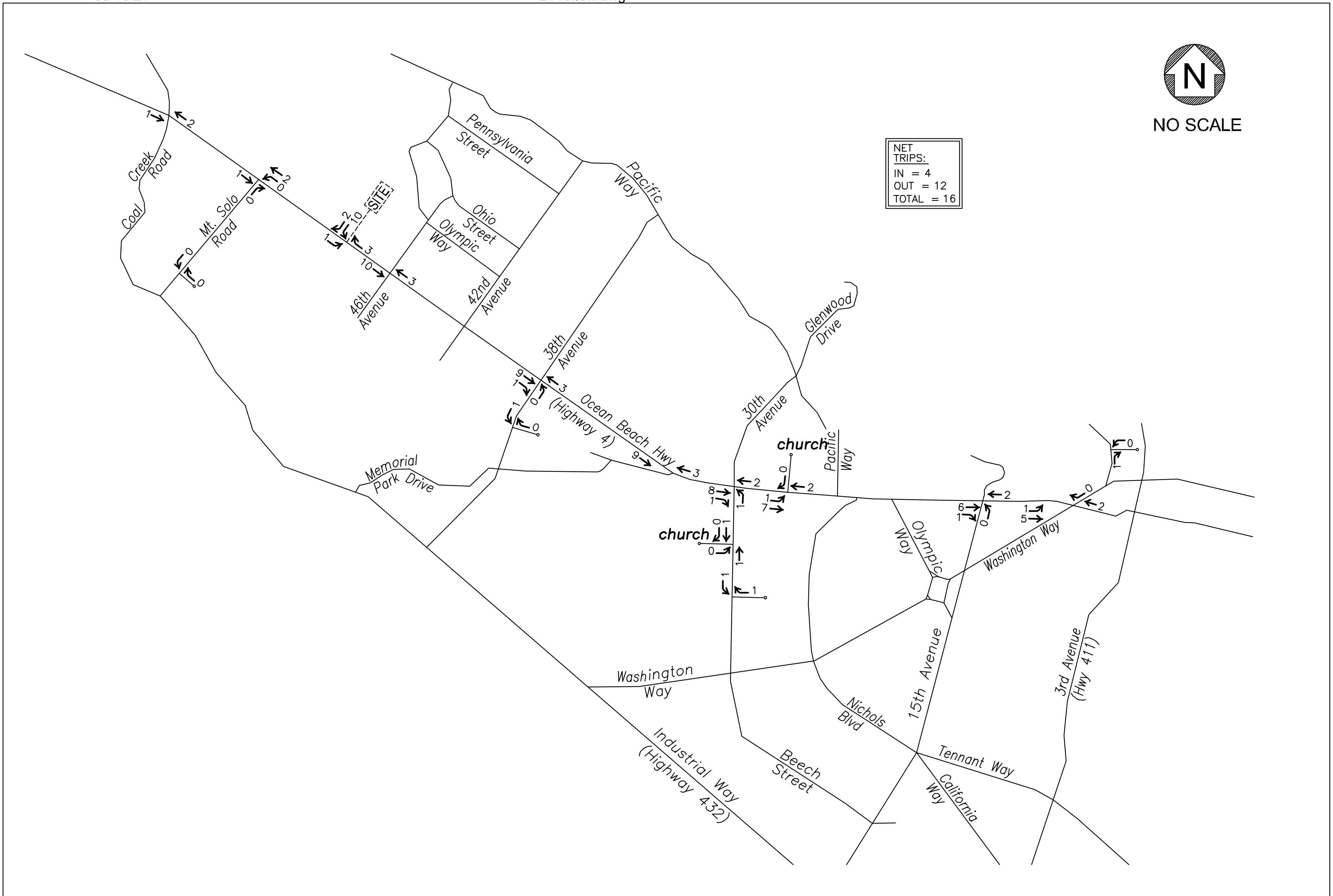
PROJECT: 24-21

NOTES: In-process traffic includes the unoccupied homes from the Mt. Solo Subdivision (to be located northeast of Altrusa Park).

IN-PROCESS TRAFFIC
MT. SOLO ROAD SUBDIVISION

FIGURE 2

PLOT DATE: 05.19.21 FILE: 2116flow.dwg



CHARBONNEAU ENGINEERING LLC

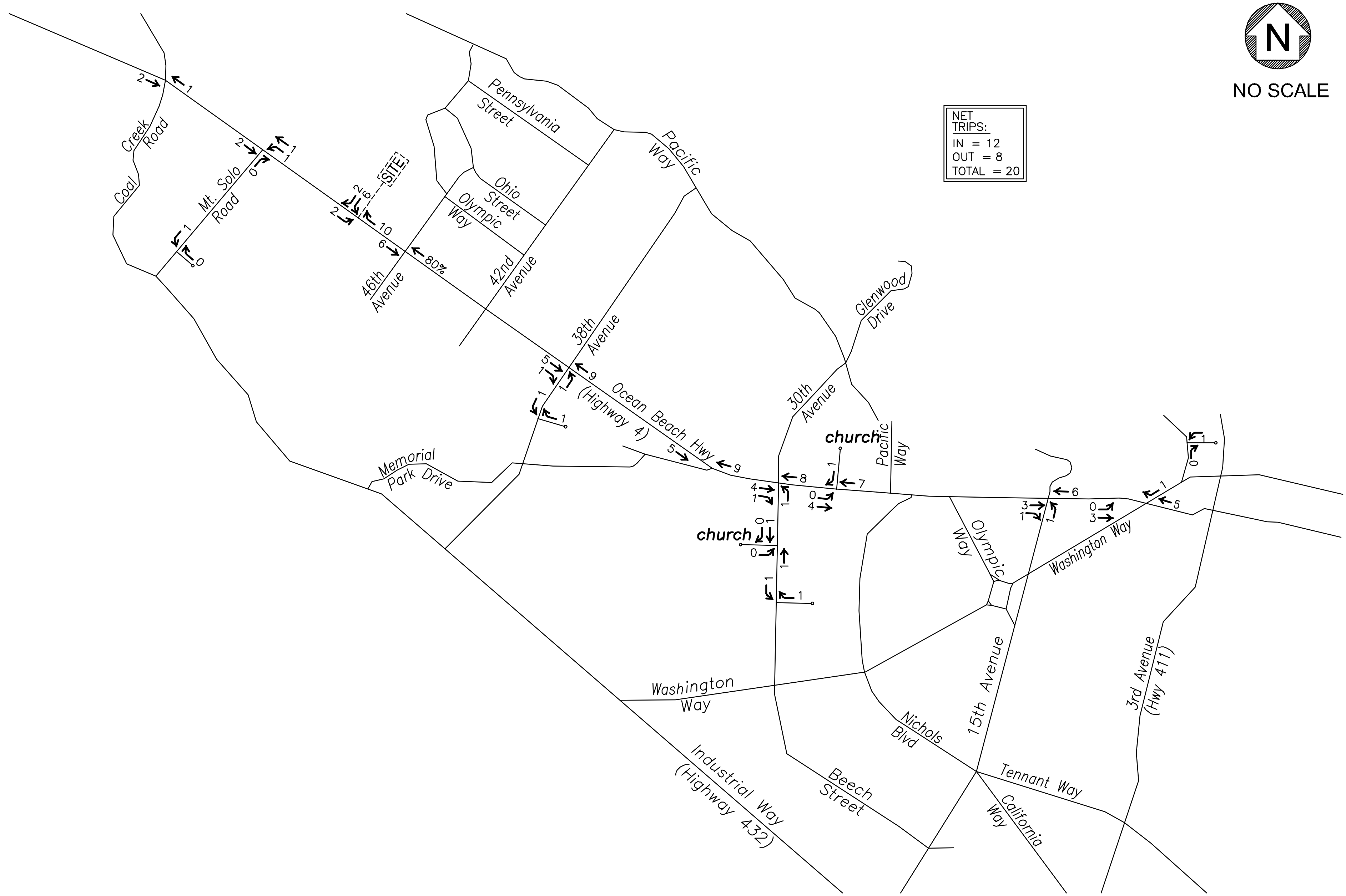
PROJECT: 21-16

NOTES: Trip generation for the proposed site is based on Mid- Rise Apartments (ITE 221) trip rates. The trip credits for the existing home are based on Single-Family Residential (ITE 210) trip rates.

TRIP ASSIGNMENT
AM PEAK HOUR
WEST BROOK APARTMENTS

FIGURE 2a

PLOT DATE: 05.19.21 FILE: 2116flow.dwg



CHARBONNEAU ENGINEERING LLC

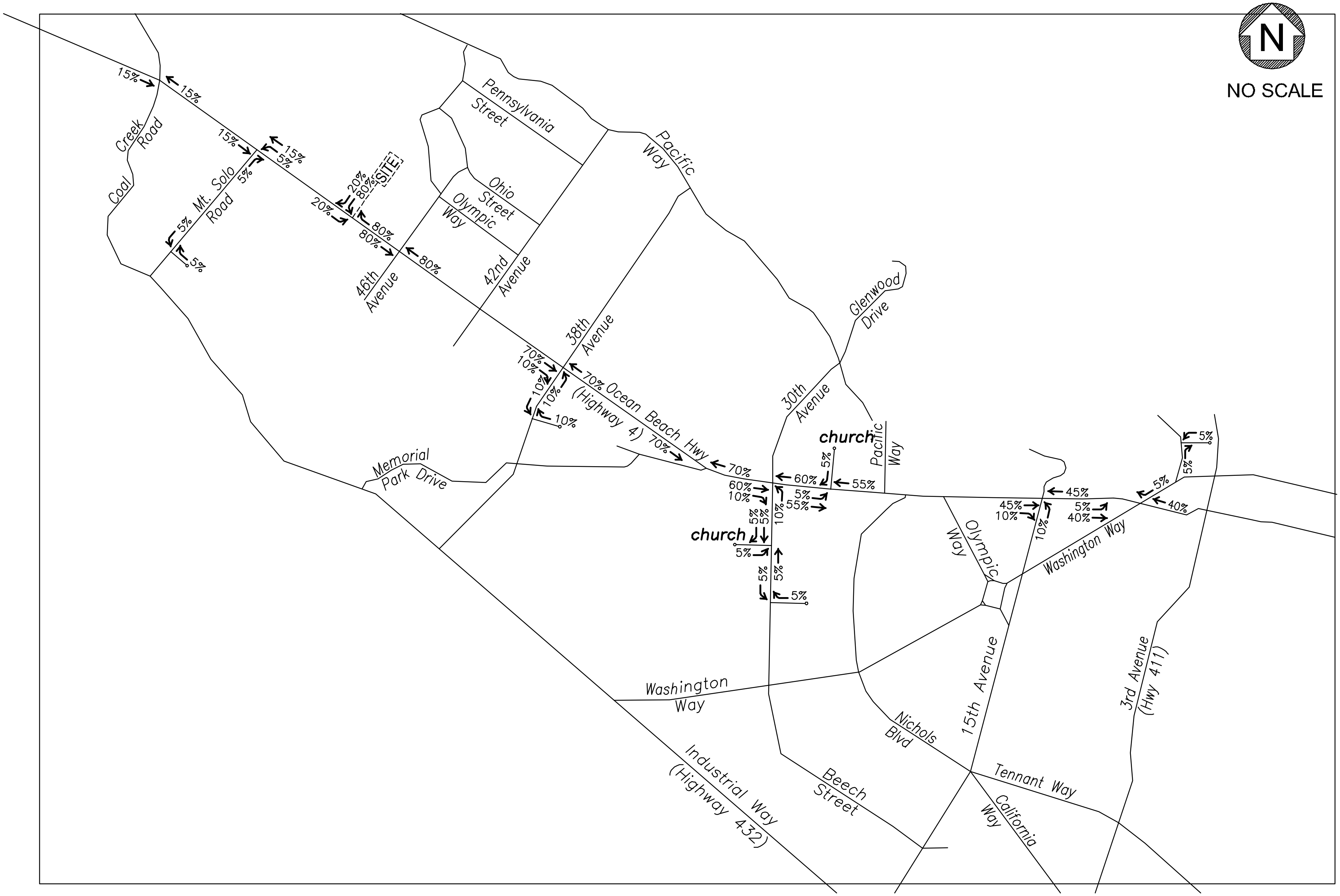
PROJECT: 21-16

NOTES: Trip generation for the proposed site is based on Mid- Rise Apartments (ITE 221) trip rates. The trip credits for the existing home are based on Single-Family Residential (ITE 210) trip rates.

TRIP ASSIGNMENT
PM PEAK HOUR
WEST BROOK APARTMENTS

FIGURE 2b

PLOT DATE: 05.19.21 FILE: 2116flow.dwg



CHARBONNEAU ENGINEERING LLC

PROJECT: 21-16

NOTES: Trip distribution based on feedback from the City's engineer and engineering judgment.

TRIP DISTRIBUTION
AM PEAK HOUR AND PM PEAK HOUR
WEST BROOK APARTMENTS

FIGURE 1

CHARBONNEAU ENGINEERING LLC

PROJECT: 24-19

NOTES: Trip distribution is based on input from City staff.

TRIP DISTRIBUTION
AM PEAK HOUR & PM PEAK HOUR
MT. SOLO APTS - LONGVIEW

FIGURE 3

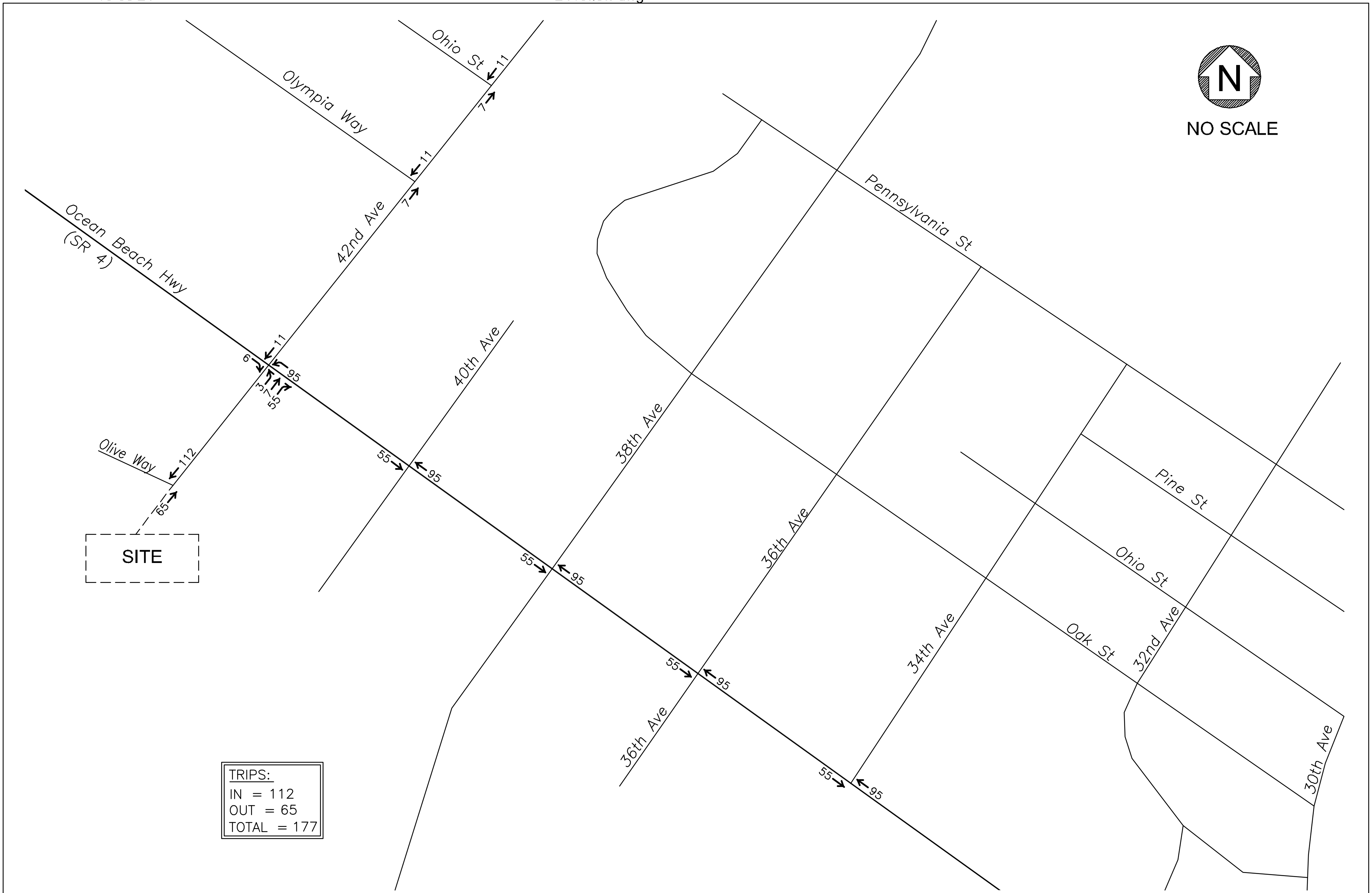
CHARBONNEAU ENGINEERING LLC

PROJECT: 24-19

NOTES: Trip generation is based on Multi-family (Low-Rise) Housing (ITE 220) trip rates.

TRIP ASSIGNMENT
AM PEAK HOUR
MT. SOLO APTS - LONGVIEW

FIGURE 4a



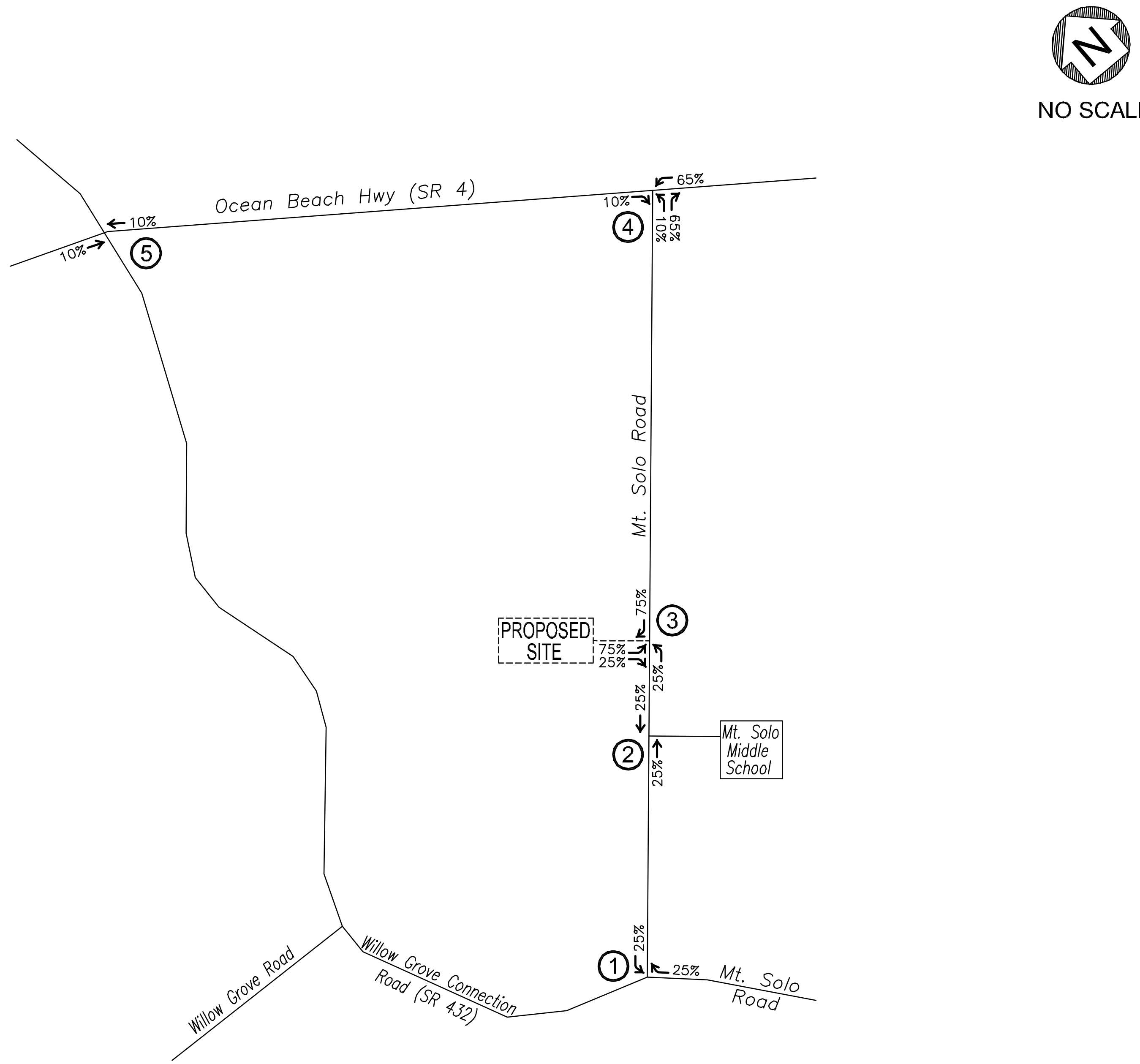
CHARBONNEAU ENGINEERING LLC

PROJECT: 24-19

NOTES: Trip generation is based on Multi-family (Low-Rise) Housing (ITE 220) trip rates.

TRIP ASSIGNMENT
PM PEAK HOUR
MT. SOLO APTS - LONGVIEW

FIGURE 4b



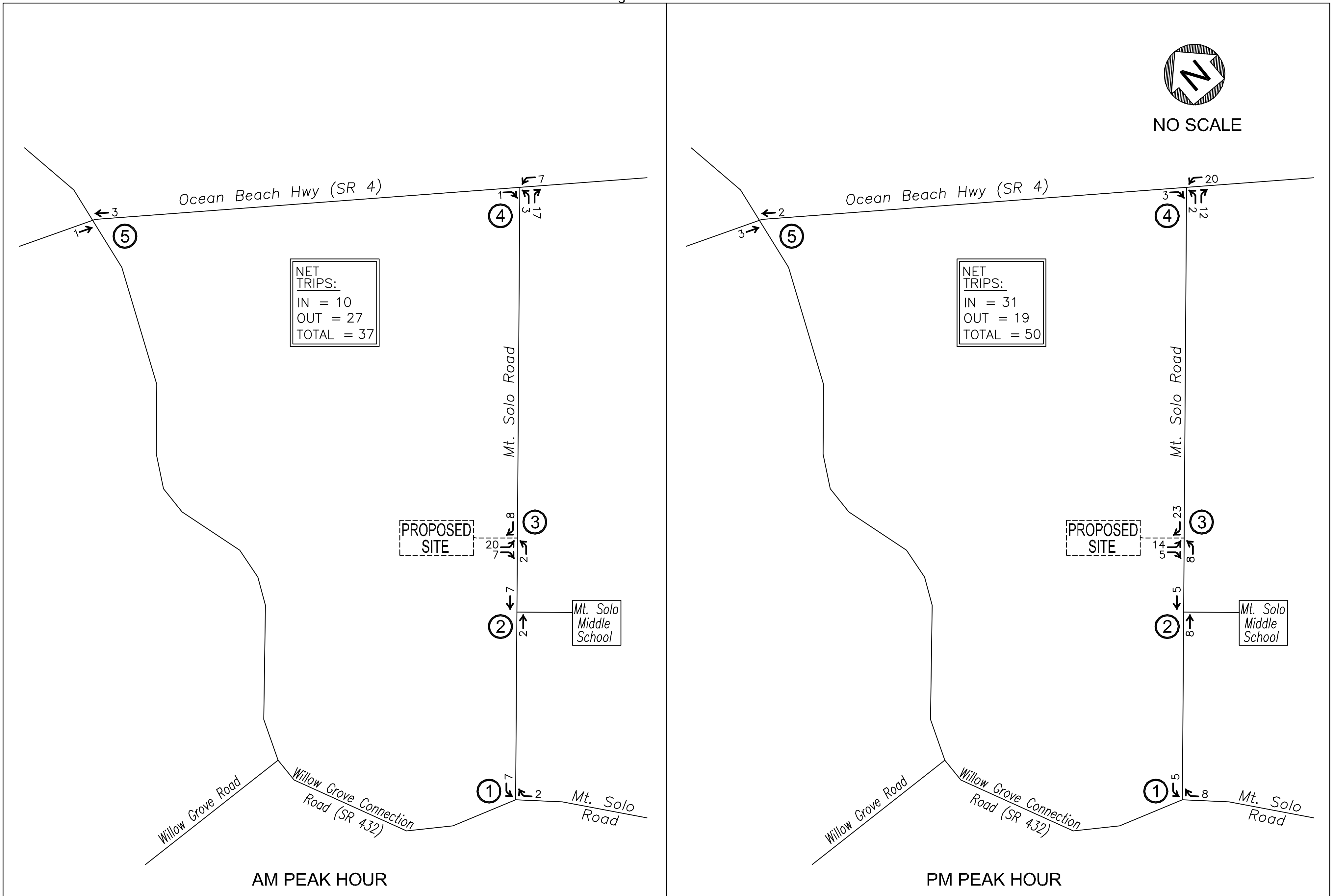
CHARBONNEAU ENGINEERING LLC

PROJECT: 24-21

NOTES: The site's trip distribution is based on City staff input and engineering judgment.

TRIP DISTRIBUTION
AM PEAK HOUR AND PM PEAK HOUR
MT. SOLO ROAD SUBDIVISION

FIGURE 4



CHARBONNEAU ENGINEERING LLC

PROJECT: 24-21

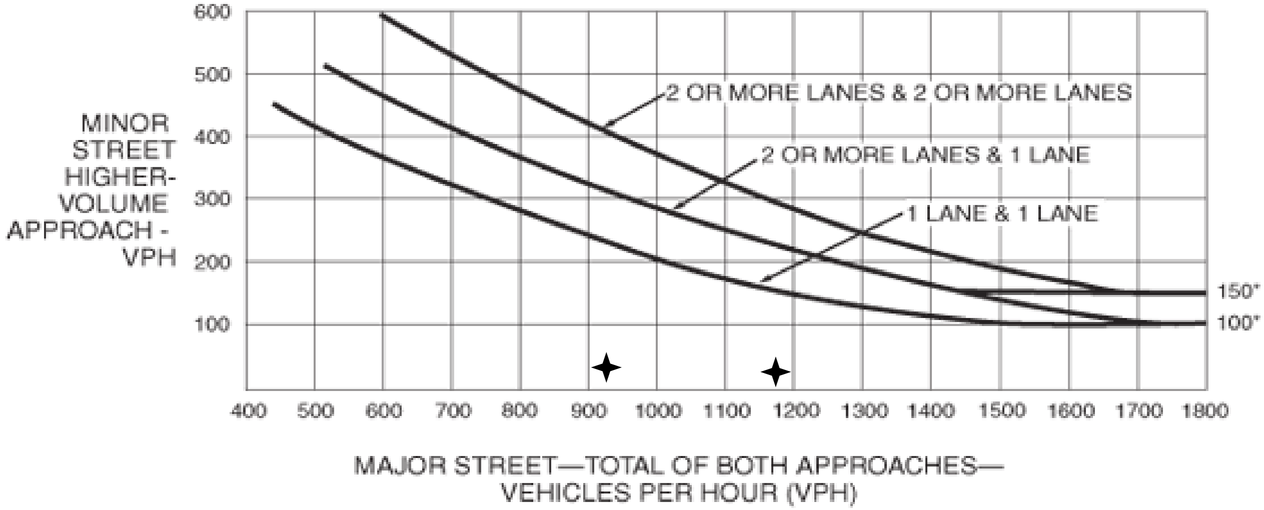
NOTES: The proposed site's trip generation is estimated with Single-Family Residential trip rates (ITE 210). The trip credit for the existing home on-site has been estimated with the same trip rates.

NET TRIP ASSIGNMENT

MT. SOLO ROAD SUBDIVISION

FIGURE 5

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Table for Figure 4C-3

One lane and one lane		Two or more lanes and one lane		Two or more lanes and two or more lanes	
VPH on the major street (Total of both approaches)	VPH on the minor street (Higher volume approach)	VPH on the major street (Total of both approaches)	VPH on the minor street (Higher volume approach)	VPH on the major street (Total of both approaches)	VPH on the minor street (Higher volume approach)
1800	100	1800	100 or 150*	1800	150
1700	100	1700	100 or 150*	1700	150
1600	100	1600	120 or 150*	1600	170
1500	100	1500	145 or 150*	1500	180
1400	120	1400	155	1400	220
1300	130	1300	190	1300	250
1200	150	1200	220	1200	285
1100	175	1100	250	1100	340
1000	200	1000	285	1000	370
900	245	900	325	900	425
800	285	800	360	800	475
700	325	700	420	700	540
600	360	600	460	600	590
500	420	500	Not available	500	Not available

* Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Peak hour volume warrant for signalization data.

Intersection	Analysis Period	Major Street Speed (mph)	Major Street		Minor Street High Volume Approach		Signal Warranted?
			Volume (vph)	Lanes (#)	Volume (vph)	Lanes (#)	
48th Avenue and Ocean Beach Hwy (SR 4)	2028 Total Traffic - AM Peak	40	932	2	33	1	No
	2028 Total Traffic - PM Peak		1,176		29		No

Source: *Manual on Uniform Traffic Control Devices (MUTCD)*, 2009 Edition.

Charbonneau
Engineering LLC

PROJECT: #25-03 48th Ave PUD Subdivision DATE: 02.16.25

OFFICER REPORTED CRASHES THAT OCCURRED AT THE FOLLOWING INTERSECTIONS IN COWLITZ COUNTY

SR 4 (MP 56.47 - 56.51) @ 48TH AVE

SR 4 (MP 56.72 - 56.78) @ 46TH AVE

01/01/2019 - 12/31/2023

Under 23 U.S. Code § 148 and 23 U.S. Code § 407, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

PRIMARY TRAFFICWAY	MILEPOST	REPORT NUMBER	DATE	MOST SEVERE INJURY TYPE	# INJ	# FAT	# VEH	# PEDS	# BIKES	VEH 1 COMPASS DIR FROM	VEH 1 COMPASS DIR TO	VEH 2 COMPASS DIR FROM	VEH 2 COMPASS DIR TO	MV DRIVER CONTRIBUTING CIRCUMSTANCE 1 (UNIT 1)
004	56.47-48TH AVE	EC12589	01/13/2022	Suspected Serious Injury	1	0	1	1	0	East	West			Under Influence of Alcohol
004	56.48-48TH AVE	ED78350	07/10/2023	No Apparent Injury	0	0	2	0	0	East	West	e Stopped	e Stopped	Under Influence of Drugs
004	56.75-46TH AVE	E965639	09/18/2019	No Apparent Injury	0	0	2	0	0	West	East	West	East	Inattention
004	56.75-46TH AVE	EB39129	06/09/2021	No Apparent Injury	0	0	1	0	1	East	West			None
004	56.76-46TH AVE	E919782	05/07/2019	No Apparent Injury	0	0	2	0	0	East	West	North	West	Disregard Stop and Go Light
004	56.76-46TH AVE	E944647	07/26/2019	No Apparent Injury	0	0	2	0	0	South	West	South	South	None
004	56.76-46TH AVE	ED86197	07/30/2023	Suspected Serious Injury	2	0	1	0	0	East	West			Other Contributing Circ Not Listed
004	56.76-46TH AVE	EB34075	05/25/2021	Suspected Minor Injury	2	0	2	0	0	West	East	South	East	Disregard Traffic Sign and Signals
004	56.76-46TH AVE	EB67246	09/10/2021	No Apparent Injury	0	0	2	0	0	East	West	North	East	Disregard Traffic Sign and Signals
004	56.76-46TH AVE	EC97540	10/26/2022	No Apparent Injury	0	0	2	0	0	cle Stopped	West	e Stopped	North	Disregard Traffic Sign and Signals
004	56.76-46TH AVE	EB12989	03/06/2021	No Apparent Injury	0	0	2	0	0	North	East	West	East	Disregard Traffic Sign and Signals
004	56.76-46TH AVE	E931184	06/10/2019	Possible Injury	2	0	2	0	0	East	West	e Stopped	e Stopped	Inattention
004	56.76-46TH AVE	EB20767	04/10/2021	No Apparent Injury	0	0	2	0	0	Southeast	Northeast	e Stopped	e Stopped	Under Influence of Alcohol
004	56.77-46TH AVE	E963737	09/22/2019	Possible Injury	1	0	2	0	0	West	East	West	East	Inattention

OFFICER REPORTED CRASHES THAT OCCURRED *at* OR *in the vicinity of* THE FOLLOWING INTERSECTIONS IN THE CITY OF LONGVIEW & COWLITZ COUNTY

SR 004 (aka Ocean Beach Hwy, mp 57.72 - 57.78) @ 38th Ave

01/01/2019 - 12/31/2023

Under 23 U.S. Code § 148 and 23 U.S. Code § 407, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

PRIMARY TRAFFICWAY	BLOCK NUMBER	INTERSECTING TRAFFICWAY	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	MILEPOST	REPORT NUMBER	DATE	MOST SEVERE INJURY TYPE	# INJ	# FAT	# VEH	# PEDS	# BIKES	JUNCTION RELATIONSHIP	VEH 1 COMPASS DIR FROM	VEH 1 COMPASS DIR TO	VEH 2 COMPASS DIR FROM	VEH 2 COMPASS DIR TO
~~38TH AVE~~	~~2200~~		~~50~~	~~F~~	~~NE~~	~~OCEAN BEACH HWY~~		~~E947918~~	~~08/07/2019~~	~~No Apparent Injury~~	~~0~~	~~0~~	~~2~~	~~0~~	~~0~~	~~Not at Intersection and Not Related~~	~~North~~	~~South~~	~~Stopped~~	~~South~~
38TH AVE	2200		37	F	SW	OCEAN BEACH HWY		EA31637	05/01/2020	No Apparent Injury	0	0	2	0	0	Intersection Related but Not at Intersection	South	North	South	North
38TH AVE	8000		100	F	NE	OCEAN BEACH HWY		EB97098	12/01/2021	No Apparent Injury	0	0	2	0	0	Intersection Related but Not at Intersection	South	e Backing	Stopped	Stopped
~~004~~		~~38th Ave~~					~~57.72~~	~~EC11289~~	~~06/24/2021~~	~~No Apparent Injury~~	~~0~~	~~0~~	~~2~~	~~0~~	~~0~~	~~At Driveway~~	~~East~~	~~South~~	~~West~~	~~East~~
~~004~~		~~38th Ave~~					~~57.72~~	~~E920018~~	~~05/13/2019~~	~~No Apparent Injury~~	~~0~~	~~0~~	~~2~~	~~0~~	~~0~~	~~At Driveway~~	~~South~~	~~North~~	~~West~~	~~East~~
~~004~~		~~38th Ave~~					~~57.72~~	~~EB03133~~	~~01/24/2021~~	~~No Apparent Injury~~	~~0~~	~~0~~	~~2~~	~~0~~	~~0~~	~~At Driveway~~	~~South~~	~~West~~	~~West~~	~~East~~
~~004~~		~~38th Ave~~					~~57.72~~	~~ED09596~~	~~11/23/2022~~	~~No Apparent Injury~~	~~0~~	~~0~~	~~2~~	~~0~~	~~0~~	~~At Driveway~~	~~South~~	~~East~~	~~West~~	~~East~~
004		38th Ave					57.73	E927020	06/01/2019	Suspected Minor Injury	2	0	2	0	0	Intersection Related but Not at Intersection	West	East	Stopped	Stopped
004		38th Ave					57.73	EA72361	10/15/2020	Possible Injury	1	0	2	0	0	Intersection Related but Not at Intersection	West	East	Stopped	Stopped
~~004~~		~~38th Ave~~					~~57.73~~	~~EB36972~~	~~06/05/2021~~	~~Suspected Minor Injury~~	~~1~~	~~0~~	~~3~~	~~0~~	~~0~~	~~Not at Intersection and Not Related~~	~~West~~	~~East~~	~~West~~	~~East~~
~~004~~		~~38th Ave~~					~~57.73~~	~~ED27722~~	~~01/22/2023~~	~~No Apparent Injury~~	~~0~~	~~0~~	~~2~~	~~0~~	~~0~~	~~Driveway Related but Not at Driveway~~	~~East~~	~~West~~	~~East~~	~~West~~
~~004~~		~~38th Ave~~					~~57.73~~	~~E995755~~	~~12/20/2019~~	~~No Apparent Injury~~	~~0~~	~~0~~	~~2~~	~~0~~	~~0~~	~~Not at Intersection and Not Related~~	~~West~~	~~East~~	~~Stopped~~	~~Stopped~~
~~004~~		~~38th Ave~~					~~57.73~~	~~ED52507~~	~~04/11/2023~~	~~No Apparent Injury~~	~~0~~	~~0~~	~~2~~	~~0~~	~~0~~	~~At Driveway~~	~~East~~	~~South~~	~~West~~	~~East~~
004		38th Ave					57.74	EA64847	09/18/2020	No Apparent Injury	0	0	2	0	0	At Intersection and Related	South	West	Stopped	Stopped
~~004~~		~~38th Ave~~					~~57.74~~	~~EA00155~~	~~01/05/2020~~	~~Possible Injury~~	~~1~~	~~0~~	~~1~~	~~0~~	~~0~~	~~Not at Intersection and Not Related~~	~~West~~	~~East~~		
004		38th Ave					57.75	ED59208	05/10/2023	No Apparent Injury	0	0	2	0	0	At Intersection and Related	South	North	Stopped	Stopped
004		38th Ave					57.75	EE27365	12/05/2023	Suspected Minor Injury	1	0	2	0	0	At Intersection and Related	West	East	Stopped	Stopped
004		38th Ave					57.75	EC08806	01/05/2022	No Apparent Injury	0	0	2	0	0	At Intersection and Related	West	East	North	South
004		38th Ave					57.75	EC22560	02/22/2022	No Apparent Injury	0	0	2	0	0	At Intersection and Related	North	West	South	West
004		38th Ave					57.75	EE02326	09/24/2023	No Apparent Injury	0	0	1	0	0	At Intersection and Related	South	West		
004		38th Ave					57.75	EC82480	09/02/2022	Possible Injury	2	0	2	0	0	At Intersection and Related	Stopped	Stopped	East	West
004		38th Ave					57.75	ED12072	12/07/2022	Unknown	0	0	2	0	0	At Intersection and Related	East	West	East	West
004		38th Ave					57.75	E978649	10/31/2019	No Apparent Injury	0	0	2	0	0	At Intersection and Related	West	North	North	East
004		38th Ave					57.75	EC74416	08/14/2022	No Apparent Injury	0	0	2	0	0	At Intersection and Related	East	West	North	East
004		38th Ave					57.75	ED10610	12/03/2022	No Apparent Injury	0	0	2	0	0	At Intersection and Not Related	East	West	East	West
004		38th Ave					57.75	ED27725	01/22/2023	Possible Injury	1	0	2	0	0	At Intersection and Related	West	East	West	East
004		38th Ave					57.75	E994408	12/16/2019	Possible Injury	1	0	1	0	1	At Intersection and Related	South	North		
004		38th Ave					57.75	EA62475	09/04/2020	No Apparent Injury	0	0	2	0	0	At Intersection and Related	North	South	Stopped	Stopped
004		38th Ave					57.75	EA57142	08/19/2020	Possible Injury	2	0	2	0	0	At Intersection and Related	West	East	East	South
004		38th Ave					57.75	ED77959	07/09/2023	Suspected Minor Injury	2	0	4	0	0	At Intersection and Related	South	North	East	West
~~004~~		~~38th Ave~~					~~57.75~~	~~EA18339~~	~~02/26/2020~~	~~Suspected Minor Injury~~	~~2~~	~~0~~	~~2~~	~~0~~	~~0~~	~~Not at Intersection and Not Related~~	~~East~~	~~East~~	~~East~~	~~West~~
004		38th Ave					57.75	EB26966	05/02/2021	No Apparent Injury	0	0	2	0	0	At Intersection and Related	West	East	West	Stopped

OFFICER REPORTED CRASHES THAT OCCURRED *at* OR *in the vicinity of* THE FOLLOWING INTERSECTIONS IN THE CITY OF LONGVIEW & COWLITZ COUNTY

SR 004 (aka Ocean Beach Hwy, mp 57.72 - 57.78) @ 38th Ave

01/01/2019 - 12/31/2023

Under 23 U.S. Code § 148 and 23 U.S. Code § 407, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

PRIMARY TRAFFICWAY	BLOCK NUMBER	INTERSECTING TRAFFICWAY	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	MILEPOST	REPORT NUMBER	DATE	MOST SEVERE INJURY TYPE	# INJ	# FAT	# VEH	# PEDS	# BIKES	JUNCTION RELATIONSHIP	VEH 1 COMPASS DIR FROM	VEH 1 COMPASS DIR TO	VEH 2 COMPASS DIR FROM	VEH 2 COMPASS DIR TO
004		38th Ave					57.75	EB06861	02/16/2021	No Apparent Injury	0	0	2	0	0	At Intersection and Related	South	North	Stopped	Stopped
004		38th Ave					57.75	ED04879	11/15/2022	No Apparent Injury	0	0	2	0	0	At Intersection and Related	West	East	South	West
004		38th Ave					57.76	E937904	07/07/2019	Possible Injury	1	0	2	0	0	At Intersection and Related	South	North	Stopped	Stopped
004		38th Ave					57.76	E894578	02/18/2019	Possible Injury	2	0	2	0	0	Intersection Related but Not at Intersection	East	West	East	West
~~004~~		~~38th Ave~~					~~57.77~~	~~EA83365~~	~~11/09/2020~~	~~No Apparent Injury~~	~~0~~	~~0~~	~~2~~	~~0~~	~~0~~	~~Not at Intersection and Not Related~~	~~East~~	~~West~~	~~East~~	~~West~~
004		38th Ave					57.77	EC05265	12/26/2021	Possible Injury	1	0	2	0	0	Intersection Related but Not at Intersection	East	West	Stopped	Stopped
004		38th Ave					57.77	EE19863	11/14/2023	No Apparent Injury	0	0	2	0	0	Intersection Related but Not at Intersection	East	West	East	West
004		38th Ave					57.77	EB89911	11/05/2021	No Apparent Injury	0	0	3	0	0	Intersection Related but Not at Intersection	East	West	Stopped	Stopped

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	589	4	9	245	10	3	0	19	15	0	7
Future Volume (vph)	7	589	4	9	245	10	3	0	19	15	0	7
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 27.8%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	589	4	9	245	10	3	0	19	15	0	7
Future Vol, veh/h	7	589	4	9	245	10	3	0	19	15	0	7
Conflicting Peds, #/hr	1	0	1	1	0	1	1	0	1	1	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	693	5	11	288	12	4	0	22	18	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	301	0	0	699	0	0	880	1036	351	681	1032	152
Stage 1	-	-	-	-	-	-	713	713	-	317	317	-
Stage 2	-	-	-	-	-	-	167	323	-	364	715	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1272	-	-	907	-	-	245	233	651	340	235	873
Stage 1	-	-	-	-	-	-	394	438	-	674	658	-
Stage 2	-	-	-	-	-	-	824	654	-	633	438	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1271	-	-	906	-	-	239	228	650	323	230	871
Mov Cap-2 Maneuver	-	-	-	-	-	-	239	228	-	323	230	-
Stage 1	-	-	-	-	-	-	391	435	-	669	649	-
Stage 2	-	-	-	-	-	-	806	645	-	607	435	-

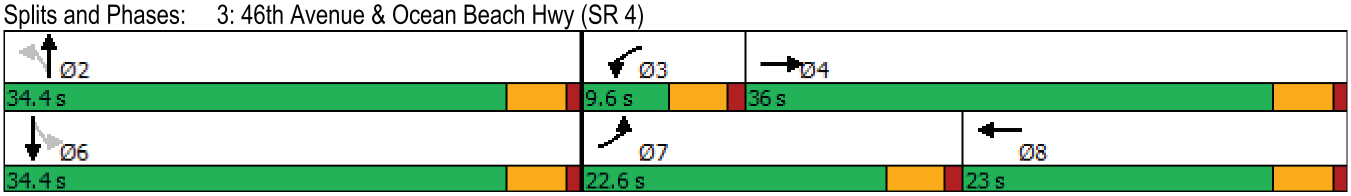
Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	12.2	14.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	527	1271	-	-	906	-	-	404
HCM Lane V/C Ratio	0.049	0.006	-	-	0.012	-	-	0.064
HCM Control Delay (s)	12.2	7.9	-	-	9	-	-	14.5
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	600	8	6	234	39	4	6	20	72	3	36
Future Volume (vph)	38	600	8	6	234	39	4	6	20	72	3	36
Confl. Peds. (#/hr)	5		8	3			8		3			5
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		30.1	30.1		32.1	32.1	
Total Split (s)	22.6	36.0		9.6	23.0		34.4	34.4		34.4	34.4	
Total Split (%)	28.3%	45.0%		12.0%	28.8%		43.0%	43.0%		43.0%	43.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	7.2	19.9		5.2	14.5			30.5			30.5	
Actuated g/C Ratio	0.12	0.33		0.09	0.24			0.50			0.50	
v/c Ratio	0.22	0.63		0.05	0.39			0.04			0.18	
Control Delay	29.6	20.0		31.0	20.7			7.1			9.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	29.6	20.0		31.0	20.7			7.1			9.6	
LOS	C	C		C	C			A			A	
Approach Delay		20.6			20.9			7.1			9.6	
Approach LOS		C			C			A			A	

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 61.1	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 19.1	Intersection LOS: B
Intersection Capacity Utilization 55.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: 46th Avenue & Ocean Beach Hwy (SR 4)

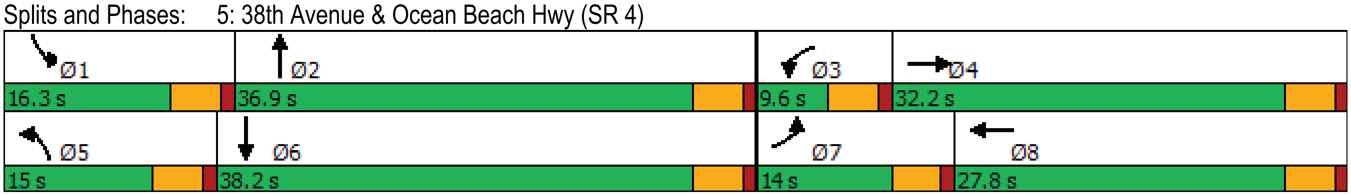


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	600	8	6	234	39	4	6	20	72	3	36
Future Volume (veh/h)	38	600	8	6	234	39	4	6	20	72	3	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	46	732	10	7	285	48	5	7	24	88	4	44
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	1	1	1
Cap, veh/h	80	1025	14	17	761	127	136	199	535	541	42	232
Arrive On Green	0.04	0.28	0.28	0.01	0.25	0.25	0.49	0.49	0.49	0.49	0.49	0.49
Sat Flow, veh/h	1810	3645	50	1810	3094	514	141	406	1095	908	85	475
Grp Volume(v), veh/h	46	362	380	7	165	168	36	0	0	136	0	0
Grp Sat Flow(s),veh/h/ln	1810	1805	1890	1810	1805	1804	1643	0	0	1468	0	0
Q Serve(g_s), s	1.5	11.0	11.0	0.2	4.6	4.7	0.0	0.0	0.0	1.9	0.0	0.0
Cycle Q Clear(g_c), s	1.5	11.0	11.0	0.2	4.6	4.7	0.7	0.0	0.0	3.0	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.29	0.14		0.67	0.65		0.32
Lane Grp Cap(c), veh/h	80	508	532	17	444	444	870	0	0	815	0	0
V/C Ratio(X)	0.57	0.71	0.71	0.42	0.37	0.38	0.04	0.00	0.00	0.17	0.00	0.00
Avail Cap(c_a), veh/h	536	930	974	151	546	546	870	0	0	815	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	28.7	19.8	19.8	30.1	19.1	19.2	8.2	0.0	0.0	8.7	0.0	0.0
Incr Delay (d2), s/veh	6.3	1.9	1.8	16.1	0.5	0.5	0.1	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	4.3	4.5	0.2	1.8	1.8	0.2	0.0	0.0	1.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.0	21.7	21.6	46.3	19.6	19.7	8.3	0.0	0.0	9.1	0.0	0.0
LnGrp LOS	C	C	C	D	B	B	A	A	A	A	A	A
Approach Vol, veh/h		788			340			36			136	
Approach Delay, s/veh		22.4			20.2			8.3			9.1	
Approach LOS		C			C			A			A	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		34.4	5.1	21.7		34.4	7.2	19.5				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		29.9	5.1	31.5		29.9	18.1	18.5				
Max Q Clear Time (g_c+I1), s		2.7	2.2	13.0		5.0	3.5	6.7				
Green Ext Time (p_c), s		0.1	0.0	4.1		0.8	0.1	1.3				
Intersection Summary												
HCM 6th Ctrl Delay			20.0									
HCM 6th LOS			C									

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	660	115	37	288	48	115	67	33	128	87	61
Future Volume (vph)	106	660	115	37	288	48	115	67	33	128	87	61
Confl. Peds. (#/hr)	2		1	2		3	1		2	3		2
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	27.2		9.5	27.8		9.5	32.9		9.5	36.7	
Total Split (s)	14.0	32.2		9.6	27.8		15.0	36.9		16.3	38.2	
Total Split (%)	14.7%	33.9%		10.1%	29.3%		15.8%	38.8%		17.2%	40.2%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)	9.2	26.8		5.1	18.5		10.0	32.9		11.0	33.9	
Actuated g/C Ratio	0.10	0.30		0.06	0.21		0.11	0.37		0.12	0.38	
v/c Ratio	0.71	0.90		0.46	0.57		0.71	0.18		0.72	0.26	
Control Delay	62.8	42.8		58.1	33.4		60.2	17.4		58.9	17.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	62.8	42.8		58.1	33.4		60.2	17.4		58.9	17.3	
LOS	E	D		E	C		E	B		E	B	
Approach Delay		45.2			35.8			40.2			36.7	
Approach LOS		D			D			D			D	

Intersection Summary	
Cycle Length: 95	
Actuated Cycle Length: 89.7	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 41.3	Intersection LOS: D
Intersection Capacity Utilization 73.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 5: 38th Avenue & Ocean Beach Hwy (SR 4)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	660	115	37	288	48	115	67	33	128	87	61
Future Volume (veh/h)	106	660	115	37	288	48	115	67	33	128	87	61
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	131	815	142	46	356	59	142	83	41	158	107	75
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	0	0	0	1	1	1	0	0	0	1	1	1
Cap, veh/h	163	901	157	68	742	122	175	435	215	192	384	269
Arrive On Green	0.09	0.29	0.29	0.04	0.24	0.24	0.10	0.36	0.36	0.11	0.37	0.37
Sat Flow, veh/h	1810	3071	535	1795	3077	505	1810	1200	593	1795	1031	722
Grp Volume(v), veh/h	131	479	478	46	206	209	142	0	124	158	0	182
Grp Sat Flow(s),veh/h/ln	1810	1805	1802	1795	1791	1791	1810	0	1792	1795	0	1753
Q Serve(g_s), s	6.4	23.1	23.1	2.3	8.9	9.1	7.0	0.0	4.3	7.8	0.0	6.6
Cycle Q Clear(g_c), s	6.4	23.1	23.1	2.3	8.9	9.1	7.0	0.0	4.3	7.8	0.0	6.6
Prop In Lane	1.00		0.30	1.00		0.28	1.00		0.33	1.00		0.41
Lane Grp Cap(c), veh/h	163	529	528	68	432	432	175	0	650	192	0	654
V/C Ratio(X)	0.80	0.90	0.90	0.68	0.48	0.48	0.81	0.00	0.19	0.82	0.00	0.28
Avail Cap(c_a), veh/h	190	553	552	101	462	462	210	0	650	234	0	654
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	40.3	30.7	30.7	42.9	29.4	29.5	40.0	0.0	19.7	39.5	0.0	19.8
Incr Delay (d2), s/veh	19.1	18.0	18.0	11.1	0.8	0.8	17.9	0.0	0.7	17.4	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	12.0	12.0	1.2	3.7	3.8	3.9	0.0	1.8	4.4	0.0	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.5	48.7	48.7	54.0	30.2	30.3	57.9	0.0	20.4	56.9	0.0	20.9
LnGrp LOS	E	D	D	D	C	C	E	A	C	E	A	C
Approach Vol, veh/h		1088			461			266			340	
Approach Delay, s/veh		50.0			32.6			40.4			37.6	
Approach LOS		D			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.2	37.3	7.9	31.0	13.2	38.2	12.6	26.3				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	11.8	32.4	5.1	27.7	10.5	33.7	9.5	23.3				
Max Q Clear Time (g_c+I1), s	9.8	6.3	4.3	25.1	9.0	8.6	8.4	11.1				
Green Ext Time (p_c), s	0.1	0.6	0.0	1.4	0.0	1.1	0.0	1.8				
Intersection Summary												
HCM 6th Ctrl Delay			43.1									
HCM 6th LOS			D									

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	445	4	21	583	25	1	0	17	15	1	8
Future Volume (vph)	2	445	4	21	583	25	1	0	17	15	1	8
Confl. Peds. (#/hr)	10		3	4		11	3		4	11		10
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 33.5%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	445	4	21	583	25	1	0	17	15	1	8
Future Vol, veh/h	2	445	4	21	583	25	1	0	17	15	1	8
Conflicting Peds, #/hr	10	0	3	4	0	11	3	0	4	11	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	2	478	4	23	627	27	1	0	18	16	1	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	665	0	0	486	0	0	858	1199	256	952	1188	348
Stage 1	-	-	-	-	-	-	488	488	-	698	698	-
Stage 2	-	-	-	-	-	-	370	711	-	254	490	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	934	-	-	1087	-	-	254	187	749	217	190	654
Stage 1	-	-	-	-	-	-	535	553	-	402	445	-
Stage 2	-	-	-	-	-	-	628	439	-	734	552	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	924	-	-	1083	-	-	242	180	738	204	183	641
Mov Cap-2 Maneuver	-	-	-	-	-	-	242	180	-	204	183	-
Stage 1	-	-	-	-	-	-	532	550	-	397	431	-
Stage 2	-	-	-	-	-	-	599	425	-	707	549	-

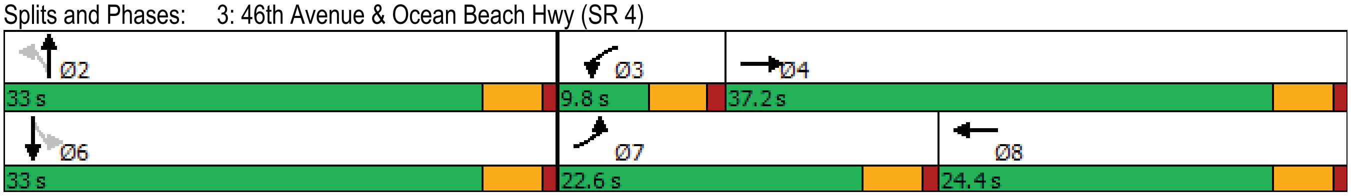
Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.3	10.6	20.2
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	663	924	-	-	1083	-	-	262
HCM Lane V/C Ratio	0.029	0.002	-	-	0.021	-	-	0.098
HCM Control Delay (s)	10.6	8.9	-	-	8.4	-	-	20.2
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0.3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	472	5	22	589	90	5	7	20	76	3	51
Future Volume (vph)	24	472	5	22	589	90	5	7	20	76	3	51
Confl. Peds. (#/hr)	9		7	2		4	7		2	4		9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		30.1	30.1		32.1	32.1	
Total Split (s)	22.6	37.2		9.8	24.4		33.0	33.0		33.0	33.0	
Total Split (%)	28.3%	46.5%		12.3%	30.5%		41.3%	41.3%		41.3%	41.3%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	6.5	17.9		5.4	17.2			29.0			29.0	
Actuated g/C Ratio	0.11	0.30		0.09	0.29			0.49			0.49	
v/c Ratio	0.13	0.48		0.15	0.72			0.04			0.19	
Control Delay	28.6	18.9		31.0	23.6			7.3			9.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	28.6	18.9		31.0	23.6			7.3			9.0	
LOS	C	B		C	C			A			A	
Approach Delay		19.4			23.9			7.3			9.0	
Approach LOS		B			C			A			A	

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 59.5	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 20.4	Intersection LOS: C
Intersection Capacity Utilization 50.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: 46th Avenue & Ocean Beach Hwy (SR 4)

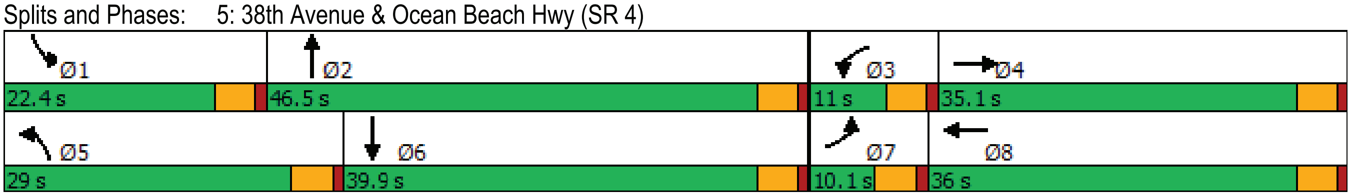


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	472	5	22	589	90	5	7	20	76	3	51
Future Volume (veh/h)	24	472	5	22	589	90	5	7	20	76	3	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	26	513	5	24	640	98	5	8	22	83	3	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	53	970	9	50	824	126	139	225	498	494	40	280
Arrive On Green	0.03	0.26	0.26	0.03	0.26	0.26	0.48	0.48	0.48	0.48	0.48	0.48
Sat Flow, veh/h	1810	3662	36	1810	3135	479	145	468	1037	827	83	582
Grp Volume(v), veh/h	26	253	265	24	368	370	35	0	0	141	0	0
Grp Sat Flow(s),veh/h/ln	1810	1805	1893	1810	1805	1809	1650	0	0	1492	0	0
Q Serve(g_s), s	0.8	7.1	7.1	0.8	11.2	11.2	0.0	0.0	0.0	1.5	0.0	0.0
Cycle Q Clear(g_c), s	0.8	7.1	7.1	0.8	11.2	11.2	0.6	0.0	0.0	2.9	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.26	0.14		0.63	0.59		0.39
Lane Grp Cap(c), veh/h	53	478	501	50	475	476	862	0	0	813	0	0
V/C Ratio(X)	0.49	0.53	0.53	0.48	0.78	0.78	0.04	0.00	0.00	0.17	0.00	0.00
Avail Cap(c_a), veh/h	552	995	1043	162	605	607	862	0	0	813	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	28.4	18.7	18.7	28.4	20.2	20.3	8.2	0.0	0.0	8.7	0.0	0.0
Incr Delay (d2), s/veh	6.8	0.9	0.9	7.0	4.8	4.9	0.1	0.0	0.0	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	2.7	2.8	0.4	4.7	4.7	0.2	0.0	0.0	1.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.2	19.6	19.5	35.5	25.1	25.2	8.3	0.0	0.0	9.2	0.0	0.0
LnGrp LOS	D	B	B	D	C	C	A	A	A	A	A	A
Approach Vol, veh/h		544			762			35			141	
Approach Delay, s/veh		20.3			25.4			8.3			9.2	
Approach LOS		C			C			A			A	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		33.0	6.1	20.2		33.0	6.2	20.1				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		28.5	5.3	32.7		28.5	18.1	19.9				
Max Q Clear Time (g_c+I1), s		2.6	2.8	9.1		4.9	2.8	13.2				
Green Ext Time (p_c), s		0.1	0.0	2.9		0.8	0.0	2.4				
Intersection Summary												
HCM 6th Ctrl Delay			21.6									
HCM 6th LOS			C									

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	590	120	57	806	97	320	195	65	150	100	95
Future Volume (vph)	65	590	120	57	806	97	320	195	65	150	100	95
Confl. Peds. (#/hr)	1		3	4		2	3		4	2		1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	27.2		9.5	27.8		9.5	32.9		9.5	36.7	
Total Split (s)	10.1	35.1		11.0	36.0		29.0	46.5		22.4	39.9	
Total Split (%)	8.8%	30.5%		9.6%	31.3%		25.2%	40.4%		19.5%	34.7%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)	5.6	32.9		6.4	31.5		23.4	44.3		14.5	35.4	
Actuated g/C Ratio	0.05	0.29		0.06	0.28		0.21	0.39		0.13	0.31	
v/c Ratio	0.77	0.72		0.58	0.95		0.90	0.38		0.68	0.35	
Control Delay	102.4	41.2		76.1	60.0		71.9	25.8		62.4	26.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	102.4	41.2		76.1	60.0		71.9	25.8		62.4	26.0	
LOS	F	D		E	E		E	C		E	C	
Approach Delay		46.3			60.9			51.2			41.8	
Approach LOS		D			E			D			D	

Intersection Summary	
Cycle Length: 115	
Actuated Cycle Length: 113.9	
Natural Cycle: 95	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 52.1	Intersection LOS: D
Intersection Capacity Utilization 88.4%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 5: 38th Avenue & Ocean Beach Hwy (SR 4)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	590	120	57	806	97	320	195	65	150	100	95
Future Volume (veh/h)	65	590	120	57	806	97	320	195	65	150	100	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	68	615	125	59	840	101	333	203	68	156	104	99
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	88	844	171	76	896	108	362	560	188	187	282	268
Arrive On Green	0.05	0.28	0.28	0.04	0.28	0.28	0.20	0.41	0.41	0.10	0.31	0.31
Sat Flow, veh/h	1810	2986	606	1810	3242	390	1810	1361	456	1810	894	851
Grp Volume(v), veh/h	68	371	369	59	468	473	333	0	271	156	0	203
Grp Sat Flow(s),veh/h/ln	1810	1805	1787	1810	1805	1826	1810	0	1816	1810	0	1745
Q Serve(g_s), s	4.2	20.9	21.0	3.6	28.5	28.5	20.3	0.0	11.6	9.5	0.0	10.1
Cycle Q Clear(g_c), s	4.2	20.9	21.0	3.6	28.5	28.5	20.3	0.0	11.6	9.5	0.0	10.1
Prop In Lane	1.00		0.34	1.00		0.21	1.00		0.25	1.00		0.49
Lane Grp Cap(c), veh/h	88	510	505	76	499	505	362	0	748	187	0	550
V/C Ratio(X)	0.78	0.73	0.73	0.77	0.94	0.94	0.92	0.00	0.36	0.83	0.00	0.37
Avail Cap(c_a), veh/h	90	510	505	105	506	512	394	0	748	288	0	550
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	52.9	36.4	36.5	53.3	39.7	39.7	44.1	0.0	22.9	49.4	0.0	29.9
Incr Delay (d2), s/veh	33.1	5.2	5.3	21.0	25.3	25.1	25.2	0.0	1.4	11.7	0.0	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	9.6	9.6	2.1	15.6	15.8	11.3	0.0	5.1	4.9	0.0	4.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.0	41.6	41.8	74.3	65.0	64.8	69.2	0.0	24.2	61.2	0.0	31.8
LnGrp LOS	F	D	D	E	E	E	E	A	C	E	A	C
Approach Vol, veh/h		808			1000			604			359	
Approach Delay, s/veh		45.4			65.4			49.0			44.5	
Approach LOS		D			E			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.1	50.8	9.2	36.3	27.0	39.9	9.9	35.6
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	17.9	42.0	6.5	30.6	24.5	35.4	5.6	31.5
Max Q Clear Time (g_c+I1), s	11.5	13.6	5.6	23.0	22.3	12.1	6.2	30.5
Green Ext Time (p_c), s	0.2	1.5	0.0	2.6	0.2	1.2	0.0	0.6

Intersection Summary	
HCM 6th Ctrl Delay	53.3
HCM 6th LOS	D

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	629	4	9	267	10	3	0	20	15	0	7
Future Volume (vph)	7	629	4	9	267	10	3	0	20	15	0	7
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 29.1%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	629	4	9	267	10	3	0	20	15	0	7
Future Vol, veh/h	7	629	4	9	267	10	3	0	20	15	0	7
Conflicting Peds, #/hr	1	0	1	1	0	1	1	0	1	1	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	740	5	11	314	12	4	0	24	18	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	327	0	0	746	0	0	940	1109	375	730	1105	165
Stage 1	-	-	-	-	-	-	760	760	-	343	343	-
Stage 2	-	-	-	-	-	-	180	349	-	387	762	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1244	-	-	871	-	-	221	211	628	314	213	857
Stage 1	-	-	-	-	-	-	369	417	-	651	641	-
Stage 2	-	-	-	-	-	-	810	637	-	614	416	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1243	-	-	870	-	-	215	207	627	297	209	855
Mov Cap-2 Maneuver	-	-	-	-	-	-	215	207	-	297	209	-
Stage 1	-	-	-	-	-	-	366	414	-	646	632	-
Stage 2	-	-	-	-	-	-	791	628	-	587	413	-

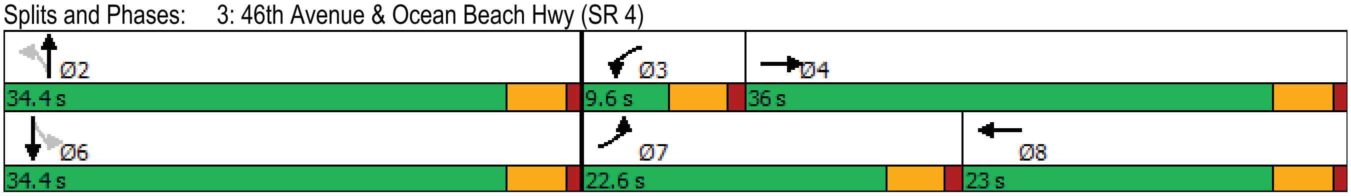
Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	12.6	15.3
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	502	1243	-	-	870	-	-	375
HCM Lane V/C Ratio	0.054	0.007	-	-	0.012	-	-	0.069
HCM Control Delay (s)	12.6	7.9	-	-	9.2	-	-	15.3
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	649	8	6	257	40	4	6	21	74	3	37
Future Volume (vph)	39	649	8	6	257	40	4	6	21	74	3	37
Confl. Peds. (#/hr)	5		8	3			8		3			5
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		30.1	30.1		32.1	32.1	
Total Split (s)	22.6	36.0		9.6	23.0		34.4	34.4		34.4	34.4	
Total Split (%)	28.3%	45.0%		12.0%	28.8%		43.0%	43.0%		43.0%	43.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	7.3	21.3		5.2	15.8			30.5			30.5	
Actuated g/C Ratio	0.12	0.34		0.08	0.25			0.49			0.49	
v/c Ratio	0.23	0.65		0.05	0.40			0.05			0.19	
Control Delay	30.4	20.1		32.0	20.7			7.3			10.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	30.4	20.1		32.0	20.7			7.3			10.2	
LOS	C	C		C	C			A			B	
Approach Delay		20.7			20.9			7.3			10.2	
Approach LOS		C			C			A			B	

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 62.5	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 19.3	Intersection LOS: B
Intersection Capacity Utilization 56.6%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: 46th Avenue & Ocean Beach Hwy (SR 4)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	649	8	6	257	40	4	6	21	74	3	37
Future Volume (veh/h)	39	649	8	6	257	40	4	6	21	74	3	37
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	48	791	10	7	313	49	5	7	26	90	4	45
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	1	1	1
Cap, veh/h	82	1082	14	17	815	126	127	186	537	529	40	227
Arrive On Green	0.05	0.30	0.30	0.01	0.26	0.26	0.48	0.48	0.48	0.48	0.48	0.48
Sat Flow, veh/h	1810	3650	46	1810	3130	485	130	388	1123	907	84	475
Grp Volume(v), veh/h	48	391	410	7	179	183	38	0	0	139	0	0
Grp Sat Flow(s),veh/h/ln	1810	1805	1891	1810	1805	1809	1641	0	0	1466	0	0
Q Serve(g_s), s	1.6	12.2	12.2	0.2	5.1	5.2	0.0	0.0	0.0	2.1	0.0	0.0
Cycle Q Clear(g_c), s	1.6	12.2	12.2	0.2	5.1	5.2	0.8	0.0	0.0	3.2	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.27	0.13		0.68	0.65		0.32
Lane Grp Cap(c), veh/h	82	535	561	17	470	471	850	0	0	796	0	0
V/C Ratio(X)	0.59	0.73	0.73	0.42	0.38	0.39	0.04	0.00	0.00	0.17	0.00	0.00
Avail Cap(c_a), veh/h	524	910	953	148	534	536	850	0	0	796	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	29.3	19.7	19.7	30.8	19.0	19.0	8.7	0.0	0.0	9.3	0.0	0.0
Incr Delay (d2), s/veh	6.5	1.9	1.9	16.2	0.5	0.5	0.1	0.0	0.0	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	4.7	4.9	0.2	2.0	2.0	0.3	0.0	0.0	1.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.8	21.7	21.6	47.0	19.5	19.5	8.8	0.0	0.0	9.8	0.0	0.0
LnGrp LOS	D	C	C	D	B	B	A	A	A	A	A	A
Approach Vol, veh/h		849			369			38			139	
Approach Delay, s/veh		22.4			20.0			8.8			9.8	
Approach LOS		C			C			A			A	

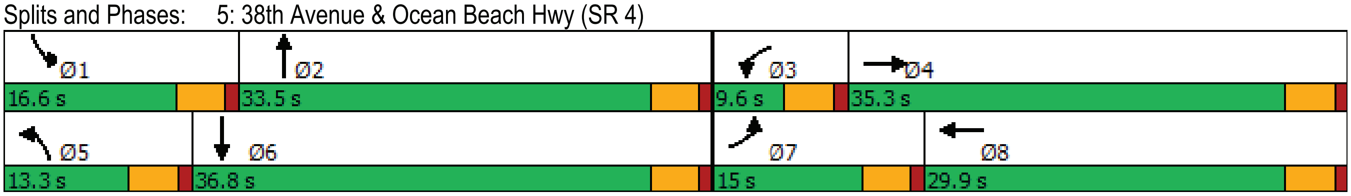
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		34.4	5.1	23.0		34.4	7.3	20.8				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		29.9	5.1	31.5		29.9	18.1	18.5				
Max Q Clear Time (g_c+I1), s		2.8	2.2	14.2		5.2	3.6	7.2				
Green Ext Time (p_c), s		0.2	0.0	4.4		0.8	0.1	1.4				

Intersection Summary			
HCM 6th Ctrl Delay			20.2
HCM 6th LOS			C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	109	798	119	38	336	49	118	69	34	132	90	63
Future Volume (vph)	109	798	119	38	336	49	118	69	34	132	90	63
Confl. Peds. (#/hr)	2		1	2		3	1		2	3		2
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	27.2		9.5	27.8		9.5	32.9		9.5	36.7	
Total Split (s)	15.0	35.3		9.6	29.9		13.3	33.5		16.6	36.8	
Total Split (%)	15.8%	37.2%		10.1%	31.5%		14.0%	35.3%		17.5%	38.7%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)	9.9	30.9		5.1	22.0		8.8	29.9		11.3	32.4	
Actuated g/C Ratio	0.11	0.34		0.06	0.24		0.10	0.33		0.12	0.36	
v/c Ratio	0.69	0.94		0.47	0.56		0.84	0.21		0.74	0.29	
Control Delay	59.3	45.1		59.4	31.8		79.5	19.8		59.9	18.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	59.3	45.1		59.4	31.8		79.5	19.8		59.9	18.8	
LOS	E	D		E	C		E	B		E	B	
Approach Delay		46.6			34.3			51.7			37.8	
Approach LOS		D			C			D			D	

Intersection Summary	
Cycle Length: 95	
Actuated Cycle Length: 91.2	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 43.3	Intersection LOS: D
Intersection Capacity Utilization 77.7%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 5: 38th Avenue & Ocean Beach Hwy (SR 4)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	109	798	119	38	336	49	118	69	34	132	90	63
Future Volume (veh/h)	109	798	119	38	336	49	118	69	34	132	90	63
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	135	985	147	47	415	60	146	85	42	163	111	78
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	0	0	0	1	1	1	0	0	0	1	1	1
Cap, veh/h	167	1036	155	68	862	124	171	397	196	197	356	250
Arrive On Green	0.09	0.33	0.33	0.04	0.27	0.27	0.09	0.33	0.33	0.11	0.35	0.35
Sat Flow, veh/h	1810	3149	470	1795	3141	451	1810	1199	593	1795	1029	723
Grp Volume(v), veh/h	135	564	568	47	235	240	146	0	127	163	0	189
Grp Sat Flow(s),veh/h/ln	1810	1805	1814	1795	1791	1801	1810	0	1792	1795	0	1753
Q Serve(g_s), s	6.8	28.5	28.5	2.4	10.2	10.4	7.4	0.0	4.8	8.3	0.0	7.4
Cycle Q Clear(g_c), s	6.8	28.5	28.5	2.4	10.2	10.4	7.4	0.0	4.8	8.3	0.0	7.4
Prop In Lane	1.00		0.26	1.00		0.25	1.00		0.33	1.00		0.41
Lane Grp Cap(c), veh/h	167	594	597	68	492	495	171	0	593	197	0	607
V/C Ratio(X)	0.81	0.95	0.95	0.69	0.48	0.48	0.86	0.00	0.21	0.83	0.00	0.31
Avail Cap(c_a), veh/h	204	596	599	98	492	495	171	0	593	233	0	607
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	41.6	30.6	30.6	44.4	28.3	28.3	41.6	0.0	22.5	40.7	0.0	22.4
Incr Delay (d2), s/veh	17.8	25.0	25.2	12.0	0.7	0.7	32.3	0.0	0.8	18.9	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.8	15.7	15.8	1.3	4.3	4.4	4.7	0.0	2.0	4.7	0.0	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.4	55.6	55.7	56.3	29.0	29.1	74.0	0.0	23.3	59.6	0.0	23.7
LnGrp LOS	E	E	E	E	C	C	E	A	C	E	A	C
Approach Vol, veh/h		1267			522			273			352	
Approach Delay, s/veh		56.1			31.5			50.4			40.3	
Approach LOS		E			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.7	35.4	8.0	35.2	13.3	36.8	13.1	30.1
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.1	29.0	5.1	30.8	8.8	32.3	10.5	25.4
Max Q Clear Time (g_c+I1), s	10.3	6.8	4.4	30.5	9.4	9.4	8.8	12.4
Green Ext Time (p_c), s	0.1	0.6	0.0	0.2	0.0	1.1	0.0	2.1

Intersection Summary		
HCM 6th Ctrl Delay		47.8
HCM 6th LOS		D

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	480	4	22	628	26	1	0	18	15	1	8
Future Volume (vph)	2	480	4	22	628	26	1	0	18	15	1	8
Confl. Peds. (#/hr)	10		3	4		11	3		4	11		10
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 34.4%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	480	4	22	628	26	1	0	18	15	1	8
Future Vol, veh/h	2	480	4	22	628	26	1	0	18	15	1	8
Conflicting Peds, #/hr	10	0	3	4	0	11	3	0	4	11	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	2	516	4	24	675	28	1	0	19	16	1	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	714	0	0	524	0	0	922	1288	275	1021	1276	373
Stage 1	-	-	-	-	-	-	526	526	-	748	748	-
Stage 2	-	-	-	-	-	-	396	762	-	273	528	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	895	-	-	1053	-	-	228	165	729	193	168	630
Stage 1	-	-	-	-	-	-	508	532	-	375	423	-
Stage 2	-	-	-	-	-	-	606	416	-	715	531	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	886	-	-	1049	-	-	216	159	719	180	161	617
Mov Cap-2 Maneuver	-	-	-	-	-	-	216	159	-	180	161	-
Stage 1	-	-	-	-	-	-	505	529	-	370	409	-
Stage 2	-	-	-	-	-	-	577	402	-	687	528	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.3	10.8	22.3
HCM LOS			B	C

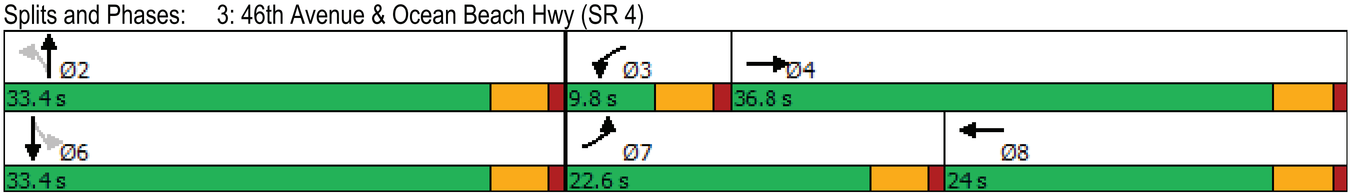
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	640	886	-	-	1049	-	-	234
HCM Lane V/C Ratio	0.032	0.002	-	-	0.023	-	-	0.11
HCM Control Delay (s)	10.8	9.1	-	-	8.5	-	-	22.3
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0.4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	512	5	23	643	93	5	7	21	78	3	53
Future Volume (vph)	25	512	5	23	643	93	5	7	21	78	3	53
Confl. Peds. (#/hr)	9		7	2		4	7		2	4		9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		30.1	30.1		32.1	32.1	
Total Split (s)	22.6	36.8		9.8	24.0		33.4	33.4		33.4	33.4	
Total Split (%)	28.3%	46.0%		12.3%	30.0%		41.8%	41.8%		41.8%	41.8%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	6.5	19.3		5.4	18.5			29.2			29.2	
Actuated g/C Ratio	0.11	0.32		0.09	0.30			0.48			0.48	
v/c Ratio	0.14	0.49		0.16	0.74			0.04			0.20	
Control Delay	28.9	19.2		31.4	24.9			7.1			9.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	28.9	19.2		31.4	24.9			7.1			9.0	
LOS	C	B		C	C			A			A	
Approach Delay		19.6			25.1			7.1			9.0	
Approach LOS		B			C			A			A	

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 61.1
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 21.2 Intersection LOS: C
Intersection Capacity Utilization 51.3% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: 46th Avenue & Ocean Beach Hwy (SR 4)

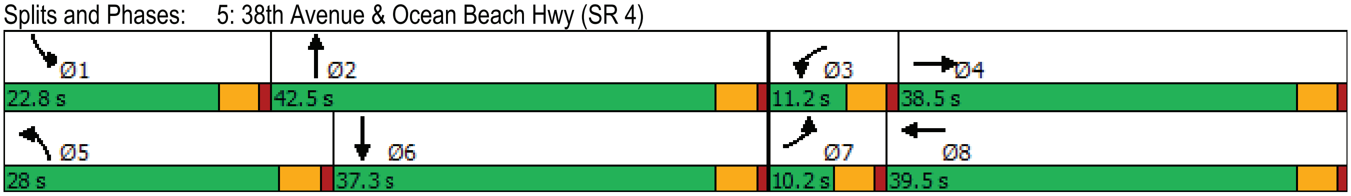


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	512	5	23	643	93	5	7	21	78	3	53
Future Volume (veh/h)	25	512	5	23	643	93	5	7	21	78	3	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	27	557	5	25	699	101	5	8	23	85	3	58
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	54	1008	9	51	864	125	134	217	500	482	39	282
Arrive On Green	0.03	0.27	0.27	0.03	0.27	0.27	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	1810	3666	33	1810	3162	457	139	456	1053	818	82	593
Grp Volume(v), veh/h	27	274	288	25	399	401	36	0	0	146	0	0
Grp Sat Flow(s),veh/h/ln	1810	1805	1893	1810	1805	1814	1649	0	0	1493	0	0
Q Serve(g_s), s	0.9	7.9	7.9	0.8	12.5	12.6	0.0	0.0	0.0	1.8	0.0	0.0
Cycle Q Clear(g_c), s	0.9	7.9	7.9	0.8	12.5	12.6	0.7	0.0	0.0	3.2	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.25	0.14		0.64	0.58		0.40
Lane Grp Cap(c), veh/h	54	496	521	51	493	495	850	0	0	803	0	0
V/C Ratio(X)	0.50	0.55	0.55	0.49	0.81	0.81	0.04	0.00	0.00	0.18	0.00	0.00
Avail Cap(c_a), veh/h	538	958	1005	158	578	581	850	0	0	803	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	29.1	18.9	18.9	29.1	20.6	20.6	8.6	0.0	0.0	9.2	0.0	0.0
Incr Delay (d2), s/veh	6.8	1.0	0.9	7.0	7.3	7.3	0.1	0.0	0.0	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	3.0	3.2	0.4	5.6	5.6	0.3	0.0	0.0	1.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.9	19.8	19.8	36.1	27.9	28.0	8.7	0.0	0.0	9.7	0.0	0.0
LnGrp LOS	D	B	B	D	C	C	A	A	A	A	A	A
Approach Vol, veh/h		589			825			36			146	
Approach Delay, s/veh		20.5			28.2			8.7			9.7	
Approach LOS		C			C			A			A	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		33.4	6.2	21.2		33.4	6.3	21.1				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		28.9	5.3	32.3		28.9	18.1	19.5				
Max Q Clear Time (g_c+I1), s		2.7	2.8	9.9		5.2	2.9	14.6				
Green Ext Time (p_c), s		0.1	0.0	3.1		0.8	0.0	2.1				
Intersection Summary												
HCM 6th Ctrl Delay			23.2									
HCM 6th LOS			C									

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	670	125	59	937	100	331	201	67	155	103	98
Future Volume (vph)	67	670	125	59	937	100	331	201	67	155	103	98
Confl. Peds. (#/hr)	1		3	4		2	3		4	2		1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	27.2		9.5	27.8		9.5	32.9		9.5	36.7	
Total Split (s)	10.2	38.5		11.2	39.5		28.0	42.5		22.8	37.3	
Total Split (%)	8.9%	33.5%		9.7%	34.3%		24.3%	37.0%		19.8%	32.4%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)	5.7	36.3		6.5	35.0		23.3	41.2		14.9	32.8	
Actuated g/C Ratio	0.05	0.32		0.06	0.30		0.20	0.36		0.13	0.29	
v/c Ratio	0.79	0.74		0.59	0.99		0.95	0.42		0.69	0.39	
Control Delay	103.8	39.7		76.4	65.1		81.0	29.3		62.7	28.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	103.8	39.7		76.4	65.1		81.0	29.3		62.7	28.7	
LOS	F	D		E	E		F	C		E	C	
Approach Delay		44.7			65.7			57.8			43.5	
Approach LOS		D			E			E			D	

Intersection Summary	
Cycle Length: 115	
Actuated Cycle Length: 114.8	
Natural Cycle: 105	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 55.2	Intersection LOS: E
Intersection Capacity Utilization 92.7%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 5: 38th Avenue & Ocean Beach Hwy (SR 4)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	67	670	125	59	937	100	331	201	67	155	103	98
Future Volume (veh/h)	67	670	125	59	937	100	331	201	67	155	103	98
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	70	698	130	61	976	104	345	209	70	161	107	102
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	90	942	175	79	1001	107	370	522	175	192	255	243
Arrive On Green	0.05	0.31	0.31	0.04	0.30	0.30	0.20	0.38	0.38	0.11	0.29	0.29
Sat Flow, veh/h	1810	3035	565	1810	3289	350	1810	1361	456	1810	893	851
Grp Volume(v), veh/h	70	415	413	61	536	544	345	0	279	161	0	209
Grp Sat Flow(s),veh/h/ln	1810	1805	1795	1810	1805	1834	1810	0	1816	1810	0	1745
Q Serve(g_s), s	4.4	23.7	23.7	3.8	33.8	33.8	21.6	0.0	12.9	10.0	0.0	11.2
Cycle Q Clear(g_c), s	4.4	23.7	23.7	3.8	33.8	33.8	21.6	0.0	12.9	10.0	0.0	11.2
Prop In Lane	1.00		0.31	1.00		0.19	1.00		0.25	1.00		0.49
Lane Grp Cap(c), veh/h	90	560	557	79	549	558	370	0	697	192	0	498
V/C Ratio(X)	0.78	0.74	0.74	0.77	0.97	0.98	0.93	0.00	0.40	0.84	0.00	0.42
Avail Cap(c_a), veh/h	90	560	557	105	549	558	370	0	697	288	0	498
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	54.0	35.5	35.5	54.4	39.6	39.6	45.0	0.0	25.8	50.5	0.0	33.4
Incr Delay (d2), s/veh	34.6	5.2	5.3	21.8	31.9	31.7	30.3	0.0	1.7	12.9	0.0	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	10.9	10.9	2.2	19.3	19.5	12.5	0.0	5.7	5.3	0.0	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	88.7	40.7	40.8	76.2	71.5	71.3	75.2	0.0	27.5	63.4	0.0	36.0
LnGrp LOS	F	D	D	E	E	E	E	A	C	E	A	D
Approach Vol, veh/h		898			1141			624			370	
Approach Delay, s/veh		44.5			71.7			53.9			47.9	
Approach LOS		D			E			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	16.7	48.6	9.5	40.2	28.0	37.3	10.2	39.5				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	18.3	38.0	6.7	34.0	23.5	32.8	5.7	35.0				
Max Q Clear Time (g_c+I1), s	12.0	14.9	5.8	25.7	23.6	13.2	6.4	35.8				
Green Ext Time (p_c), s	0.2	1.5	0.0	3.1	0.0	1.2	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			57.1									
HCM 6th LOS			E									

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	630	6	10	269	10	11	0	22	15	0	7
Future Volume (vph)	7	630	6	10	269	10	11	0	22	15	0	7
Confl. Peds. (#/hr)	1		1	1		1	1		1	1		1
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 27.9%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	630	6	10	269	10	11	0	22	15	0	7
Future Vol, veh/h	7	630	6	10	269	10	11	0	22	15	0	7
Conflicting Peds, #/hr	1	0	1	1	0	1	1	0	1	1	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	741	7	12	316	12	13	0	26	18	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	329	0	0	749	0	0	945	1115	376	735	1112	166
Stage 1	-	-	-	-	-	-	762	762	-	347	347	-
Stage 2	-	-	-	-	-	-	183	353	-	388	765	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1242	-	-	869	-	-	220	210	627	311	211	856
Stage 1	-	-	-	-	-	-	368	416	-	648	638	-
Stage 2	-	-	-	-	-	-	807	634	-	613	415	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1241	-	-	868	-	-	214	205	626	293	206	854
Mov Cap-2 Maneuver	-	-	-	-	-	-	214	205	-	293	206	-
Stage 1	-	-	-	-	-	-	365	413	-	643	628	-
Stage 2	-	-	-	-	-	-	787	624	-	583	412	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	15.5	15.5
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	381	1241	-	-	868	-	-	370
HCM Lane V/C Ratio	0.102	0.007	-	-	0.014	-	-	0.07
HCM Control Delay (s)	15.5	7.9	-	-	9.2	-	-	15.5
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.2

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	10	1	0	3	1
Future Volume (vph)	0	10	1	0	3	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 13.3%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	1	0	3	1
Future Vol, veh/h	0	10	1	0	3	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	11	1	0	3	1

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	8	1	0	0	1	0
Stage 1	1	-	-	-	-	-
Stage 2	7	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	1013	1084	-	-	1622	-
Stage 1	1022	-	-	-	-	-
Stage 2	1016	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	1011	1084	-	-	1622	-
Mov Cap-2 Maneuver	1011	-	-	-	-	-
Stage 1	1022	-	-	-	-	-
Stage 2	1014	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.4	0	5.4
HCM LOS	A		

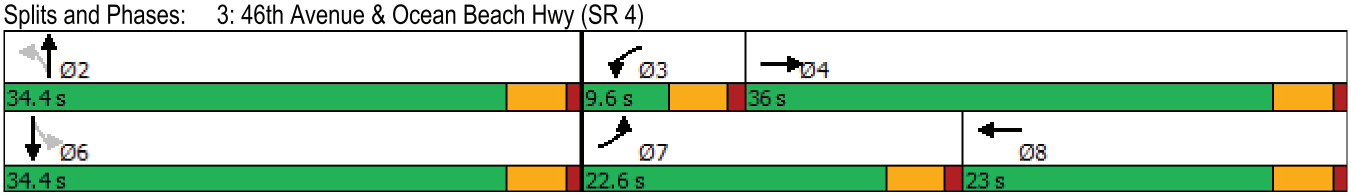
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1084	1622	-
HCM Lane V/C Ratio	-	-	0.01	0.002	-
HCM Control Delay (s)	-	-	8.4	7.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	651	9	15	258	40	6	6	49	74	3	37
Future Volume (vph)	39	651	9	15	258	40	6	6	49	74	3	37
Confl. Peds. (#/hr)	5		8	3			8		3			5
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		30.1	30.1		32.1	32.1	
Total Split (s)	22.6	36.0		9.6	23.0		34.4	34.4		34.4	34.4	
Total Split (%)	28.3%	45.0%		12.0%	28.8%		43.0%	43.0%		43.0%	43.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	7.3	21.4		5.2	15.9			30.5			30.5	
Actuated g/C Ratio	0.12	0.34		0.08	0.25			0.49			0.49	
v/c Ratio	0.23	0.65		0.12	0.40			0.09			0.19	
Control Delay	30.5	20.1		33.1	20.7			5.6			10.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	30.5	20.1		33.1	20.7			5.6			10.3	
LOS	C	C		C	C			A			B	
Approach Delay		20.7			21.2			5.6			10.3	
Approach LOS		C			C			A			B	

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 62.6
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 19.1 Intersection LOS: B
Intersection Capacity Utilization 56.7% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: 46th Avenue & Ocean Beach Hwy (SR 4)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	651	9	15	258	40	6	6	49	74	3	37
Future Volume (veh/h)	39	651	9	15	258	40	6	6	49	74	3	37
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	48	794	11	18	315	49	7	7	60	90	4	45
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	1	1	1
Cap, veh/h	81	1079	15	39	854	131	98	109	620	513	39	220
Arrive On Green	0.04	0.30	0.30	0.02	0.27	0.27	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	1810	3645	50	1810	3133	482	76	231	1318	893	83	467
Grp Volume(v), veh/h	48	393	412	18	180	184	74	0	0	139	0	0
Grp Sat Flow(s),veh/h/ln	1810	1805	1890	1810	1805	1810	1626	0	0	1444	0	0
Q Serve(g_s), s	1.7	12.5	12.5	0.6	5.1	5.2	0.0	0.0	0.0	1.6	0.0	0.0
Cycle Q Clear(g_c), s	1.7	12.5	12.5	0.6	5.1	5.2	1.6	0.0	0.0	3.2	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.27	0.09		0.81	0.65		0.32
Lane Grp Cap(c), veh/h	81	535	560	39	492	493	826	0	0	772	0	0
V/C Ratio(X)	0.59	0.74	0.74	0.46	0.37	0.37	0.09	0.00	0.00	0.18	0.00	0.00
Avail Cap(c_a), veh/h	515	894	936	145	525	527	826	0	0	772	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	29.8	20.1	20.1	30.8	18.7	18.7	9.3	0.0	0.0	9.7	0.0	0.0
Incr Delay (d2), s/veh	6.6	2.0	1.9	8.4	0.5	0.5	0.2	0.0	0.0	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	4.9	5.1	0.3	2.0	2.0	0.6	0.0	0.0	1.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.4	22.1	22.0	39.2	19.1	19.2	9.6	0.0	0.0	10.2	0.0	0.0
LnGrp LOS	D	C	C	D	B	B	A	A	A	B	A	A
Approach Vol, veh/h		853			382			74			139	
Approach Delay, s/veh		22.9			20.1			9.6			10.2	
Approach LOS		C			C			A			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		34.4	5.9	23.3		34.4	7.4	21.8				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		29.9	5.1	31.5		29.9	18.1	18.5				
Max Q Clear Time (g_c+I1), s		3.6	2.6	14.5		5.2	3.7	7.2				
Green Ext Time (p_c), s		0.4	0.0	4.4		0.8	0.1	1.5				
Intersection Summary												
HCM 6th Ctrl Delay			20.3									
HCM 6th LOS			C									

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	30	0	0	5	3	10
Future Volume (vph)	30	0	0	5	3	10
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 13.3%	ICU Level of Service A
Analysis Period (min) 15	

Intersection						
Int Delay, s/veh	5.4					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	0	0	5	3	10
Future Vol, veh/h	30	0	0	5	3	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	0	0	6	3	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	15	9	14	0	-	0
Stage 1	9	-	-	-	-	-
Stage 2	6	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	1004	1073	1604	-	-	-
Stage 1	1014	-	-	-	-	-
Stage 2	1017	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	1004	1073	1604	-	-	-
Mov Cap-2 Maneuver	1004	-	-	-	-	-
Stage 1	1014	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.7	0	0
HCM LOS	A		

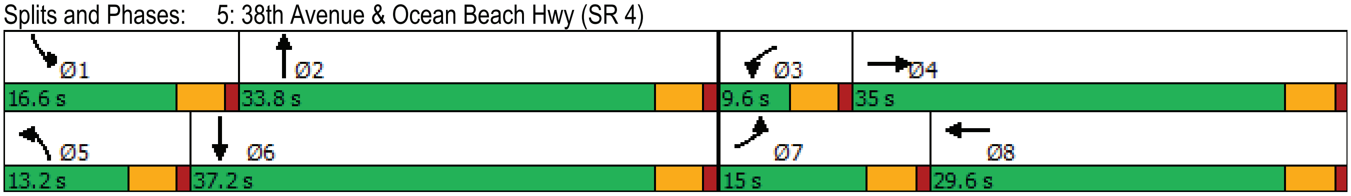
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1604	-	1004	-	-
HCM Lane V/C Ratio	-	-	0.033	-	-
HCM Control Delay (s)	0	-	8.7	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	109	818	129	38	342	49	122	69	34	132	90	63
Future Volume (vph)	109	818	129	38	342	49	122	69	34	132	90	63
Confl. Peds. (#/hr)	2		1	2		3	1		2	3		2
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	27.2		9.5	27.8		9.5	32.9		9.5	36.7	
Total Split (s)	15.0	35.0		9.6	29.6		13.2	33.8		16.6	37.2	
Total Split (%)	15.8%	36.8%		10.1%	31.2%		13.9%	35.6%		17.5%	39.2%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)	9.9	30.6		5.1	21.7		8.7	30.2		11.3	32.8	
Actuated g/C Ratio	0.11	0.34		0.06	0.24		0.10	0.33		0.12	0.36	
v/c Ratio	0.69	0.98		0.47	0.57		0.88	0.21		0.74	0.29	
Control Delay	59.3	52.5		59.4	32.4		86.3	19.6		59.9	18.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	59.3	52.5		59.4	32.4		86.3	19.6		59.9	18.4	
LOS	E	D		E	C		F	B		E	B	
Approach Delay		53.2			34.8			55.8			37.6	
Approach LOS		D			C			E			D	

Intersection Summary

Cycle Length: 95
Actuated Cycle Length: 91.2
Natural Cycle: 95
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 47.3 Intersection LOS: D
Intersection Capacity Utilization 78.7% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 5: 38th Avenue & Ocean Beach Hwy (SR 4)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	109	818	129	38	342	49	122	69	34	132	90	63
Future Volume (veh/h)	109	818	129	38	342	49	122	69	34	132	90	63
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	135	1010	159	47	422	60	151	85	42	163	111	78
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	0	0	0	1	1	1	0	0	0	1	1	1
Cap, veh/h	167	1020	160	68	856	121	169	400	198	197	360	253
Arrive On Green	0.09	0.33	0.33	0.04	0.27	0.27	0.09	0.33	0.33	0.11	0.35	0.35
Sat Flow, veh/h	1810	3124	491	1795	3148	445	1810	1199	593	1795	1029	723
Grp Volume(v), veh/h	135	583	586	47	239	243	151	0	127	163	0	189
Grp Sat Flow(s),veh/h/ln	1810	1805	1810	1795	1791	1802	1810	0	1792	1795	0	1753
Q Serve(g_s), s	6.8	30.0	30.1	2.4	10.5	10.6	7.7	0.0	4.7	8.3	0.0	7.3
Cycle Q Clear(g_c), s	6.8	30.0	30.1	2.4	10.5	10.6	7.7	0.0	4.7	8.3	0.0	7.3
Prop In Lane	1.00		0.27	1.00		0.25	1.00		0.33	1.00		0.41
Lane Grp Cap(c), veh/h	167	589	591	68	487	490	169	0	598	197	0	614
V/C Ratio(X)	0.81	0.99	0.99	0.69	0.49	0.50	0.90	0.00	0.21	0.83	0.00	0.31
Avail Cap(c_a), veh/h	203	589	591	98	487	490	169	0	598	233	0	614
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	41.6	31.3	31.3	44.4	28.6	28.6	41.9	0.0	22.3	40.7	0.0	22.1
Incr Delay (d2), s/veh	17.9	34.3	34.8	12.0	0.8	0.8	41.1	0.0	0.8	18.9	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.8	17.8	18.0	1.3	4.4	4.5	5.2	0.0	2.0	4.7	0.0	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.5	65.6	66.1	56.4	29.3	29.4	83.0	0.0	23.1	59.7	0.0	23.4
LnGrp LOS	E	E	E	E	C	C	F	A	C	E	A	C
Approach Vol, veh/h		1304			529			278			352	
Approach Delay, s/veh		65.2			31.8			55.6			40.2	
Approach LOS		E			C			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.7	35.7	8.0	35.0	13.2	37.2	13.1	29.9
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.1	29.3	5.1	30.5	8.7	32.7	10.5	25.1
Max Q Clear Time (g_c+I1), s	10.3	6.7	4.4	32.1	9.7	9.3	8.8	12.6
Green Ext Time (p_c), s	0.1	0.6	0.0	0.0	0.0	1.1	0.0	2.1

Intersection Summary	
HCM 6th Ctrl Delay	53.4
HCM 6th LOS	D

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	482	13	23	630	26	9	0	20	15	1	8
Future Volume (vph)	2	482	13	23	630	26	9	0	20	15	1	8
Confl. Peds. (#/hr)	10		3	4		11	3		4	11		10
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 31.9%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	482	13	23	630	26	9	0	20	15	1	8
Future Vol, veh/h	2	482	13	23	630	26	9	0	20	15	1	8
Conflicting Peds, #/hr	10	0	3	4	0	11	3	0	4	11	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	2	518	14	25	677	28	10	0	22	16	1	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	716	0	0	536	0	0	932	1299	281	1026	1292	374
Stage 1	-	-	-	-	-	-	533	533	-	752	752	-
Stage 2	-	-	-	-	-	-	399	766	-	274	540	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	894	-	-	1042	-	-	224	163	722	192	165	629
Stage 1	-	-	-	-	-	-	503	528	-	373	421	-
Stage 2	-	-	-	-	-	-	604	415	-	714	524	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	885	-	-	1038	-	-	212	156	712	179	158	616
Mov Cap-2 Maneuver	-	-	-	-	-	-	212	156	-	179	158	-
Stage 1	-	-	-	-	-	-	500	525	-	368	407	-
Stage 2	-	-	-	-	-	-	574	401	-	684	521	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.3	14.5	22.4
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	411	885	-	-	1038	-	-	233
HCM Lane V/C Ratio	0.076	0.002	-	-	0.024	-	-	0.111
HCM Control Delay (s)	14.5	9.1	-	-	8.6	-	-	22.4
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0.4

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	6	1	0	11	1
Future Volume (vph)	0	6	1	0	11	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 17.3%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	6.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	6	1	0	11	1
Future Vol, veh/h	0	6	1	0	11	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	7	1	0	12	1

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	26	1	0	0	1	0
Stage 1	1	-	-	-	-	-
Stage 2	25	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	989	1084	-	-	1622	-
Stage 1	1022	-	-	-	-	-
Stage 2	998	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	982	1084	-	-	1622	-
Mov Cap-2 Maneuver	982	-	-	-	-	-
Stage 1	1022	-	-	-	-	-
Stage 2	991	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.3	0	6.6
HCM LOS	A		

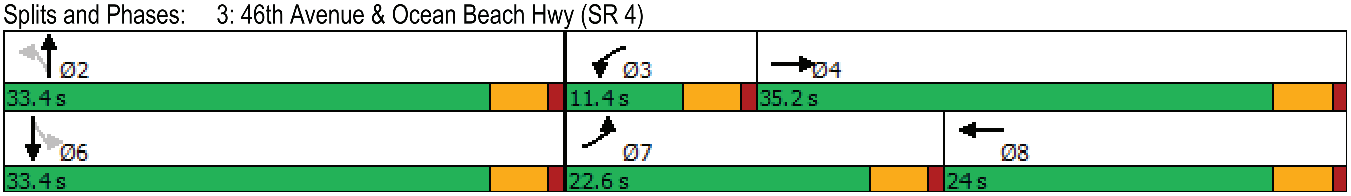
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1084	1622	-
HCM Lane V/C Ratio	-	-	0.006	0.008	-
HCM Control Delay (s)	-	-	8.3	7.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	513	7	55	645	93	6	7	40	78	3	53
Future Volume (vph)	25	513	7	55	645	93	6	7	40	78	3	53
Confl. Peds. (#/hr)	9		7	2		4	7		2	4		9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		30.1	30.1		32.1	32.1	
Total Split (s)	22.6	35.2		11.4	24.0		33.4	33.4		33.4	33.4	
Total Split (%)	28.3%	44.0%		14.3%	30.0%		41.8%	41.8%		41.8%	41.8%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	6.6	18.2		6.5	20.2			29.3			29.3	
Actuated g/C Ratio	0.10	0.29		0.10	0.32			0.47			0.47	
v/c Ratio	0.14	0.54		0.32	0.70			0.07			0.21	
Control Delay	29.8	21.8		33.5	23.3			6.2			9.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	29.8	21.8		33.5	23.3			6.2			9.7	
LOS	C	C		C	C			A			A	
Approach Delay		22.1			24.0			6.2			9.7	
Approach LOS		C			C			A			A	

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 62.9
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 21.4 Intersection LOS: C
Intersection Capacity Utilization 59.3% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: 46th Avenue & Ocean Beach Hwy (SR 4)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	513	7	55	645	93	6	7	40	78	3	53
Future Volume (veh/h)	25	513	7	55	645	93	6	7	40	78	3	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	27	558	8	60	701	101	7	8	43	85	3	58
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	54	915	13	95	865	125	119	148	574	477	39	279
Arrive On Green	0.03	0.25	0.25	0.05	0.27	0.27	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	1810	3642	52	1810	3164	455	111	311	1209	809	81	587
Grp Volume(v), veh/h	27	276	290	60	400	402	58	0	0	146	0	0
Grp Sat Flow(s),veh/h/ln	1810	1805	1889	1810	1805	1814	1631	0	0	1477	0	0
Q Serve(g_s), s	0.9	8.2	8.3	2.0	12.6	12.6	0.0	0.0	0.0	1.8	0.0	0.0
Cycle Q Clear(g_c), s	0.9	8.2	8.3	2.0	12.6	12.6	1.2	0.0	0.0	3.2	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.25	0.12		0.74	0.58		0.40
Lane Grp Cap(c), veh/h	54	454	475	95	494	496	841	0	0	795	0	0
V/C Ratio(X)	0.50	0.61	0.61	0.63	0.81	0.81	0.07	0.00	0.00	0.18	0.00	0.00
Avail Cap(c_a), veh/h	538	910	953	205	578	581	841	0	0	795	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	29.1	20.2	20.2	28.3	20.6	20.6	8.7	0.0	0.0	9.2	0.0	0.0
Incr Delay (d2), s/veh	6.8	1.3	1.3	6.8	7.4	7.4	0.2	0.0	0.0	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	3.2	3.4	1.0	5.6	5.7	0.4	0.0	0.0	1.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.9	21.5	21.4	35.1	28.0	28.1	8.9	0.0	0.0	9.7	0.0	0.0
LnGrp LOS	D	C	C	D	C	C	A	A	A	A	A	A
Approach Vol, veh/h		593			862			58			146	
Approach Delay, s/veh		22.1			28.5			8.9			9.7	
Approach LOS		C			C			A			A	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		33.4	7.7	19.8		33.4	6.3	21.2				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		28.9	6.9	30.7		28.9	18.1	19.5				
Max Q Clear Time (g_c+I1), s		3.2	4.0	10.3		5.2	2.9	14.6				
Green Ext Time (p_c), s		0.3	0.0	3.1		0.8	0.0	2.0				
Intersection Summary												
HCM 6th Ctrl Delay			23.9									
HCM 6th LOS			C									

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	20	0	0	5	5	34
Future Volume (vph)	20	0	0	5	5	34
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary	
Control Type: Unsignalized	
Intersection Capacity Utilization 13.3%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	0	0	5	5	34
Future Vol, veh/h	20	0	0	5	5	34
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	0	0	6	6	38

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	31	25	44	0	-	0
Stage 1	25	-	-	-	-	-
Stage 2	6	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	983	1051	1564	-	-	-
Stage 1	998	-	-	-	-	-
Stage 2	1017	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	983	1051	1564	-	-	-
Mov Cap-2 Maneuver	983	-	-	-	-	-
Stage 1	998	-	-	-	-	-
Stage 2	1017	-	-	-	-	-

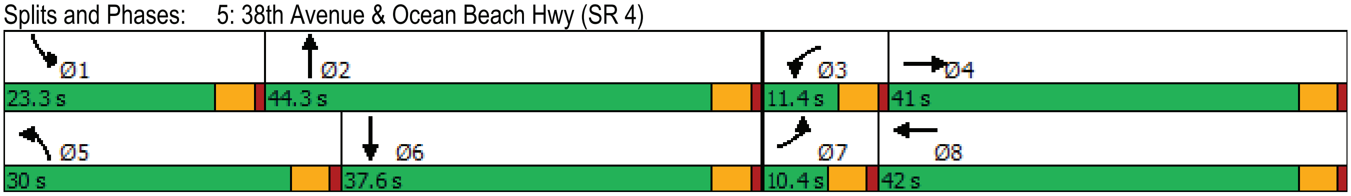
Approach	EB	NB	SB
HCM Control Delay, s	8.7	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1564	-	983	-	-
HCM Lane V/C Ratio	-	-	0.023	-	-
HCM Control Delay (s)	0	-	8.7	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	683	131	59	960	100	342	201	67	155	103	98
Future Volume (vph)	67	683	131	59	960	100	342	201	67	155	103	98
Confl. Peds. (#/hr)	1		3	4		2	3		4	2		1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	27.2		9.5	27.8		9.5	32.9		9.5	36.7	
Total Split (s)	10.4	41.0		11.4	42.0		30.0	44.3		23.3	37.6	
Total Split (%)	8.7%	34.2%		9.5%	35.0%		25.0%	36.9%		19.4%	31.3%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)	5.9	38.8		6.7	37.5		25.0	42.8		15.3	33.1	
Actuated g/C Ratio	0.05	0.32		0.06	0.31		0.21	0.36		0.13	0.28	
v/c Ratio	0.80	0.74		0.60	0.99		0.94	0.42		0.70	0.41	
Control Delay	107.4	40.4		80.0	64.3		81.1	30.5		65.8	31.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	107.4	40.4		80.0	64.3		81.1	30.5		65.8	31.3	
LOS	F	D		E	E		F	C		E	C	
Approach Delay		45.5			65.1			58.8			46.3	
Approach LOS		D			E			E			D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 119.5	
Natural Cycle: 115	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.99	
Intersection Signal Delay: 55.7	Intersection LOS: E
Intersection Capacity Utilization 93.9%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 5: 38th Avenue & Ocean Beach Hwy (SR 4)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	67	683	131	59	960	100	342	201	67	155	103	98
Future Volume (veh/h)	67	683	131	59	960	100	342	201	67	155	103	98
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	70	711	136	61	1000	104	356	209	70	161	107	102
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	89	964	184	79	1033	107	381	519	174	191	247	235
Arrive On Green	0.05	0.32	0.32	0.04	0.31	0.31	0.21	0.38	0.38	0.11	0.28	0.28
Sat Flow, veh/h	1810	3020	577	1810	3298	343	1810	1361	456	1810	893	851
Grp Volume(v), veh/h	70	425	422	61	547	557	356	0	279	161	0	209
Grp Sat Flow(s),veh/h/ln	1810	1805	1793	1810	1805	1836	1810	0	1816	1810	0	1745
Q Serve(g_s), s	4.6	25.1	25.1	4.0	35.8	35.8	23.1	0.0	13.4	10.5	0.0	11.8
Cycle Q Clear(g_c), s	4.6	25.1	25.1	4.0	35.8	35.8	23.1	0.0	13.4	10.5	0.0	11.8
Prop In Lane	1.00		0.32	1.00		0.19	1.00		0.25	1.00		0.49
Lane Grp Cap(c), veh/h	89	576	572	79	566	575	381	0	693	191	0	482
V/C Ratio(X)	0.78	0.74	0.74	0.77	0.97	0.97	0.93	0.00	0.40	0.84	0.00	0.43
Avail Cap(c_a), veh/h	89	576	572	104	566	575	386	0	693	284	0	482
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	56.3	36.3	36.3	56.7	40.5	40.5	46.4	0.0	27.0	52.6	0.0	35.6
Incr Delay (d2), s/veh	35.6	5.0	5.0	22.4	29.7	29.5	29.6	0.0	1.7	13.7	0.0	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	11.5	11.5	2.3	20.0	20.3	13.3	0.0	6.0	5.5	0.0	5.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	91.9	41.2	41.3	79.1	70.2	70.0	76.1	0.0	28.8	66.3	0.0	38.4
LnGrp LOS	F	D	D	E	E	E	E	A	C	E	A	D
Approach Vol, veh/h		917			1165			635			370	
Approach Delay, s/veh		45.1			70.6			55.3			50.5	
Approach LOS		D			E			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	17.1	50.2	9.7	42.7	29.7	37.6	10.4	42.0
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	18.8	39.8	6.9	36.5	25.5	33.1	5.9	37.5
Max Q Clear Time (g_c+I1), s	12.5	15.4	6.0	27.1	25.1	13.8	6.6	37.8
Green Ext Time (p_c), s	0.2	1.5	0.0	3.5	0.0	1.2	0.0	0.0

Intersection Summary		
HCM 6th Ctrl Delay		57.5
HCM 6th LOS		E

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	46	742	7	333	36	136
v/c Ratio	0.22	0.63	0.05	0.39	0.04	0.18
Control Delay	29.6	20.0	31.0	20.7	7.1	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.6	20.0	31.0	20.7	7.1	9.6
Queue Length 50th (ft)	16	112	2	55	2	19
Queue Length 95th (ft)	45	175	14	82	18	59
Internal Link Dist (ft)		1399		1668	506	1960
Turn Bay Length (ft)	275		260			
Base Capacity (vph)	544	1892	153	1144	844	748
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.39	0.05	0.29	0.04	0.18

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	131	957	46	415	142	124	158	182
v/c Ratio	0.71	0.90	0.46	0.57	0.71	0.18	0.72	0.26
Control Delay	62.8	42.8	58.1	33.4	60.2	17.4	58.9	17.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.8	42.8	58.1	33.4	60.2	17.4	58.9	17.3
Queue Length 50th (ft)	78	287	28	107	84	40	93	59
Queue Length 95th (ft)	#139	318	57	135	#143	71	#152	96
Internal Link Dist (ft)		541		1317		953		1207
Turn Bay Length (ft)	265		340		270		200	
Base Capacity (vph)	192	1107	101	925	212	676	236	689
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.86	0.46	0.45	0.67	0.18	0.67	0.26

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	26	518	24	738	35	141
v/c Ratio	0.13	0.48	0.15	0.72	0.04	0.19
Control Delay	28.6	18.9	31.0	23.6	7.3	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.6	18.9	31.0	23.6	7.3	9.0
Queue Length 50th (ft)	8	69	8	103	2	15
Queue Length 95th (ft)	31	132	31	205	19	59
Internal Link Dist (ft)		1399		1668	506	1960
Turn Bay Length (ft)	275		260			
Base Capacity (vph)	559	2018	163	1213	830	750
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.26	0.15	0.61	0.04	0.19

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	68	740	59	941	333	271	156	203
v/c Ratio	0.77	0.72	0.58	0.95	0.90	0.38	0.68	0.35
Control Delay	102.4	41.2	76.1	60.0	71.9	25.8	62.4	26.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	102.4	41.2	76.1	60.0	71.9	25.8	62.4	26.0
Queue Length 50th (ft)	51	261	43	358	240	133	111	91
Queue Length 95th (ft)	#133	334	#102	#495	#399	213	179	157
Internal Link Dist (ft)		541		1317		953		1207
Turn Bay Length (ft)	265		340		270		200	
Base Capacity (vph)	88	1025	103	987	388	717	283	573
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.72	0.57	0.95	0.86	0.38	0.55	0.35

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	48	801	7	362	38	139
v/c Ratio	0.23	0.65	0.05	0.40	0.05	0.19
Control Delay	30.4	20.1	32.0	20.7	7.3	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.4	20.1	32.0	20.7	7.3	10.2
Queue Length 50th (ft)	17	123	2	61	2	20
Queue Length 95th (ft)	48	190	14	89	19	64
Internal Link Dist (ft)		1399		1668	506	1960
Turn Bay Length (ft)	275		260			
Base Capacity (vph)	533	1851	150	1142	826	729
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.43	0.05	0.32	0.05	0.19

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	135	1132	47	475	146	127	163	189
v/c Ratio	0.69	0.94	0.47	0.56	0.84	0.21	0.74	0.29
Control Delay	59.3	45.1	59.4	31.8	79.5	19.8	59.9	18.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.3	45.1	59.4	31.8	79.5	19.8	59.9	18.8
Queue Length 50th (ft)	80	348	28	123	88	44	96	64
Queue Length 95th (ft)	#133	#405	58	151	#169	77	#156	103
Internal Link Dist (ft)		541		1317		953		1207
Turn Bay Length (ft)	265		340		270		200	
Base Capacity (vph)	208	1207	99	987	174	607	237	649
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.94	0.47	0.48	0.84	0.21	0.69	0.29

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	27	562	25	800	36	146
v/c Ratio	0.14	0.49	0.16	0.74	0.04	0.20
Control Delay	28.9	19.2	31.4	24.9	7.1	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.9	19.2	31.4	24.9	7.1	9.0
Queue Length 50th (ft)	9	77	8	116	2	17
Queue Length 95th (ft)	32	145	32	#237	19	61
Internal Link Dist (ft)		1399		1668	506	1960
Turn Bay Length (ft)	275		260			
Base Capacity (vph)	541	1929	158	1152	814	735
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.29	0.16	0.69	0.04	0.20

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	70	828	61	1080	345	279	161	209
v/c Ratio	0.79	0.74	0.59	0.99	0.95	0.42	0.69	0.39
Control Delay	103.8	39.7	76.4	65.1	81.0	29.3	62.7	28.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	103.8	39.7	76.4	65.1	81.0	29.3	62.7	28.7
Queue Length 50th (ft)	52	290	45	415	253	146	115	98
Queue Length 95th (ft)	#135	367	#104	#567	#431	234	183	169
Internal Link Dist (ft)		541		1317		953		1207
Turn Bay Length (ft)	265		340		270		200	
Base Capacity (vph)	89	1121	105	1089	369	663	288	530
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.74	0.58	0.99	0.93	0.42	0.56	0.39

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	48	805	18	364	74	139
v/c Ratio	0.23	0.65	0.12	0.40	0.09	0.19
Control Delay	30.5	20.1	33.1	20.7	5.6	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.5	20.1	33.1	20.7	5.6	10.3
Queue Length 50th (ft)	17	124	6	61	3	20
Queue Length 95th (ft)	48	191	26	90	25	64
Internal Link Dist (ft)		1399		1668	1092	1960
Turn Bay Length (ft)	275		260			
Base Capacity (vph)	532	1849	150	1142	829	713
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.44	0.12	0.32	0.09	0.19

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	135	1169	47	482	151	127	163	189
v/c Ratio	0.69	0.98	0.47	0.57	0.88	0.21	0.74	0.29
Control Delay	59.3	52.5	59.4	32.4	86.3	19.6	59.9	18.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.3	52.5	59.4	32.4	86.3	19.6	59.9	18.4
Queue Length 50th (ft)	80	~380	28	125	92	44	96	63
Queue Length 95th (ft)	#133	#432	58	154	#178	77	#156	102
Internal Link Dist (ft)		541		1317		953		1207
Turn Bay Length (ft)	265		340		270		200	
Base Capacity (vph)	208	1195	99	976	172	613	237	657
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.98	0.47	0.49	0.88	0.21	0.69	0.29

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	27	566	60	802	58	146
v/c Ratio	0.14	0.54	0.32	0.70	0.07	0.21
Control Delay	29.8	21.8	33.5	23.3	6.2	9.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.8	21.8	33.5	23.3	6.2	9.7
Queue Length 50th (ft)	10	105	23	117	3	23
Queue Length 95th (ft)	32	152	59	#230	24	62
Internal Link Dist (ft)		1399		1668	1092	1960
Turn Bay Length (ft)	275		260			
Base Capacity (vph)	525	1780	200	1212	789	706
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.32	0.30	0.66	0.07	0.21

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	70	847	61	1104	356	279	161	209
v/c Ratio	0.80	0.74	0.60	0.99	0.94	0.42	0.70	0.41
Control Delay	107.4	40.4	80.0	64.3	81.1	30.5	65.8	31.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	107.4	40.4	80.0	64.3	81.1	30.5	65.8	31.3
Queue Length 50th (ft)	55	308	47	443	273	154	120	107
Queue Length 95th (ft)	#140	387	#107	#596	#453	242	190	179
Internal Link Dist (ft)		541		1317		953		1207
Turn Bay Length (ft)	265		340		270		200	
Base Capacity (vph)	88	1152	103	1120	385	662	283	512
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.74	0.59	0.99	0.92	0.42	0.57	0.41

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

REDMOND GEOTECHNICAL SERVICES

Geotechnical Investigation and Consultation Services

Proposed 48th Avenue Residential Development Site

Parcel #'s 108990100, 109000100, 10910100, 109020100, 109020100, 109230100 & 109240100

2019 46th Avenue & 2025 48th Avenue

Longview (Cowlitz County), Washington

for

Hinton Development Corp.

Project No. 1209.004.G
September 6, 2024

September 6, 2024

Ms. Nikole Hinton
Hinton Development Corp.
14010 NE 3rd Court, Suite A-106
Vancouver, Washington 98685

Dear Ms. Hinton:

Re: Geotechnical Investigation and Consultation Services,
Proposed 48th Avenue Residential Development Site,
#'s 108990100/109000100/109010100/109020100/109030100/109230100 & 109240100,
2019 46th Avenue and 2025 48th Avenue, Longview (Cowlitz County), Washington

Submitted herewith is our report entitled "Geotechnical Investigation and Consultation Services, Proposed 48th Avenue Residential Development Site, Parcel #'s 108990100/109000100/10910100/109020100/10903011/109230100 & 109240100, 2019 46th Avenue and 2025 48th Avenue, Longview (Cowlitz County), Washington". The scope of our services was outlined in our formal discussions with Ms. Nikole Hinto of Hinton Development Corp on July 18, 2024. Authorization of our services was provided by Ms. Nikole Hinton of Hinton Development Corp on August 8, 2024.

During the course of our investigation, we have kept you and/or others advised of our schedule and preliminary findings. We appreciate the opportunity to assist you with this phase of the project. Should you have any questions regarding this report, please do not hesitate to call.

Sincerely,

Daniel M. Redmond, P.E., G.E.
President/Principal Engineer

DANIEL M. REDMOND
STATE OF WASHINGTON
28831
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 3-22-26

Cc: Mr. Scott Taylor
SGA Engineering

TABLE OF CONTENTS

	Page No.
INTRODUCTION	1
PROJECT DESCRIPTION	1
SCOPE OF WORK	2
SITE CONDITIONS	3
Regional Geology	3
Geologic Maps	3
Surface Conditions	4
Subsurface Soil Conditions	4
Groundwater	5
INFILTRATION TESTING	5
LABORATORY TESTING	6
SEISMICITY AND EARTHQUAKE SOURCES	6
Liquefaction	7
Lateral Spreading	8
Landslides	8
Surface Rupture	8
Tsunami and Seiche	8
Flooding and Erosion	9
CONCLUSIONS AND RECOMMENDATIONS	9
General	9
Site Preparation	10
Foundation Support	11

Table of Contents (continued)

Conventional Shallow Foundations 11

Floor Slab Support 12

Retaining/Below Grade Walls 13

Pavements 14

Vehicle Drive Areas 14

Pavement Subgrade, Base Course & Asphalt Materials 14

Wet Weather Grading and Soft Spot Mitigation 15

Shrink-Swell and Frost Heave 15

Excavations/Slopes 15

Surface Drainage/Groundwater 16

Design Infiltration Rates 16

Seismic Design Considerations 17

CONSTRUCTION MONITORING AND TESTING 17

CLOSURE AND LIMITATIONS 18

LEVEL OF CARE 18

REFERENCES 19

ATTACHMENTS

Figure No. 1 - Site Vicinity Map
Figure No. 2 - Site Exploration Plan
Figure No. 3 - Typical Perimeter Footing/Retaining Wall Drain Detail

APPENDIX A

Test Pit Logs and Laboratory Test Data

GEOTECHNICAL INVESTIGATION AND CONSULTATION SERVICES
PROPOSED 48TH AVENUE RESIDENTIAL DEVELOPMENT SITE
#'s 108990100/109000100/109010100/109020100/109030100/109230100 & 109240100
2019 46TH AVENUE AND 2025 48th AVENUE
LONGVIEW (COWLITZ COUNTY), WASHINGTON

INTRODUCTION

Redmond Geotechnical Services, LLC is pleased to submit to you the results of our Geotechnical Investigation and Consultation Services at the site of the proposed new 48th Avenue residential development project which is to be located at an existing residential and/or farm property which is sited to the east of 48th Avenue and west of 46th Avenue in Longview (Cowlitz County), Washington. The general location of the subject site, which encompasses seven (7) separate tax lots and a total area of approximately 8.61 acres, is shown on the Site Vicinity Map, Figure No. 1. The purpose of our geotechnical investigation services at this time was to explore the existing subsurface soils and/or groundwater conditions across the subject site and to develop and/or provide appropriate geotechnical design and construction recommendations for the proposed new single-family project.

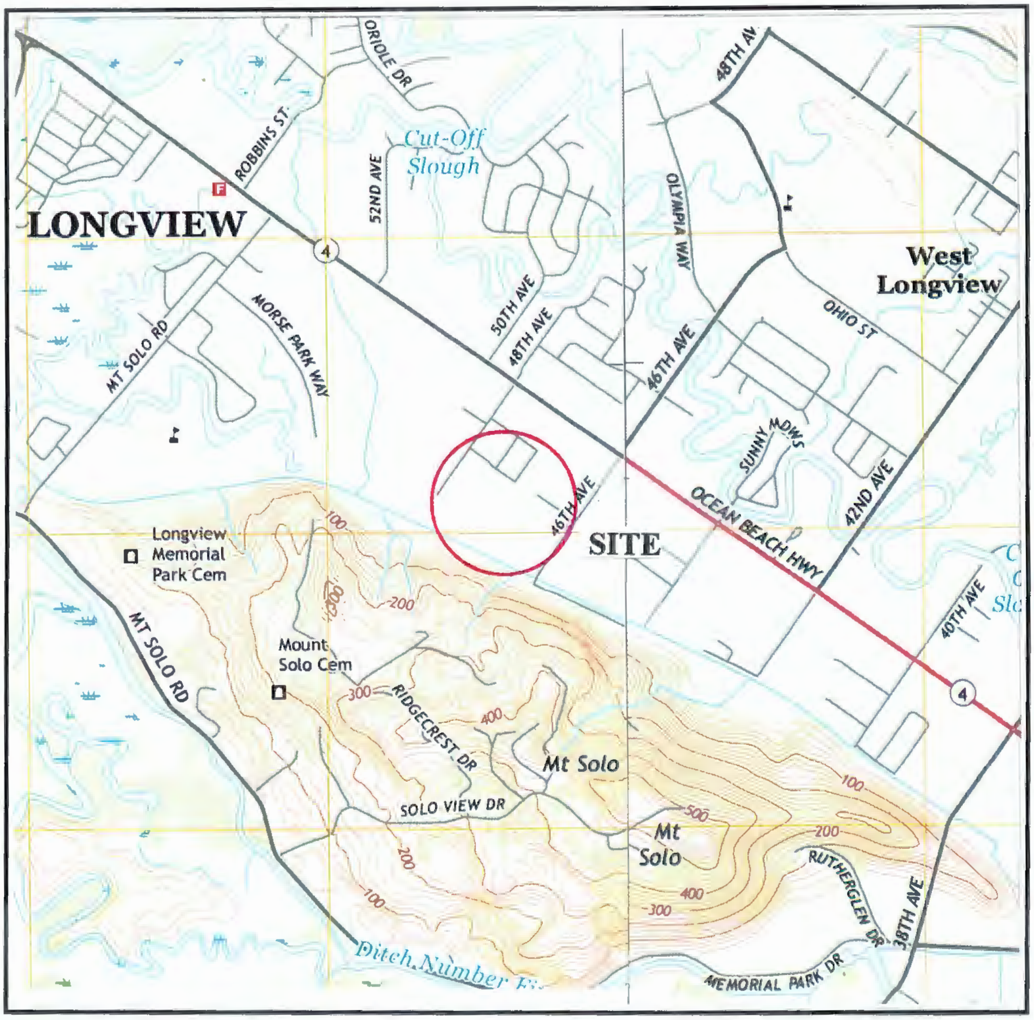
PROJECT DESCRIPTION

Based on a review of the proposed site development plan, we understand that present plans for the project will consist of the development of sixty-three (63) new single-family residential home sites (lots) which will range in size from about 3,000 to 3,900 square feet. Reportedly, the new single-family residential homes will be single- and/or two-story wood-frame structures with a raised wooden post-and-beam floor system and will range in size from about 1,200 to 1,500 square feet.

Support for the proposed new single-family residential homes will likely consist of conventional shallow continuous (strip) footings although some individual (spread) column-type footings are also possible. Structural loading information, although currently unavailable, is expected to be fairly typical and/or light for this type of single- and/or two-story wood-frame structure and should result in maximum dead plus live continuous (strip) and individual (spread) column-type footings loads on the order of about 2.0 to 3.0 kips per lineal foot (klf) and 10 to 25 kips, respectively.

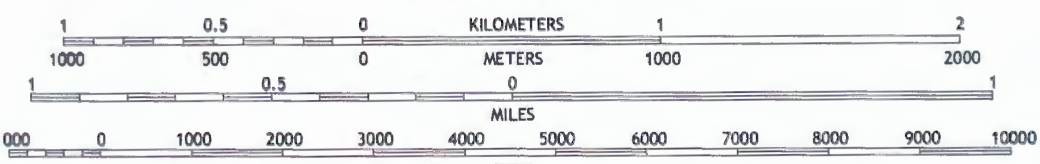
Other associated improvements for the project will also include a new paved public and/or private access road as well as a possible stormwater detention facility.

Earthwork and grading operations associated with bringing the subject site and/or single-family residential property to finish design grades are presently unknown but are generally expected to result in relatively minor cuts and/or fills of about one (1) to two (2) feet.



COAL CREEK QUADRANGLE
WASHINGTON-OREGON
7.5-MINUTE SERIES

SCALE 1:24 000



CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

SITE VICINITY MAP

Project No. 1209.004.G	48TH AVENUE SUBDIVISION SITE 2019 46TH AVENUE/LONGVIEW, WA	Figure No. 1

SCOPE OF WORK

The purpose of our geotechnical studies was to evaluate the overall existing site subsurface soil and/or groundwater conditions underlying the site with regard to the proposed new single-family residential construction and/or any associated impacts or concerns with respect to the proposed residential development at the site as well as to provide appropriate geotechnical design and construction recommendations for the project. Specifically, our geotechnical investigation included the following scope of work items:

1. A detailed field reconnaissance and subsurface exploration program of the soil and ground water conditions underlying the site by means of five (5) exploratory test holes. The exploratory test holes were advanced to depths of about seven (7) to eight (8) feet beneath existing site grades with portable Geoprobe test equipment. Additionally, field infiltration testing was also performed at the time of the field work. The approximate locations of the test holes are shown on the Site Exploration Map, Figure No. 2.

2. Laboratory testing to help evaluate and identify pertinent physical and engineering properties of the subsurface soils encountered at the site relative to the planned site development and construction at the site. The laboratory testing program included tests to help evaluate the natural (field) moisture content and dry density, maximum dry density and optimum moisture content, Atterberg Limits and gradational characteristics as well as consolidation and "R"-value tests.

3. A literature review and engineering evaluation and assessment of the regional seismicity to evaluate the potential ground motion hazard(s) at the subject site. The evaluation and assessment included a review of the regional earthquake history and sources such as potential seismic sources, maximum credible earthquakes, and reoccurrence intervals as well as a discussion of the possible ground response to the selected design earthquake(s), fault rupture, landsliding, liquefaction, and tsunami and seiche flooding.

4. Engineering analyses utilizing the field and laboratory data as a basis for furnishing recommendations for foundation support of the proposed new residential structures. Recommendations include maximum design allowable contact bearing pressure(s) for lightly loaded structures, depth of footing embedment, estimates of foundation settlement, lateral soil resistance, and foundation subgrade preparation. Additionally, our report includes recommendations regarding site preparation, placement and compaction of structural fill materials, suitability of the on-site soils for use as structural fill, criteria for import fill materials, and preparation of foundation and/or concrete floor slab subgrades (if required). Further, we have provided seismic design parameters for the single-family residential project.

5. Flexible pavement design and construction recommendations for the proposed new private access drives and parking area improvements.

SITE CONDITIONS

Regional Geology

The site is located within the Kelso-Cathlamet area which was formed when the volcanic rocks of the Oregon Coast Range, originally formed as submarine islands, were added onto the North American Continent. The addition of the volcanic rocks caused inland downwarping, forming a depression in which various types of marine sedimentary rocks accumulated. Approximately 15 million years ago, these marine sediments were covered by Columbia River Basalts that flowed down the Columbia River Gorge. Later, uplift and tilting of these Columbia River Basalts, the Oregon Coast Range, and the western Cascade Range formed the trough-like character of the Kelso-Cathlamet area that we observe today. Catastrophic floods later washed into the Columbia River Basin approximately 12,000 to 15,000 years ago and deposited fine to course-grained sedimentary assemblages (Pleistocene age Flood Deposits) mapped throughout the Longview area.

Geologic Maps

Available geologic mapping of the area and/or subject site indicates that the subject site is underlain by Quaternary aged alluvium consisting of silt, sand, organic rich clay and minor amounts of gravel deposited by the Cowlitz and Columbia Rivers. This alluvium may be on the order of 150 to 200 feet in thickness and is underlain by the Troutdale Formation. The Troutdale Formation, consisting of conglomerate with minor sand and silt interbeds deposited by the Columbia River, is underlain by the Columbia River Basalts at depths ranging from approximately 400 to 800 feet. The mapping suggests that the Columbia River Basalts may be inter-fingered with the Cowlitz River Mudstones near the contact of the Troutdale Formation and underlying Columbia River Basalts.

The region is considered to be seismically active and may be affected by a large offshore subduction zone earthquake as well as smaller earthquakes that occur along local crustal faults. While faulting appears to have played a minor role in the structural development of the area, several faults are mapped in the Longview-Kelso area, the most notable being the Kelso Fault. The Kelso Fault is a large north-trending structure that extends from Kelso northward through the east side of Rocky Point. Throughout the Kelso area, basalt on the west side of the fault is in juxtaposition with sedimentary rocks on the east side of the structure. There is no evidence as to the relative movement of the walls or the inclination of the fault plane.

The available earthquake hazard mapping (Open File Report 2004-20) indicates that the site is located in an area with a relatively moderate to high earthquake hazard. OFR 2004-20 defines the relative earthquake hazard into six (6) zones, A through F, with zone F representing the highest relative hazard. The relative hazard is based on the evaluation of potential soil liquefaction, earthquake induced landsliding, and amplification of ground shaking during a seismic event. The resulting zoning indicates areas that have the greatest tendency to experience damage due to any of and/or a combination of these individual hazards.

This mapping indicates that the subject site has a relatively high liquefaction hazard, a moderate hazard (Do) of amplification of ground shaking, and a low hazard of earthquake induced landsliding. OFR 2004-20 indicates that the amplification factor for peak ground accelerations is less than or equal to 1.

Surface Conditions

The subject and/or proposed new 48th Avenue residential development property is generally irregular in shape and encompasses a total plan area of approximately 8.61 acres. The proposed new 48th Avenue residential development site is roughly bounded to the east by 46th Avenue, to the west by 48th Avenue, to the north by developed residential land and to the south by farm property. At the time of our work, the subject proposed new 48th Avenue residential development site was generally improved and contained one (1) existing single-family residential structure as well as associated site improvements within the southeasterly portion of the site while the remainder of the subject property consist of existing undeveloped farm and/or agricultural land. However, we understand that the northwesterly corner of the subject property (i.e., Parcel #109230100/2025 48th Avenue) may also have previously been developed with a residential home and/or farmhouse.

Topographically, the site is characterized as relatively flat-lying to gently sloping terrain descending downward towards the south/southwest with overall topographic relief across the site estimated at about two (2) to three (3) feet and is estimated to lie between about Elevation 8 feet and Elevation 10 feet.

Subsurface Soil Conditions

Our understanding of the overall subsurface soil and groundwater conditions underlying the site was developed by means of five (5) exploratory test holes (TH-#1 through TH-#5) advanced to a depth of about seven (7) to eight (8) feet beneath existing site grades on August 22, 2024 with portable Geoprobe equipment. The location of the exploratory test holes were located in the field by marking off distances from existing and/or known site features and are shown in relation to the existing site features and/or proposed site improvements on the Site Exploration Map, Figure No. 2. Detailed logs of the test hole explorations, presenting conditions encountered at each location explored, are presented in Appendix A, Figure No's. A-5 through A-7.

The exploratory test holes were observed by staff from Redmond Geotechnical Services, LLC who logged the test hole explorations and obtained representative samples of the subsurface soils encountered beneath the site. Additionally, the elevation of the exploratory test holes were referenced from the Coal Creek USGS Quadrangle and should be considered as approximate. All subsurface soils encountered at the site and/or within the exploratory test boring were logged and classified in general conformance with the Unified Soil Classification System (USCS) which is outlined on Figure No. A-4.

The test hole explorations revealed that the subject site is generally underlain at depth by native soil deposits comprised of lacustrine and fluvial sedimentary soil deposits of Pleistocene age.

Project No. 1209.004.G

48TH AVENUE SUBDIVISION SITE
2019 46TH AVENUE/LONGVIEW, WA

Figure No. 2

SITE EXPLORATION PLAN

LEGEND

TH-#5 Indicates approximate location of exploratory test hole

1:2,257

0	0.02	0.04	0.07 mi
0	0.03	0.06	0.11 km

Specifically, the native subsurface soils encountered across the proposed 48th Avenue residential development site consist an upper unit of topsoil materials comprised of dark brown, moist, soft, organic, sandy, clayey silt to a depth of about 12 to 14 inches. These surficial topsoil materials were inturn underlain by medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey silt to a depth of at least eight (8) feet beneath the existing site and/or surface grades. These sandy, clayey silt subgrade soils become very moist to wet at a depth of about seven (7) feet and are best characterized by relatively low to moderate strength and moderate compressibility.

Groundwater

Groundwater was generally not encountered at the time of our field work within any of the exploratory test holes (TH-#1 through TH-#5) to depths of up to eight (8) feet beneath the existing site and/or surface grades. However, the native sandy, clayey silt subgrade soils were found to be very moist to wet at a depth of about seven (7) feet beneath the existing site and/or surface grades. Additionally, due to proximity of nearby sloughs and/or waterways as well as the nearby Columbia River and/or Cowlitz River, we anticipate that groundwater will be encountered at a depth of about five (5) feet beneath existing site grades during the wet season.

As such, groundwater elevations at the site may fluctuate seasonally in accordance with rainfall conditions and will seasonally perch near surface elevations of the site during periods of prolonged and/or heavy rainfall conditions.

INFILTRATION TESTING

We previously performed one (1) field infiltration test at the site on August 22, 2024. The infiltration testing was performed in test hole TH-#3 at a depth of about three (3) feet beneath existing site grades. The subgrade soils consisted of sandy, clayey silt.

The field infiltration testing was performed in general conformance with current EPA and/or the Cowlitz County Encased Single-Sleeve Falling Head Test Method which consisted of driving a 3-inch inner diameter PVC pipe approximately 6 inches into the exposed soil horizon at the test location. Using a steady water flow, water was discharged into the pipe and allowed to penetrate the subgrade soils. The water level was adjusted over a two (2) hour period and allowed to achieve a saturated subgrade soil condition consistent with the bottom elevation of the surrounding test pit excavation. Following the required saturation period, water was again added into the pipe and the time and/or rate at which the water level dropped was monitored and recorded. Each 6-inch drop in the water level was recorded until a consistent infiltration rate was observed and/or repeated.

Based on the results of the field infiltration testing, we have found that the sandy, clayey silt subgrade soil deposits possess an ultimate infiltration rate on the order of about 0.5 inches per hour (in/hr).

LABORATORY TESTING

Representative samples of the on-site subsurface soils were collected at selected depths and intervals from the supplemental test boring explorations and returned to our laboratory for further examination and testing and/or to aid in the classification of the subsurface soils as well as to help evaluate and identify their engineering strength and compressibility characteristics. The laboratory testing consisted of visual and textural sample inspection, moisture content and dry density determinations, maximum dry density and optimum moisture content, Atterberg Limits and gradation analyses as well as consolidation and "R"-value tests. Results of the various laboratory tests are presented in the Appendix, Figure No's. A-8 through A-12.

SEISMICITY AND EARTHQUAKE SOURCES

The seismicity of the southwest Washington and northwest Oregon area, and hence the potential for ground shaking, is controlled by three separate fault mechanisms. These include the Cascadia Subduction Zone (CSZ), the mid-depth intraplate zone, and the relatively shallow crustal zone. Descriptions of these potential earthquake sources are presented below.

The CSZ is located offshore and extends from northern California to British Columbia. Within this zone, the oceanic Juan de Fuca Plate is being subducted beneath the continental North American Plate to the east. The interface between these two plates is located at a depth of approximately 15 to 20 kilometers (km). The seismicity of the CSZ is subject to several uncertainties, including the maximum earthquake magnitude and the recurrence intervals associated with various magnitude earthquakes. Anecdotal evidence of previous CSZ earthquakes has been observed within coastal marshes along the Washington and Oregon coastlines. Sequences of interlayered peat and sands have been interpreted to be the result of large Subduction zone earthquakes occurring at intervals on the order of 300 to 500 years, with the most recent event taking place approximately 300 years ago. A study by Geomatrix (1995) and/or USGS (2008) suggests that the maximum earthquake associated with the CSZ is moment magnitude (Mw) 8 to 9. This is based on an empirical expression relating moment magnitude to the area of fault rupture derived from earthquakes that have occurred within Subduction zones in other parts of the world. An Mw 9 earthquake would involve a rupture of the entire CSZ. As discussed by Geomatrix (1995) this has not occurred in other subduction zones that have exhibited much higher levels of historical seismicity than the CSZ. However, the 2008 USGS report has assigned a probability of 0.67 for a Mw 9 earthquake and a probability of 0.33 for a Mw 8.3 earthquake. For the purpose of this study an earthquake of Mw 9.0 was assumed to occur within the CSZ.

The intraplate zone encompasses the portion of the subducting Juan de Fuca Plate located at a depth of approximately 30 to 50 km below western Washington and western Oregon. Very low levels of seismicity have been observed within the intraplate zone in western Oregon and western Washington. However, much higher levels of seismicity within this zone have been recorded in Washington and California. Several reasons for this seismic quiescence were suggested in the Geomatrix (1995) study and include changes in the direction of Subduction between Oregon, Washington, and British Columbia as well as the effects of volcanic activity along the Cascade Range.

Historical activity associated with the intraplate zone includes the 1949 Olympia magnitude 7.1 and the 1965 Puget Sound magnitude 6.5 earthquakes. Based on the data presented within the Geomatrix (1995) report, an earthquake of magnitude 7.25 has been chosen to represent the seismic potential of the intraplate zone.

The third source of seismicity that can result in ground shaking within the northwest Oregon and southwest Washington area is near-surface crustal earthquakes occurring within the North American Plate. The historical seismicity of crustal earthquakes in this area is higher than the seismicity associated with the CSZ and the intraplate zone. The 1993 Scotts Mills (magnitude 5.6) and Klamath Falls (magnitude 6.0), Oregon earthquakes were crustal earthquakes.

Liquefaction

Seismic induced soil liquefaction is a phenomenon caused by a rapid increase in pore water pressure that reduces the effective stress between the soil particles to near zero. The excess buildup of pore water pressure results in the sudden loss of shear strength in a soil. In general, loose saturated granular soils with low silt and clay content and which relies on interparticle friction for strength, are the most susceptible to liquefaction until the excess pore pressure can dissipate. Soil liquefaction can cause seismically induces densification of subsurface soil which can result in settlement at the ground surface. Additionally, if the ground surface is sloped or if there is an open face such as a ravine, liquefaction can result in lateral flow (lateral spreading) of material into river channels, ground settlements and increased lateral and uplift pressures on underground structures. Buildings supported on soils that have liquefied often settle and tilt and may displace laterally. Soils located above the groundwater table cannot liquefy, but granular soils located above the water table may settle during the earthquake shaking.

We performed a liquefaction analysis for the site using data collected from the field explorations and our laboratory testing program. We considered both subduction zone and crustal earthquake scenarios. For our analysis, we modeled a subduction zone earthquake as a magnitude 9.0 event with a PGA of 0.20g. We modeled a crustal earthquake as a magnitude 6.8 event with a PGA of 0.37g. The subduction zone parameters were determined using the BC Hydro model (Abrahamson et. al. 2015) and USGS deaggregations (USGS, 2013). The crustal zone parameters were determined using ASCE 7-10 code (ASCE, 2010) and USGS deaggregations (USGS, 2013). We assumed groundwater was present at a depth of 5 feet BGS. In accordance with published literature, we assumed that fine-grained soil with a plasticity index of greater than 7 to 18 does not liquefy (Bray and Idriss, 2006). We performed independent liquefaction calculations using both SPT and CPT data from the site. We evaluated the liquefaction potential using the method proposed by Boulanger and Idriss (2014) as well as the commercial software program CLiq version 1.7 that was developed by Geologismiki and calculates liquefaction potential based on a variety of different methods.

We found that a crustal earthquake and subduction zone earthquake will produce similar results at the site. Our analysis indicates that the upper 8 feet of clayey silt has sufficient high plasticity that it is not susceptible to liquefaction. This conclusion is supported by laboratory test results that indicate the clayey silt has plasticity index value of approximately 7.

This conclusion is also supported by our engineering analysis, which indicates that the soil behaves like clay and does not liquefy. Our analysis indicates that liquefaction of the underlying medium stiff, sandy, clayey silt deposits located below a depth of about eight (8) 8 feet is also unlikely.

As such, we anticipate that the effects of any liquefaction at the site will not be significant and that liquefaction mitigation is not necessary. Additionally, in our professional opinion, seismic induced settlement caused by liquefaction will generally be less than 1.0 inches and will generally be uniform.

Lateral Spreading

As part of our seismic site hazard evaluation, we evaluated the potential for seismic induced lateral spreading at the site. However, the subject property is not located adjacent to any slopes and/or significant waterways.

In this regard, based on our evaluation and experience in the area, we anticipate that the risk of significant lateral spreading occurring at the site to be very low.

Landslides

No ancient and/or active landslides were observed or are known to be present on the subject site. Additionally, the subject property does not contain any steep slopes. As such, development of the subject site into the planned single-family residential development does not appear to present a potential geologic and/or landslide hazard provided that the site grading and development activities conform with the recommendations presented within this report.

Surface Rupture

Although the site is generally located within a region of the country known for seismic activity, no known faults exist on and/or immediately adjacent to the subject site. As such, the risk of surface rupture due to faulting is considered negligible.

Tsunami and Seiche

A tsunami, or seismic sea wave, is produced when a major fault under the ocean floor moves vertically and shifts the water column above it. A seiche is a periodic oscillation of a body of water resulting in changing water levels, sometimes caused by an earthquake. Tsunami and seiche are not considered a potential hazard at this site because the site is not near to the coast and/or there are no adjacent significant bodies of water.

Flooding and Erosion

Stream flooding is a potential hazard that should be considered in lowland areas of Cowlitz County and Longview. The FEMA (Federal Emergency Management Agency) flood maps should be reviewed as part of the design for the proposed new single-family residential structures and/or its associated site improvements. Elevations of structures on the site should be designed based upon consultants reports, FEMA (Federal Emergency Management Agency), and Cowlitz County requirements for the 100-year flood levels of any nearby creeks and/or streams such the Cowlitz and Columbia Rivers.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the results of our field explorations, laboratory testing, and engineering analyses, it is our professional opinion that the site can be developed as proposed provided that new single-family residential structure(s) and any associated site improvements described herein are designed and constructed in accordance with the recommendations contained within the following sections of this report.

The primary features of concern at the site are 1) the presence of the moderately compressible Upper sandy, clayey silt subgrade soils to depths of approximately eight (8) feet beneath existing surface grades across the site, 2) the moisture sensitivity of the near surface clayey silt subgrade soils beneath the site, and 3) the presence of the existing site and/or surface improvements across the southeasterly portion of the subject property.

In regard to the presence of the moderately compressible near surface sandy, clayey silt subgrade soils across the site, under the anticipated maximum static design continuous (strip) and individual (spread) column-type foundation loads of approximately 2 to 3 kips per lineal foot (klf) and 10 to 25 kips, respectively, as well as limits structural fill placement generally less than two (2) feet, our engineering analysis indicates that potential post-construction settlements greater than one (1) inch will not likely occur. As such, continuous (strip) and individual (spread) column footings for the support of the proposed single-family residential homes appears suitable and does not require over-excavation and/or preloading of the site.

With regard to the moisture sensitivity if the near surface clayey silt subgrade soils, we are generally of the opinion that all site grading and earthwork activities be scheduled for the drier summer months which is typically June through September.

In regard to the presence of the existing site improvements, we understand that the existing residential home will be razed from the site. In this regard, close monitoring by the Geotechnical Engineer during the site grading and earthwork operations will be required.

The following sections of this report provide specific recommendations regarding subgrade preparation and grading as well as foundation and floor slab design and construction for the new 48th Avenue residential development project.

Site Preparation

As an initial step in site preparation, we recommend that the proposed new single-family residential building area(s) and their associated structural and/or site improvement area(s) be stripped and cleared of all existing surface improvements, any existing undocumented and/or unsuitable surficial fill materials, surface debris, existing vegetation, topsoil materials, and/or any other deleterious materials present at the time of construction. In general, we envision that the site stripping to remove existing vegetation and topsoil materials will generally be about twelve (12) to fourteen (14) inches. However, localized areas requiring deeper stripping and removal may be encountered and should be evaluated and/or approved at the time of construction by the Geotechnical Engineer. The stripped and cleared materials should be properly disposed of as they are generally considered unsuitable for use/reuse as fill materials.

Following the completion of the site stripping and clearing work and prior to the placement of any new required structural fill materials and/or structural improvements, the exposed subgrade soils within the planned structural improvement area(s) should be inspected and approved by the Geotechnical Engineer and possibly proof-rolled with a half and/or fully loaded dump truck. Areas found to be soft or otherwise unsuitable should be over-excavated and removed or scarified and recompacted as structural fill. During wet and/or inclement weather conditions, proof rolling and/or scarification and recompaction as noted above may not be appropriate.

The on-site native sandy, clayey silt subgrade soils and/or existing silty and sandy fill soil materials are generally considered suitable for use/reuse as structural fill materials provided that they are free of organic materials, debris, and rock fragments in excess of about 6 inches in dimension. However, if site grading is performed during wet or inclement weather conditions, the use of the on-site native silty soil materials will be difficult at best. In this regard, during wet or inclement weather conditions, we recommend that an import structural fill material be utilized which should consist of a free-draining (clean) granular fill (sand & gravel) containing no more than about 5 percent fines. Representative samples of the materials which are to be used as structural fill materials should be submitted to the Geotechnical Engineer and/or laboratory for approval and determination of the maximum dry density and optimum moisture content for compaction.

In general, all site earthwork and grading activities should be scheduled for the drier summer months (June through September) if possible. However, if wet weather site preparation and grading is required, it is generally recommended that the stripping and clearing be accomplished with a tracked excavator utilizing a large smooth-toothed bucket working from areas yet to be excavated. Additionally, the loading of strippings into trucks and/or protection of moisture sensitive subgrade soils will also be required during wet weather grading and construction.

In this regard, we recommend that areas in which construction equipment will be traveling be protected by covering the exposed subgrade soils with a woven geotextile fabric such as Mirafi FW404 followed by at least 12 inches or more of crushed aggregate base rock. Further, the geotextile fabric should have a minimum Mullen burst strength of at least 250 pounds per square inch for puncture resistance and an apparent opening size (AOS) between the U.S. Standard No. 70 and No. 100 sieves.

All structural fill materials placed within the new single-family residential home building area(s) and the associated structural and/or site improvement area(s) should be moistened or dried as necessary to near (within 3 percent) optimum moisture conditions and compacted by mechanical means to a minimum of 92 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Additionally, all fill materials placed within three (3) lineal feet of the perimeter (limits) of the proposed new residential structures should be considered structural fill which requires a minimum degree of compaction of 92 percent. However, structural fill materials required outside of the proposed new residential building area(s) need only be compacted to a minimum of 90 percent of the maximum dry density. Structural fill materials should be placed in lifts (layers) such that when compacted do not exceed about 8 inches. All aspects of the site grading should be monitored and approved by a representative of Redmond Geotechnical Services, LLC.

Foundation Support

Based on the results of our investigation, it is our opinion that the site of the proposed new 48th Avenue residential development is generally suitable for support of the single- and/or two-story wood-frame single-family structures provided that the above site preparation and/or following foundation design recommendations are followed. However and as previous noted, construction of the proposed new single- and/or two-story wood-frame residential structures across the site under an anticipated static design load greater than 3.0 kips per lineal foot (klf) and/or 30 kips as well as site grading resulting in the placement of more than two (2) feet of structural fill is expected to result in total and/or differential settlements greater than 1-inch and 1/2-inch, respectively. In this regard, under the above anticipated site grading and foundation construction, over-excavation and/or preloading of the site does not appear to be required for the project.

The following sections of this report present specific foundation design and construction recommendations for the planned new 48th Avenue residential development structures.

Conventional Shallow Foundations

In general, conventional shallow continuous (strip) footings and individual (spread) pad footings for the proposed single- and/or two-story wood-frame single-family residential structures and supported by approved native sandy, clayey silt subgrade soil materials and/or properly placed and compacted structural fill soil materials may be designed based on an allowable contact bearing pressure of about 2,000 pounds per square foot (psf). This recommended allowable contact bearing pressure is intended for dead loads and sustained live loads and may be increased by one-third for the total of all loads including short-term wind or seismic loads.

However, as previously noted, moderately loaded (i.e., greater than 3 klf and/or 30 kips) continuous (strip) footings and individual column-type foundations constructed at the site and supported directly by the underlying native sandy, clayey silt subgrade soils may experience post-construction settlements greater than 1-inch. As such, we recommend that all moderately loaded (i.e., greater than 3 klf and 30 kips) continuous and individual column footings constructed beneath the proposed single-family residential structures be over-excavated and filled with at least 18 inches or more of properly compacted crushed aggregate structural fill and/or the proposed building site should be preloaded. Additionally, due to the moisture sensitivity of the native sandy, clayey silt subgrade soils beneath the site, we recommend that all footing excavations and bearing surfaces constructed during wet and/or inclement weather conditions be protected with at least 3 inches of compacted crushed aggregate.

In general, shallow continuous (strip) footings should have a minimum width of at least 16 inches and be embedded at least 18 inches below the lowest adjacent finish grade (includes frost protection). Individual (spread) pad footings (where required) should be embedded at least 18 inches below grade and have a minimum width of at least 24 inches. Additionally, foundations should constructed no closer than five (5) feet to the top of any permanent cut and/or fill slope.

Total and differential settlements of conventional shallow foundations constructed as recommended above and supported by approved native sandy, clayey silt subgrade soils and/or by no more than two (2) feet of properly compacted structural fill materials are expected to be well within the tolerable limits for this type of wood-frame structure and should generally be less than about 1-inch and 1/2-inch, respectively.

Allowable lateral frictional resistance between the base of the footing element and the supporting subgrade bearing soil can be expressed as the applied vertical load multiplied by a coefficient of friction of 0.30 and 0.50 for native sandy, clayey silt subgrade soils and/or import gravel fill materials, respectively. In addition, lateral loads may be resisted by passive earth pressures on footings poured "neat" against in-situ (native) subgrade soils or properly backfilled with structural fill materials based on an equivalent fluid density of 250 pounds per cubic foot (pcf) and 350 pcf, respectively. These recommended values include a factor of safety of approximately 1.5 which is appropriate due to the amount of movement required to develop full passive resistance.

Floor Slab Support

In order to provide uniform subgrade reaction beneath concrete slab-on-grade floors, we recommend that the floor slab area be underlain by a minimum of 6 inches of free-draining (less than 5 percent passing the No. 200 sieve), well-graded, crushed rock. The crushed rock should help provide a capillary break to prevent migration of moisture through the slab. Additional moisture protection, where needed, can be provided by using a 10-mil polyolefin geo-membrane sheeting such as StegoWrap.

The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Where floor slab subgrade materials are undisturbed, firm and stable and where the underslab aggregate base rock section has been prepared and compacted as recommended above, we recommend that a modulus of subgrade reaction of 250 pci be used for design.

Retaining/Below Grade Walls

Retaining and/or below grade walls should be designed to resist lateral earth pressures imposed by native soils or granular backfill materials as well as any adjacent surcharge loads. For walls which are unrestrained at the top and free to rotate about their base, we recommend that active earth pressures be computed on the basis of the following equivalent fluid densities:

Table 2: Retaining Wall Earth Pressures

Non-Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	35	30
3H:1V	60	50
2H:1V	90	80

For walls which are fully restrained at the top and prevented from rotation about their base, we recommend that at-rest earth pressures be computed on the basis of the following equivalent fluid densities:

Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	55	50
3H:1V	75	70
2H:1V	95	90

The above recommended values assume that the walls will be adequately drained to prevent the buildup of hydrostatic pressures. Where wall drainage will not be present and/or if adjacent surcharge loading is present, the above recommended values will be significantly higher.

Backfill materials behind walls should be compacted to 90 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Special care should be taken to avoid over-compaction near the walls which could result in higher lateral earth pressures than those indicated herein. In areas within three (3) to five (5) feet behind walls, we recommend the use of hand-operated compaction equipment.

Pavements

Flexible pavement design for the project was determined on the basis of projected (anticipated) traffic volume and loading conditions relative to laboratory subgrade soil strength ("R"-value) characteristics. Based on a laboratory subgrade "R"-value of 28 (Resilient Modulus = 5,000 to 10,000) and utilizing the Asphalt Institute Flexible Pavement Design Procedures and/or the American Association of State Highway and Transportation Officials (AASHTO) 1993 "Design of Pavement Structures" manual, we recommend that the asphaltic concrete pavement section(s) for the new 48th Avenue residential development areas at the site consist of the following:

	Asphaltic Concrete Thickness (inches)	**Crushed Base Rock Thickness (inches)**
Vehicle Drive Areas	4.0	10.0

Note: Where heavy vehicle traffic is anticipated such as those required for fire and/or garbage trucks, we recommend that the automobile drive area pavement section be increased by adding 2.0 inches of aggregate base rock. Additionally, the above recommended flexible pavement section assumes a design life of 25 years.

Pavement Subgrade, Base Course & Asphalt Materials

The above recommended pavement section(s) were based on the design assumptions listed herein and on the assumption that construction of the pavement section(s) will be completed during an extended period of reasonably dry weather.

All thicknesses given are intended to be the minimum acceptable. Increased base rock sections and the use of a woven geotextile fabric may be required during wet and/or inclement weather conditions and/or in order to adequately support construction traffic and protect the subgrade during construction. Additionally, the above recommended pavement section(s) assume that the subgrade will be prepared as recommended herein, that the exposed subgrade soils will be properly protected from rain and construction traffic, and that the subgrade is firm and unyielding at the time of paving. Further, it assumes that the subgrade is graded to prevent any ponding of water which may tend to accumulate in the base course.

Pavement base course materials should consist of well-graded 1-1/2 inch and/or 3/4-inch minus crushed base rock having less than 5 percent fine materials passing the No. 200 sieve. The base course and asphaltic concrete materials should conform to the requirements set forth in the latest edition of the Oregon Department of Transportation, Standard Specifications for Highway Construction. The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. The asphaltic concrete paving materials should be compacted to at least 92 percent of the theoretical maximum density as determined by the ASTM D-2041 (Rice Gravity) test method.

Wet Weather Grading and Soft Spot Mitigation

Construction of the proposed new paved site improvements is generally recommended during dry weather. However, during wet weather grading and construction, excavation to subgrade can proceed during periods of light to moderate rainfall provided that the subgrade remains covered with aggregate. A total aggregate thickness of 8- to 12-inches may be necessary to protect the subgrade soils from heavy construction traffic. Construction traffic should not be allowed directly on the exposed subgrade but only atop a sufficient compacted base rock thickness to help mitigate subgrade pumping. If the subgrade becomes wet and pumps, no construction traffic shall be allowed on the road alignment. Positive site drainage shall be maintained if site paving will not occur before the on-set of the wet season.

Depending on the timing for the project, any soft subgrade found during proof-rolling or by visual observations can either be removed and replaced with properly dried and compacted fill soils or removed and replaced with compacted crushed aggregate. However, and where approved by the Geotechnical Engineer, the soft area may be covered with a bi-axial geogrid and covered with compacted crushed aggregate.

Soil Shrink-Swell and Frost Heave

The results of the laboratory "R"-value tests indicate that the native subgrade soils possess a low to moderate expansion potential. As such, the exposed subgrade soils should not be allowed to completely dry and should be moistened to near optimum moisture content (plus or minus 3 percent) at the time of the placement of the crushed aggregate base rock materials. Additionally, exposure of the subgrade soils to freezing weather may result in frost heave and softening of the subgrade. As such, all subgrade soils exposed to freezing weather should be evaluated and approved by the Geotechnical Engineer prior to the placement of the crushed aggregate base rock materials.

Excavation/Slopes

Temporary excavations of up to about four (4) feet in depth may be constructed with near vertical inclinations for short periods of time provided that groundwater seepage is not present. Temporary excavations greater than about four (4) feet but less than eight (8) feet should be excavated with inclinations of at least 1 to 1 (horizontal to vertical) or properly braced/shored. Where excavations are planned to exceed about eight (8) feet, this office should be consulted. All shoring systems and/or temporary excavations including bracing as well as dewatering for the project should be the responsibility of the excavation contractor and should be made in accordance with applicable Occupational Safety and health Administration (OSHA) and state regulations.

Permanent cut and/or fill slopes, if required, should be constructed no steeper than about 2H:1V.

Depending on the time of year in which trench excavations occur, trench dewatering may be required in order to maintain dry working conditions if the invert elevations of the proposed utilities are located at and/or below the groundwater level.

If groundwater is encountered during utility excavation work, we recommend placing trench stabilization materials along the base of the excavation. Trench stabilization materials should consist of 1-foot of well-graded gravel, crushed gravel, or crushed rock with a maximum particle size of 4 inches and less than 5 percent fines passing the No. 200 sieve. The material should be free of organic matter and other deleterious material and placed in a single lift and compacted until well keyed.

Surface Drainage/Groundwater

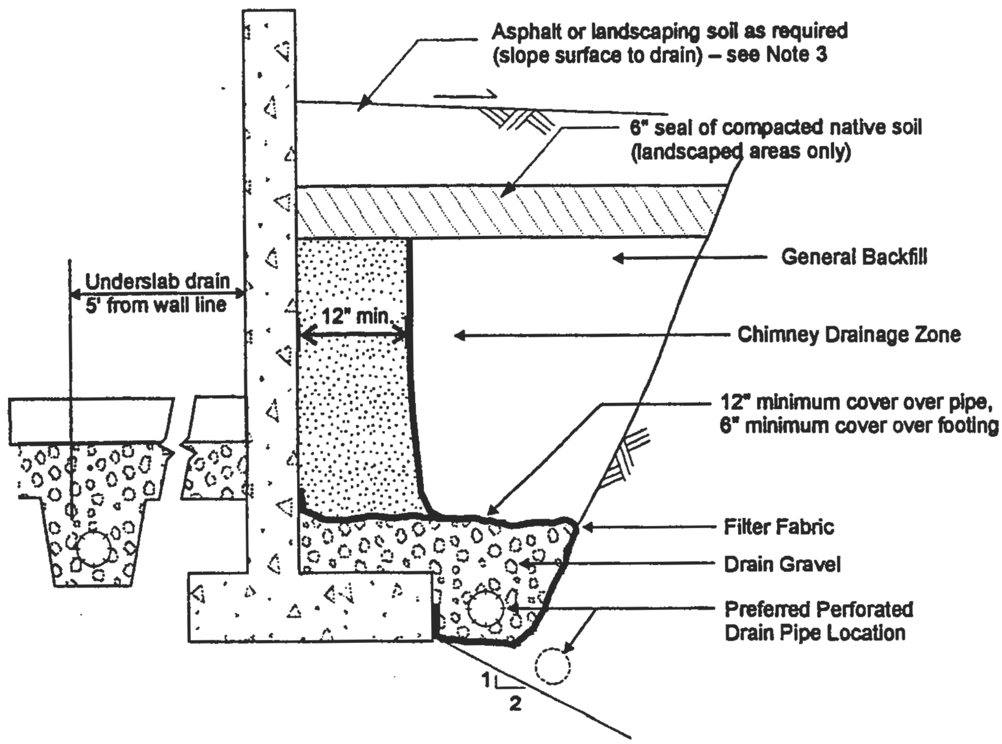
We recommend that positive measures be taken to properly finish grade the site so that drainage waters from building and/or landscaping areas as well as adjacent properties or buildings are directed away from the new single-family residential structures foundations. Any roof drains and/or subsurface drainage systems should be directed into non-perforated conduits (pipes) that carry runoff water away from any new building to a suitable outfall. Roof downspouts should not be connected to foundation drains. A minimum ground slope of about 2 percent is generally recommended in unpaved areas around the residential structure(s).

Groundwater was generally not encountered at the site within any of the exploratory test holes at the time of the field work at depth of up to eight (8) feet beneath existing site grades. However, the sandy, clayey silt subgrade soils were found to become very moist to wet at a depth of about seven (7) feet. Additionally, although groundwater elevations in the area may fluctuate seasonally and may temporarily pond/perch near the ground surface during periods of prolonged rainfall, based on our current understanding of the project, we are generally of the opinion that the observed static groundwater levels encountered during our field work are likely near to the seasonal high groundwater elevation(s) at the site.

As such, based on our current understand of the site grading required to bring the subject site to finish design grades as well as the type of structure(s) which will be constructed at the site, we are of the opinion that an underslab drainage system is not required for the proposed new residential structure(s). However, due to the presence of the near surface sandy, clayey silt subgrade soils across the site, we are of the opinion that a perimeter foundation drainage system should be considered at the site. A typical perimeter footing and/or retaining wall drain detail is shown on Figure No. 3.

Design Infiltration Rate(s)

Based on the results of our field infiltration testing at the site and the sensitivity of the subject site due to infiltration of storm water, we do not recommend storm water be infiltrated at the site. However, should infiltration of storm water be required, we recommend using an allowable infiltration rate of 0.25 inches per hour (in/hr) to design any required storm water infiltration and/or disposal system for the project. Additionally, we recommend that the Geotechnical Engineer review the storm water infiltration system proposed for construction at the site.



SCHEMATIC - NOT TO SCALE

NOTES:

1. Filter Fabric to be non-woven geotextile (Amoco 4545, Mirafi 140N, or equivalent)
2. Lay perforated drain pipe on minimum 0.5% gradient, widening excavation as required. Maintain pipe above 2:1 slope, as shown.
3. All-granular backfill is recommended for support of slabs, pavements, etc. (see text for structural fill).
4. Drain gravel to be clean, washed ¾" to 1½" gravel.
5. General backfill to be on-site gravels, or ¾"-0 or 1½"-0 crushed rock compacted to 92% Modified Proctor (AASHTO T-180).
6. Chimney drainage zone to be 12" wide (minimum) zone of clean washed, medium to coarse sand or drain gravel if protected with filter fabric. Alternatively, prefabricated drainage structures (Miradrain 6000 or similar) may be used.

TYPICAL PERIMETER FOOTING/RETAINING WALL DRAIN DETAIL

Project No. 1209.004.G	48TH AVENUE SUBDIVISION SITE 2019 46TH AVENUE/LONGVIEW, WA	Figure No. 3

Note: A safety factor of three (3) was used to calculate the above recommended design infiltration rate for the project. Additionally, given the possible variability of the on-site silty subgrade soils across the site, we recommend consideration be given to performing a field test of the actual storm water system constructed at the site in order to confirm that the above recommended design infiltration rate is appropriate.

Seismic Design Considerations

Structures at the site should be designed to resist earthquake loading in accordance with the methodology described in the latest edition of the State of Washington Structural Specialty Code (WSSC), ASCE 7-16 and/or the latest amendments to the 2018 International Building Code (IBC). The maximum considered earthquake ground motion for short period and 1.0 period spectral response may be determined from the Washington Structural Specialty Code (WSSC), ASCE 7-16 or the 2015 National Earthquake Hazard Reduction Program (NEHRP) "Recommended Provisions for Seismic Regulations for New Buildings and Other Structures" published by the Building Seismic Safety Council. Assuming an IBC building category importance factor I_E = 1.0 and a seismic use group of III, we recommend a seismic design category "E" be used for design per Table 1613.5.2.

Using this information, the structural engineer can select the appropriate site coefficient values (F_a and F_v) from ASCE 7-16 or the 2018 IBC to determine the maximum considered earthquake spectral response acceleration for the project. However, we have assumed the following response spectrum for the project:

Table 3: ASCE 7-16 Seismic Design Parameters

Site Class	S_D	S_1	Fa	Fv	S_{MS}	S_{M1}	S_{DS}	S_{D1}
E	0.925	0.454	1.230	2.291	1.138	1.041	0.758	0.694

Notes: 1. S_s and S_1 were established based on the USGS 2015 mapped maximum considered earthquake spectral acceleration maps for 2% probability of exceedence in 50 years.

2. Fa and Fv were established based on ASCE 7-16 using the selected S_s and S_1 values.

CONSTRUCTION MONITORING AND TESTING

We recommend that **Redmond Geotechnical Services, LLC** be retained to provide construction monitoring and testing services during all earthwork operations for the proposed new 48th Avenue residential development. The purpose of our monitoring services would be to confirm that the site conditions reported herein are as anticipated, provide field recommendations as required based on the actual conditions encountered, document the activities of the grading contractor and assess his/her compliance with the project specifications and recommendations.

It is important that our representative meet with the contractor prior to grading to help establish a plan that will minimize costly over-excavation and site preparation work. Of primary importance will be observations made during site preparation, structural fill placement, pile driving and/or foundation excavations and construction as well as any retaining wall backfill.

CLOSURE AND LIMITATIONS

This report is intended for the exclusive use of the addressee and/or their representative(s) to use to design and construct the proposed new 48th Avenue residential structure(s) and any associated site improvements described herein as well as to prepare any related construction documents. The conclusions and recommendations contained in this report are based on site conditions as they presently exist and assume that the explorations are representative of the subsurface conditions between the explorations and/or across the study area. The data, analyses, and recommendations herein may not be appropriate for other structures and/or purposes. We recommend that parties contemplating other structures and/or purposes contact our office. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. Additionally, the above recommendations are contingent on Redmond Geotechnical Services, LLC being retained to provide all site grading inspection and construction monitoring services for the project. Redmond Geotechnical Services, LLC will not assume any responsibility and/or liability for any engineering judgment, inspection, or testing services performed by others.

It is the owners/developers responsibility for insuring that the project designers and/or contractors involved with this project implement our recommendations into the final design plans, specifications and/or construction activities for the project. Further, in order to avoid delays during construction, we recommend that the final design plans and specifications for the project be reviewed by our office to evaluate as to whether our recommendations have been properly interpreted and incorporated into the project.

If during any future site grading and construction, subsurface conditions different from those encountered in the explorations are observed or appear to be present beneath excavations, we should be advised immediately so that we may review these conditions and evaluate whether modifications of the design criteria are required. We also should be advised if significant modifications of the proposed site development are anticipated so that we may review our conclusions and recommendations.

LEVEL OF CARE

The services performed by the Geotechnical Engineer for this project have been conducted with that level of care and skill ordinarily exercised by members of the profession currently practicing in the area under similar budget and time restraints. No warranty or other conditions, either expressed or implied, is made.

REFERENCES

Adams, John, 1984, Active Deformation of the Pacific Northwest Continental Margin: Tectonics, v.3, no. 4, p. 449-472.

Applied Technology Council, ATC-13, 1985, Earthquake Damage Evaluation Data for California.

Atwater, B.F., 1992, Geologic evidence for earthquakes during the past 2000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

Atwater, B.F., 1987a, A periodic Holocene recurrence of widespread, probably coseismic Subsidence in southwestern Washington: EOS, v. 68, no. 44.

Atwater, B.F., 1987b, Evidence for great Holocene earthquakes along the outer coast of Washington State: Science, v. 236, no. 4804, pp. 942-944.

Campbell, K.W., 1990, Empirical prediction of near-surface soil and soft-rock ground motion for the Diablo Canyon Power Plant site, San Luis Obispo County, California: Dames & Moore report to Lawrence Livermore National Laboratory.

Carver, G.A., and Burke, R.M., 1987, Late Holocene paleoseismicity of the southern end of the Cascadia Subduction zone [abs.]: EOS, v. 68, no. 44, p. 1240.

Chase, R.L., Tiffin, D.L., Murray, J.W., 1975, The western Canadian continental margin: In Yorath, C.J., Parker, E.R., Glass, D.J., editors, Canada's continental margins and offshore petroleum exploration: Canadian Society of Petroleum Geologists Memoir 4, p. 701-721.

Crouse, C.B., 1991a, Ground motion attenuation equations for earthquakes on the Cascadia Subduction Zone: Earthquake Spectra, v. 7, no. 2, pp. 201-236.

Crouse, C.B., 1991b, Errata to Crouse (1991a), Earthquake Spectra, v. 7, no. 3, p. 506.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes, northern Oregon central Cascadia margin: Tectonics, v. 9, p. 1-22.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes northwest Oregon [abs]: EOS, v. 68, no. 44, p. 1469.

EERI (Earthquake Engineering Research Institute), 1993, The March 25, 1993, Scotts Mill Earthquake, Western Oregon's Wake-Up Call: EERI Newsletter, Vol. 27, No. 5, May.

Geomatrix, 1995 Seismic Design Mapping, State of Oregon: Final Report to Oregon Department of Transportation, January.

Geologic Map Series (GMS-75), Geologic Map of the Portland Quadrangle, Multnomah and Washington Counties, Oregon and Clark County, Washington dated 1991.

Geologic Map Series (GMS-79), Earthquake Hazard Maps of the Portland Quadrangle, Multnomah and Washington Counties Oregon and Clark County, Washington dated 1993.

Grant, W.C., and McLaren, D.D., 1987, Evidence for Holocene Subduction earthquakes along the northern Oregon coast [abs]: EOS v. 68, no. 44, p. 1239.

Grant, W.C., Atwater, B.F., Carver, G.A., Darienzo, M.E., Nelson, A.R., Peterson, C.D., and Vick, G.S., 1989, Radiocarbon dating of late Holocene coastal subsidence above the Cascadia Subduction zone-compilation for Washington, Oregon, and northern California, [abs]: EOS Transactions of the American Geophysical Union, v. 70, p. 1331.

IMS-1, Relative Earthquake Hazard Map of the Portland Metro Region, Clackamas, Multnomah, and Washington Counties, Oregon dated 1997.

International Conference of Building Officials (ICBO), 1994, Uniform Building Code: 1994 Edition, Whittier, CA. 1994.

Joyner, W.B., and Boore, D.M., 1998, Measurement, characterization and prediction of strong ground motion: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 43-102.

OFR 0-90-2, Earthquake Hazard Geology Maps of the Portland Metropolitan Area, Oregon dated 1990.

Riddihough, R.P., 1984, Recent movements of the Juan de Fuca plate system: Journal of Geophysical Research, v. 89, no. B8, p. 6980-6994.

Youngs, R.R., Day, S.M., and Stevens, J.L., 1998, Near field ground motions on rock for large Subduction earthquakes: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 445-462.

Appendix A

Log of Test Pits and Laboratory Test Data

APPENDIX

FIELD EXPLORATIONS AND LABORATORY TESTING

FIELD EXPLORATION

Subsurface conditions at the site under this scope of work were explored by performing five (5) exploratory test holes on August 22, 2024. The approximate location of the exploratory test holes are shown in relation to the existing site features and/or proposed new site improvements on the Site Exploration Map, Figure No. 2.

The test holes performed under this scope of work were advanced using portable Geoprobe equipment in general conformance with ASTM Methods in Vol. 4.08, D-1586-94 and D-1587-83. The test holes were advanced to depths of up to eight (8) feet beneath existing site grades. Detailed logs of the test holes are presented on the Log of Test Pits, Figure No's. A-5 through A-7 in Appendix A. The soils were classified in accordance with the Unified Soil Classification System (USCS), which is outlined on Figure No. A-4.

The exploration program was coordinated by a field engineer who monitored the exploration activity, obtained representative samples of the subsurface soils encountered, classified the soils by visual and textural examination, and maintained continuous logs of the subsurface conditions. Disturbed and/or undisturbed samples of the subsurface soils were obtained at appropriate depths and/or intervals and placed in plastic bags and/or with a thin walled ring sample.

Groundwater was generally not encountered in any of the exploratory test holes (TH-#1 through TH-#5) at the time of the field work to depths of up to eight (8) feet beneath existing site grades.

LABORATORY TESTING

Pertinent physical and engineering characteristics of the soils encountered during our subsurface investigation were evaluated by a laboratory testing program to be used as a basis for selection of soil design parameters and for correlation purposes. Selected tests were conducted on representative soil samples. The program consisted of tests to evaluate the existing (in-situ) moisture-density, maximum dry density and optimum moisture content, Atterberg Limits and gradational characteristics as well as consolidation and "R"-value tests.

Dry Density and Moisture Content Determinations

Density and moisture content determinations were performed on both disturbed and relatively undisturbed samples from the test hole explorations in general conformance with ASTM Vol. 4.08 Part D-216. The results of these tests were used to calculate existing overburden pressures and to correlate strength and compressibility characteristics of the soils. Test results are shown on the test pit logs at the appropriate sample depths.

Maximum Dry Density

One (1) Maximum Dry Density and Optimum Moisture Content test was performed on a representative sample of the upper sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-1557. This test was conducted to help establish various engineering properties for use as structural fill. The test results are presented on Figure No. A-8.

Atterberg Limits

Liquid Limit (LL) and Plastic Limit (PL) tests were performed on a representative sample of the upper sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-4318-85. The tests were conducted to facilitate classification of the soils and for correlation purposes. The test results appear on Figure No. A-9.

Gradation Analysis

Gradation analyses were performed on representative samples of the subsurface soils in accordance with ASTM Vol. 4.08 Part D-422. The test results were used to classify the soil in accordance with the Unified Soil Classification System (USCS). The test results are shown graphically on Figure No. A-10.

Consolidation Test

One (1) Consolidation test was performed on a representative sample of the sandy, clayey silt fill soil to assess the compressibility characteristics of the near surface sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-2435-80.

Conventional loading increments of 100, 200, 400, ... 12,800 psf were applied after the 100 percent time of primary consolidation was identified for each loading increment. The samples were unloaded and allowed to rebound after the completion of the loading sequence. Deflection versus time readings were recorded for all load increments from 100 through 12,800 psf. The deflection corresponding to 100 percent primary consolidation was plotted on the consolidation strain versus consolidation pressure curve, which is presented on Figure No. A-11.

"R"-Value Tests

One (1) "R"-value test was performed on a remolded subgrade soil sample in accordance with ASTM Vol. 4.08 Part D-2844. The test results were used to help evaluate the subgrade soils supporting and performance capabilities when subjected to traffic loading. The test results are shown on Figure No. A-12.

A-3

The following figures are attached and complete the Appendix:

Figure No. A-4	Key To Exploratory Test Pit Logs
Figure No's. A-5 through A-7	Log of Test Pits
Figure No. A-8	Maximum Dry Density
Figure No. A-9	Atterberg Limits Test Results
Figure No. A-10	Gradation Test Results
Figure No. A-11	Consolidation Test Results
Figure No. A-12	"R"-Value Test Results

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS — MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS — LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS — LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

DEFINITION OF TERMS

	U.S. STANDARD SERIES SIEVE: 200	40	10	4	CLEAR SQUARE SIEVE OPENINGS: 3/4"	3"	12"
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT†
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

CLAYS AND PLASTIC SILTS	STRENGTH‡	BLOWS/FOOT†
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

†Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).
‡Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

REDMOND GEOTECHNICAL SERVICES
PO Box 20547 • Portland, Oregon 97294

KEY TO EXPLORATORY TEST PIT LOGS
Unified Soil Classification System (ASTM D-2487)

48TH AVENUE SUBDIVISION SITE
2019 46TH AVENUE/LONGVIEW, WA

PROJECT NO.	DATE	Figure A-4
1209.004.G	9/06/24	

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 8/22/24

TEST PIT NO. TH-#1 ELEVATION

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
	X			18.5	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5	X			23.3		Becomes very moist to wet
10						Total Depth = 8.0 feet No groundwater encountered at time of exploration
15						

TEST PIT NO. TH-#2 ELEVATION

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
					ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1209.004.G | 48TH AVENUE SUBDIVISION SITE | FIGURE NO. A-5

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 8/22/24

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION TEST PIT NO. TH-#3 ELEVATION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
	X		87.9	18,7	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	TEST PIT NO. TH-#4 ELEVATION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
					ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1209.004.G | 48TH AVENUE SUBDIVISION SITE | FIGURE NO. A-6

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 8/22/24

TEST PIT NO. TH-#5 ELEVATION

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
	X			19.3	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						
	X			23.9		Becomes very moist to wet
						Total Depth = 8.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. ELEVATION

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0						
5						
10						
15						

LOG OF TEST PITS

PROJECT NO. 1209.004.G | 48TH AVENUE SUBDIVISION SITE | FIGURE NO. A-7

MAXIMUM DENSITY TEST RESULTS

SAMPLE LOCATION	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
TH-#3 @ 2.0'	Medium to olive-brown, sandy, clayey SILT (ML)	106.4	16.5

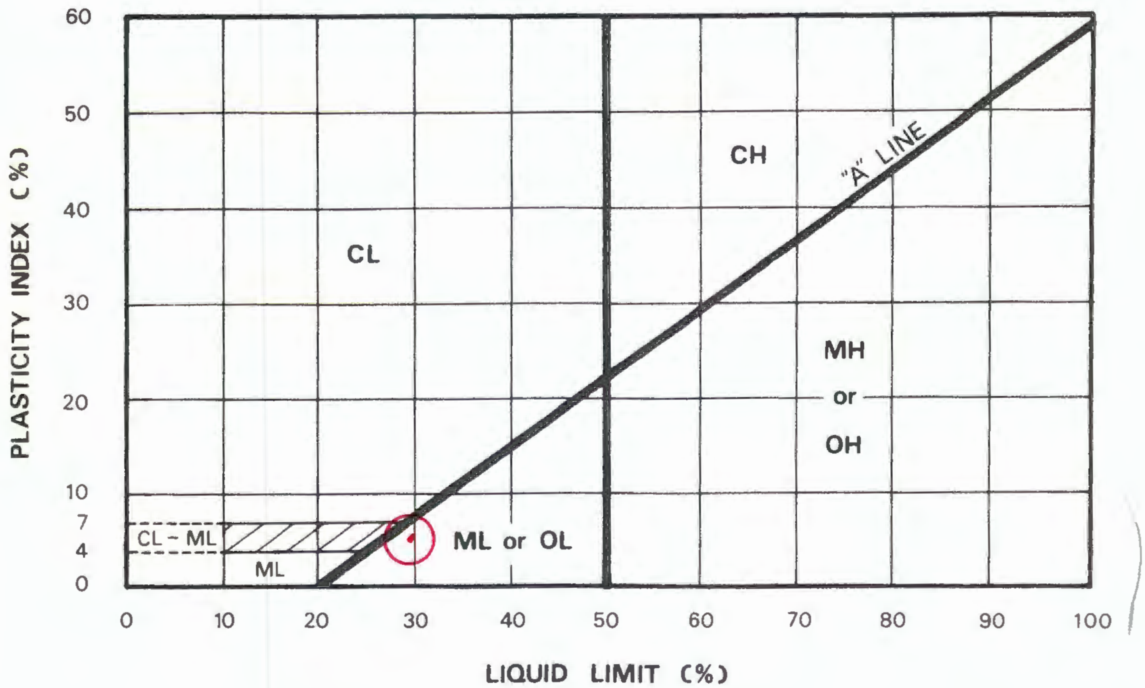
EXPANSION INDEX TEST RESULTS

SAMPLE LOCATION	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (pcf)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (%)	EXPANSION INDEX	EXPANSIVE CLASS.

MAXIMUM DENSITY & EXPANSION INDEX TEST RESULTS

PROJECT NO.: 1209.004.G	48TH AVENUE SUBDIVISION SITE	FIGURE NO.: A-8

REDMOND GEOTECHNICAL SERVICES



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
⊙	TH-#3	2.0	18.7	29.9	5.9	86.2		ML

REDMOND GEOTECHNICAL SERVICES
PO Box 20547 • Portland, Oregon 97294

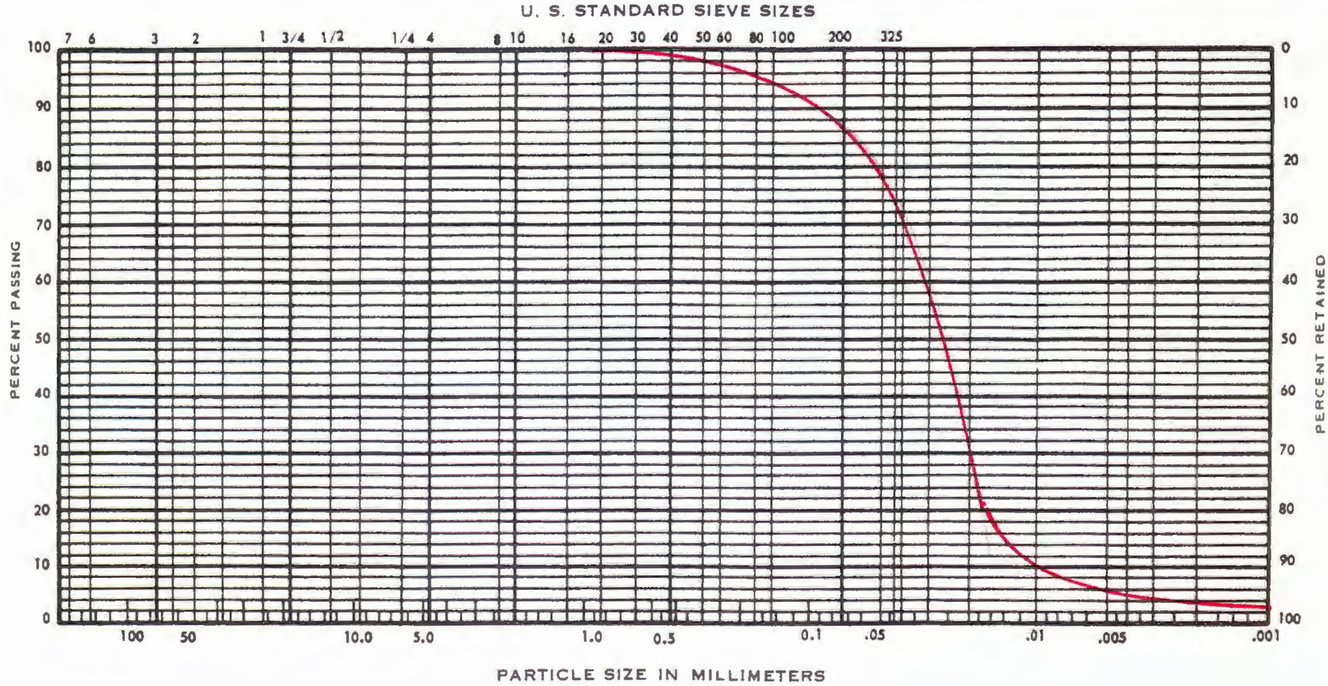
PLASTICITY CHART AND DATA

48TH AVENUE SUBDIVISION SITE
2019 46TH AVENUE/LONGVIEW, WA

PROJECT NO.	DATE	
1209.004.G	9/06/24	Figure A-9

UNIFIED SOIL CLASSIFICATION SYSTEM

(ASTM D 422-72)

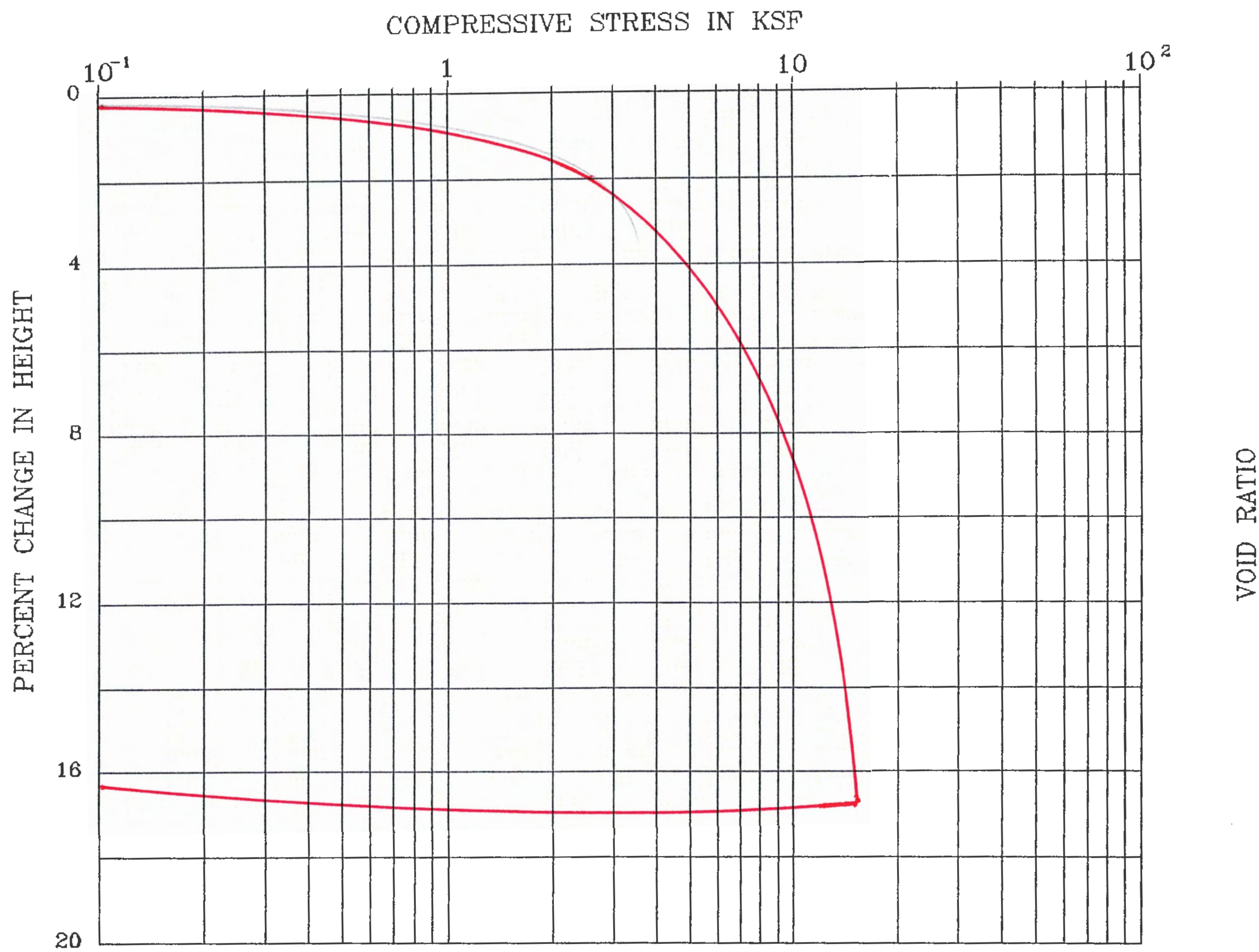


COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	ELEV. (feet)	UNIFIED SOIL CLASSIFICATION SYMBOL	SAMPLE DESCRIPTION
——	TH-#3	2.0		ML	Medium to olive-brown, sandy, clayey SILT

REDMOND GEOTECHNICAL SERVICES
PO Box 20547 • Portland, Oregon 97294

GRADATION TEST DATA		
48TH AVENUE SUBDIVISION SITE 2019 46TH AVENUE/LONGVIEW, WA		
PROJECT NO. 2019.004.G	DATE 9/06/24	FIGURE A-10



BORING	: TH-#3	DESCRIPTION	: sandy, clayey SILT (ML)
DEPTH (ft)	: 2.0	LIQUID LIMIT	: 29.9
SPEC. GRAVITY	: 2.5 (assumed)	PLASTIC LIMIT	: 24.0

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	18.7	87.9	80.7	
FINAL	7.1	106.2	95.1	

REDMOND GEOTECHNICAL SERVICES
PO Box 20547 • Portland, Oregon 97294

CONSOLIDATION TEST DATA

48TH AVENUE SUBDIVISION SITE
2019 46TH AVENUE/LONGVIEW, WA

PROJECT NO.	DATE	Figure A-11
1209.004.G	9/06/24	

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#1

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	211	327	434
Expansion Dial (o.ooo1")	0	0	1
Expansion Pressure (psf)	0	0	3
Moisture Content (%)	22.5	18.9	14.4
Dry Density (pcf)	101.6	105.9	109.1
Resistance Value, "R"	18	30	42
"R"-Value at 300 psi Exudation Pressure = 29			

SAMPLE LOCATION:

SAMPLE DEPTH:

Specimen	A	B	C
Exudation Pressure (psi)			
Expansion Dial (0.0001")			
Expansion Pressure (psf)			
Moisture Content (%)			
Dry Density (pcf)			
Resistance Value "R"			
"R"-Value at 300 psi Exudation Pressure =			

Figure No. A-12

48th Avenue PUD Subdivision Pre-Application Narrative

INTRODUCTION

The 48th Avenue PUD Subdivision proposes to subdivide 6 parcels, totaling approximately 8.26 acres, into 75 single-family lots. This work will be completed in one phase. The site is located at approx.. 2024 48th Avenue in Longview, WA 98632. New addresses will be provided once the subdivision is recorded. All future homes will gain access from the new public road on-site which connects through from 48th Avenue to 46th Avenue. All parcels involved are zoned (TNR) Traditional Neighborhood Residential as well as the parcels to the south, east and west. The parcels to the north are zoned (R-1) and (R-2) which are both within the Residential District. The parcels to the north contain existing single-family homes and the parcels to the south contain existing single-family homes on acreage.

The minimum lot size allowed in the TNR zone is 5,000 square feet for Single-Family Residences and 2,000 square feet for Townhouses, unless otherwise approved via PUD. The maximum density allowed is 8 units per acre. *The allowable density may be increased to up to 12 units in TNR zone areas that are outside of the Columbia Valley Gardens neighborhood….)per note 2.* This project is outside of the CVG neighborhood. The proposed gross density is 9.08 units per acre. The minimum lot width allowed is 35 feet in the TNR zone with zero lot lines. PUD's allow for a reduced minimum lot width. The minimum width proposed for this project is 25 feet. This project also proposes to utilize the zero lot line standards. Setbacks on one side of the home will be 5 feet and setbacks on the opposite lot line would be 0 feet. Construction is tentatively set for Fall 2025 / Spring 2026.

Table 19.20.030-1 Density and Dimensional Standards by Zone

Standard	Zoning District					
	R-1	R-2	R-3	R-4	TNR	Proposed
Minimum lot size (square feet)	6,000; townhouses per PUD approval	1,800 (townhouses); 6,000 (other uses)	1,800 (townhouses); 6,000 (other uses)[10]	1,800 (townhouses); 6,000 (other uses)[10]	5,000; 2,000 (townhouse), unless otherwise approved via PUD process	2,649 sf
Minimum lot frontage/width (feet)*[11]	50	20 (townhouse); 50 (other)	20 (townhouse); 50 (other)	20 (townhouse); 50 (other)	35 (zero lot line and two-unit townhouses); 45[1] (other)	25 ft (zero lot line development)
Minimum lot frontage on a cul-de-sac	In all zones, lot frontage on cul-de-sac lots may be reduced up to 25 percent of base standard (see above)					N/A
Maximum density (units per acre)	6 units	30 units	No requirement	No requirement	8 units[2]	9 units
Front yard setback	25	25	20	20	20	20

48th Avenue PUD Subdivision
Pre-Application Narrative

Standard	Zoning District					
	R-1	R-2	R-3	R-4	TNR	Proposed
(feet)						
Front yard setback (alley-loading)[3]	15	15	10	10	10	N/A
Rear yard setback[4] (feet)	15	10	10	10	10	10
Side yard setback[5] (feet)	5	5	5	5	5[6]	0 ft , 4'
Side yard (street) setback – corner lot, street flanking (feet)	15	15	15	15	10	10
Maximum building height – residential (feet)	35	35	45, with no building over 4 stories[9]	60, with no building over 6 stories[9]	35	25
Maximum building height – accessory building (feet)[7]	20	20	20	20	20	N/A
Maximum impervious area of lot[8]	65%	75%	85%	85%	75%	63%

Notes/Additional Standards:
1. Residences designed as zero lot line units, including two-unit townhouse structures, shall adhere to the standards set forth in LMC 19.20.050(5) for lot width/frontage.
2. The allowable density may be increased to up to 12 units in TNR zones areas that are outside of the Columbia Valley Gardens neighborhood, as presently defined in the Longview Comprehensive Plan (Figure 3-1) or as subsequently amended.
3. To utilize the reduced setback in any of the residential districts, alley access must be provided and all off-street parking, garages and driveways for a given lot and residence shall be located and accessed from the alley. In the R-1, R-2, and TNR districts, the reduced front yard setback applies to lots in a subdivision or short subdivision where the reduced setback was approved as part of the overall approval process for the subdivision or short subdivision. In the R-3 and R-4 districts, there shall be a minimum of an eight-foot-wide planting strip along the fronting street. If there is a narrower or no eight-foot-wide planting strip, the reduced front yard setback is allowed only upon receiving a special property use permit per Chapter 19.12 LMC. The term "planting strip" is defined in LMC 12.02.010.
4. See LMC 19.20.070(3)(c).
5. For single-family attached housing units (e.g., townhouses), the setback for the nonattached side of a dwelling unit (end units) shall be 10 feet (excepting corner lots), otherwise there is no side yard setback.
6. Homes in the TNR zone may utilize the zero lot line setback provisions set forth in this chapter.
7. See LMC 19.20.080(4)(c).
8. Townhouse units/lots are not subject to the maximum impervious area standard.
9. Height limits apply only if the property is adjacent to the R-1 residential district or the traditional neighborhood residential district.
10. For multifamily development with a density over 30 units per acre the minimum lot size shall be 12,000 square feet.
11. Alternate minimum lot frontage/widths may be approved in accordance with Chapter 19.77 LMC as approved by the community development director or designee, city engineer, and fire marshal.

PLANNED UNIT DEVELOPMENT (LMC 19.66)

LMC 19.66.020 - This section of the PUD code states that the provisions of this code apply to the TNR zone district in which this project is located.

LMC 19.66.040 – The proposed use of this PUD is consistent with the approved uses in the underlying zone as we are proposing single-family detached units.

LMC 19.66.050 – As described above, a zero lot line setback is being proposed which is allowed outright in the TNR zone. This section of the PUD code further encourages the use of zero lot line setback at the discretion of the city.

LMC 19.66.050(3) - The discretionary standards also expand on the minimum dimension requirements which are set forth in LMC 19.80.130. The proposed lots having a 25′ width dimension comply with all standards set forth in LMC 19.80.130(8).

LMC 19.66.050(4) - *To provide opportunities for unique development designs and the ability to accommodate site constraints, the minimum development standards for street right-of-way improvements including the regulations related to right-of-way width, pavement width, planting strips, sidewalk construction and similar standards may be modified for the "residential access" street classification, subject to review and approval by the city engineer and city fire chief if the applicant demonstrates that all of the following criteria are met:*

(a) There are topographical or physical conditions such as steep slopes, wetlands, stormwater mitigations, streets, utilities, lot patterns, street patterns or other conditions that justify departure from strict adherence to the standard to be modified;

(b) That the modification is consistent with sound engineering principles and it will be safe, practical and efficient;

(c) That the proposed modification is consistent with the intent and purpose of the standard being modified; and

(d) That the proposed modification is consistent with the goals and policies of the comprehensive plan;

The proposed project has physical conditions of wetlands constraining the proposed design to deviate from the standards outlined in the underlying zone district. The modifications will be consistent with sound engineering principles and adhere to the standards where possible making it safe, practical and efficient. The proposed design will be consistent with the purpose of the underlying zone district as well as meet the goals of the comprehensive plan.

LMC 19.66.060 – The proposed density does not exceed the allowable 12 units per the "Notes/Additional Standards" set forth in the TNR zone district for the proposed use.

LMC 19.66.070 – A minimum of 20% of the total area of the PUD must be devoted to open space. At least half of the total open space must be suitable for recreational use (10% of total PUD area). This project proposes to have approximately 20.7% of open space while 10.87% is suitable for recreational use. The recreation use portion of the open space is located in the southern central part of the PUD between lots 67 and 68. A formal playground area is provided on the southeast side of the park. A 4 foot wide bark trail will provide a nature walk opportunity along the wetland buffer and mature trees. The northwest corner of the park will have a paved pump track for use by bikes, scooter, skate boards and other wheeled recreation. No motorized vehicles of any kind will be allowed on the pump track. Helmets along with other safety requirements will be posted at the entrance/exit of the pump track.

CRITICAL AREAS (LMC 17.12.010 and LMC 17.12.020)

There are critical areas known to be on the site, i.e. wetlands. Ecological Land Services provided a critical areas report with this Preliminary Subdivision Application. You can find this report in section I of the preliminary application submittal. The site area is mostly flat with 0-3 percent slopes across most of the site. The site has approximately 3 ft of fall across the development area. There are no riparian habitats or Oregon White Oaks on the project site.

The soil located on site is Caples Silty Clay Loam. Caples soils are generally fine textured, somewhat poorly drained soils developed in flood plains derived from alluvial materials. Caples soils exhibit low permeability, high shrink swell potential, low shear strength, and a slight erosion hazard based primarily on grade. See the Geotechnical report by Redmond Geotechnical included in this application.

STORMWATER (LMC 17.80)

Stormwater control will conform to the requirements of the City of Longview Stormwater Manual. Stormwater from the new impervious surfaces will be treated by a wet pond, or other approved BMP's. The stormwater facility will be used for detention and treatment. A preliminary stormwater and TIR has been submitted with this preliminary subdivision application.

ROADS AND PARKING (LMC 19.78.100)(LMC 19.78.030)

48th Avenue is an existing local access road, over 25 ft in width, fronting the west side of the property. 46th Avenue is an existing local access road, over 25 ft in width, fronting the east side of the property. Public road frontage improvements will be completed for both roads. The proposed interior road named Branch Street will be constructed with a 50-foot right-of-way, 30-foot paved width and a detached sidewalk with planter strips and street trees as required by the City of Longview. The name of the road can be changed by the city prior to final plat and addressing.

48^{th} Avenue PUD Subdivision
Pre-Application Narrative

All on-site roadway improvements are proposed to meet or exceed City of Longview standards.

Two driveway parking stalls and two garage parking stalls will be provided for each lot providing at least 4 parking spaces per lot. City code does not recognize parking in the front setback so the driveway parking spaces do not technically count towards the minimum parking requirement of two per lot. This code was going to be updated and may change before the hearing for this project. Either way this project meets the minimum requirements for parking. There will also be on-street parking. Approximately 37 parallel parking spaces will be available for first come first serve public guest and residence use along Branch Street. No on-street parking is shown along 46^{th} Avenue or 48^{th} Avenue.

ACCESS (LMC 12.50)

Access for the project will come from both of the existing public paved roads; 48^{th} Avenue and 46^{th} Avenue. All driveway access will be internal to the project from the new proposed public Branch Street.

TRAFFIC

A complete traffic study has been prepared by Charbonneau Engineering for this preliminary subdivision application and can be found in section G of this application. The existing site is vacant. Currently there are 0 AM peak trips and 0 PM peak trips and 0 average daily trips.

FIRE

All future homes will comply with the City of Longview Fire Code. Fire hydrants will be placed throughout the site and will be tested for fire flow prior to above-ground combustible construction commencing. Fire flow will be a minimum of 1,000 gallons per minute with 20 pounds of pressure per square inch for a minimum duration of 60 minutes. The water mains supplying fire hydrants will be a minimum of 6-inches in diameter to meet code for this project. Fire hydrants will be equally spaced along the proposed access road but will not exceed more than 500’ apart. The proposed local access road running through the site will be 30’ wide to support fire apparatuses. Buildings will have extra fire construction requirements for the 0’ lot line construction. This will be provided at time of building permit application and review.

48^{th} Avenue PUD Subdivision
Pre-Application Narrative

WATER & SEWER

Public water and sewer lines exist within 48^{th} Avenue and 46^{th} Avenue. Water and sewer service will be supplied by The City of Longview. Water lines will be looped through the site from 48^{th} Avenue to 46^{th} Avenue, under the new public street. 48^{th} Ave has a 12-inch and 46^{th} Ave is a 6-inch Ductile Iron. The City provided option is to have shared laterals from the main to the property lines. This would require additional valves at the main. All lots will have an individual water meter.

Sewer lines will be extended into the site and will require a 10' horizontal clearance from water mains. Currently there are exiting 8-inch sewer mains located within 48^{th} Ave and 46^{th} Ave. The City provided option is to install 6-inch sewer laterals from each property line to the main.

Both sewer and water lines will have a private maintenance and operations agreement recorded for the private laterals between the property owners if shared laterals are constructed.

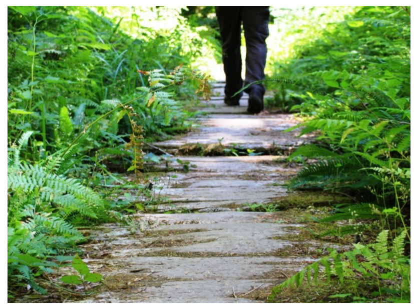
SCHOOLS & WALKWAYS

All Elementary, Middle and High Schools are over 1 mile away from the proposed subdivision and will have kids bused to and from school.

Thank you for your time and review of this pre-application plan. If you have any questions or need more information, please contact Scott Taylor of SGA Engineering at or 306-993-0911

CRITICAL AREAS REPORT

January 20, 2025



48th Longview

Longview, Washington

Prepared for

Hinton Development
Attn: Nikki Hinton
14010-A NE 3rd Court Suite 106
Vancouver, WA 98685
(360) 852-2035

Prepared by

Ecological Land Services

1157 3rd Avenue, Suite 220A • Longview, WA 98632

(360) 578-1371 • Project Number 0152.22

SIGNATURE PAGE

The information and data in this report was compiled and prepared under the supervision and direction of the undersigned.

Natalie T. Denson

Natalie Denson
Biologist

Beau Johnson
Project Coordinator/Biologist V

TABLE OF CONTENTS

INTRODUCTION **1**
SITE DESCRIPTION **1**
METHODOLOGY **1**
VEGETATION **2**
WETLANDS 2
UPLANDS 2
SOILS **2**
WETLAND SOILS 2
UPLAND SOILS 3
HYDROLOGY **3**
WETLAND A 3
PRECIPITATION 3
CRITICAL AREAS INVENTORIES **4**
NATIONAL WETLANDS INVENTORY 4
COWLITZ COUNTY CRITICAL AREAS 4
PRIORITY HABITATS AND SPECIES 4
WASHINGTON DEPARTMENT OF NATURAL RESOURCES 4
CRITICAL AREAS SUMMARY **5**
WETLAND A 5
WETLAND BUFFERS 5
EXEMPT HISTORICAL DRAINAGE DITCH 5
LIMITATIONS **6**
REFERENCES **7**

TABLES (IN TEXT)

Table 1. Mapped Soils..........Error! Bookmark not defined.
Table 2. Precipitation Data **4**
Table 3. Critical Areas Summary **5**

FIGURES

Figure 1 Vicinity Map
Figure 2 Existing Conditions
Figure 3 NRCS Soil Survey
Figure 4 USFWS National Wetlands Inventory
Figure 5 Cowlitz County Critical Areas
Figure 6 WDFW Priority Habitats and Species
Figure 7 WDNR Stream Type Map
Figure 8 Wetland Rating Form – 1 km Offset
Figure 9 Wetland Rating Form – 150' Offset
Figure 10 Wetland Rating Form – 303(d) and TMDLs
Photoplates 1-3

APPENDICES

Appendix A – Routine Determination Method and Plant Indicator Rating Definitions
Appendix B – Wetland Determination Data Forms
Appendix C – Antecedent Precipitation Tool Data
Appendix D – Wetland Rating Form

INTRODUCTION

Ecological Land Services, Inc. (ELS) has completed this critical areas report on behalf of the applicant, Hinton Development, LLC, for the purpose of future development of the site. The site consists of Cowlitz County Parcel Numbers 109240100, 109230100, 109020100, 109010100, 108990100, and 109000100 located at 2025 48th Avenue in Longview, Washington. The parcels are located within a portion of Section 24, Township 8 North, Range 3 West of the Willamette Meridian (Figure 1). On January 8, 2025, ELS biologists conducted a comprehensive onsite assessment for the presence of wetlands and fish and wildlife habitat conservation areas, including streams and other priority habitats. This critical areas report summarizes ELS' findings according to *Longview Municipal Code (LMC) Chapter 17.10 Critical Areas* (September 2024).

SITE DESCRIPTION

The approximately 8.2-acre site is accessed via a gravel driveway from 48th Avenue to the north or from a gravel driveway off 46th Avenue to the south (Figure 2). The site is zoned as Traditional Residential Neighborhood (TRN) while surrounding parcels are also zoned as TRN and Residential District (R-1 and R-2), consisting primarily of high-density single-family dwellings and single-family homes on large lots. There is a cement foundation from a demolished home in the northwest corner of the site.

Topography onsite is generally flat with a very gentle slope down towards the central-eastern boundary of the site. There is a historical drainage ditch that runs through the northwestern portion of the site (Figure 2). The dominant vegetation onsite consists of pasture grasses, weedy herbs and forbs, and Himalayan blackberry (*Rubus armeniacus*; Photoplates 1-3). There is one emergent and forested wetland along the central-western boundary of the site that continues offsite to the south and southwest (Wetland A; Photoplate 2, Photopoints 2a and 2b). The site is not located within a floodplain and is in an area with reduced flood risk due to levee (FEMA 2024).

METHODOLOGY

The property was evaluated for the presence of wetlands using the Routine Determination Method according to the U.S. Army Corps of Engineers' 1987 *Wetland Delineation Manual* and the *Regional Supplement to the Corps of Engineers' Wetland Delineation Manual* (Environmental Laboratory 1987); *Western Mountains, Valleys, and Coast Region* (Version 2.0) (Corps 2010). The Routine Determination Method and defining wetland criteria are discussed further in Appendix A. Wetlands are regulated as "Waters of the United States" by the U.S. Army Corps of Engineers (Corps) and as "Waters of the State" by the Washington Department of Ecology (Ecology), and locally by the City of Longview.

ELS biologists evaluated the property on January 8, 2025, for the presence of critical areas including wetlands and fish and wildlife habitat conservation areas. The onsite boundaries of one wetland (Wetland A) were delineated along the central-western boundary of the site (Figure 2). Wetland A's onsite boundaries were determined through breaks in topography, changes in vegetation, and evidence of hydrology. Standard vegetation, soils, and hydrology data were collected from eight test plots to determine the location and extent of onsite wetlands. Wetland

A's offsite boundaries are approximate and were determined through aerial photography and topographic changes. The locations of test plots and wetland flagging were recorded using a hand-held GPS unit capable of sub-meter accuracy under ideal conditions (Figure 2).

VEGETATION

General vegetation consists of pasture grasses, weedy herbs and forbs, and invasive reed canarygrass (*Phalaris arundinacea*) and Himalayan blackberry (*Rubus armeniacus*). Vegetation in the open field is routinely mowed for maintenance. The plant indicator status following the plant scientific name is defined by the *National Wetland Plant List Indicator Rating Definitions* (Corps 2012) and can be found in Appendix A.

WETLANDS

Wetland A's eastern and central vegetation consisted primarily of a forested canopy with emergent species beneath. In the western portion of the wetland, emergent species were the majority of the vegetation. Dominant wetland vegetation consisted of reed canarygrass (FACW), creeping buttercup (*Ranunculus repens*, FAC), Himalayan blackberry (FAC), Pacific willow (*Salix lucida*, FACW), and Oregon ash (*Fraxinus latifolia*, FACW).

UPLANDS

Upland vegetation consisted primarily of pasture grasses and weedy herbs and forbs. The following were dominant species: tall fescue (*Schedonorus arundinaceus,* FAC), colonial bentgrass (*Agrostis capillaris,* FAC), common velvet grass (*Holcus lanatus*, FAC), orchard grass (*Dactylis glomerata*, FACU), reed canarygrass, and Himalayan blackberry.

SOILS

Soils onsite are mapped as Caples silty clay loam, 0 to 3 percent slopes (17) as referenced on the Natural Resources Conservation Service (NRCS) Web Soil Survey website (NRCS 2025a; Figure 3). Appendix B contains the Wetland Determination Data Forms with soil descriptions as observed onsite.

Caples silty clay loam, 0 to 3 percent slopes is characterized as somewhat poorly drained with a depth to water table of about 18 to 30 inches below ground surface and is formed on floodplains with a parent material of alluvium (NRCS 2025a). Caples silty clay loam is rated as hydric by the NRCS (NRCS 2025b).[1]

WETLAND SOILS

Evaluated wetland soils consisted of silty clay loams having very dark grayish brown and dark grayish brown (10YR 3/2, 4/2) matrix colors. Redoximorphic concentrations were present over

[1] Areas mapped as hydric soils do not necessarily mean that an area is or is not a wetland—hydrology, hydrophytic vegetation, and hydric soils must all be present to classify an area as a wetland.

12 percent of the matrix that had a yellowish brown (10YR 5/8) color. This profile met the criterion for hydric soil indicator Depleted Matrix (F3).

UPLAND SOILS

Evaluated upland soils consisted of silty clay loams and silt loams having very dark grayish brown to dark grayish brown (10YR 3/2 to 10YR 4/2) matrix colors. Redoximorphic features were observed within some of the sampled soils as concentrations in the matrix having dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) colors. However, the features were not observed in high enough percentages or at the right soil depths to meet the requirements of any hydric soil indicators.

HYDROLOGY

WETLAND A

Wetland A is a depressional, seasonally flooded, and saturated only wetland (Figure 9). During the site visit, 10 to 18 inches of standing water was observed within the wetland, and the water table and soil saturation were also observed at the surface of the soil. The hydrology indicators of High Water Table (A2), Saturation (A3), Geomorphic Position (D2), and FAC Neutral Test (D5) were met. Wetland A extends offsite to the northwest and appears to have no outlet. Cowlitz Diking Improvement District #1’s Ditch 8 is offsite to the south but does not appear to have any hydrologic connectivity to Wetland A. Hydrology is supported by precipitation, surface runoff from upslope areas, and a shallow groundwater table.

PRECIPITATION

Precipitation data was gathered from the NOAA Regional Climate Center’s *Cowlitz County, Washington, WETS Station: Longview* (2025), which is the closest station to the project site. During the two weeks prior to the site visit, precipitation totaled 4.15 inches with 0.00 inches of rainfall occurring on the day of the visit. Precipitation for three months prior to the visit fell within normal levels. Review of the USACE Antecedent Precipitation Tool (APT; Deters 2023) evidences these findings. A copy of the APT data is provided in Appendix C. Table 2 summarizes the precipitation data.

Table 1. Precipitation Data

Precipitation (inches)									
Date of Visit	2 Weeks Prior	30 Days Ending		30% Below	30% Above	DAREM[1]			
		Month/Year	Monthly Total			Value	Weight	Total
1/8/2025 0.00	4.15	2025-01-08	7.80	6.17	8.78	2	3	6
		2024-12-09	8.02	5.35	8.53	2	2	4
		2024-11-09	5.17	3.31	5.17	2	1	2
Rainfall 3 months prior was: normal (sum 6-9), normal (sum 10-14), wetter (sum 15-18).[2]								12
Year to Date Mean Rainfall[2,3]: 47.31 inches								
Year to Date Actual Rainfall[3]: 17.38 inches								

[1] *Direct Antecedent Rainfall Evaluation Methods (Sumner et al 2009),* [2]*Based on 2004-2025 data,* [3]*Includes missing data*

CRITICAL AREAS INVENTORIES

National Wetlands Inventory

The US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping indicates the presence of one PEM1C[2] wetland onsite, extending offsite to the west (USFWS 2025; Figure 4). ELS' observations generally agree with the NWI mapping of the PEM1C wetland as it corresponds with the location of Wetland A.

Cowlitz County Critical Areas

Cowlitz County Critical Areas (CCCA) mapping shows one freshwater emergent wetland onsite as well as the site being located in an area with reduced flooding risk due to levee (Cowlitz County 2025; Figure 5). ELS' observations generally agree with this mapping as the location of the CCCA mapped wetland corresponds to the location of Wetland A, and the site is located in an area that is protected by levees along the Columbia River.

Priority Habitats and Species

The Washington Department of Fish and Wildlife (WDFW) Priority Habitat and Species (PHS) maps indicate the presence of one freshwater, emergent wetland onsite (WDFW; Figure 6). ELS' observations generally agree with the PHS mapping as it corresponds to the location of Wetland A.

Washington Department of Natural Resources

The Washington Department of Natural Resources (WDNR) online Forest Practices Application Mapping Tool (FPAMT) indicates the presence of a Type F (fish-bearing) stream offsite to the south (WDNR 2025; Figure 7). ELS' observations generally agree with the WDNR's FPAMT mapping as it corresponds to the location of offsite Ditch 8.

[2] Palustrine, emergent, persistent, seasonally flooded

Critical area inventory maps are typically used to gather general information about a region and due to the large scale necessary for regional mapping, are limited in accuracy for localized analyses.

CRITICAL AREAS SUMMARY

WETLAND A

Wetland A is Category III, depressional, emergent, forested, seasonally flooded, and saturated only wetland totaling 0.18 acres onsite and extending offsite to the south and southwest (Figure 2). Wetland A's onsite vegetation is dominated by Oregon ash, Pacific willow, creeping buttercup, and reed canarygrass. Wetland hydrology is supported by precipitation, a shallow groundwater table, and runoff from upslope areas. Wetland A has no observable outlet. According to the *Washington State Wetland Rating System for Western Washington: 2014 Update (Version 2.0)* (Rating System; Hruby 2023), Wetland A is a Category III wetland with 16 points; scoring 6 points for water quality functions, 6 points for hydrologic functions, and 4 points for habitat functions. The wetland rating form can be found in Appendix D.

WETLAND BUFFERS

Standard wetland buffers are based on wetland category and habitat score from the Rating System, in conjunction with the proposed land use intensity (*LMC 17.10.110(5)(a))*. Wetland A is a Category III wetland with a habitat score of 4, and according to *LMC Table 17.10.110-3* the wetland buffers are based solely on the water quality buffers specified in *LMC Table 17.10.110-1*. Per *LMC Table 17.10.110-1*, Wetland A buffers for a proposed low land use intensity, moderate land use intensity, and high land use intensity are 40 feet, 60 feet, or 80 feet, respectively. Wetland A and its regulated buffers are summarized in Table 3.

Table 2. Critical Areas Summary

Name	Size (acres)	Hydrogeomorphic Classification[1]	Cowardin Class[2]	Habitat Score	Category[3]	Buffer Width (Feet)[4]
Wetland A	0.18 onsite	Depressional	Emergent & forested	4	III	Low intensity – 40
						Moderate intensity - 60
						High intensity - 80

[1]NRCS 2008, [2]FGDC 2013, [3]Hruby 2023, [4]LMC Table 17.10.110-1

EXEMPT HISTORICAL DRAINAGE DITCH

Per Longview Municipal Code*,* the historical drainage ditch that runs through the northwestern portion of the property is exempt from meeting the criteria of a wetland and subsequently any associated buffers*.* According to *LMC 17.10.050*, wetlands are defined as not including those artificial wetlands intentionally created from nonwetland sites, such as irrigation and drainage ditches (2024). Because this ditch is surrounded by uplands on all sides, it is artificially created from nonwetland sites.

LIMITATIONS

ELS bases the above listed determinations and conclusions on standard scientific methodology and best professional judgment. In our opinion, local, state, and federal regulatory agencies should agree with the conclusions of this report. However, this should be considered a preliminary report and should be used at your own risk until it has been reviewed and approved in writing by the appropriate regulatory agencies. ELS is not responsible for the impacts of any changes in environmental standards, practices, or regulations after the date of this report.

REFERENCES

City of Longview. 2024. *Longview Municipal Code Chapter 17.10 – Critical Areas.* December 12, 2024.

Cowlitz County. 2025. *Environmental Planning Internet Clearance (EPIC)*. https://www.co.cowlitz.wa.us/2898/Web-Map-Applications. Accessed January 2025.

Deters, J.C. 2023. *Antecedent Precipitation Tool (APT)* (Version 2.0). U.S. Army Corps of Engineers. https://github.com/erdc/Antecedent-Precipitation-Tool/releases/latest.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual,* Technical Report Y-87-1. U.S. Army Corps of Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Federal Geographic Data Committee (FGDC). 2013. *Classification of Wetlands and Deepwater Habitats of the United States*. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.

Hruby, T. & Yahnke, A. 2023. *Washington State Wetland Rating System for Western Washington: 2014 Update (Version 2)*. Publication #23-06-009. Washington Department of Ecology.

National Oceanic and Atmospheric Administration (NOAA) Regional Climate Centers AgACIS website *WETS Station: Cowlitz County, Washington, WETS Station: Longview*. https://agacis.rcc-acis.org/. Accessed January 2025.

Natural Resource Conservation Service (NRCS). 2008. *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service.* United States Department of Agriculture Technical Note, #190-8-76.

Natural Resources Conservation Service (NRCS). 2025a. *Web Soil Survey*. https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed January 2025.

Natural Resources Conservation Service (NRCS). 2025b. *State Soil Data Access (SDA) Hydric Soils List*. https://www.nrcs.usda.gov/publications/query-by-state.html. Accessed January 2025.

U.S. Army Corps of Engineers. 2010. *Final Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*, ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-13. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

U.S. Fish & Wildlife Service (USFWS). 2025. *National Wetlands Inventory*. https://www.fws.gov/wetlands/data/mapper.html. Accessed January 2025.

Washington Department of Ecology (Ecology). 2016. Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State. Final Review. Publication No. 16-06-029. October.

Washington Department of Fish and Wildlife (WDFW). 2025. *Priority Habitats and Species (PHS)* on the Web. https://geodataservices.wdfw.wa.gov/hp/phs/. Accessed January 2025.

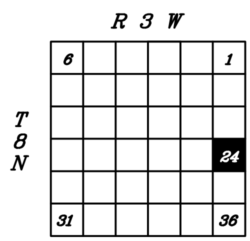
Washington Department of Natural Resources (WDNR). 2025. *Forest Practices Application Mapping Tool FPAMT)*. https://www.dnr.wa.gov/programs-and-services/forest-practices/forest-practices-application-review-system-fpars. Accessed January 2025.

FIGURES AND PHOTOPLATES

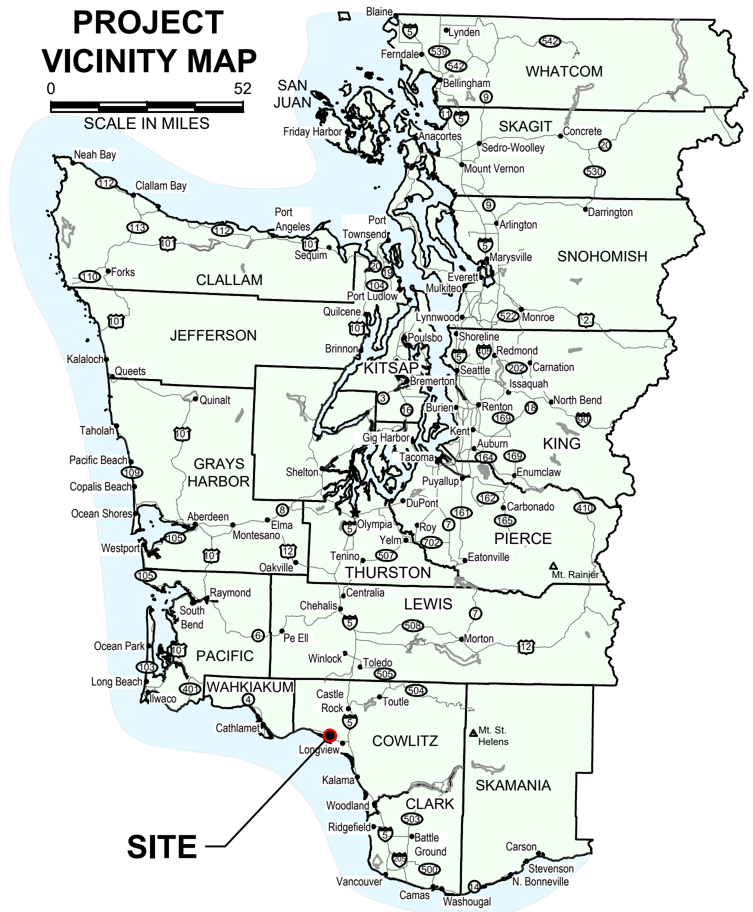
WASHINGTON

46.1622° Latitude
-123.0050° Longitude

LOCATION MAP



PROJECT VICINITY MAP



NOTE:
Quadrangle topographic map from USGS.

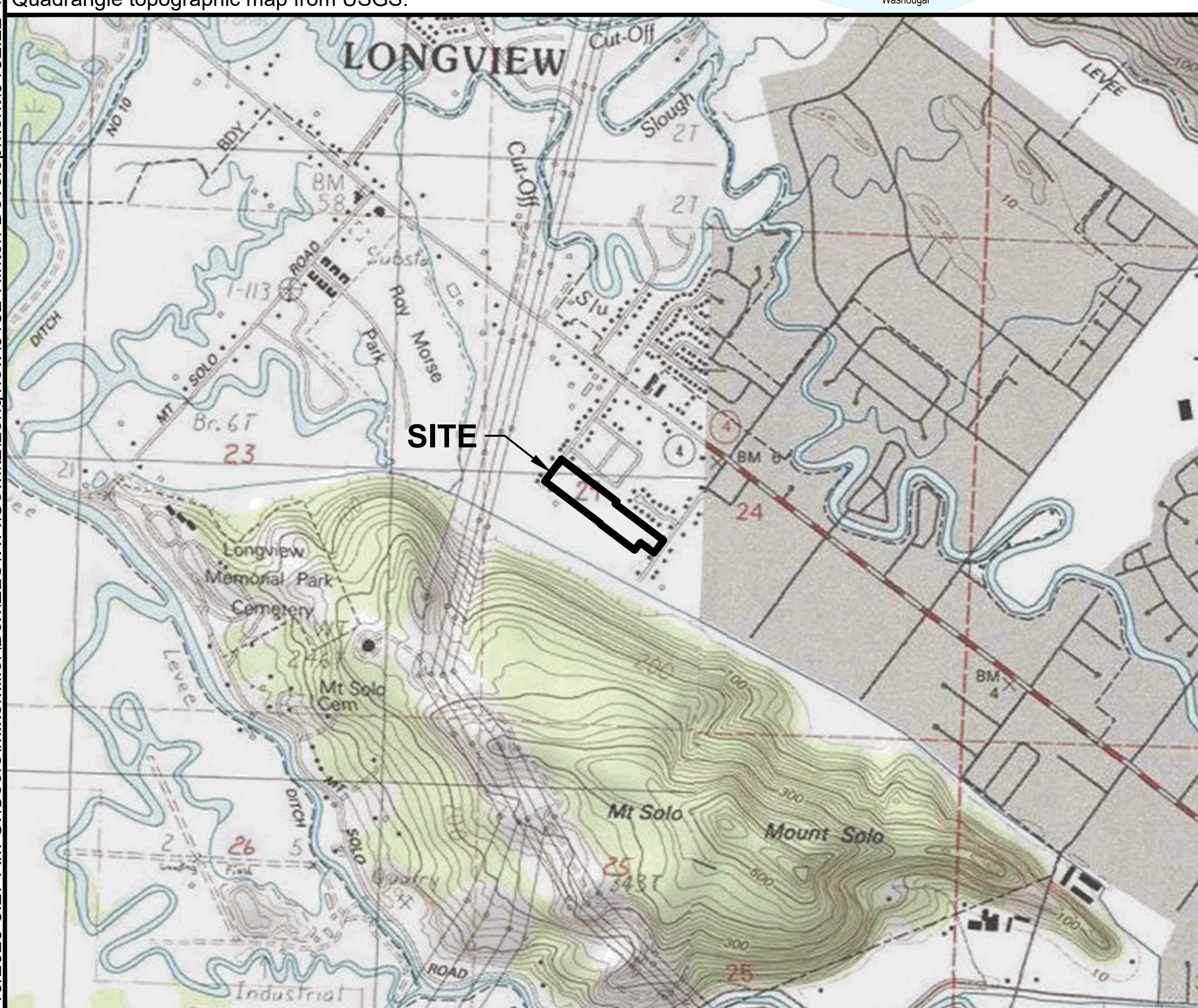


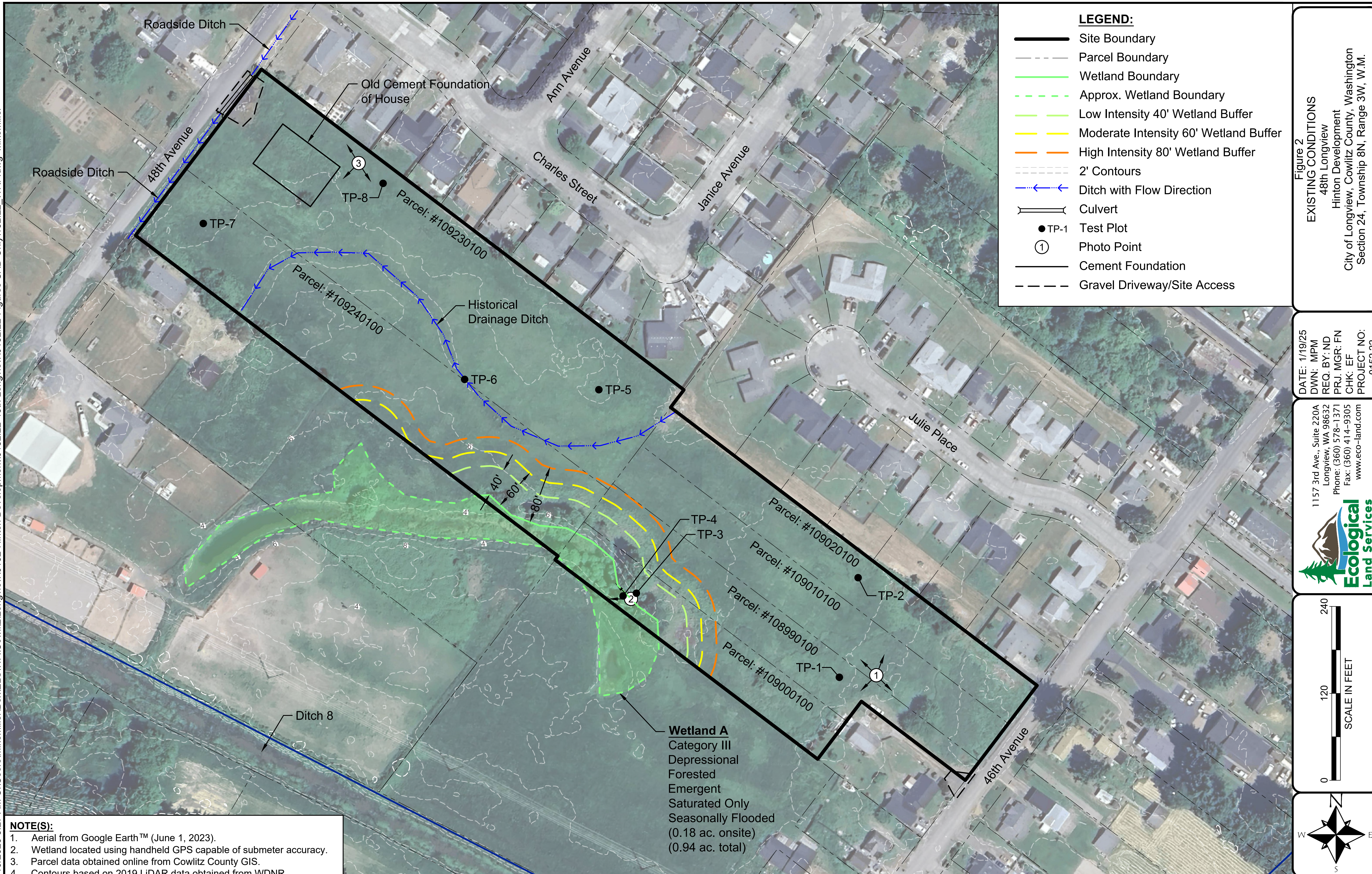
Figure 1
VICINITY MAP
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

DATE: 1/19/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

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

0 2000 4000
SCALE IN FEET

1/19/2025 8:27 AM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22 WRF.dwg MikeMiller



1/19/2025 8:27 AM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22_WRF.dwg MikeMiller

1/19/2025 8:27 AM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22 WRF.dwg MikeMiller

Figure 3
NRCS SOIL SURVEY
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

DATE: 1/19/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

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

Ecological Land Services

0 300 600
SCALE IN FEET

N W E S

LEGEND:

Site Boundary
NRCS Soil Boundary
17 Caples silty clay loam, 0 to 3 percent slopes. **Hydric.**

NOTE(S):
1. Map provided on-line by NRCS at web address: *http://websoilsurvey.nrcs.usda.gov/app/*

Figure 4
USFWS NATIONAL WETLANDS INVENTORY
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

DATE: 1/19/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

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

Ecological Land Services

0 300 600
SCALE IN FEET

N W E S

LEGEND:

Site Boundary

Wetlands

Freshwater Emergent Wetland

Riverine

PEM1C	Palustrine, emergent, persistent, seasonally flooded.
R2ABH	Riverine, lower perennial, aquatic bed, permanently flooded.
R4SBC	Riverine, intermittent, streambed, seasonally flooded.

NOTE(S):

1. Map provided on-line by US Fish & Wildlife Service at web address: *https://www.fws.gov/program/national-wetlands-inventory/wetlands-mapper*

1/19/2025 8:27 AM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22_WRF.dwg MikeMiller

1/19/2025 8:27 AM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22_WRF.dwg MikeMiller

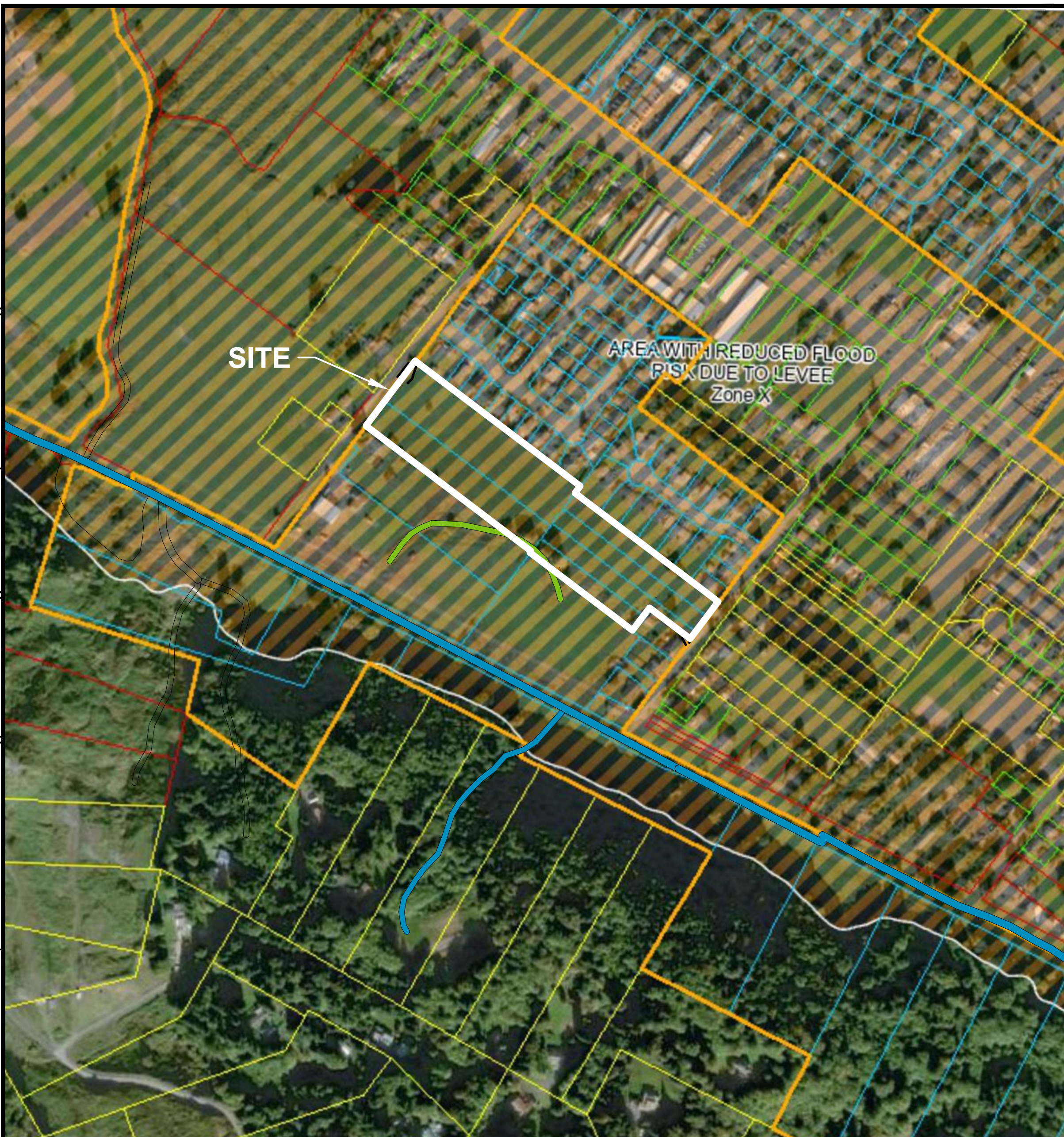


Figure 5
COWLITZ COUNTY CRITICAL AREAS
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

DATE: 1/19/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

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

0 600 1200
SCALE IN FEET

N W E S

LEGEND:

Site Boundary

Parcels
EPIC Data
- Green
- Red
- Within City Limits
- Yellow

City Limits
- City Limits

NFHL
Flood Hazard Boundaries
- Limit Lines
- SFHA / Flood Zone Boundary

Flood Hazard Zones
- Area with Reduced Risk Due to Levee

Wetlands
- Freshwater Emergent Wetland
- Riverine

NOTE(S):
1. Map provided on-line by Cowlitz County at web address: *https://cowlitz.maps.arcgis.com/apps/webappviewer/index.html?id=5f8bb5c362a449648606077d1fcbf764*

LEGEND:

- Site Boundary
- Parcel Boundary
- Freshwater Emergent Wetland Riverine

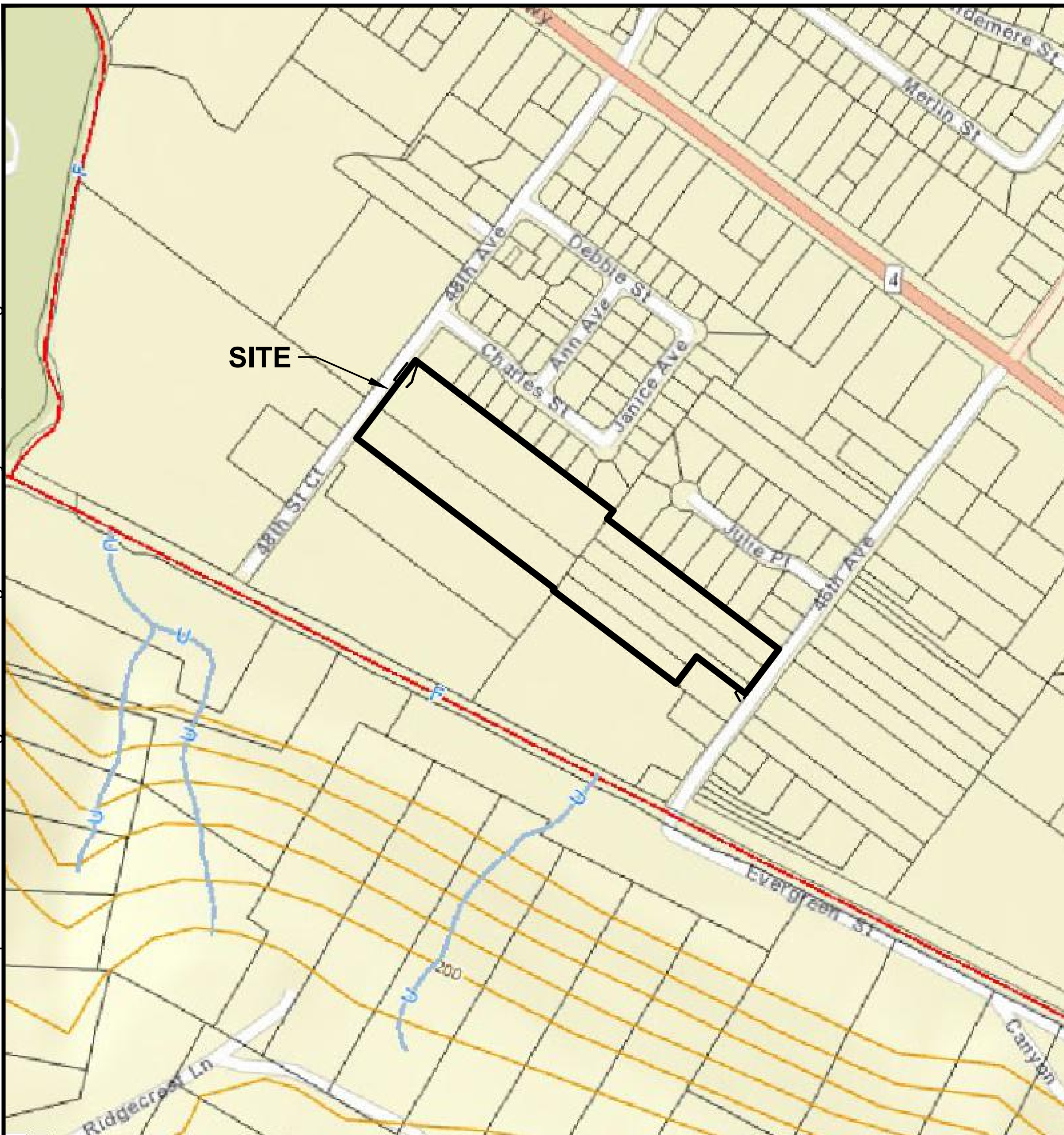
NOTE: Map provided on-line by Washington State Department of Fish & Wildlife at web address: *http://apps.wdfw.wa.gov/phsontheweb/*

0 300 600
SCALE IN FEET

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

DATE: 1/19/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

Figure 6
WDFW PRIORITY HABITATS AND SPECIES
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.



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

LEGEND:

Site Boundary

40-foot Contours

40 ft. Contours

Water Courses (FP)

Type F

U, unknown

NOTE: Map provided on-line by Washington State Department of Natural Resources at web address: *http://fortress.wa.gov/dnr/app1/Fpars/viewer.htm*

Figure 7
WDNR STREAM TYPE MAP
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

DATE: 1/19/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

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

0 500 1000
SCALE IN FEET

N
W E
S

1/19/2025 8:27 AM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22 WRF.dwg MikeMiller

1/19/2025 8:27 AM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22 WRF.dwg MikeMiller

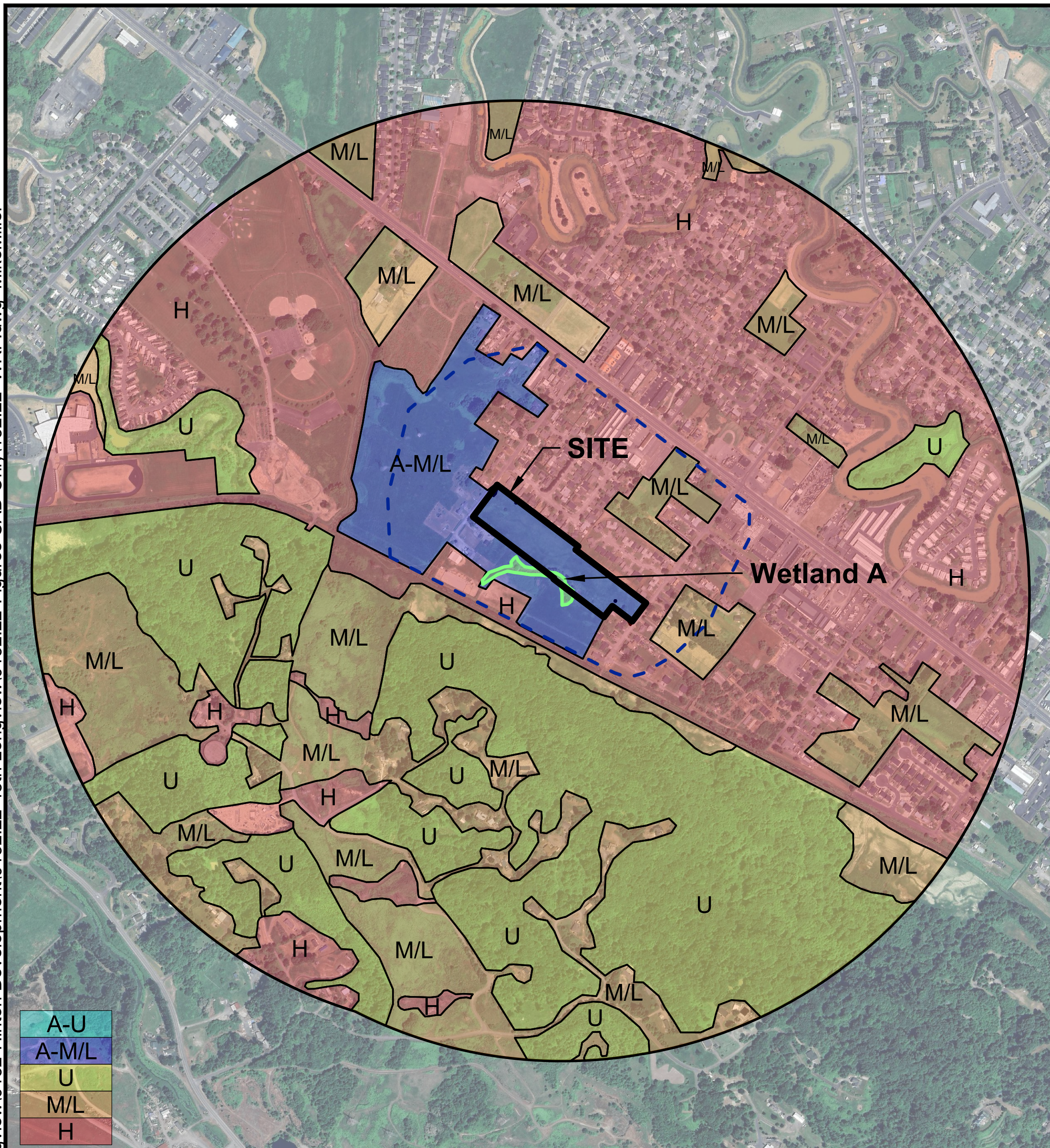


Figure 8
WETLAND RATING FORM-1 km OFFSET
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

DATE: 1/19/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

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

0 1200 2400
SCALE IN FEET

N W E S

LEGEND:

Site Boundary

Wetland Unit Boundary

Contributing Basin
98x area of Wetland A

H2.1 Accessible Habitat

A-U	A-U (0.0%)
A-M/L	A-M/L (5.3%)

H2.2 Undisturbed Habitat

U	U (26.2%)
M/L	M/L (19.8%)

H2.3 Land Use Intensity

H	H (48.7%)

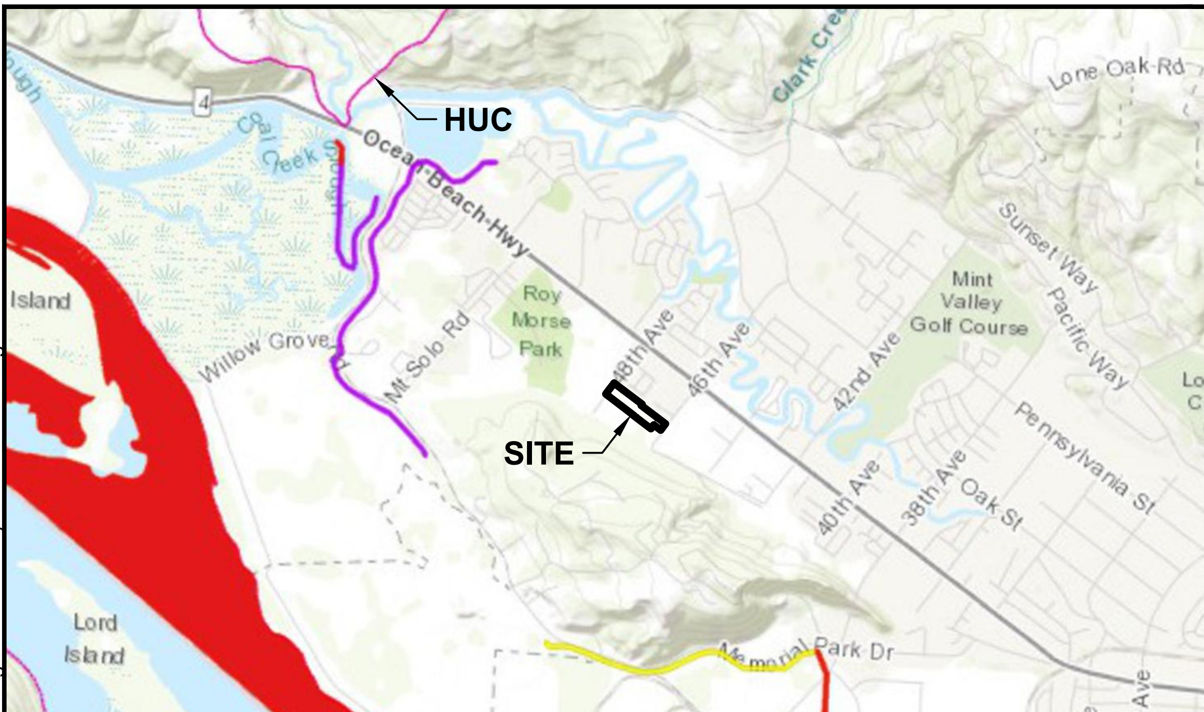
H 2.1. Accessible Habitat Equation

% A-U habitat **0.0%** + [(% A-M/L intensity land uses)/2] **2.7%** = **2.7%**

H 2.2. Total Undisturbed Habitat Equation

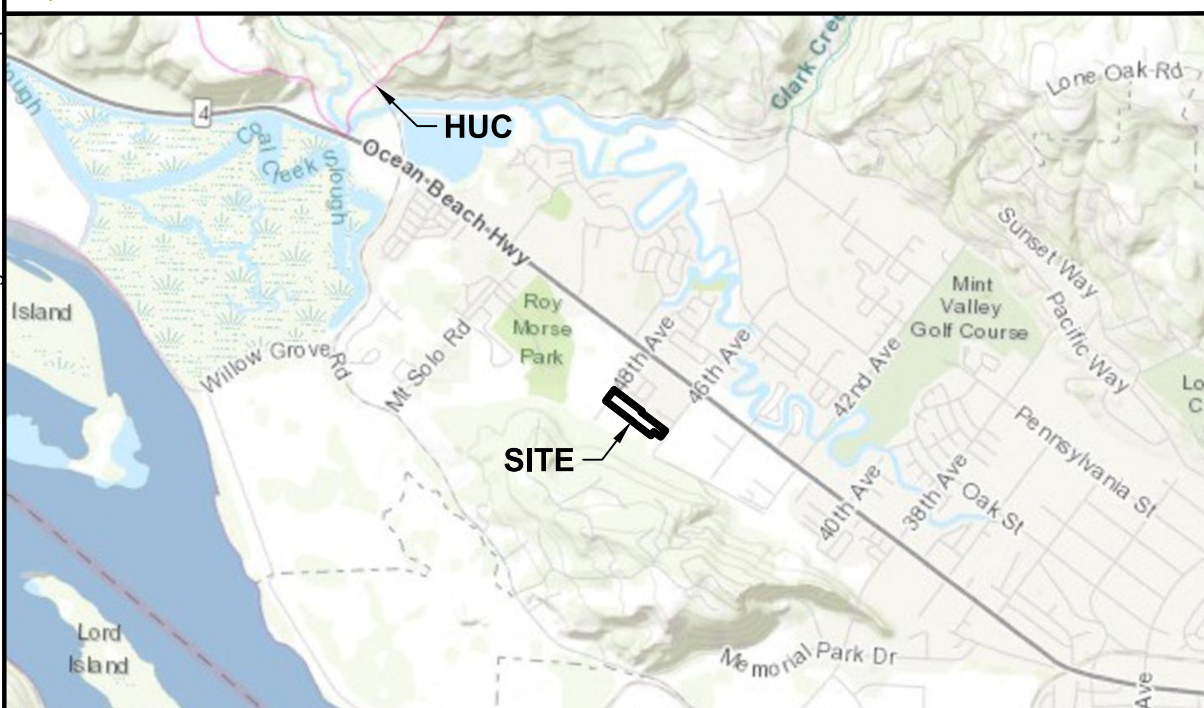
% A-U + % U habitat **26.2%** + [(% A-M/L + % M/L land uses)/2] **12.6%** = **38.8%**

1/19/2025 8:27 AM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22_WRF.dwg MikeMiller



Assessed Waters/Sediment

Water	Sediment	Subbasins
Category 5 - 303d	Category 5 - 303d	12 Digit HUC Boundary
Category 4C	Category 4C	
Category 4B	Category 4B	
Category 4A	Category 4A	
Category 2	Category 2	
Category 1	Category 1	



WQ Improvement Projects

TMDL Approved

NOTE(S):

1. Map provided on-line by Washington State Department of Ecology at web address: *https://fortress.wa.gov/ecy/waterqualityatlas/map.aspx?*

Figure 10
WETLAND RATING FORM-303(d) and TMDLs
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

DATE: 1/19/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

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

0 4005 8009
SCALE IN FEET

N
W E
S

Photopoint 1a. Photo taken facing southeast documenting the dominant pasture grass vegetation of the site.

Photopoint 1b. Photo taken facing southwest.

Photopoint 1c. Photo taken facing northwest.

Photo 1d. Photo taken facing north-northeast.

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

DATE: 1/20/2025
DWN: ND
PRJ. MGR: BJ
PROJ.#: 0152.22

Photoplate 1
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

Photopoint 2a. Photo taken facing northwest documenting the standing water within Wetland A.

Photopoint 2b. Photo taken facing west into Wetland A.

Photopoint 3a. Photo taken facing southeast documenting dominant site vegetation of pasture grasses.

Photopoint 3b. Photo taken facing southwest.

Ecological Land Services

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

DATE: 1/20/2025
DWN: ND
PRJ. MGR: BJ
PROJ.#: 0152.22

Photoplate 2
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

Photopoint 3c. Photo taken facing northwest.

Ecological Land Services

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

DATE: 1/20/2025
DWN: ND
PRJ. MGR: BJ
PROJ.#: 0152.22

Photoplate 3
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

APPENDIX A

ROUTINE DETERMINATION METHOD AND PLANT INDICATOR RATING DEFINITIONS

Routine Determination Method

The Routine Determination Method is defined according to the U.S. Army Corps of Engineers' 1987 *Wetland Delineation Manual* and the *Regional Supplement to the Corps of Engineers' Wetland Delineation Manual* (Environmental Laboratory 1987)*; Western Mountains, Valleys, and Coast Region (Version 2.0)* (Corps 2010). The Routine Determination Method examines three parameters – vegetation, soils, and hydrology – to determine if wetlands exist in a given area. Hydrology is critical in determining what is a wetland, but if often difficult to assess because hydrologic conditions can change periodically (hourly, daily, or seasonally). Consequently, it is necessary to determine if hydrophytic vegetation and hydric soils are present, which would indicate that water is present for a long enough duration to support a wetland plant community. By definition, wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Vegetation Indicator Status

The indicator status, following the scientific names of plant species, indicates the likelihood of the species to be found in wetlands according to the *National Wetland Plant List Indicator Rating Definitions* (Corps 2012). Listed from most likely to least likely to be found in wetlands, the indicator status categories are:

- **OBL** (obligate wetland) - occur almost always under natural conditions in wetlands.
- **FACW** (facultative wetland) - usually occur in wetlands, but occasionally found in non-wetlands.
- **FAC** (facultative) - equally likely to occur in wetlands or non-wetlands.
- **FACU** (facultative upland) - usually occur in non-wetlands, but occasionally found in wetlands.
- **UPL** (obligate upland) - occur almost always under natural conditions in non-wetlands.
- **NI** (no indicator) - insufficient data to assign to an indicator category.

APPENDIX B

WETLAND DETERMINATION DATA FORMS

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: 48th Longview City/County: Longview/Cowlitz Sampling Date: 1/8/2024
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-1
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S24, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): None Slope (%): 0-3%
Subregion (LRR): A Lat: 46.161538 Long: -123.003859 Datum: NAVD83
Soil Map Unit Name: Caples silty clay loam, 0 to 3 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?** **Yes ☐ No ☒**
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: Test Plot 1 was collected in the southeastern portion of the site.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
50% = ___ 20% = ___	%	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
50% = ___ 20% = ___	%	=Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. *Phalaris arundinacea*	100%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 50 20% = 20	100%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 0%

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species	___	x 1=	___
FACW species	___	x 2=	___
FAC species	___	x 3=	___
FACU species	___	x 4=	___
UPL species	___	x 5=	___
Column Totals:	___ (A)		___ (B)

Prevalence Index = B/A= ___

Hydrophytic Vegetation Indicators:

- ☒ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: TP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	99%	10YR 4/6	1%	C	M	Silty clay loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: _____
Depth (inches):_____

Hydric Soil Present? **Yes**☐ **No**☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (Inches): _____
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: 48th Longview City/County: Longview/Cowlitz Sampling Date: 1/8/2024
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-2
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S24, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): None Slope (%): 0-3%
Subregion (LRR): A Lat: 46.161917 Long: -123.003774 Datum: NAVD83
Soil Map Unit Name: Caples silty clay loam, 0 to 3 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☐ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	Is the Sampled Area within a Wetland?	Yes ☐ No ☒
Hydric Soils Present?	Yes ☐ No ☒		
Wetland Hydrology Present?	Yes ☒ No ☐		

Remarks: Test Plot 2 was collected in the southeastern portion of the site.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
50% = ___ 20% = ___	%	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
50% = ___ 20% = ___	%	=Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. *Phalaris arundinacea*	100%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 50 20% = 20	100%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 0%

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species	___	x 1=	___
FACW species	___	x 2=	___
FAC species	___	x 3=	___
FACU species	___	x 4=	___
UPL species	___	x 5=	___
Column Totals:	___ (A)		___ (B)

Prevalence Index = B/A= ___

Hydrophytic Vegetation Indicators:

- ☒ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: TP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	100%		%			Silt loam	
12-16	10YR 3/2	45%		%			Silt loam	
	10YR 4/1	45%	10YR 5/8	10%	C	M	Silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: _____

Depth (inches):_____

Hydric Soil Present? **Yes**☐ **No**☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches): _____
Water Table Present?	Yes ☒	No ☐	Depth (Inches): 8
Saturation Present? (Includes Capillary fringe)	Yes ☒	No ☐	Depth (Inches): 8

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: 48th Longview City/County: Longview/Cowlitz Sampling Date: 1/8/2024
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-3
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S24, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): None Slope (%): 0-3%
Subregion (LRR): A Lat: 46.161832 Long: -123.004979 Datum: NAVD83
Soil Map Unit Name: Caples silty clay loam, 0 to 3 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	Is the Sampled Area within a Wetland? Yes ☐ No ☒
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: Test Plot 3 was collected in the southern central portion of the site.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus latifolia*	35%	yes	FACW
2.	%		
3.	%		
4.	%		
50% = 18 20% = 7	35%	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1. *Rubus armeniacus*	40%	yes	FAC
2. *Corylus cornuta*	10%	no	FACU
3. *Fraxinus latifolia*	5%	no	FACW
4.	%		
5.	%		
50% = 28 20% = 11	55%	=Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. *Ranunculus repens*	60%	yes	FAC
2. *Phalaris arundinacea*	10%	no	FACW
3. *Holcus lanatus*	5%	no	FAC
4. *Rumex crispus*	2%	no	FAC
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 39 20% = 15	77%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 23%

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species	____	x 1=	____
FACW species	____	x 2=	____
FAC species	____	x 3=	____
FACU species	____	x 4=	____
UPL species	____	x 5=	____
Column Totals:	____ (A)		____ (B)

Prevalence Index = B/A=____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: TP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/3	100%		%			Silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: _____
Depth (inches):_____

Hydric Soil Present? **Yes** ☐ **No** ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (Inches): _____
Water Table Present? Yes ☐ No ☒ Depth (Inches): _____
Saturation Present? Yes ☐ No ☒ Depth (Inches): _____
(Includes Capillary fringe)

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: 48th Longview City/County: Longview/Cowlitz Sampling Date: 1/8/2024
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-4
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S24, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): Concave Slope (%): 0-3%
Subregion (LRR): A Lat: 46.161820 Long: -123.005051 Datum: NAVD83
Soil Map Unit Name: Caples silty clay loam, 0 to 3 percent slopes NWI classification: PEM1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?** **Yes ☒ No ☐**
Hydric Soils Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	

Remarks: Test Plot 4 was collected in the southern central portion of the site, within Wetland A.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft radius)			
1. *Fraxinus latifolia*	60%	yes	FACW
2. *Salix lucida*	10%	no	FACW
3.	%		
4.	%		
50% = 35 20% = 14	70%	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1. *Rubus armeniacus*	5%	yes	FAC
2.	%		
3.	%		
4.	%		
5.	%		
50% = 3 20% = 1	5%	=Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. *Phalaris arundinacea*	80%	yes	FACW
2. *Galium aparine*	2%	no	FACU
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 41 20% = 16	82%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	
% Bare Ground in Herb Stratum 18%			

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species		x 1=	
FACW species		x 2=	
FAC species		x 3=	
FACU species		x 4=	
UPL species		x 5=	
Column Totals:	(A)		(B)

Prevalence Index = B/A=_____

Hydrophytic Vegetation Indicators:

☐ 1 – Rapid Test for Hydrophytic Vegetation
☒ 2 – Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0[1]
☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
☐ 5 - Wetland Non-Vascular Plants[1]
☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: TP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100%		%			Silty clay loam	
6-16	10YR 4/2	88%	10YR 5/8	12%	C	M	Silty clay loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: _____
Depth (inches):_____

Hydric Soil Present? **Yes**☒ **No**☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches): _____
Water Table Present?	Yes ☒	No ☐	Depth (Inches): 0
Saturation Present? (Includes Capillary fringe)	Yes ☒	No ☐	Depth (Inches): 0

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: 48th Longview City/County: Longview/Cowlitz Sampling Date: 1/8/2024
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-5
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S24, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): Convex Slope (%): 0-3%
Subregion (LRR): A Lat: 46.162597 Long: -123.005218 Datum: NAVD83
Soil Map Unit Name: Caples silty clay loam, 0 to 3 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒	**Is the Sampled Area within a Wetland?** **Yes ☐ No ☒**
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: Test Plot 5 was collected in the northern central portion of the site.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
50% = ___ 20% = ___	%	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
50% = ___ 20% = ___	%	=Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. *Schedonorus arundinaceus*	45%	yes	FAC
2. *Dactylis glomerata*	45%	yes	FACU
3. *Agrostis capillaris*	10%	no	FAC
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 50 20% = 20	100%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 0%

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species		x 1=	
FACW species		x 2=	
FAC species		x 3=	
FACU species		x 4=	
UPL species		x 5=	
Column Totals:	(A)		(B)

Prevalence Index = B/A=______

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☐ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☐ No ☒**

Remarks:

SOIL

Sampling Point: TP-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	50%		%			Silt loam	
	10YR 4/2	50%		%			Silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: _____
Depth (inches):_____

Hydric Soil Present? **Yes**☐ **No**☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (Inches): _____
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: 48th Longview City/County: Longview/Cowlitz Sampling Date: 1/8/2024
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-6
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S24, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): Concave Slope (%): 0-3%
Subregion (LRR): A Lat: 46.162597 Long: -123.005218 Datum: NAVD83
Soil Map Unit Name: Caples silty clay loam, 0 to 3 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soils Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?**	**Yes ☐ No ☒**

Remarks: Test Plot 6 was collected in the northwestern central portion of the site.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
50% = ___ 20% = ___	%	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
50% = ___ 20% = ___	%	=Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. *Holcus lanatus*	70%	yes	FAC
2. *Agrostis capillaris*	10%	no	FAC
3. *Schedonorus arundinaceus*	10%	no	FAC
4. *Cirsium vulgare*	10%	no	FACU
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 50 20% = 20	100%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 0%

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species	____	x 1=	____
FACW species	____	x 2=	____
FAC species	____	x 3=	____
FACU species	____	x 4=	____
UPL species	____	x 5=	____
Column Totals:	____ (A)		____ (B)

Prevalence Index = B/A=____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: TP-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	100%		%			Silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: _____

Depth (inches):_____

Hydric Soil Present? **Yes** ☐ **No** ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (Inches): _____

Water Table Present? Yes ☐ No ☒ Depth (Inches): _____

Saturation Present? Yes ☐ No ☒ Depth (Inches): _____

(Includes Capillary fringe)

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: 48th Longview City/County: Longview/Cowlitz Sampling Date: 1/8/2024
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-7
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S24, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): None Slope (%): 0-3%
Subregion (LRR): A Lat: 46.163178 Long: -123.007401 Datum: NAVD83
Soil Map Unit Name: Caples silty clay loam, 0 to 3 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?** **Yes ☐ No ☒**
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: Test Plot 7 was collected within the northeastern portion of the site.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
50% = ___ 20% = ___	%	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
50% = ___ 20% = ___	%	=Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. *Holcus lanatus*	70%	yes	FAC
2. *Schedonorus arundinaceus*	15%	no	FAC
3. *Agrostis capillaris*	15%	no	FAC
4. *Cirsium vulgare*	1%	no	FACU
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 51 20% = 20	101%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 0%

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species	____	x 1=	____
FACW species	____	x 2=	____
FAC species	____	x 3=	____
FACU species	____	x 4=	____
UPL species	____	x 5=	____
Column Totals:	____ (A)		____ (B)

Prevalence Index = B/A=____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: TP-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	100%		%			Silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: _____
Depth (inches):_____

Hydric Soil Present? **Yes** ☐ **No** ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (Inches): _____
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: 48th Avenue City/County: Longview/Cowlitz Sampling Date: 1/8/2024
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-8
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S24, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): None Slope (%): 0-3%
Subregion (LRR): A Lat: 46.163351 Long: -123.006429 Datum: NAVD83
Soil Map Unit Name: Caples silty clay loam, 0 to 3 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	Is the Sampled Area within a Wetland? Yes ☐ No ☒
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: Test Plot 8 was collected in the northeastern portion of the site.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
50% = ___ 20% = ___	%	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
50% = ___ 20% = ___	%	=Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. *Phalaris arundinacea*	100%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 50 20% = 20	100%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 0%

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species	___	x 1=	___
FACW species	___	x 2=	___
FAC species	___	x 3=	___
FACU species	___	x 4=	___
UPL species	___	x 5=	___
Column Totals:	___ (A)		___ (B)

Prevalence Index = B/A= ___

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: TP-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	100%		%			Silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soil Present? **Yes** ☐ **No** ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches): _____
Water Table Present?	Yes ☐	No ☒	Depth (Inches): _____
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

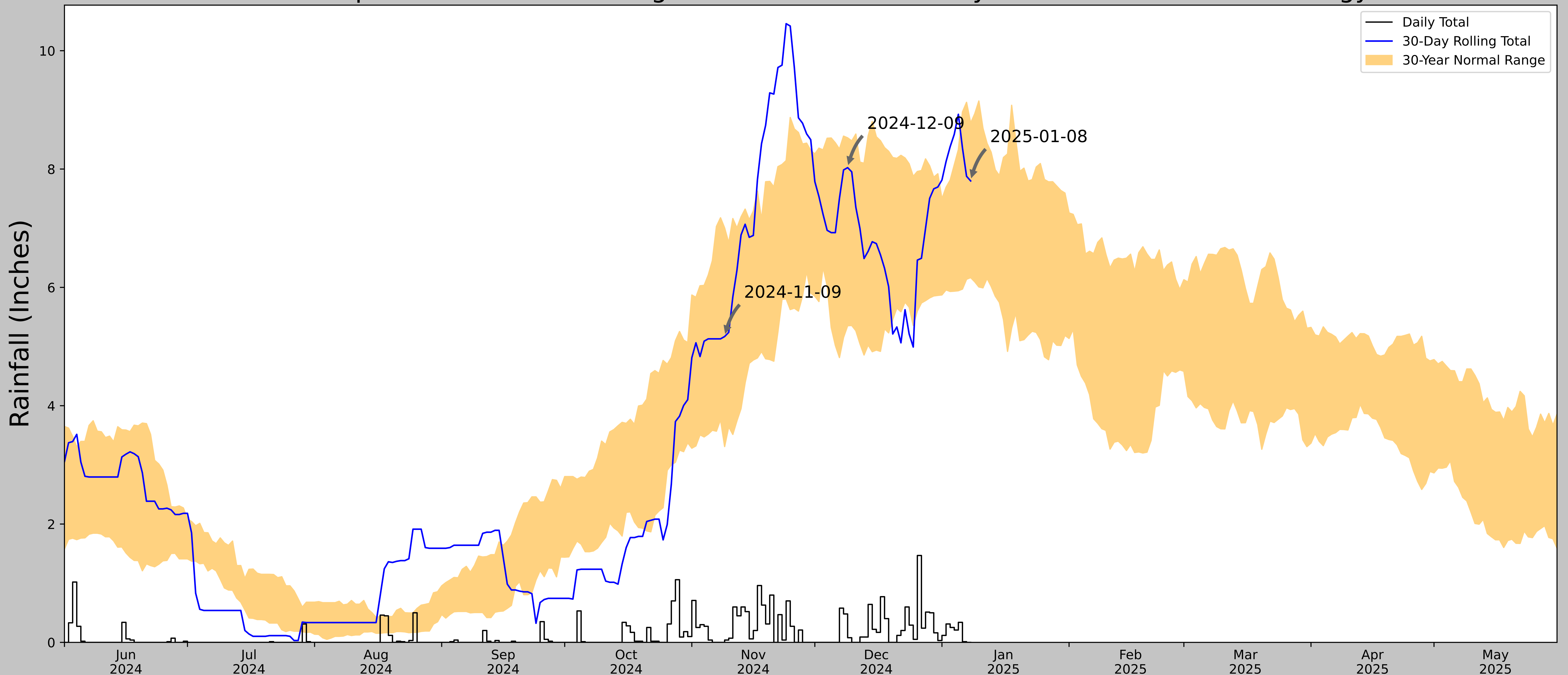
Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX C

ANTECEDENT PRECIPITATION TOOL DATA

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	46.161538, -123.003859
Observation Date	2025-01-08
Elevation (ft)	5.693
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2025-01-08	6.165355	8.777166	7.799213	Normal	2	3	6
2024-12-09	5.351575	8.527559	8.023622	Normal	2	2	4
2024-11-09	3.309449	7.004725	5.169292	Normal	2	1	2
Result							Normal Conditions - 12

US Army Corps of Engineers

ERDC

Figures and tables made by the Antecedent Precipitation Tool Version 2.0

Developed by:
U.S. Army Corps of Engineers and U.S. Army Engineer Research and Development Center

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
LONGVIEW	46.1372, -122.9781	11.155	2.085	5.462	0.95	10512	87
RAINIER 0.4 WSW	46.0894, -122.954	358.924	3.499	347.769	2.791	552	3
RAINIER 1.5 W	46.0919, -122.9781	699.147	3.13	687.992	3.562	24	0
RAINIER 5.7 WNW	46.1139, -123.0607	550.853	4.271	539.698	4.227	47	0
CLATSKANIE 3.0 NE	46.1313, -123.1571	145.997	8.58	134.842	5.018	4	0
CLATSKANIE	46.1081, -123.2058	21.982	11.088	10.827	5.11	214	0

APPENDIX D

WETLAND RATING FORM

Wetland name or number: A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: 1/8/24

Rated by: Gabby Bender Trained by Ecology? X Yes _No Date of training: 9/2022

HGM Class used for rating: Depressional Wetland has multiple HGM classes? ___Y X N

NOTE: **Form is not complete without the required figures** (figures can be combined).
Source of base aerial photo/map: Google Earth (2024)

OVERALL WETLAND CATEGORY III (based on functions X or special characteristics__)

1. Category of wetland based on FUNCTIONS

_______**Category I** – Total score = 23 - 27

_______**Category II** – Total score = 20 - 22

___X___**Category III** – Total score = 16 - 19

_______**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality			Hydrologic			Habitat			
Circle the appropriate ratings										
Site Potential	H	M	L	H	M	L	H	M	L	
Landscape Potential	H	M	L	H	M	L	H	M	L	
Value	H	M	L	H	M	L	H	M	L	**TOTAL**
Score Based on Ratings	6			6			4			16

Score for each function based on three ratings
(order of ratings is not important)

9 = H, H, H
8 = H, H, M
7 = H, H, L
7 = H, M, M
6 = H, M, L
6 = M, M, M
5 = H, L, L
5 = M, M, L
4 = M, L, L
3 = L, L, L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	I II
Wetland of High Conservation Value	I
Bog	I
Mature Forest	I
Old Growth Forest	I
Coastal Lagoon	I II
Interdunal	I II III IV
None of the above	Not Applicable

Wetland name or number: A

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	9
Hydroperiods	D 1.4, H 1.2	9
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	9
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	9
Map of the contributing basin	D 4.3, D 5.3	8
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	8
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	10
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	10

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and total habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

NO – go to 2 **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

NO – Saltwater Tidal Fringe (Estuarine) **YES – Freshwater Tidal Fringe**
If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe, it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.

2. The entire wetland unit is flat, and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

NO – go to 3 **YES** – The wetland class is **Flats**
If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit **meet all** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size,
___At least 30% of the open water area is deeper than 6.6 ft (2 m).

NO – go to 4 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?
____The wetland is on a slope (slope can be very gradual),
____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheet flow, or in a swale without distinct banks,
____The water leaves the wetland **without being impounded**.

NO – go to 5 **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

Wetland name or number: A

5. Does the entire wetland unit **meet all** of the following criteria?
   ____The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
   ____The overbank flooding occurs at least once every 2 years.

   NO – go to 6 **YES** – The wetland class is **Riverine**
   NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? This means that any outlet, if present, is higher than the interior of the wetland.

   NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched but has no obvious natural outlet.

   NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.

Wetland name or number: A

DEPRESSIONAL AND FLATS WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	3
D 1.2. The soil 2 in. below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed plants > 95% of area points = 5 Wetland has persistent, ungrazed plants > ½ of area points = 3 Wetland has persistent, ungrazed plants ≥ $^{1}/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^{1}/_{10}$ of area points = 0	3
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is ≥ ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	2
Total for D 1 Add the points in the boxes above	**8**

Rating of Site Potential If score is: ____**12-16 = H** X **6-11 = M** ___**0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source Livestock droppings in neighboring field Yes = 1 No = 0	1
Total for D 2 Add the points in the boxes above	**2**

Rating of Landscape Potential If score is: ___**3 or 4 = H** X **1 or 2 = M** ___**0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? No outlet. Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? (Answer YES if there is a TMDL in development or in effect for the basin in which the unit is found.) Yes = 2 No = 0	0
Total for D 3 Add the points in the boxes above	**1**

Rating of Value If score is: ___**2-4 = H** X **1 = M** ___**0 = L** *Record the rating on the first page*

DEPRESSIONAL AND FLATS WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and stream degradation	
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream/ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (question 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	4
D 4.2. Depth of storage during wet periods: Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part. Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	3
D 4.3. Contribution of the wetland to storage in the watershed: Estimate the ratio of the area of upstream basin contributing surface water to the area of the wetland unit itself. The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	3
Total for D 4 Add the points in the boxes above	**10**
Rating of Site Potential If score is: ___**12-16 = H** _X_**6-11 = M** ___**0-5 = L** *Record the rating on the first page*	
D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	**2**
Rating of Landscape Potential If score is: ___**3 = H** _X_**1 or 2 = M** ___**0 = L** *Record the rating on the first page*	
D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. Is the unit in a landscape that has flooding problems? Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met. The wetland captures surface water that would otherwise flow downgradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately downgradient of unit. points = 2 • Surface flooding problems are in a sub-basin farther downgradient. points = 1 • Flooding from groundwater is an issue in the sub-basin. points = 1 • The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* ____________________ points = 0 • There are no problems with flooding downstream of the wetland. points = 0	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	**1**
Rating of Value If score is: __**2-4 = H** _X_**1 = M** ___**0 = L** *Record the rating on the first page*	

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: Indicators are Cowardin classes and strata within the Forested class. Check the Cowardin plant classes in the wetland. Up to 10 patches may be combined for each class to meet the threshold of ¼ ac if the unit is at least 2.5 ac, or more than 10% of the unit if it is smaller than 2.5 ac.

____Aquatic bed	4 structures or more: points = 4
__X__Emergent	3 structures: points = 2
____Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points = 1
__X__Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/groundcover) that each cover 20% within the Forested polygon

1

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland if the unit is < 2.5 ac, or ¼ ac if the unit is at least 2.5 ac to count (see text for descriptions of hydroperiods).

____Permanently flooded or inundated	4 or more types present: points = 3
__X__Seasonally flooded or inundated	3 types present: points = 2
____Occasionally flooded or inundated	2 types present: points = 1
__X__Saturated only	1 type present: points = 0
____Permanently flowing stream or river in, or adjacent to, the wetland	
____Intermittently or seasonally flowing stream in, or adjacent to, the wetland	
____Lake Fringe wetland	**2 points**
____Freshwater tidal wetland	**2 points**

1

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

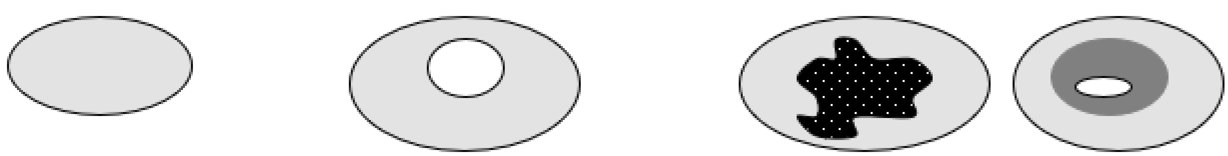
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. **Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canada thistle**

If you counted: > 19 species	points = 2
5 - 19 species	points = 1
< 5 species	points = 0

1

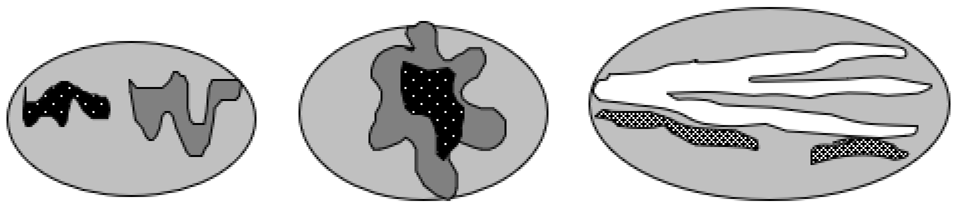
H 1.4. Interspersion of habitats

Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. If you have four or more plant classes or three classes and open water, the rating is always high.



None = 0 points **Low** = 1 point **Moderate** = 2 points

All three diagrams in this row are **High** = 3 points



1

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. The number of checks is the number of points. ____Large, downed, woody debris within the wetland (> 4 in. diameter and 6 ft long). ____Standing snags (dbh > 4 in.) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extend at least 3.3 ft (1 m) over open water or a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (cut shrubs or trees that have not yet weathered where wood is exposed) _X_At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (structures for egg-laying by amphibians) ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (see H 1.1 above for the list of strata and H 1.5 in the manual for the list of aggressive plant species)	1
Total for H 1 Add the points in the boxes above	**5**

Rating of Site Potential If score is: __**15-18 = H** ___**7-14 = M** _**X**_**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include only habitat polygons accessible from the wetland. *Calculate:* % relatively undisturbed habitat 0.0%**+**[(% moderate and low intensity land uses)/2] 2.7% **= 2.7**% Total accessible habitat is: > $^1/_3$ (33.3%) of 1 km Polygon points = 3 20-33% of 1 km Polygon points = 2 10-19% of 1 km Polygon points = 1 < 10% of 1 km Polygon points = 0	0
H 2.2. Total habitat in 1 km Polygon around the wetland. *Calculate:* % relatively undisturbed habitat 26.2%**+**[(% moderate and low intensity land uses)/2]12.6% **= 38.8%** Total habitat > 50% of Polygon points = 3 Total habitat 10-50% and in 1-3 patches points = 2 Total habitat 10-50% and > 3 patches points = 1 Total habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	0
Total for H 2 Add the points in the boxes above	**1**

Rating of Landscape Potential If score is**:** __**4-6 = H** _**X**__**1-3 = M** _**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 — It has 3 or more Priority Habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW Priority Species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources data — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 Priority Habitats (listed on next page) within 100 m points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value If score is: __**2 = H** __**1 = M** _**X**_**0 = L** *Record the rating on the first page*

WDFW Priority Habitats

See complete descriptions of Priority Habitats listed by WDFW, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008 (current year, as revised). Priority Habitat and Species List.[133] This list was updated for consistency with guidance from WDFW.

This question is independent of the land use between the wetland unit and the Priority Habitat. All vegetated wetlands are by definition a Priority Habitat but are not included in this list because they are addressed by this rating system.

Count how many of the following Priority Habitats are within 330 ft (100 m) of the wetland unit:

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife. This habitat automatically counts if mapped on the PHS online map within 100m of the wetland. If not mapped, a determination can be made in the field.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Fresh Deepwater:** Lands permanently flooded with freshwater, including environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live. Substrate does not support emergent vegetation. Do not select if Instream habitat is also present, or if the entire Deepwater feature is included in the wetland unit being rated (such as a pond with a vegetated fringe).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources. Do not select if Fresh Deepwater habitat is also present.

— **Nearshore:** Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in. (81 cm) diameter at breast height (dbh) or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in. (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

---

[133] http://wdfw.wa.gov/publications/00165/wdfw00165.pdf

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important. For single oaks or oak stands <0.4 ha in urban areas, WDFW's Management Recommendations for Oregon White Oak[134] provides more detail for determining if they are Priority Habitats

__ **Riparian:** The area adjacent to freshwater aquatic systems with flowing or standing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

__ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in. (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in. (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie.

[134] https://wdfw.wa.gov/publications/00030/wdfw00030.pdf

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	Category
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? — The dominant water regime is tidal, — Vegetated, and — With a salinity greater than 0.5 ppt Yes **–** Go to **SC 1.1** No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? Yes = **Category I** No – Go to **SC 1.2**	**Cat. I**
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 10% cover of non-native plant species. If non-native species are *Spartina*, see chapter 4.8 in the manual. — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Does the wetland overlap with any known or historical rare plant or rare & high-quality ecosystem polygons on the WNHP Data Explorer?[135] Yes **= Category I** No – Go to **SC 2.2** SC 2.2. Does the wetland have a rare plant species, rare ecosystem (e.g., plant community), or high-quality common ecosystem that may qualify the site as a WHCV? Contact WNHP for resources to help determine the presence of these elements. Yes – Submit data to WA Natural Heritage Program for determination,[136] Go to **SC 2.3** No **= Not a WHCV** SC 2.3. Did WNHP review the site within 30 days and determine that it has a rare plant or ecosystem that meets their criteria? Yes **= Category I** No **= Not a WHCV**	**Cat. I**
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES, you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in. or more of the first 32 in. of the soil profile? Yes – Go to **SC 3.3** No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in. deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 3.3** No = **Not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? Yes = **Category I bog** No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in. deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? Yes = **Category I bog** No **= Not a bog**	**Cat. I**

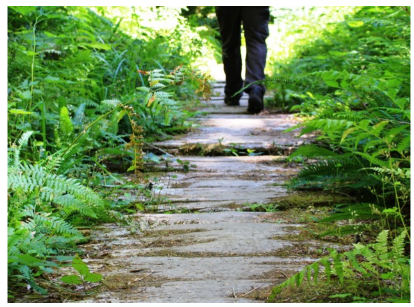
[135] https://www.dnr.wa.gov/NHPdata
[136] https://www.dnr.wa.gov/Publications/amp_nh_sighting_form.pdf

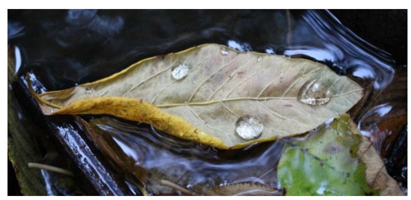
SC 4.0. Forested Wetlands Does the wetland have at least <u>1 contiguous acre</u> of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as Priority Habitats? ***If you answer YES, you will still need to rate the wetland based on its functions.*** — **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in. (81 cm) or more. — **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in. (53 cm). Yes = **Category I** No = **Not a forested wetland for this section**	**Cat. I**
SC 5.0. Wetlands in Coastal Lagoons Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks — The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* — The lagoon retains some of its surface water at low tide during spring tides Yes – Go to **SC 5.1** No = **Not a wetland in a coastal lagoon** SC 5.1. Does the wetland meet all of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species in H 1.5 in the manual). — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland is larger than $^1/_{10}$ ac (4350 ft^2) Yes = **Category I** No = **Category II**	**Cat. I** **Cat. II**
SC 6.0. Interdunal Wetlands Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer YES, you will still need to rate the wetland based on its habitat functions.*** In practical terms that means the following geographic areas: — Long Beach Peninsula: Lands west of SR 103 — Grayland-Westport: Lands west of SR 105 — Ocean Shores-Copalis: Lands west of SR 115 and SR 109 and Ocean Shores Blvd SW, including lands west of E. Oceans Shores Blvd SW. Yes – Go to **SC 6.1** No = **Not an interdunal wetland for rating** SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = **Category I** No – Go to **SC 6.2** SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = **Category II** No – Go to **SC 6.3** SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = **Category III** No = **Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics If you answered No for all types, enter "Not Applicable" on Summary Form	**Not Applicable**

Ecological Land Services

BANK USE PLAN

March 31, 2025





48th Longview Site

Longview, Washington

Prepared for

Hinton Development
Attn: Nikki Hinton
14010-A NE 3rd Court Suite 106
Vancouver, WA 98685
(360) 852-2035

Prepared by

Ecological Land Services
1157 3rd Avenue, Suite 220A • Longview, WA 98632
(360) 578-1371 • Project Number 0152.22

SIGNATURE PAGE

The information in this report was compiled and prepared under the supervision and direction of the undersigned.

Natalie T. Denson
____
Natalie Denson
Biologist I

____
Beau Johnson
Biologist V

Table of Contents

Introduction **1**
Responsible Parties **1**
Project Description **2**
Project Location 2
Brief Project Description 2
Existing Conditions **2**
Existing and Surrounding Land Uses 2
Existing Wetland and Buffer 3
Wetland Buffers 3
Exempt Historical Drainage Ditch 3
Wetland Landscape Position 4
Avoidance and Minimization of Wetland Impacts **4**
Avoidance of Impacts 4
Minimization of Impacts 4
Unavoidable Wetland Impacts **5**
Impacted Wetland and Buffer Functions **5**
Water Quality Functions 6
Hydrologic Functions 6
Habitat Functions 7
Indirect Wetland Impacts 7
Wetland Mitigation Bank Site Selection Rationale **7**
Wetland Functions Provided at Mitigation Bank **8**
Water Quality Functions 9
Hydrology Functions 9
Habitat Functions 9
Anticipated Functional Lift **10**
Proposed Mitigation Credits **10**
Credit Purchase or Transfer Timing **11**
Confirmation of Mitigation Credit Availability **12**
References **13**

Tables (in text)

Table 1. Summary of Wetland A 3
Table 2. Expected Impacts to Wetland A 5
Table 3. Typical Credit-Debit Ratios for Coweeman River Joint Wetland and Conservation Bank.... 10
Table 4. Mitigation Bank Credits Proposed for Project Impacts 11

Figure Set

Figure 1 Vicinity Map
Figure 2 Existing Conditions Site Map
Figure 3 Proposed Conditions Site Map
Figure 4 Coweeman Mitigation Bank Service Area
Figure 5 Coweeman Mitigation Bank Site Design

INTRODUCTION

Ecological Land Services, Inc. (ELS) prepared this Bank Use Plan on behalf of the applicant, Hinton Development, to address indirect impacts to one onsite wetland resulting from the future development of a 75-lot, single-family residential housing development. The approximately 8.2-acre site consists of Cowlitz County Parcel Numbers 109240100, 109230100, 109020100, 109010100, 109000100, and 108990100 located at 2025 48th Avenue in Longview, Washington. The parcels are located within a portion of Section 24, Township 8 North, Range 3 West of the Willamette Meridian (Figure 1).

Project construction will indirectly impact 0.25 acres of a Category III wetland due to insufficient buffer. Indirect wetland impacts will be mitigated by purchasing 0.125 mitigation bank credits from the Coweeman River Mitigation Bank (Bank). Construction is expected to start upon receipt of all necessary local, state, and federal permits. This Bank Use Plan was prepared according to *Longview Municipal Code (LMC) Chapter 17.12 Standards for Preparing Critical Areas Reports and Mitigation Plans* (December 2024), Interagency Review Team (IRT) for Washington State's Guidance Paper, *Using Credits from Wetland Mitigation Banks: Guidance to Applicants on Submittal Contents for Bank Use Plans* (June 2020), the Washington State Department of Ecology's (Ecology) *Wetland Mitigation in Washington State Parts 1 and 2* (2021 and 2006), and the U.S. Army Corps of Engineers' (Corps) *Compensatory Mitigation for Losses of Aquatic Resources* (33 C.F.R. §332 (2008)).

RESPONSIBLE PARTIES

PROPERTY OWNER/APPLICANT
Hinton Development
Nikole Duke
14010-A NE 3rd Court Suite 106
Vancouver, Washington 98685
(360) 852-2035

BIOLOGICAL CONSULTANT
Ecological Land Services, Inc.
Natalie Denson and Beau Johnson
1157 3rd Avenue, Suite 220A
Longview, Washington 98632
(360) 578-1371

MITIGATION BANK
Coweeman River Mitigation Bank
Habitat Bank, LLC
Zach Woodward
1015 E 2nd Street, Suite 2-107
Cle Elum, Washington 98922
(425) 205-0279

PROJECT DESCRIPTION

PROJECT LOCATION

The site includes Cowlitz County Tax Parcel Numbers 109240100, 109230100, 109020100, 109010100, 109000100, and 108990100 located at 2025 48th Avenue in Longview, Washington. The parcels are located within a portion of Section 24, Township 8 North, Range 3 West of theWillamette Meridian (Figure 1).

BRIEF PROJECT DESCRIPTION

The proposed project involves the construction of a 75-lot, single-family residential housing development including utilities, associated roads, storm water facilities, and open space tract for play equipment and a skate track (Figure 3). There will be access road improvements on both 46thand 48th Avenue. Stormwater generated from impervious surfaces onsite will be directed to a proposed stormwater detention pond in the northwest corner of the project site for treatment. Treated stormwater will be discharged into the municipal roadside ditch along 48th Avenue to the north of the site (Figure 3). Project construction will indirectly impact 0.25 acres of a Category III, depressional wetland (Wetland A; Figure 3). All indirect wetland impacts are proposed to be mitigated through the purchase of credits at the Bank. Construction is expected to start upon receipt of all necessary federal, state, and local permits.

Best management practices (BMPs) will be utilized to minimize impacts to the critical area. BMPs include designating staging and stockpile areas, establishing a standard construction entrance, and installing silt fencing at the edge of the proposed clearing. When site preparation is complete, infrastructure will be installed, and lot preparation will occur. Equipment used may include haul trucks, bulldozers, excavators, and pavers. Upon completion of construction activities, any disturbed areas not graveled or paved will be seeded with a native seed mix.

EXISTING CONDITIONS

EXISTING AND SURROUNDING LAND USES

The approximately 8.2-acre site is accessed via a gravel driveway from 48th Avenue to the north or from a gravel driveway off 46th Avenue to the south (Figure 2). The site is zoned as Traditional Residential Neighborhood (TRN) while surrounding parcels are also zoned as TRN and Residential District (R-1 and R-2), consisting primarily of single-family dwellings. There is a cement foundation from a demolished home in the northeast corner of the site.

Topography onsite is generally flat with a very gentle slope down towards the onsite wetland (Wetland A) in the western portion of the site. Wetland A is a depressional, emergent, and forested wetland along the western site boundary extending offsite to the west. There is a historical drainage ditch that bisects the site from east to west (Figure 2). The site is not located within a floodplain and is in an area with reduced flood risk due to levee (FEMA 2024). It is bordered to the northwest by 48th Avenue and to the southeast by 46th Avenue.

EXISTING WETLAND AND BUFFER

ELS biologists evaluated the property on January 8, 2025, to determine the presence of critical areas including streams, wetlands, and priority habitats. One wetland was delineated in the southwestern portion of the site, identified as Wetland A (Figure 2) following the appropriate technical manuals: *The Routine Determination Method according to the Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (U.S. Army Corps of Engineers 2010). The wetland was rated according to the *Washington State Wetlands Rating System for Western Washington-2014 Update (Version 2.0)* (Rating System; Hruby & Yahnke 2023). The *48th Longview Critical Areas Report* (ELS 2025) contains detailed information regarding delineation methodology and field observations of the wetland, as well as the wetland rating form. The wetland is described below and summarized in Table 1.

Wetland A

Wetland A is Category III, depressional, emergent, forested, seasonally flooded, and saturated only wetland totaling 0.18 acres onsite and extending offsite the west (Figure 2). Wetland A's onsite vegetation is dominated by Oregon ash (*Fraxinus latifolia*), Pacific willow (*Salix Lucinda*), creeping buttercup (*Ranunculus repens*), and reed canarygrass (*Phalaris arundinacea*). Wetland hydrology is supported by a shallow groundwater table, runoff from upslope areas, and precipitation. Wetland A has no observable outlet. According to the *Washington State Wetland Rating System for Western Washington: 2014 Update (Version 2.0)* (Rating System; Hruby 2023), Wetland A is a Category III wetland scoring 16 points: 6 points for water quality functions, 6 points for hydrologic functions, and 4 points for habitat functions.

WETLAND BUFFERS

Standard wetland buffers are based on wetland category and habitat function score from the Rating System in conjunction with the proposed land use intensity and habitat score (*LMC 17.10.110(5)(a)*). Wetland A is a Category III wetland with a habitat score of 4 and the project has a proposed high land use intensity. As such, Wetland A is allocated a standard buffer width of 80 feet in accordance with *LMC Table 17.10.110-3* and *Table 17.10.110-1*.

Table 1. Summary of Wetland A

Critical Area	**Area Onsite** (acres)	**Cowardin**[1]	**Category**[2]	**Standard Buffer Width**[3] (feet)
Wetland A	0.18	Emergent, forested	III	80

[1]*FGDC 2013*, [2]*Hruby & Yahnke 2023*, [3]*LMC 17.10.110(5)(a)*

EXEMPT HISTORICAL DRAINAGE DITCH

Per Longview Municipal Code, the historical drainage ditch that bisects the site from east to west is exempt from meeting the criteria of a wetland and subsequently any associated buffers.

According to *LMC 17.10.050*, wetlands are defined as not including those artificial wetlands intentionally created from nonwetland sites, such as irrigation and drainage ditches (2024). Because this ditch is surrounded by uplands on all sides, it is artificially created from nonwetland sites.

Wetland Landscape Position

The site is located on a broad terrace overlaying a consistently shallow groundwater table within the City of Longview-Frontal Columbia River sub-watershed of the Germany Creek-Frontal Columbia River watershed, within the 12-digit Hydrologic Unit Code (HUC) 170800030602, and Water Resource Inventory Area (WRIA) 25 Grays – Elochoman. The topography slopes predominantly southwest, directing onsite hydrology downhill into Wetland A. Wetland A is a depressional wetland located in the southwest portion of the project site that provides localized flood storage and groundwater recharge functions within the central portion of the HUC.

Avoidance and Minimization of Wetland Impacts

The wetland mitigation requirements of the local, state, and federal agencies specify that all regulated development activities proposing permanent impact to wetlands or buffers shall examine whether the impacts can be avoided and/or minimized prior to proposing compensation for the impacts. The preferred mitigation sequencing of first avoidance, then minimization, and finally compensation for unavoidable wetland impacts was taken into consideration during the project design process. This project proposes the construction of a 75-lot, single-family residential housing development including utilities, associated roads, stormwater facilities, access road improvements on 46th and 48th Avenue, and an open space tract for play equipment and a skate track. Project construction will indirectly impact 0.25 acres of a Category III depressional wetland.

Avoidance of Impacts

Every effort was made to avoid impacts to Wetland A to the greatest extent possible while meeting the City's transportation and development requirements. The project has been designed to completely avoid all direct impacts to Wetland A; however, indirect wetland impacts were unavoidable in order to accommodate the mandated public road alignment, and compliance with lot size and depth regulations.

Minimization of Impacts

To minimize impacts to Wetland A, an open space tract was placed where most indirect impacts will occur, reducing buffer conversion to impervious surfaces. While some indirect impacts from the proposed road, trail, and lot construction were unavoidable due to insufficient buffer width, every effort was made to limit encroachment and preserve wetland function. The project maximizes the use of available upland space to accommodate the residential development and required infrastructure. Additionally, stormwater infrastructure will be designed to collect, detain, and treat all new runoff from the site.

Impacts to the wetland will be further minimized utilizing BMPs during construction. BMPs to be followed prior to, during, and after construction are as follows:

- Install silt fencing or similar measures to control sedimentation and general ground disturbance.
- Locate construction access and staging and stockpile areas within uplands.
- Limit ground disturbance to only those areas necessary to construct project elements.
- Grading will occur during the dry season to minimize surface runoff.
- Maintain stable construction access per the 2019 *Stormwater Management Manual for Western Washington*.
- Use a water truck as needed during construction to control fugitive dust.
- Maintain, repair, and service vehicles and equipment outside of any critical area onsite.
- Maintenance, service, and repair operations include, but are not limited to:
    - Prohibiting discharge of wastewaters into stormwater drains or hose down work areas.
    - Removing buildup of oils and grease on equipment.
    - Removing construction maintenance waste materials from work site and dispose and/or recycle.
    - Having a spill kit onsite.
- Stabilize exposed soils with straw mulch or other suitable BMP if left exposed and unworked according to the 2019 Stormwater Management Manual for Western Washington.

UNAVOIDABLE WETLAND IMPACTS

Approximately 0.25 acres of Wetland A will be indirectly impacted. Table 2 summarizes expected wetland impacts.

Table 2. Expected Impacts to Wetland A

Wetland Name	**Impact Area** (acres)	**Impact Type**	**Category**[1]	**Cowardin Class**[2]	**Hydrogeomorphic Class**[3]
A	0.25	Indirect	III	Emergent, Forested	Depressional

[1]Hruby & Yanke 2023, [2]FGDC 2013, [3]NRCS 2008

IMPACTED WETLAND AND BUFFER FUNCTIONS

Wetland functions were assessed in January 2024 using the analysis provided in the Rating System (Hruby & Yanke 2023). The wetland rating form can be found in the *Critical Areas Report 48th Longview Critical Areas Report* (ELS 2025). Wetland buffers can reduce adverse impacts to wetland functions and values from adjacent development by moderating the effects of stormwater runoff including stabilizing soil to prevent erosion, filtering runoff, and moderating water level fluctuations. Buffers also provide habitat opportunities for forage, refuge, mobility, and thermal protection. Additionally, buffers help screen the wetland from adjacent developments blocking noise, providing visual separation, and providing protection from other human disturbances (Castelle et al. 1992). Wetland A and its remaining associated buffer will continue to provide groundwater recharge, and detention functions.

Water Quality Functions

According to the Rating System, Wetland A received a moderate water quality function score of 6 points. The wetland provides high potential for improving water quality as it is a depressional wetland with no surface outlet allowing for particulate retention and filtration. Wetland A has moderate potential to support water quality functions of the site as it has persistent, ungrazed plants in greater than half of its area and the area that is seasonally ponded is greater than or equal to a quarter the total area of the wetland. These attributes allow the wetland to filter pollutants from surrounding land use runoff. The wetland provides water quality functions that are moderately valuable to society as it is in a sub-basin where an aquatic resource is on the 303(d) list. The wetland provides the sub-basin with pollutant filtration and retention functions thereby reducing the amount of pollutants that flow downgradient to the affected aquatic resource. Post-construction water quality functions of Wetland A will be moderately affected due to increased impervious surfaces from the road and adjacent lots. However, the elevation of the wetland buffer is approximately five feet higher than the wetland and will likely allow runoff to infiltrate before reaching the wetland. Runoff from the proposed development will be treated onsite in the proposed stormwater detention pond before discharging into the roadside municipal ditch along 48th Avenue. All indirect impacts to Wetland A’s water quality functions will be mitigated by purchasing wetland mitigation credits from the Bank.

Hydrologic Functions

According to the Rating System, Wetland A received moderate hydrologic function score of 6 points. The wetland has moderate potential for reducing flooding and erosion due marks of storage during wet periods being greater than 0.5 feet and less than two feet from the surface and the area of the contributing basin is 10 to 100 times the area of the unit giving the wetland a moderate level of flood storage, retention, and groundwater recharge. Additionally, greater than 10 percent of the area within 150 feet of the wetland is in land uses or cover that generate excess runoff. The wetland is bordered by a livestock pasture to the northwest which generates excess nutrients that the wetland serves to retain and filtrate. Additionally, the wetland provides moderate water quality functions valuable to society in that flooding from groundwater is an issue in the sub-basin and the wetland serves to retain a portion of surface runoff that would otherwise contribute to the flooding potential down-gradient. There will be an increase in surface runoff due to additional impervious surface coverage; however, stormwater runoff will be routed to a proposed stormwater pond for treatment. Any changes in hydrology will be minimal, as the buffer sits at a slightly higher elevation than Wetland A and plays a limited role in directing water flow or maintaining wetland hydrology. Additionally, increased vehicle presence will not introduce pollutants or nutrients to the wetland through surface runoff. All indirect impacts to Wetland A’s hydrologic functions will be mitigated by purchasing wetland mitigation credits from the Bank.

HABITAT FUNCTIONS

Wetland A received a low habitat function score of 4 points according to the Rating System. The wetland has low habitat interspersion with two Cowardin classes with only one special habitat feature. Accessibility of habitat provided by the wetland and its buffer to other wetlands and forested areas is limited by the maintained Cowlitz Diking Improvement District Ditch #8 to the south of the site and by Ocean Beach Highway to the north. These manmade constraints limit the amount of diversity of species that can inhabit Wetland A. The nominal habitat functions provided by the wetland will be minimally impacted by the buffer impacts proposed by the project and will be mitigated by purchasing wetland mitigation credits form the Bank.

INDIRECT WETLAND IMPACTS

Indirect wetland impacts are adverse effects that extend beyond the area of direct disturbance, reducing wetland function and necessitating compensatory mitigation to offset these losses. The recommended buffer width serves as an initial guideline for assessing the extent of indirect impacts. The agencies will evaluate existing buffer conditions—such as presence, width, vegetation type, and slope—when determining the scope of indirect impacts and the appropriate compensation ratio. (Ecology et al. 2021). Indirect wetland impacts can adversely affect the ability of the wetland to provide functions and values that the wetland provided prior to disturbance. Examples include changes in drainage characteristics, changes in water levels, and changes in wetland characteristics over time. Wetland A's buffer is primarily composed of Himalayan blackberry (*Rubus armeniacus*) and reed canarygrass (*Phalaris arundinacea*), providing minimal ecological functions or habitat.

Human presence and disturbances to the site will increase as will vehicular traffic. There will be an increase in surface runoff due to additional impervious surface coverage; however, runoff from the proposed development will be routed to the stormwater detention pond for treatment and subsequently discharged into the municipal roadside ditch along 48th Avenue. No additional pollutants due to increased vehicle presence will be directed to the wetland through surface runoff. Also, the elevation of the wetland buffer is approximately five feet higher than the wetland which will allow runoff to infiltrate prior to reaching Wetland A. Any changes in hydrology to Wetland A will be minimal.

WETLAND MITIGATION BANK SITE SELECTION RATIONALE

The wetland proposed for impact is located within the service area for the Coweeman River Mitigation Bank. The project area is located approximately 6.72 miles west of the Bank site near the southwestern boundary of the City of Longview-Frontal Columbia River subwatershed (Figure 4).

The rationale for selecting this mitigation bank is as follows:

- The development project does not propose impacts to critical wetland functions that should be replaced onsite. The impacted functions are water quality, hydrology, and habitat, which can be fully replaced within the Bank site.

- The wetland mitigation needs of the project correspond directly with the purpose, goals, and objectives of the Bank, as the general bank goal is to establish, reestablish, rehabilitate, enhance and preserve approximately 320.9 acres of aquatic and associated upland habitat.

The 2008 *Compensatory Mitigation for Losses of Aquatic Resources, Final Rule* (Corps) recommends purchasing mitigation bank credits for ecological considerations (lower risk of failure and lower temporal loss of resources and services) and to avoid the maintenance and contingency issues and outright failures that often accompany permitee-responsible mitigation sites. Use of the Bank substantially lowers the risk of failure and temporal loss of resource functions and services over newly established, permitee-responsible mitigation sites. As described below, the functional lift anticipated at the Coweeman River Mitigation Bank will adequately compensate for wetland functions lost by development.

WETLAND FUNCTIONS PROVIDED AT MITIGATION BANK

The following is an excerpt from the Coweeman River Mitigation Bank *Mitigation Banking Instrument* (Habitat Bank 2016):

> The broad ecological goals of the CRMB's establishment are:
>
> - Restore site hydrology and floodplain connectivity to existing and created aquatic areas;
> - Increase habitat function and complexity for anadromous fish and other aquatic dependent wildlife;
> - Reestablish wetland and riparian vegetation communities typically found in the Lower Columbia River floodplain environment.
>
> The project grading, planting, and habitat feature development plans propose to reconstruct a mosaic of habitat types within the floodplain environment consistent with what would have historically been found in this dynamic riverine environment, prior to human alteration during the late 19th and early 20th centuries.
>
> The bank project design proposes to create, rehabilitate, enhance, and preserve wetlands, as well as enhance and preserve tributary streams, forested uplands and riparian corridors. Existing wetlands will be planted to create or enhance palustrine forested, scrub-shrub, and emergent vegetation communities and preserve palustrine aquatic bed habitat as defined by Cowardin *et al.* (1979). In most areas these habitat types will be interspersed to create a mosaic of different Cowardin classes, which would most likely be present in the unaltered floodplain environment of the Coweeman River, where differences in hydrologic regime, sedimentation, large woody material (LWM) transport and beaver activity created clustered and varied vegetation communities. In addition to the work within the floodplain, the Bank includes the preservation of old growth and

second growth forest, which include six hillside tributaries to the Coweeman River and associated wetland areas (Habitat Bank, LLC and ELS 2016).

The Bank site is designed to have a functional lift in all of its baseline water quality, water quantity, and habitat functions over time as the site matures. The Bank site's construction was completed in October 2016 and plant installation was completed in early 2017. A wetland functional assessment was performed for the Bank site wetlands, based on the water quality, hydrology, and habitat functions using the 2008 Wetland Rating Form for Western Washington (Hruby 2008) (2008 Rating System).

WATER QUALITY FUNCTIONS

Water quality functions will be significantly improved within the floodplain by eliminating cattle grazing and improving the connection of the floodplain wetlands with the Coweeman River. Adding native plantings within the wetland creation, rehabilitation and enhancement areas will also improve water quality helping to trap and filter sediments and other pollutants, as well as reduce nutrient loads. Tributary 1 and the Wetland A Outlet Channel will be remeandered to help slow flow velocity. Tree and shrub plantings along the river and tributaries within the floodplain will also provide temperature regulation.

HYDROLOGY FUNCTIONS

Direct connections to the Coweeman River will be made within Wetland B and Wetland C by excavating channels that connect directly to the river during high water. A channel will be excavated in Wetland A connecting to the Coweeman River that is designed to engage during a two-year flood event. Within Area A, large portions of the riverbank will be graded creating a gentler slope to the river and LWM structures will be placed throughout the graded areas near the water’s edge. These measures will significantly improve floodplain connectivity helping to regulate peak flows, provide flood attenuation, and reduce downstream erosion and incision along the diked portion of the Coweeman River. Additionally, this will increase frequency, duration, and depth of ponding within the floodplain wetlands.

HABITAT FUNCTIONS

Eliminating disturbances (e.g., grazing) within the floodplain will improve vegetation diversity, structure, and interspersion creating an increase in potential and opportunity for improved wildlife habitat. Improving the connection of the wetlands to the Coweeman River and tributaries will provide a significant increase in fish access and habitat, particularly during flooding events. Large woody material placed at the water’s edge and the creation of the alcove along the Coweeman River will provide additional habitat structure as well as provide refuge for fish during flooding events. Tree and shrub establishment within the wetlands and riparian areas will provide temperature regulation, cover, and leaf litter, important to the overall health of aquatic systems. It will also create a corridor between the forested hillside and the Coweeman River. Large woody material incorporated within the floodplain, in the form of horizontal logs, snags, piles and habitat features such as bird boxes and perch poles will provide additional areas for perching and nesting habitat for avian species.

ANTICIPATED FUNCTIONAL LIFT

The Bank site will re-habilitate, create, and enhance floodplain connectivity, wetland, and riparian habitat where there is currently grazed pasture, providing a significant overall functional lift. Under the 2008 Rating System, the following improvements are anticipated within the floodplain wetlands:

- Wetland A is expected to remain a Category I with a 5-point lift in overall functions.
- Wetland B is expected to increase from a Category III to a Category II with a 34-point lift in overall functions.
- Wetland C is expected to increase from a Category III to a Category II with a 14-point lift in overall functions.
- Wetland D is expected to increase from a Category III to a Category II with an 18-point lift in overall functions.

The Bank site activities will improve hydrology, hydrologic and habitat functions in the existing wetlands onsite as well as create additional wetlands, create off- channel rearing, refuge, forage, and potential spawning habitat for anadromous fish species, reconnect the highly incised Coweeman River to its floodplain, and preserve approximately 200-acres of mature and old growth forested habitat. This will provide high quality habitat for a variety of both terrestrial and aquatic species' entire life cycles in the watershed.

PROPOSED MITIGATION CREDITS

Table 3 is from the *Coweeman River Mitigation Bank Mitigation Banking Instrument* (Habitat Bank 2016), and it lists the recommended credit ratios for purchasing credits based on the impacted wetland category or buffer.

Table 3. Typical Credit-Debit Ratios for Coweeman River Joint Wetland and Conservation Bank

Resource Impact	Bank Credits: Impact Area
Category I Wetland	Case-by-Case
Category II Wetland	1.2:1
Category III Wetland	1:1
Category IV Wetland	0.85:1
Critical Area Buffer	Case-by-Case

Direct impacts result in immediate changes of hydrological characteristics of a wetland, loss of habitat, loss of flood storage, and loss of nutrient removal or retention and will be mitigated by purchasing credits at the ratios listed in Table 3 above. Indirect wetland impacts will be compensated by multiplying the credits necessary for direct wetland impacts in Table 3 by 0.5 (50 percent of the direct wetland ratio). The 0.50 (50 percent) multiplier is based on the rationale that indirect impacts can be adequately compensated for by using 50 percent of the Bank's required ratio for direct wetland impacts. Indirect impacts adversely affect the ability of the wetland to provide functions and values over time, which the wetland provided prior to disturbance. Examples are changes in drainage characteristics, changes in water levels, and changes in wetland characteristics. Mitigating at 50 percent of the Bank's required ratio for direct wetland impacts is therefore reasonable and ecologically sound.

Normally, indirect wetland impacts are quantified by taking the lowest allowed buffer width per the local code after buffer averaging or reduction measures have been applied and applying this width from the edge of the fill, into the wetland. No wetland buffer modifications are proposed, and the full wetland buffer width of 80 feet was used to measure off the edge of the impact into the wetland to quantify the indirect wetland impacts (Figure 3). This results in the remaining portion of Wetland B after construction being indirectly impacted due to insufficient buffer width.

Bank credits will be purchased from the Bank at the ratio of 1:1 designated for indirect impacts to Category III wetlands. Indirect wetland impacts will be calculated by applying a 0.50 multiplier to the corresponding ratio for wetland category. Table 4 details the mitigation ratio used to calculate the total number of Bank credits needed to compensate for the project impacts. A total of 0.125 credits will be purchased to compensate for 0.25 acres of indirect impacts to Wetland A.

Table 4. Mitigation Bank Credits Proposed for Project Impacts

Wetland	Wetland Category	Impact Type	Impact Amount (acres)	Mitigation Ratio	Multiplier	Proposed Credit Purchase
A	III	Indirect	0.25	1:1	0.5	0.125

Credit Purchase or Transfer Timing

Following permit issuance, Hinton Development, as the applicant, will enter into a Buy/Sell Agreement with Habitat Bank, LLC, for purchase of 0.125 mitigation credits that would appropriately mitigate for the proposed project impacts. The actual purchase of credits will occur upon permit issuance. Prior to impacting project wetlands, the applicant will submit proof of transfer of mitigation credits to project managers for Ecology, the Corps, and the City of Longview. Proof of the mitigation transfer will be provided in the form of a notification letter to the approving agencies. Upon service of this notification, the mitigation requirement to purchase 0.125 mitigation credits will be fully satisfied.

CONFIRMATION OF MITIGATION CREDIT AVAILABILITY

Proof of the current number of available mitigation credits at the Coweeman Mitigation Bank site can be confirmed by approving agency(s) through the Interagency Review Team.

Kate Thompson
Washington Department of Ecology
Shorelands and Environmental Assistance Program
P.O. Box 47600
Olympia, WA 98504
(360) 407-6749
kate.thompson@ecy.wa.gov

Michael Ladouceur
US Army Corps of Engineers
Regulatory Branch, Seattle District
PO Box C-3755
Seattle, WA 98124
(206) 472-0783
Michael.A.Ladouceur@usace.army.mil

REFERENCES

Castelle, A.J., C. Connolly, M. Emers, E.D. Metz, S. Meyer, M.Witter, S. Mauermann, T. Erickson, S.S. Cook. 1992. Wetland Buffer: Use and Effectiveness. Adolfson Associates, Inc. Shorelaneds and Coast Zone Management Program, Washington Department of Ecology, Olympia, Pub. NO. 92-10

City of Longview. 2025. *Longview Municipal Code Chapter 17.12 Standards for Preparing Critical Areas Reports and Mitigation Plans*. Longview Washington. January 9, 2025.

Ecological Land Services, Inc. (ELS). 2025. *48th Longview Critical Areas Report*. January 2025.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1. U.S. Army Corps of Engineer Waterways Experiment Station. Vicksburg, Mississippi.

Federal Geographic Data Committee (FGDC). 2013. Classification of Wetlands and Deepwater Habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC. Cowardin, L.M., C. Carter, F.C. Golet, and E.T. LaRoe.

Habitat Bank, LLC. 2016. *Coweeman River Mitigation Bank Mitigation Banking Instrument*. Kelso, Washington.

Hruby, T. & Yahnke, A. 2023. *Washington State Wetland Rating System for Western Washington: 2014 Update (Version 2)*. Publication No. 23-06-009. Washington Department of Ecology. Olympia, Washington.

Interagency Review Team for Washington State. February 19, 2009. *Using Credits from Wetland Mitigation Banks: Guidance to Applicants on Submittal Contents for Bank Use Plans*. Online http://www.ecy.wa.gov/programs/sea/wetlands/mitigation/banking/pdf/mitig_ plan_guidance.pdf. Accessed January 2024.

Natural Resource Conservation Service (NRCS). 2008. *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service.* United States Department of Agriculture Technical Note, #190-8-76.

U.S. Army Corps of Engineers (Corps). 2008. *Compensatory Mitigation for Losses of Aquatic Resources, Final Rule.* 33 C.F.R. §332, Federal Register, April 30, 2008.

U.S. Army Corps of Engineers (Corps). 2010. *Final Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0), ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-13. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

Washington State Department of Ecology, U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. (2021). *Wetland Mitigation in Washington State–Part 1: Agency Policies and Guidance (Version 2)*. Washington State Department of Ecology Publication #21-06-003.

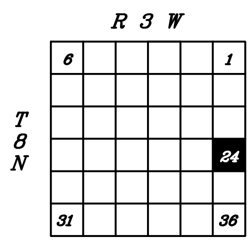
Washington State Department of Ecology, U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. March 2006*. Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1)*. Washington State Department of Ecology Publication #06-06-011b. Olympia, Washington.

FIGURE SET

WASHINGTON

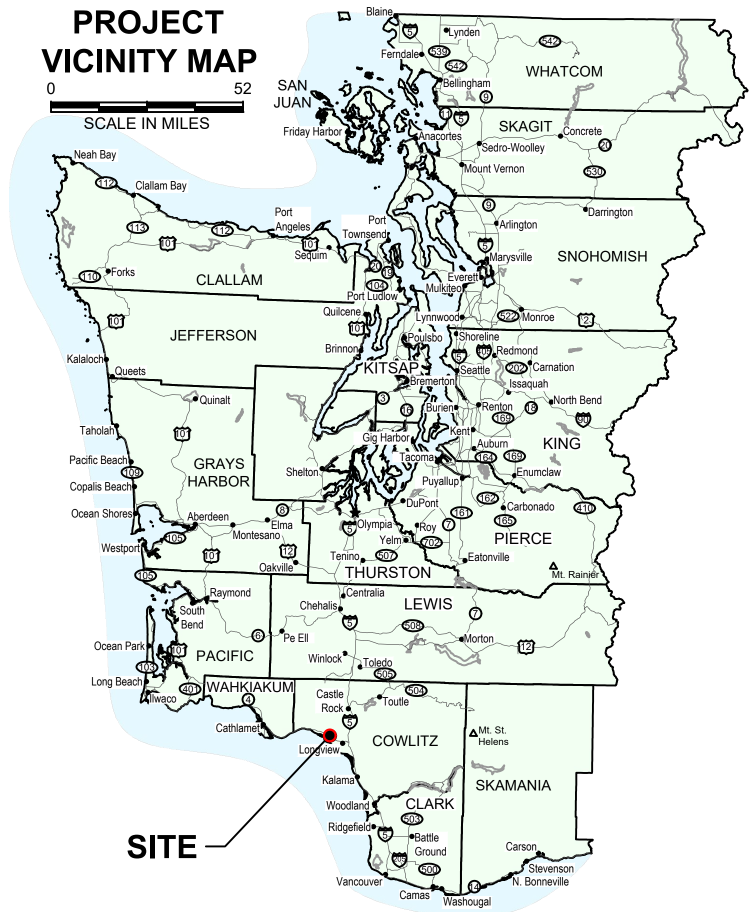
46.1622° Latitude
-123.0050° Longitude

LOCATION MAP

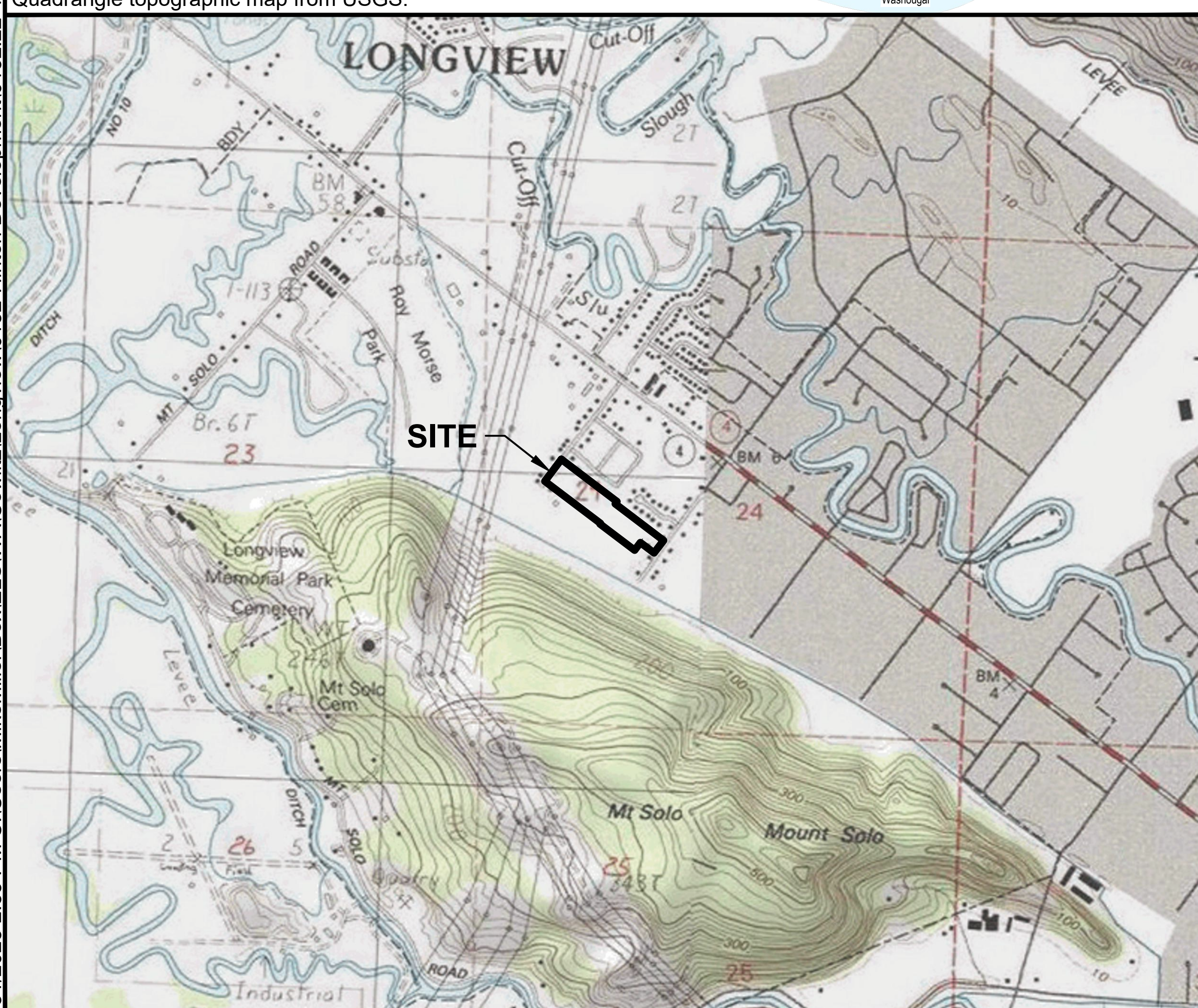


PROJECT VICINITY MAP

0 52
SCALE IN MILES



NOTE:
Quadrangle topographic map from USGS.



0
2000
4000
SCALE IN FEET

N
W
E
S

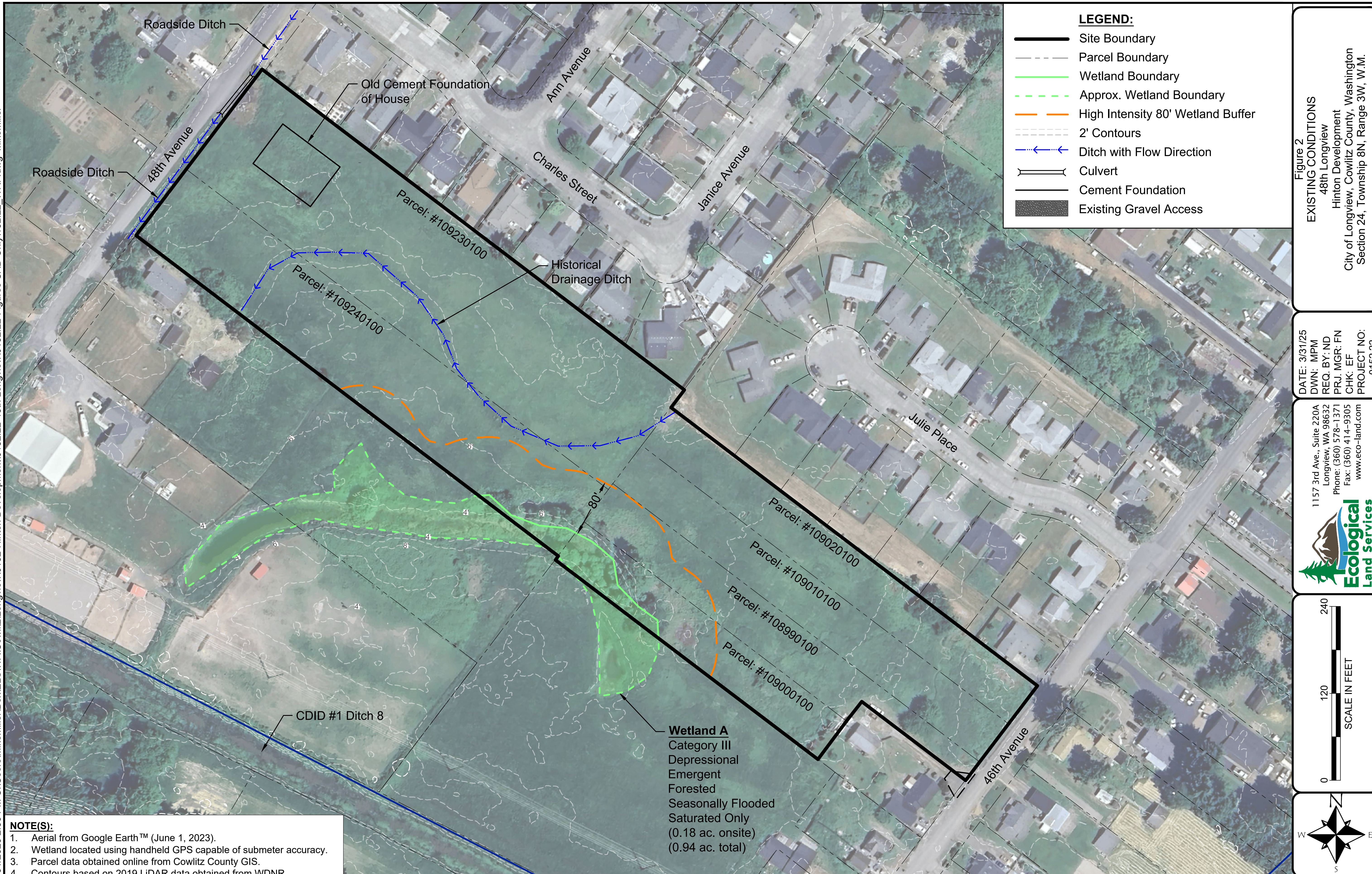
1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com

DATE: 3/31/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

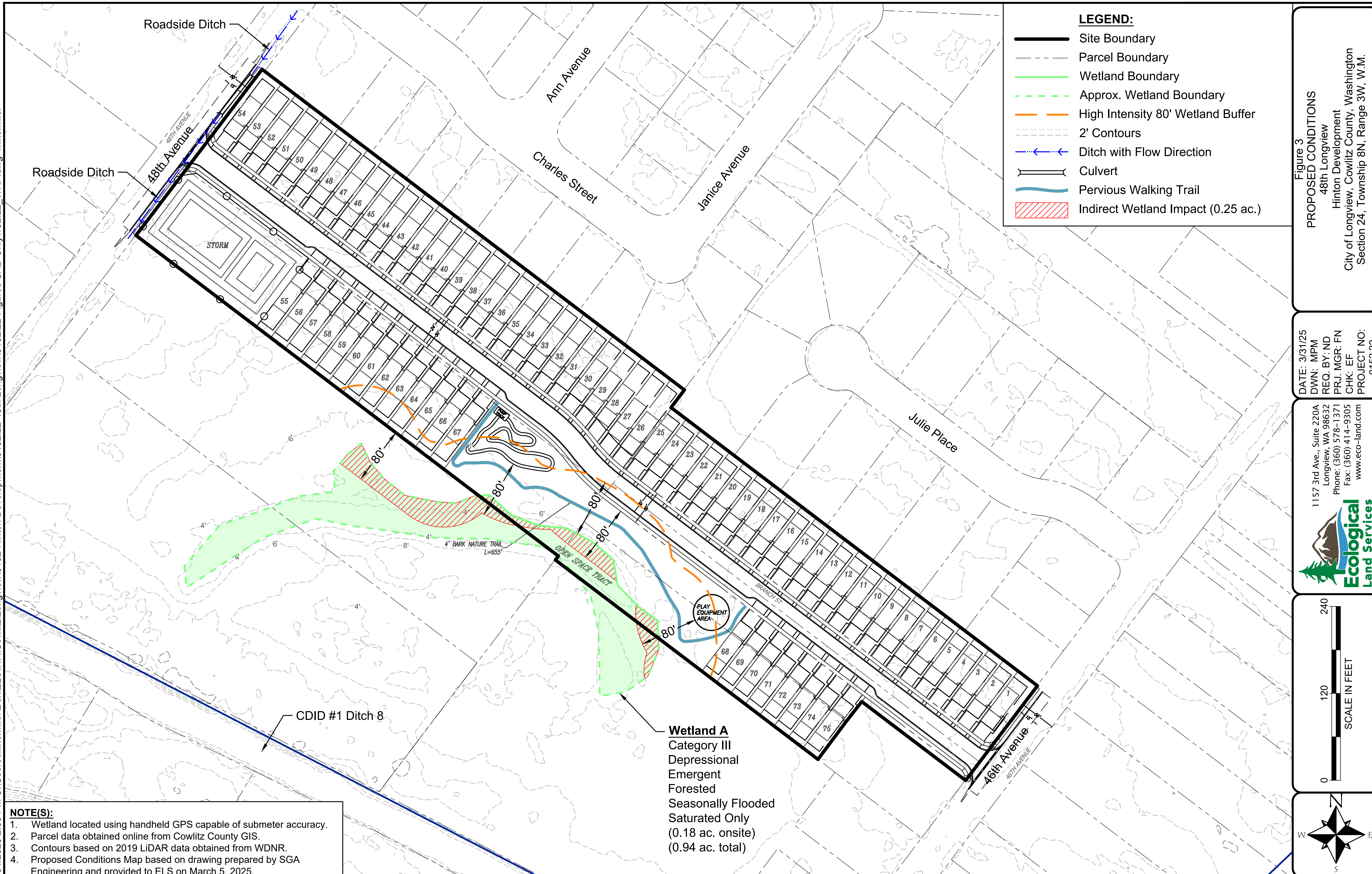
Figure 1
VICINITY MAP
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.

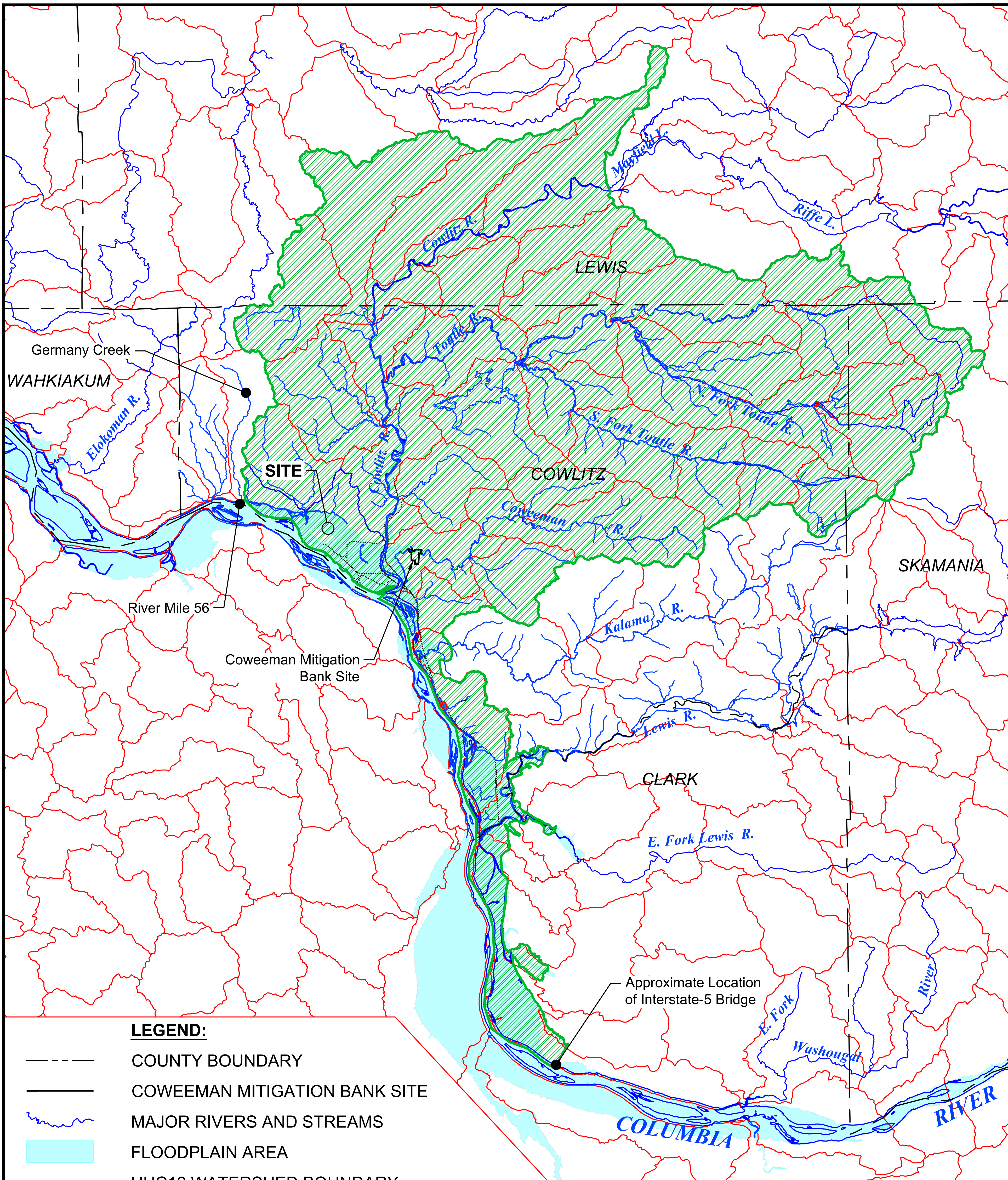
3/31/2025 2:55 PM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22_WRF.dwg MikeMiller

3/31/2025 2:55 PM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22_WRF.dwg MikeMiller



3/31/2025 2:55 PM C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\152.22_WRF.dwg MikeMiller





LEGEND:

- COUNTY BOUNDARY
- COWEEMAN MITIGATION BANK SITE
- MAJOR RIVERS AND STREAMS
- FLOODPLAIN AREA
- HUC12 WATERSHED BOUNDARY
- COWEEMAN MITIGATION BANK UNIVERSAL CREDIT SERVICE AREA

SERVICE AREA LIMITATIONS:

COLUMBIA RIVER UPSTREAM LIMIT: INTERSTATE 5 BRIDGE IN VANCOUVER

COLUMBIA RIVER DOWNSTREAM LIMIT: RIVER MILE 56 NEAR STELLA

COWLITZ WATERSHED: ALL OF WRIA 26 BELOW MAYFIELD DAM

NOTES:

1. STATE, COUNTY, RIVERS, AND STREAM BOUNDARIES FROM ECOLOGY WEBSITE: http://www.wsdot.wa.gov/mapsdata/geodatacatalog/default.htm
2. FLOODPLAIN DATA FROM J. BURKE, UNIVERSITY OF WASHINGTON.
3. HUC12 WATERSHED BOUNDARIES FROM USGS WEBSITE: http://www.water.usgs.gov/wsc/cat/17080001.html.
4. BASE MAP PREPARED BY ECOLOGICAL LAND SERVICES, INC., FEBRUARY 2015.

N W E S

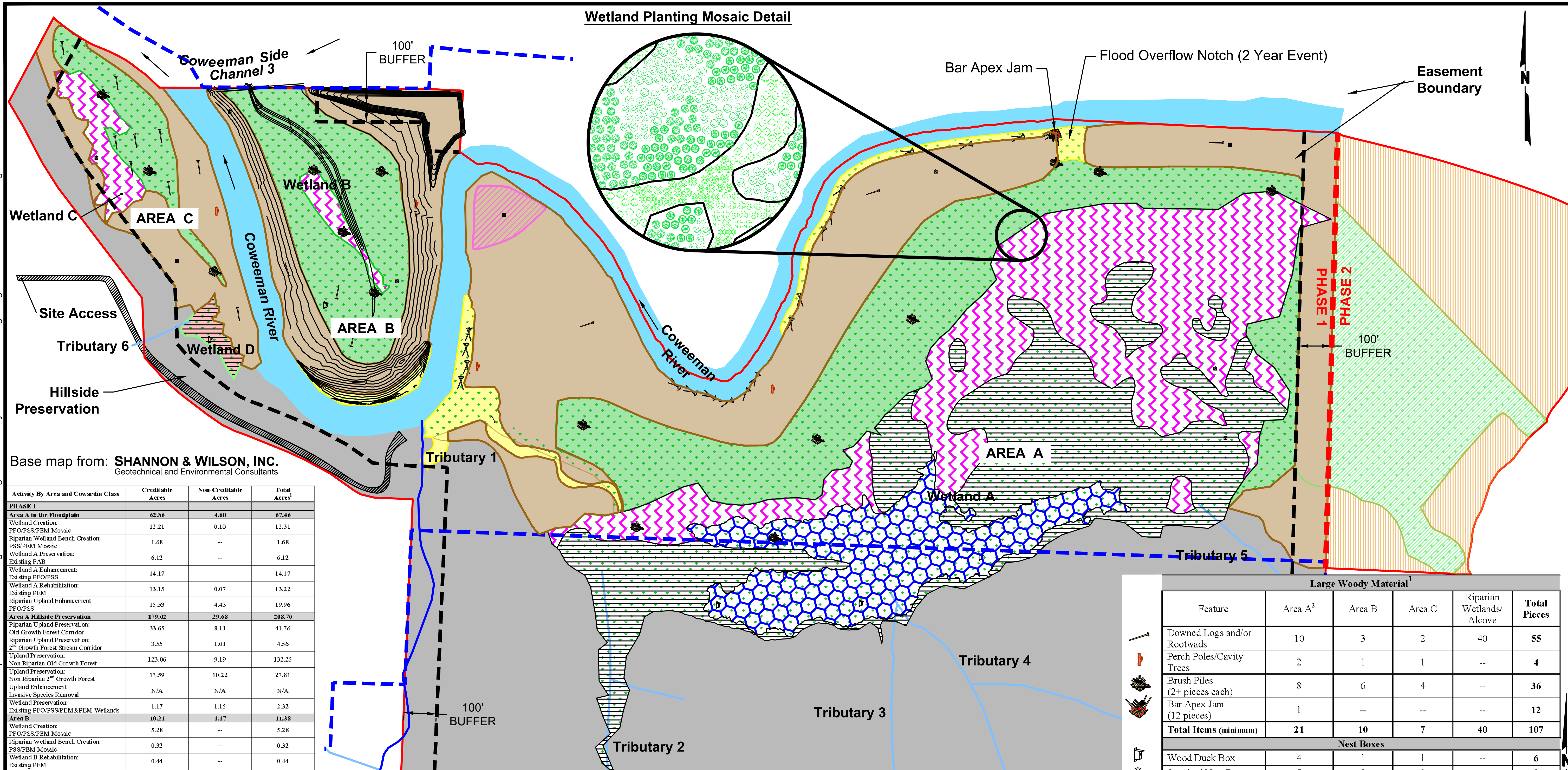
0 7 14
SCALE IN MILES
1 INCH = 7 MILES

Ecological Land Services

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

DATE: 3/12/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

Figure 4
COWEEMAN MITIGATION BANK - SERVICE AREA
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.



Base map from: **SHANNON & WILSON, INC.**
Geotechnical and Environmental Consultants

Activity By Area and Cowardin Class	Creditable Acres	Non-Creditable Acres	Total Acres[1]
PHASE 1			
Area A in the Floodplain	**62.86**	**4.60**	**67.46**
Wetland Creation: PFO/PSS/PEM Mosaic	12.21	0.10	12.31
Riparian Wetland Bench Creation: PSS/PEM Mosaic	1.68	--	1.68
Wetland A Preservation: Existing PAB	6.12	--	6.12
Wetland A Enhancement: Existing PFO/PSS	14.17	--	14.17
Wetland A Rehabilitation: Existing PEM	13.15	0.07	13.22
Riparian Upland Enhancement PFO/PSS	15.53	4.43	19.96
Area A Hillside Preservation	**179.02**	**29.68**	**208.70**
Riparian Upland Preservation: Old Growth Forest Corridor	33.65	8.11	41.76
Riparian Upland Preservation: 2nd Growth Forest Stream Corridor	3.55	1.01	4.56
Upland Preservation: Non Riparian Old Growth Forest	123.06	9.19	132.25
Upland Preservation: Non Riparian 2nd Growth Forest	17.59	10.22	27.81
Upland Enhancement: Invasive Species Removal	N/A	N/A	N/A
Wetland Preservation: Existing PFO/PSS/PEM&PEM Wetlands	1.17	1.15	2.32
Area B	**10.21**	**1.17**	**11.38**
Wetland Creation: PFO/PSS/PEM Mosaic	5.28	--	5.28
Riparian Wetland Bench Creation: PSS/PEM Mosaic	0.32	--	0.32
Wetland B Rehabilitation: Existing PEM	0.44	--	0.44
Riparian Upland Enhancement PFO/PSS	4.17	1.17	5.34
Area C	**6.18**	**0.53**	**6.71**
Wetland Creation: PFO/PSS/PEM Mosaic	1.59	0.15	1.74
Wetland C Rehabilitation: Existing PSS/PEM	0.95	0.07	1.02
Wetland D Enhancement: Existing PSS/PEM	0.36	--	0.36
Riparian Upland Enhancement PFO/PSS	3.28	0.31	3.59
Floodplain Area Summary (A, B, C)			
Wetland Creation (not including riparian wetland bench)	19.08	0.25	19.33
Riparian Wetland Bench Creation	2.00	--	2.00
Wetland Enhancement	14.53	--	14.53
Wetland Rehabilitation	14.54	0.14	14.68
Wetland Preservation	6.12	--	6.12
Riparian Upland Enhancement	22.98	5.91	28.89
Phase 1 Overall Totals	**258.27**	**35.98**	**294.25**
Coweeman River Total			7.75
PHASE 2			
Area D			**18.90**
Wetland Creation			8.90
Riparian Upland Enhancement			10.00

[1] Total acres includes areas within bank buffer and easements which are non-creditable

Large Woody Material[1]					
Feature	Area A[2]	Area B	Area C	Riparian Wetlands/ Alcove	**Total Pieces**
Downed Logs and/or Rootwads	10	3	2	40	**55**
Perch Poles/Cavity Trees	2	1	1	--	**4**
Brush Piles (2+ pieces each)	8	6	4	--	**36**
Bar Apex Jam (12 pieces)	1	--	--	--	**12**
Total Items (minimum)	**21**	**10**	**7**	**40**	**107**
Nest Boxes					
Wood Duck Box	4	1	1	--	**6**
Standard Nest Box	5	2	2	--	**9**
Total Items (minimum)	**9**	**3**	**3**	--	**15**

[1] Habitat feature locations and amounts may be modified in the field. This table supersedes the amount of LWM pieces shown on the figure(s) and lists the minimum amount of required pieces. Final amounts and locations will be provided in the as-built report.
[2] Not including riparian wetlands and alcove.

0 300 600
SCALE IN FEET

LEGEND

- Existing Contour 1'
- Existing Contour 5'
- Bank Site Boundary
- Underground Gas
- FO — Fiber Optic
- Easement
- Existing Wetland
- Stream
- 100' Bank Buffer
- Area to Remain Undisturbed
- City of Kelso Jurisdictional Boundary
- Riparian Upland Enhancement Wetland
- Creation (PFO/PSS/PEM Mosaic) Riparian
- Wetland Creation (PSS/PEM) Existing
- Wetland/Wetland Enhancement Area
- Hillside Preservation Existing
- PFO/PSS/PEM Enhancement Existing
- PAB Preservation Existing PEM
- Rehabilitation

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

DATE: 3/12/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: FN
CHK: EF
PROJECT NO: 0152.22

Figure 5
COWEEMAN MITIGATION BANK - SITE DESIGN
48th Longview
Hinton Development
City of Longview, Cowlitz County, Washington
Section 24, Township 8N, Range 3W, W.M.
Section 36, Township 8N, Range 2W, W.M.

Filename: C:\Users\MikeMiller\Box\ELS\WA\Cowlitz\Longview\0152-Hinton Development\0152.22-48th Longview\0152.22-Figures CAD Only\Coweeman site design.dwg Date: 03-31-2025 Login: MikeMiller

SEPA[1] Environmental Checklist

Purpose of checklist

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

Instructions for applicants

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

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

Instructions for lead agencies

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

Use of checklist for nonproject proposals

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B, plus the Supplemental Sheet for Nonproject Actions (Part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-

[1] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/Checklist-guidance

projects) questions in “Part B: Environmental Elements” that do not contribute meaningfully to the analysis of the proposal.

A.Background

Find help answering background questions[2]

1. **Name of proposed project, if applicable:**

   48th AVE PUD Subdivision

2. **Name of applicant:**

   Hinton Development Corporation – Attn: Nikole Duke

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

   Nikole Duke: 14010 – A NE 3rd Ct. Suite 106. Vancouver, WA 98685 / (360) 546-1220

   Scott Taylor: 2005 Broadway Vancouver, WA 98663 / (360) 993-0911

4. **Date checklist prepared:**

   4-10-25

5. **Agency requesting checklist:**

   City of Longview, WA

6. **Proposed timing of schedule (including phasing, if applicable):**

   1 phase - Project will break ground Summer of 2025

7. **Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.**

   None known at this time.

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

   Ecological Land Services will prepare a Critical Areas report and Redmond Geotechnical will prepare a geological report for the preliminary review.

9. **Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.**

   None known at this time.

10. **List any government approvals or permits that will be needed for your proposal, if known.**

    Preliminary Land Division, PUD and Engineering from City of Longview.

11. **Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on**

---

[2] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-A-Background

this page. (Lead agencies may modify this form to include additional specific information on project description.)

PUD on 8.26 acres, subdividing into 75 lots.

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

2025 48th AVE. – Directly off Ocean Beach Hwy. This project encompasses 6 different parcels: 109240100, 109230100, 109000100, 108990100, 109010100, and 109020100.

B.Environmental Elements

1. Earth

Find help answering earth questions[3]

a. **General description of the site:**

Generally Flat with some rolling hills. Mostly Grass that has been hayed in the past. Sporadic trees through all 6 parcels with a cluster of trees on the southern central portion of the site.

Circle or highlight one: Flat, *rolling*, hilly, steep slopes, mountainous, other:

b. **What is the steepest slope on the site (approximate percent slope)?**

Approximately 10%

c. **What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them, and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.**

The site has previously been hayed. Superficial topsoil materials consist of sandy, clayey silt to a depth of at least eight feet beneath the existing site. The anticipated ground water is believed to be approximately 5ft.

d. **Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.**

None known.

[3] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-earth

e. **Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.**

The project plans to bring in 31,000 cubic yards of fill dirt for the subdivision.

f. **Could erosion occur because of clearing, construction, or use? If so, generally describe.**

It is unlikely that erosion would occur from clearing or construction due to the flat topography. Proper erosion control measures will be installed to protect the site.

g. **About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?**

~54%

h. **Proposed measures to reduce or control erosion, or other impacts to the earth, if any.**

This project will comply with City of Longview Erosion Control standards. A gravel construction entrance, sediment traps, silt fencing, inlet protection, and mulching and seeding will be installed during site grading

2. Air

Find help answering air questions[4]

a. **What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.**

Construction equipment will emit exhaust. Air may get dusty during construction. Quantities are unknown.

b. **Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.**

No significant sources known. Some emissions from passing traffic will be present. Odors from adjacent businesses or homes might be present.

c. **Proposed measures to reduce or control emissions or other impacts to air, if any:**

Water will be used to keep dust down.

[4] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-Air

3. Water

Find help answering water questions[5]

a. Surface:

Find help answering surface water questions[6]

1. **Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

   There is a wetland that runs through the very southeast end of parcel #109240100. No direct wetland impacts are proposed with this project.

2. **Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

   Yes, the project will be built within 200' of the wetlands. Plans will be attached showing the buffer size.

3. **Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

   We will not be replacing or filling any material into the water or the wetlands.

4. **Will the proposal require surface water withdrawals or diversions? Give a general description, purpose, and approximate quantities if known.**

   No, it will not.

5. **Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

   No, it does not.

6. **Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

   No, it does not.

b. Ground:

Find help answering ground water questions[7]

1. **Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate**

---

[5] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water

[6] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water/Environmental-elements-Surface-water

[7] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-3-Water/Environmental-elements-Groundwater

quantities withdrawn from the well. Will water be discharged to groundwater? Give a general description, purpose, and approximate quantities if known.

No, the site will be connected to city water.

2. **Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (domestic sewage; industrial, containing the following chemicals…; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

The site will be connected to city sewer.

c. Water Runoff (including stormwater):

1. **Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

Stormwater control will conform to the requirements of the City of Longview Municipal Code LMC 17.80 and the 2019 Western Washington Stormwater Manual. Pollution-generating stormwater will be collected and treated via proprietary treatment units. The treated stormwater and other non-pollution-generating runoff will be conveyed to an orifice-controlled detention pond that will discharge to the existing ditch along 48th Avenue. There are currently no stormwater facilities on site.

2. **Could waste materials enter ground or surface waters? If so, generally describe.**

No.

3. **Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.**

No.

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

Stormwater control will conform to the requirements of the City of Longview Municipal Code LMC 17.80 and the 2019 Western Washington Stormwater Manual.

4. Plants

Find help answering plants questions

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

☒ **deciduous tree: alder, maple, aspen, other**

☒ **evergreen tree: fir, cedar, pine, other**

☒ **shrubs**

☒ **grass**

☒ **pasture**

☐ **crop or grain**

☐ **orchards, vineyards, or other permanent crops.**

☐ **wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other**

☐ **water plants: water lily, eelgrass, milfoil, other**

☐ **other types of vegetation**

b. What kind and amount of vegetation will be removed or altered?

Some grass, trees and shrubs will be removed for homes, driveways, and the proposed local access street, as well as the open green space area surrounding the wetland.

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

None known.

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

Private landscaping will be added. Native and drought tolerant plants are proposed in the landscape buggers where possible.

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

Himalayan Blackberry.

5. Animals

Find help answering animal questions[8]

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

Examples include:

- **Birds: hawk, heron, eagle, songbirds, other:**
- **Mammals: deer, bear, elk, beaver, other:**
- **Fish: bass, salmon, trout, herring, shellfish, other:**

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

None known.

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

The site is located within what is commonly referred to as the Pacific Flyway. The flyway stretches from Alaska to Mexico and from the Pacific Ocean to the Rocky Mountains.

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

[8] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-5-Animals

Landscape plantings on-site will provide food and cover for small mammals, birds, insects, and soil organisms.

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

None known.

6. Energy and natural resources

Find help answering energy and natural resource questions[9]

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

Electricity or natural gas will be used to heat the buildings and electricity for lighting.

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

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any.

Comply with state building and energy codes. Incorporate sustainable building design features like passive solar heating, through the use of certain building designs to maximize building materials and minimize waste.

7. Environmental health

Health Find help with answering environmental health questions[10]

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

1. Describe any known or possible contamination at the site from present or past uses.

None known.

2. Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

None known.

3. Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

---

[9] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-6-Energy-natural-resou

[10] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-7-Environmental-health

None known.

4. **Describe special emergency services that might be required.**

   Fire, Police and Ambulance are typical for all projects.

5. **Proposed measures to reduce or control environmental health hazards, if any.**

   Public water will serve the development, not well water. Public sewer will also be used to serve the site, instead of septic.

b. **Noise**

1. **What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

   The site is close to busy roads. Background neighborhood noise will be ongoing.

   What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site)?

   Short term: 7am-7pm construction noise; Long term: noise associated with residential uses, similar to existing traffic noise on adjacent roads.

2. **Proposed measures to reduce or control noise impacts, if any:**

   Construction noise will be limited to allowed hours by City Code. Ongoing on-site work will be during normal business hours.

8. Land and shoreline use

Find help answering land and shoreline use questions[11]

a. **What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.**

   The current site is vacant with some grass and shrubs and trees. The proposal will not affect current land uses on nearby or adjacent properties.

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

   The site has been mowed and hayed in the past but is not considered agricultural or forest land.

   1. **Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how?**

[11] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-8-Land-shoreline-use

No, it will not.

c. **Describe any structures on the site.**

No structures currently exist on site.

d. **Will any structures be demolished? If so, what?**

No. No structures currently exist on site.

e. **What is the current zoning classification of the site?**

TNR Zoning

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

Single Family Residential – Zoned TNR (Traditional Neighborhood)

g. **If applicable, what is the current shoreline master program designation of the site?**

N/A

h. **Has any part of the site been classified as a critical area by the city or county? If so, specify.**

There are mapped wetlands on site located in the south central portion.

i. **Approximately how many people would reside or work in the completed project?**

Approximately 75-300 people, which would be 1 resident per house up to 4 per house.

j. **Approximately how many people would the completed project displace?**

None.

k. **Proposed measures to avoid or reduce displacement impacts, if any.**

None.

l. **Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any.**

Access roadway improvements. Residential development with sidewalks will provide pedestrian circulation around and through the site.

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

None.

9. Housing

[Find help answering housing questions](https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-9-Housing)[12]

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

---

[12] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-9-Housing

There will be 75, middle income, detached housing lots provided on this site.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

No units will be eliminated.

c. Proposed measures to reduce or control housing impacts, if any:

None.

10. Aesthetics

Find help answering aesthetics questions[13]

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

The building/canopy will be a 2-story wood framed structure. Some form of wood, concrete or viny-based siding will cover the buildings.

b. What views in the immediate vicinity would be altered or obstructed?

No large vistas or views will be altered with this project. Only neighbors directly adjacent to the property will have views of the new development with associated fencing and landscaping.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Adding landscape buffers to screen the site from adjacent properties. Construction of aesthetically pleasing buildings with some unique architecture and upgraded finishes. Private landscaping will be added to the proposed development as well.

11. Light and glare

Find help answering light and glare questions[14]

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

The buildings, sidewalks and roads will be lit at night. Lights will be shielded to minimize glare off-site when possible, as required by the code.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No, lights will be shielded to avoid off-site glare.

c. What existing off-site sources of light or glare may affect your proposal?

Non known. Lighting from 48th AVE and 46th AVE shouldn't shine onto the site but if it does it will only help to illuminate the site and increase safety.

---

[13] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-10-Aesthetics

[14] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-11-Light-glare

d. Proposed measures to reduce or control light and glare impacts, if any:

Proper orientation and shielding of light sources.

12. Recreation

Find help answering recreation questions

a. What designated and informal recreational opportunities are in the immediate vicinity?

None

b. Would the proposed project displace any existing recreational uses? If so, describe.

No, it wouldn't.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

None.

13. Historic and cultural preservation

Find help answering historic and cultural preservation questions[15]

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe.

None known.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

None known. High Risk is noted on Cowlitz County GIS but no evidence or artifacts have been found that we are aware of.

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

Cowlitz County GIS

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

Inadvertent discovery language will be on the grading plans and construction plans.

[15] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-13-Historic-cultural-p

14. Transportation

Find help with answering transportation questions[16]

a. **Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.**

   This project will take it's access from both 48th AVE or 46th AVE. The proposed local access street will loop through the site and give access to each individual lot.

b. **Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?**

   RiverCities Transit has routes along Ocean Beach Hwy, a principal arterial approximately 0.2 miles north of the proposed site. There are 2 bus stops at the corners of 48th Ave and Ocean Beach Hwy as well as 46th Ave and Ocean Beach Hwy, each are 0.2 miles north of the proposed site.

c. **Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle, or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).**

   48th and 46th AVE will require frontage improvements. They are existing public roads. On-site will be a newly proposed local access road that runs directly through the middle of the site.

d. **Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

   No.

e. **How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?**

   See the full traffic report which has been submitted with this application.

f. **Will the proposal interfere with, affect, or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.**

   No.

g. **Proposed measures to reduce or control transportation impacts, if any:**

   A traffic study was completed to determine if there were any failing intersections or mitigation necessary close to the project. No mitigation measures were deemed necessary or required based on The City of Longview's transportation code.

[16] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-B-Environmental-elements/Environmental-elements-14-Transportation

15. Public services

[Find help answering public service questions[17]](https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-15-public-services)

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

The development will require all public services' and they are all available to serve the site.

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

The proposed development will pay Traffic Impact Fees.

16. Utilities

[Find help answering utilities questions[18]](https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-16-utilities)

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

Electricity, natural gas, water, telephone, sanitary sewer and refuse service.

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

Water: City of Longview

Sewer: City of Longview

Telephone: Qwest or Comcast

Electricity: Cowlitz County PUD

Gas: Cascade Natural Gas

[17] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-15-public-services
[18] https://ecology.wa.gov/regulations-permits/sepa/environmental-review/sepa-guidance/sepa-checklist-guidance/sepa-checklist-section-b-environmental-elements/environmental-elements-16-utilities

C.Signature

Find help about who should sign[19]

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

X 

Type name of signee: Scott Taylor

Position and agency/organization: Planner at SGA Engineering

Date submitted: **4-16-25**

[19] https://ecology.wa.gov/Regulations-Permits/SEPA/Environmental-review/SEPA-guidance/SEPA-checklist-guidance/SEPA-Checklist-Section-C-Signature

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Southwest Region Office
PO Box 47775, Olympia, WA 98504-7775 • 360-407-6300

August 27, 2025

Irene Rutikanga, City Planner
Cowlitz County
Department of Building and Planning
207 Fourth Avenue North
Kelso, WA 98626

Dear Irene Rutikanga:

Thank you for the opportunity to comment on the determination of non-significance for the 48th Ave/46th Ave Planned Unit Development (PUD) Project located at 2025 48th Avenue as proposed by Hinton Development Corporation. The Department of Ecology (Ecology) reviewed the environmental checklist and has the following comment(s):

SOLID WASTE MANAGEMENT: Derek Rockett (360) 995-3176

All grading and filling of land must utilize only clean fill. All other materials may be considered solid waste and permit approval may be required from your local jurisdictional health department prior to filling. All removed debris resulting from this project must be disposed of at an approved site. Contact the local jurisdictional health department or Department of Ecology for proper management of these materials.

TOXICS CLEANUP: Katie McNulty (360) 407-6221

If contamination is encountered, please report it to comply with WAC 173-340-120 and -310 by using the online statewide environmental incident reporting (ERTS) form at: ********ecology.wa.gov/footer-pages/report-an-environmental-issue/statewide-reporting-form-erts

Ecology's comments are based upon information provided by the lead agency. As such, they may not constitute an exhaustive list of the various authorizations that must be obtained or legal requirements that must be fulfilled in order to carry out the proposed action.

If you have any questions or would like to respond to these comments, please contact the appropriate reviewing staff listed above.

Department of Ecology
Southwest Regional Office

(CNS:202503388)

cc: Derek Rockett, SWM
Katie McNulty, TCP

COWLITZ COUNTY WASHINGTON

DEPARTMENT OF PUBLIC WORKS
1600 – 13th Avenue South
Kelso, WA 98626
TEL (360) 577-3030
FAX (360) 636-0845
Washington Relay Service 711 or (888) 833-8633

www.co.cowlitz.wa.us/235/Public-Works

Board of County Commissioners
Steve Rader District 1
Steven L. Ferrell District 2
Richard R. Dahl District 3

July 2, 2025

Nick Little
Community Development Director
City of Longview
Nick.Little@ci.longview.wa.us

Mr. Little,

We have had an opportunity to review the 48th Ave. PUD plan set and have the following comments.

- 48th Ave is a county road, is anticipated to be extended beyond Ditch 8 at some time in the future and is considered an Urban Sub-Collector. Cowlitz County Standard Plan CC-1306 requires an Urban Sub-Collector to have a 30′ half width ROW, 18′ half width asphalt, 5.5′ landscape strip and a 4′ sidewalk. The applicant has proposed a half width that includes 25′ ROW, 15′ asphalt, 4.5′ landscape strip and a 5′ sidewalk. Due to the adjacent proximity of the ROW to the City of Longview, a 25′ ROW half width is acceptable, with 16′ half-width asphalt, 3.5′ landscape strip and a 5′ sidewalk. The applicant will need to design and construct 48th Ave. to meet this standard.
- 46th Ave is a county Road, is not anticipated to be extended beyond Ditch 8 and can be considered an Urban Sub-Collector. Cowlitz County Standard Plan CC-1306 requires an Urban Sub-Collector to have a 30′ half width ROW, 18′ half width asphalt, 5.5′ landscape strip and a 4′ sidewalk. The applicant has proposed a half width that includes 25′ ROW, 15′ asphalt, 4.5′ landscape strip and a 5′ sidewalk. Due to the adjacent proximity of the ROW to the City of Longview, a 25′ ROW half width is acceptable, with 16′ half-width asphalt, 3.5′ landscape strip and a 5′ sidewalk. The applicant will need to design and construct 46th Ave. to meet this standard.
- The applicant will need to install streetlights and street trees in accordance with City of Longview Standards on 46th Ave. and 48th Ave.
- Stormwater for frontage improvements will need to meet CCC 16.22. As the majority of the project is within the City of Longview, who has similar standards that meet the same Ecology NPDES requirements, a single report meeting City of Longview requirements may be submitted for review by the County that accounts for the impervious area located in the County and associated with the project.
- CDID #1 has noted that the roadside ditches along 48th Ave currently back-up and cause localized flooding from Ditch 8 to Charles Street. It is unclear if this is related to the

DEPARTMENT OF PUBLIC WORKS
1600 – 13th Avenue South
Kelso, WA 98626
TEL (360) 577-3030
FAX (360) 636-0845
Washington Relay Service 711 or (888) 833-8633
www.co.cowlitz.wa.us/235/Public-Works

capacity of the roadside ditches or a backwater from Ditch 8 possibly related to the elevations of the Charles Street area. The applicant will need to work with CDID #1, their hydraulic study of the system, determine elevations of key points in the Charles Street neighborhood and 48th Ave and complete an evaluation of this issue. The County will work with the applicant to determine what, if any, improvements can be made that will help remedy the issue.

We recommend the following conditions:

- The design and construction of streets, pedestrian paths, street trees, storm drainage systems, site grading and erosion control plans, shall be in accordance with Cowlitz County Code, Cowlitz County's Road and Street Design Standards and Cowlitz County Standard Plans and Specifications, unless otherwise specified.

- The design and construction of the streetlights and street trees shall be in accordance with City of Longview Code, Special Provisions and Standard Drawings.

- The applicant shall obtain a right-of-way permit for any work (including construction signage) within Cowlitz County right-of-way.

- The applicant shall construct frontage improvements along 46th Avenue and 48th Avenue that include a 25' ROW half width, a 16' half-width asphalt, 3.5' landscape strip and a 5' sidewalk

- The applicant shall submit a stormwater report and receive Cowlitz County stormwater approval prior to the start of construction. The stormwater system shall be designed and constructed in accordance with Cowlitz County Code 16.20 and the City of Longview stormwater requirements.

- The applicant shall evaluate the drainage issues associated with the 48th Avenue roadside ditch utilizing the CDID #1 hydraulic model and elevations of key points in the Charles Street neighborhood and 48th Ave. and submit a design memo with the results and possible solutions. The County will coordinate with the applicant on appropriate, proportionate solutions that can be associated with this project.

If you have any questions or concerns, please let me know at harbison@cowlitzwa.gov.

Sincerely

Patrick Harbison

48TH AVENUE SUBDIVISION

PRELIM STORMWATER REPORT

Prepared for:

HINTON DEVELOPMENT CORPORATION
ATTN: NIKKI DUKE
14010-A NE 3RD COURT, SUITE 106
VANCOUVER, WA 98685
NIKOLE@HINTONDEVELOPMENT.COM

Prepared by:

SGA EGINEERING & DESIGN, PLLC
2005 BROADWAY
VANCOUVER, WA 98663
(360) 993-0911
NWILLIAMS@SGAENGINEERING.COM

03/20/2025

This project complies with Longview Municipal Code (LMC) 17.80

PRJ #: ______

ENG #: ______

DATE: 3/20/2025

JOB #: 2418

Table of Contents

SECTION A - Project Overview	*3*
SECTION B – Minimum Requirements	*3*
SECTION C – Soils Evaluation	*7*
SECTION D – Source Control	*7*
SECTION E – Onsite Stormwater Management BMPs	*7*
SECTION F – Runoff Treatment Analysis and Design	*7*
SECTION G – Flow Control Analysis and Design	*8*
SECTION H – Wetlands Protection	*8*
References	*9*

Tables

Table 1. – Surface Area Breakdown	*3*

Technical Appendix

Maps	*Appendix A*
Design Criteria	*Appendix B*
Hydraulic Calculations	*Appendix C*
Geotechnical Report	*Appendix D*
Maintenance Manuals	*Appendix E*

SECTION A - Project Overview

This stormwater report has been prepared for the proposed 48th Avenue Subdivision. The purpose of this report is to provide a drainage analysis to support the project. The stormwater system has been designed in accordance with Chapter 17.80 of the Longview Municipal Code and the 2019 Stormwater Management Manual for Western Washington (SWMMWW).

The 48th Avenue Subdivision project is located in northwest Longview, between 46th Avenue and 48th Avenue. The project will be constructed on parcels 108990-100, 109000-100, 109010-100, 109020-100, 109230-100, and 109240-100, which are 8.27 acres in total. The site does not contain any existing homes or structures and currently consists of short to medium grass. 46th Avenue and 48th Avenue border the site to the east and west, respectively, an existing subdivision borders the site to the north, and an undeveloped parcel borders the site to the south. The soil consists of Caples, which is from Hydrologic Group C and typically has an average permeability rate of 0.3 inches/hour. The existing surface slopes are flat, ranging from 0 to 3 percent. In the predeveloped state, the site drains to the roadside ditches along 46th and 48th Avenues and to an existing wetland at the southern edge of the site.

The project proposes the development of 75 single family residential Lots. An entrance will be provided at each end of the site; one from 46th Avenue and another from 48th Avenue. Construction activities will include internal road improvements, sidewalks, driveways, lot grading, and the necessary utilities to serve the future homes. Per section I-3.4.7 of the 2019 SWMMWW, CDID No. 1 receiving waterbodies are flow control exempt. Specifically, waters that lie within the area bounded by the Columbia River on the south, the Cowlitz River on the east, Ditch 10 to the west, and Ditch 6 to the north are flow control exempt. However, per LMC 17.80.080.5.a, projects that are flow control exempt shall control the developed peak discharge rate to the predeveloped rate for the 25-year, 24-hour storm event. Stormwater treatment will be provided via a wetpond (BMP T10.10) and four Contech Stormfilter Catch Basins. The 25-year storm event will be metered via the wetpond. Roof and rear yard runoff will be collected at the rear of the lots.

SECTION B – Minimum Requirements

Table 1 below gives the surface area breakdown for the project.

Table 1. – Surface Area Breakdown

Surface Type	Area
Existing Hard Surface	0.00 Acres
Proposed Hard Surface	4.17 Acres
Proposed Lawn/Landscaping	3.83 Acres
Total Land-disturbing Activity	8.00 Acres

According to Figure I-3.1 of the 2019 SWMMWW, all Minimum Requirements apply to the disturbed areas associated with the project. Below are the applicable minimum requirements and explanations for compliance with them.

Minimum Requirement 1 – Preparation of Stormwater Site Plans:
This stormwater report along with the street and stormwater plan submitted for review will serve as the stormwater plan.

Minimum Requirement 2 – Construction Stormwater Pollution Prevention:
A Construction Stormwater Pollution Prevention Plan (SWPPP) is required and will be submitted. The contractor will comply with construction SWPPP requirements including elements 1-13. Suggested BMPs include but are not limited to:

- BMP C105 Stabilized Construction Entrance
- BMP C106 Wheel Wash
- BMP C107 Construction Road/Parking Area Stabilization
- BMP C240 Sediment Trap
- BMP C233 Silt Fence

Refer to the SWPPP for possible additional BMPs.

Minimum Requirement 3 – Source Control:
The intent of Source Control BMPs is to prevent stormwater from coming in contact with pollutants. All known, available, and reasonable Source Control BMPs will be applied to the project and will be selected, designed, and maintained in accordance with the 2019 SWMMWW. The BMPs that may apply to land disturbance activities during construction of this project could be **BMPs for Dust Control at Disturbed Land Areas and Parking Lots, BMPs for Landscaping and Lawn/Vegetation Management, BMPs for Maintenance of Stormwater Drainage and Treatment Systems, and BMPs for Urban Streets.** See Appendix C for more information on the proposed stormwater drainage and treatment design.

Minimum Requirement 4. – Preservation of Natural Drainage Systems and Outfalls:
The proposed improvements will preserve the existing conveyance and drainage patterns to the maximum extent possible. In the predeveloped state, the site drains to the roadside ditches along 46th and 48th Avenues and to an existing wetland at the southern edge of the site. In the developed condition, stormwater will be discharged to all three of these locations after receiving water quality treatment. Per LMC 17.80.080.5.a, the 25-year developed discharge will not exceed that of the predeveloped.

Minimum Requirement 5. – Onsite Stormwater Management:
Onsite Stormwater Management is a means to implement inexpensive practices on individual properties to reduce the amount of disruption of natural hydrology. Per section I-3.4.7 of the 2019 SWMMWW, this project is flow control exempt from MR #7. To meet MR #5, section I-3.4.5 states

that flow control exempt projects shall either use the LID BMPs from List #3 for all surfaces within each surface type OR use any flow control BMP desired to achieve the LID Performance Standard. List #3 will be used to satisfy MR #5. Below are the BMPs from List #3 in correct order and an evaluation of feasibility.

Surface Type: Lawn and Landscaped Areas

BMP T5.13 – Post Construction Soil Quality and Depth
Naturally occurring (undisturbed) soil and vegetation provide important stormwater functions that are largely lost when development strips away native soil and vegetation and replaces it with minimal topsoil and sod. Establishing soil quality and depth regains greater stormwater functions in the post development landscape.
Feasibility: BMP T5.13 is feasible. Since disturbed areas will be stripped of topsoil and/or organic material for grading purposes, they shall be restored with the appropriate soil quality and depth.

Surface Type: Roofs

BMP T5.10A – Downspout Full Infiltration
Downspout full infiltration systems are trench or drywell designs for use in infiltrating runoff from roof downspout drains.
Feasibility: BMP T5.10A is not feasible. Infiltration is not a suitable option for stormwater management on this project due to poor infiltration rates and the presence of groundwater.

BMP T5.10B – Downspout Dispersion
Downspout dispersion systems are splash blocks or gravel-filled trenches, which serve to spread roof runoff over vegetated pervious areas.
Feasibility: BMP T5.10B is not feasible. The required vegetated flow path cannot be provided for each lot within the project. The only areas available for discharging this BMP would be located within 10 feet of property lines.

BMP T5.10C – Perforated Stub-out Connections
A perforated stub-out connection is a length of perforated pipe within a gravel-filled trench that is placed between roof downspouts and a stub-out to the local drainage system.
Feasibility: BMP T5.10C is not feasible. Infiltration is not a suitable option for stormwater management on this project due to poor infiltration rates and the presence of groundwater.

Surface Type: Other Hard Surfaces

BMP T5.11 – Concentrated Flow Dispersion
Dispersion of concentrated flows from driveways or other pavement through a vegetated pervious area attenuates peak flows by slowing entry of the runoff, allowing for some infiltration, and providing some water quality benefits.

Feasibility: BMP T5.11 is not feasible. The only areas available for this BMP would be located within 25' of property lines, structures, and/or sensitive areas, deeming it infeasible.

<u>BMP T5.12 – Sheet Flow Dispersion</u>
Sheet flow dispersion is the simplest method of runoff control. This BMP can be used for any impervious or pervious surface that is graded to avoid concentrating flows. Because flows are already dispersed as they leave the surface, they need only traverse a narrow band of adjacent vegetation for effective on-site stormwater management.
Feasibility: BMP T5.12 is not feasible. Dispersing runoff along the edge of driveways and roads within this project would direct stormwater toward the houses, so this BMP is not a feasible option.

After reviewing the BMPs in List #3, it was determined that BMP T5.13 is feasible for all lawn and landscaped areas associated with this project and will thus be implemented. For the roofs and other hard surfaces, it was determined that none of the BMPs are feasible. The above analysis and implementation of the feasible BMPs satisfies Minimum Requirement #5.

Since the BMPs for roofs and other hard surfaces in List #3 are infeasible, alternative methods to manage these surfaces are being proposed. Runoff from the driveways and roads will be collected via catch basins and runoff from the roofs will be collected via rear yard ditch conveyance systems. See the discussions under MRs #6 and #7 below for additional information.

<u>Minimum Requirement #6. – Runoff Treatment</u>:
Since the amount of impervious area being added exceeds the threshold listed in section I-3.4.6 of the 2019 SWMMWW, basic runoff treatment is required. Basic treatment is proposed via a wetpond (BMP T10.10) and four Contech Stormfilter Catch Basins. The pollution-generating surfaces proposed with this project include front yards, driveways, sidewalks, and roadways. The HydroCAD software package was used to size the water quality portion of the proposed wetpond. Per Contech requirements, the Western Washington Hydrology Model (WWHM) will be used to size the stormfilter catch basins. Refer to Section F of this report for more information. Rear yards will be managed by the implementation of S411 BMPs for Landscaping and Lawn/Vegetation Management and BMP T5.13, and therefore do not require water quality treatment. Rear yard, roof, and crawl space runoff will be collected via rear yard conveyance systems.

<u>Minimum Requirement #7. – Runoff Flow Control</u>:
Per section I-3.4.7 of the 2019 SWMMWW, CDID No. 1 receiving waterbodies are flow control exempt. Specifically, waters that lie within the area bounded by the Columbia River on the south, the Cowlitz River on the east, Ditch 10 to the west, and Ditch 6 to the north are flow control exempt. However, per LMC 17.80.080.5.a, projects that are flow control exempt shall control the developed peak discharge rate to the predeveloped rate for the 25-year, 24-hour storm event. The 25-year storm event will be metered via an orifice-controlled wetpond. See Section G below for design information.

***Minimum Requirement #8. – Wetlands Protection*:**
A wetland exists along the south edge of the site. The stormwater discharge from Basin 1C will trigger General Protection and Protection from Pollutants. Specifics for complying with these requirements will be provided during final engineering.

***Minimum Requirement #9. – Operation and Maintenance*:**
The wetpond will be privately owned and maintained while the Contech Stormfilter Catch Basins will be publicly owned and maintained. Refer to Appendix E for maintenance and operations manuals.

SECTION C – Soils Evaluation

The City of Longview soil map indicates that the onsite soil is classified as Capels soil from hydrological group "C". The storm flows used in storm facility sizing were calculated using soil group "C". Infiltration is not being proposed with this project. Refer to the Geotechnical Report by Redmond Geotechnical Services dated September 6, 2024 for additional information.

SECTION D – Source Control

All development activities shall consult the City of Longview Municipal Code. The BMPs that may apply to single family neighborhoods are BMPs for Landscaping and Lawn/Vegetation Management, BMPs for Maintenance of Stormwater Drainage and Treatment Systems and BMPs for Urban Streets.

SECTION E – Onsite Stormwater Management BMPs

The final design will use a wetpond and Contech Stormfilter Catch Basins to provide treatment for the streets, sidewalks, driveways, planters, and front yards. Rear yard, roof, and crawl space runoff will be collected via rear yard conveyance systems. The following is a list of onsite stormwater management BMPs:

BMP T5.13 – Post-Construction Soil Quality and Depth

BMP T10.10 – Wetpond

Manufactured Treatment Device – Contech Stormfilter Catch Basin

SECTION F – Runoff Treatment Analysis and Design

Since the amount of impervious area being added exceeds the threshold listed in section I-3.4.6 of the 2019 SWMMWW, basic runoff treatment is required. Several treatment BMPs were evaluated for feasibility (cost, size, required elevation drop for treatment, etc.) including bioretention areas, wetponds, and mechanical systems. The combination of a wetpond along with four Stormfilter Catch Basins were decided as the most feasible option.

More detailed design information for the wetpond and Stormfilter Catch Basins will be provided during final engineering.

SECTION G – Flow Control Analysis and Design

A wetpond will be used to meet the City of Longview's 25-yr flow control requirement for projects that are exempt from MR #7. There are three portions of the project that cannot be conveyed to the wetpond due to elevation constraints. These areas will be discharged from the site without passing through a flow control BMP. However, the wetpond will be orifice-controlled so that the total developed discharge from the project for the 25-year storm event will not exceed the predeveloped rate.

More detailed design information for the wetpond will be provided during final engineering. See HydroCAD reports in Appendix C.

SECTION H – Wetlands Protection

A wetland exists along the south edge of the site. The stormwater discharge from Basin 1C will trigger General Protection and Protection from Pollutants. Specifics for complying with these requirements will be provided during final engineering.

References

United States Department of Agriculture, Soil Conservation Service. "Soil Survey of Clark County Washington," Washington, D.C., 1972.

United States Department of Agriculture, Soil Conservation Service, Engineering Division, "Technical Release 55: Urban Hydrology for Small Watersheds, 2nd Ed.," Washington, D.C., 1986.

United States Department of Transportation, Federal Highway Administration, "Hydraulic Engineering Circular No. 12: Drainage of Highway Pavements," Springfield, VA, 1984.

United States Department of Transportation, Federal Highway Administration, "Hydraulic Engineering Circular No. 15: Design of Roadside Channels with Flexible Linings," Springfield, VA, 1984.

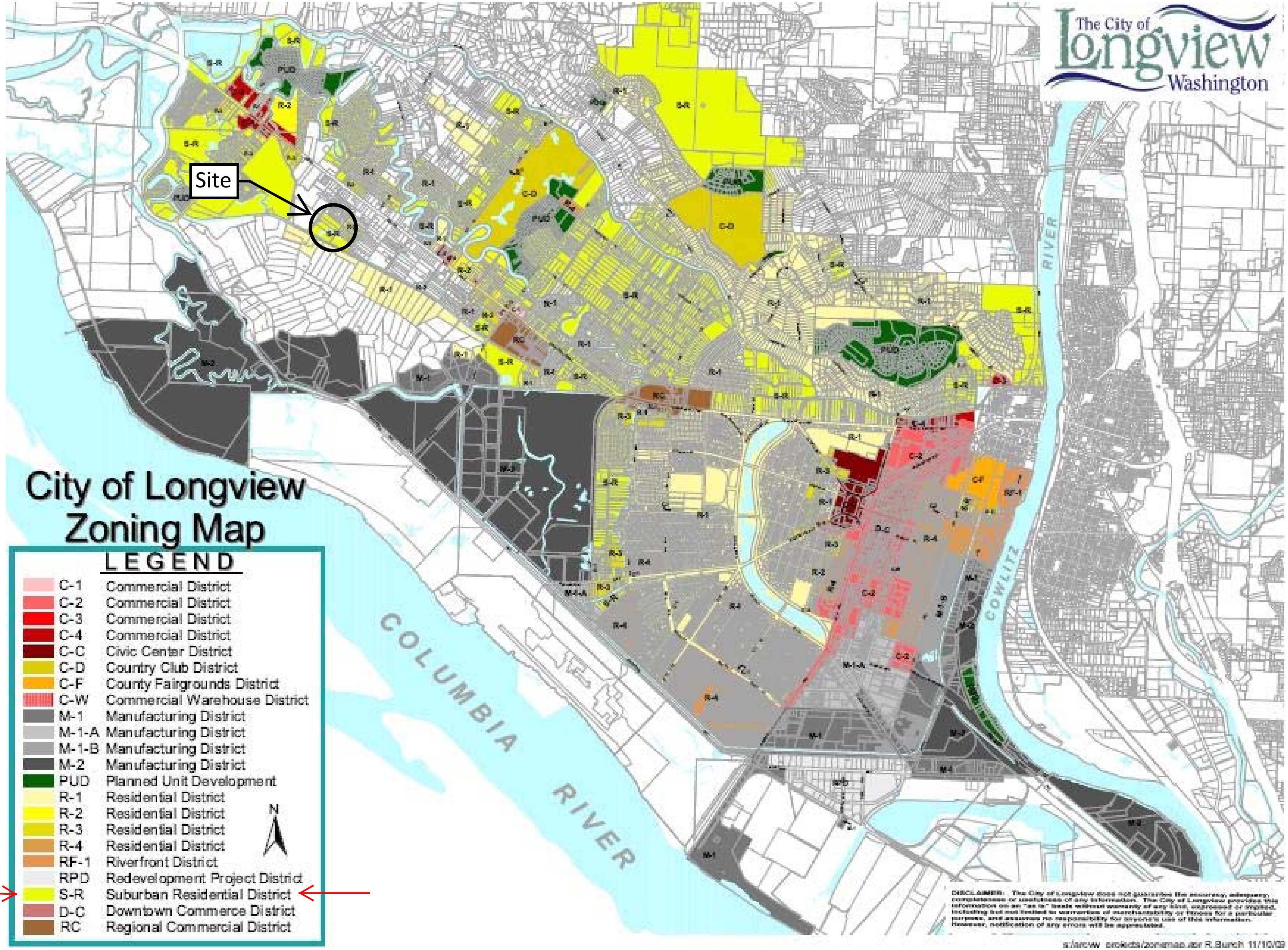
Washington State Department of Ecology, "Stormwater Management Manual for Western Washington, Volume I-V," Olympia, WA, February 2005.

Washington State Department of Transportation, "Hydraulic Manual," Olympia, WA, 1989.

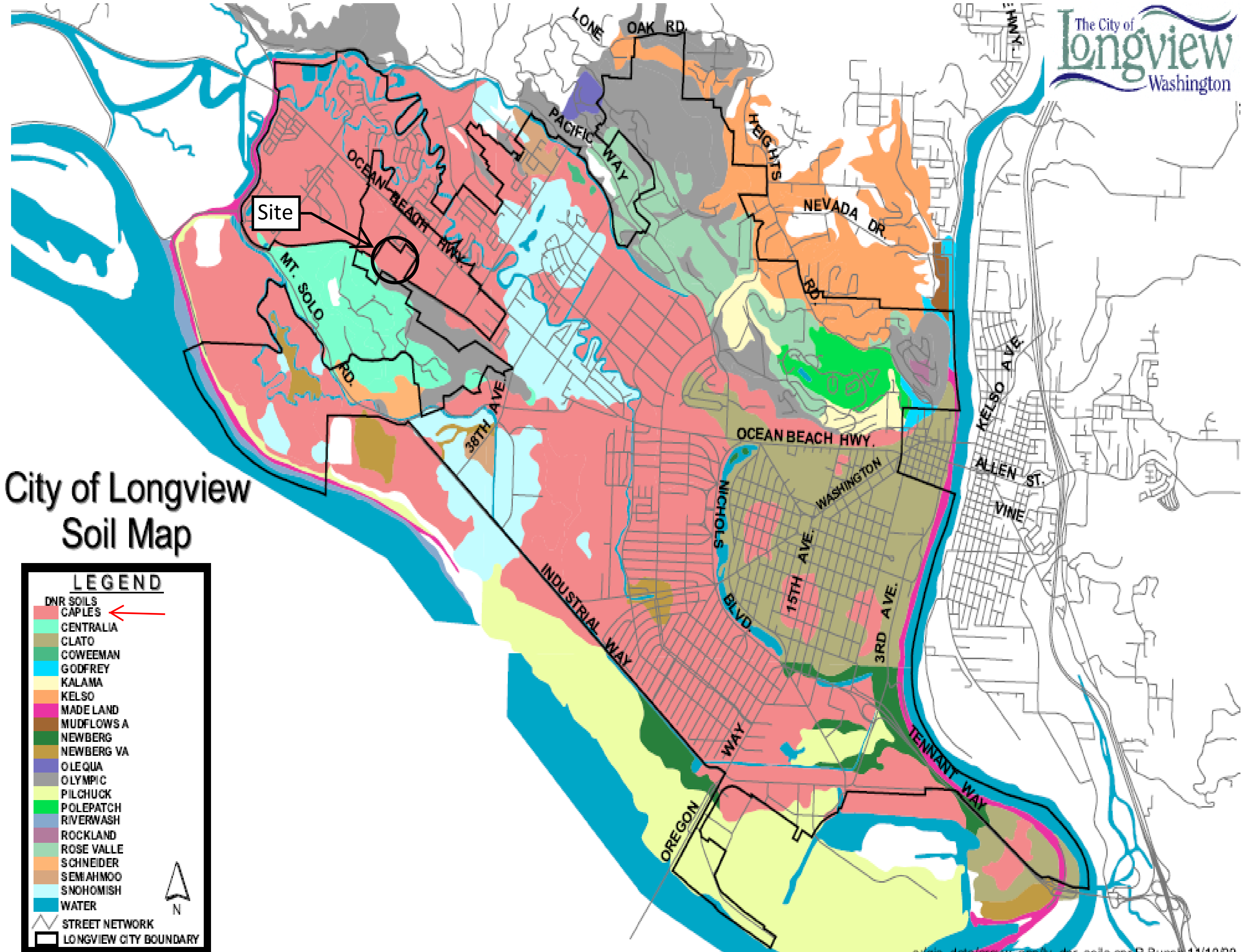
City of Longview, "Longview Municipal Code Chapter 17.80," Longview, WA, May 2019

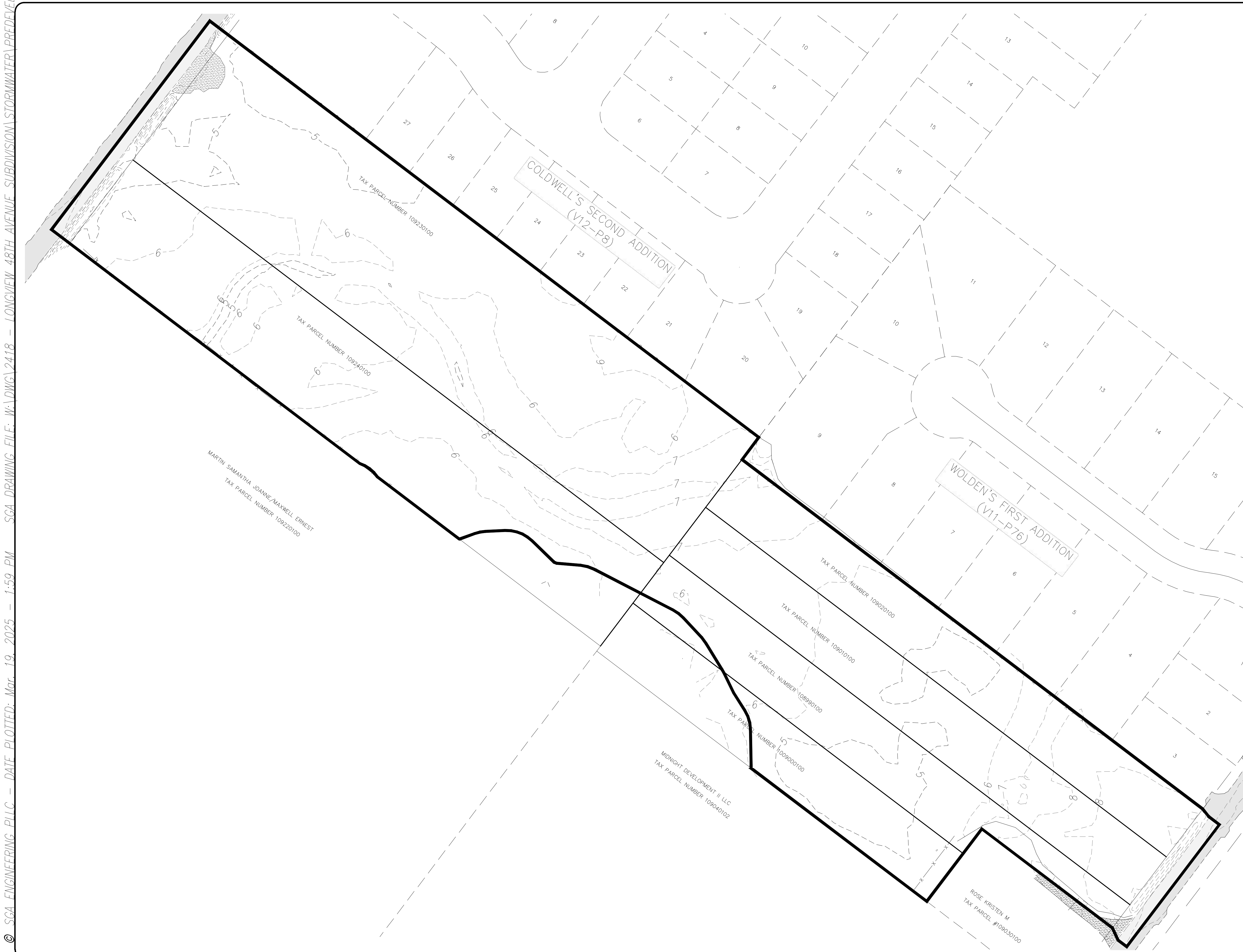
Maps Appendix A

Zoning Map	**A1**
Soil Types Map	**A2**
Pre-Developed Basin Map	**A3**
Developed Basin Map	**A4**



The City of Longview Washington
City of Longview Zoning Map
LEGEND
C-1 Commercial District
C-2 Commercial District
C-3 Commercial District
C-4 Commercial District
C-C Civic Center District
C-D Country Club District
C-F County Fairgrounds District
C-W Commercial Warehouse District
M-1 Manufacturing District
M-1-A Manufacturing District
M-1-B Manufacturing District
M-2 Manufacturing District
PUD Planned Unit Development
R-1 Residential District
R-2 Residential District
R-3 Residential District
R-4 Residential District
RF-1 Riverfront District
RPD Redevelopment Project District
S-R Suburban Residential District
D-C Downtown Commerce District
RC Regional Commercial District
N
Site
COLUMBIA RIVER
COWLITZ RIVER
s:/arcvw_projects/zonemap.apr R.Burch 11/10/09

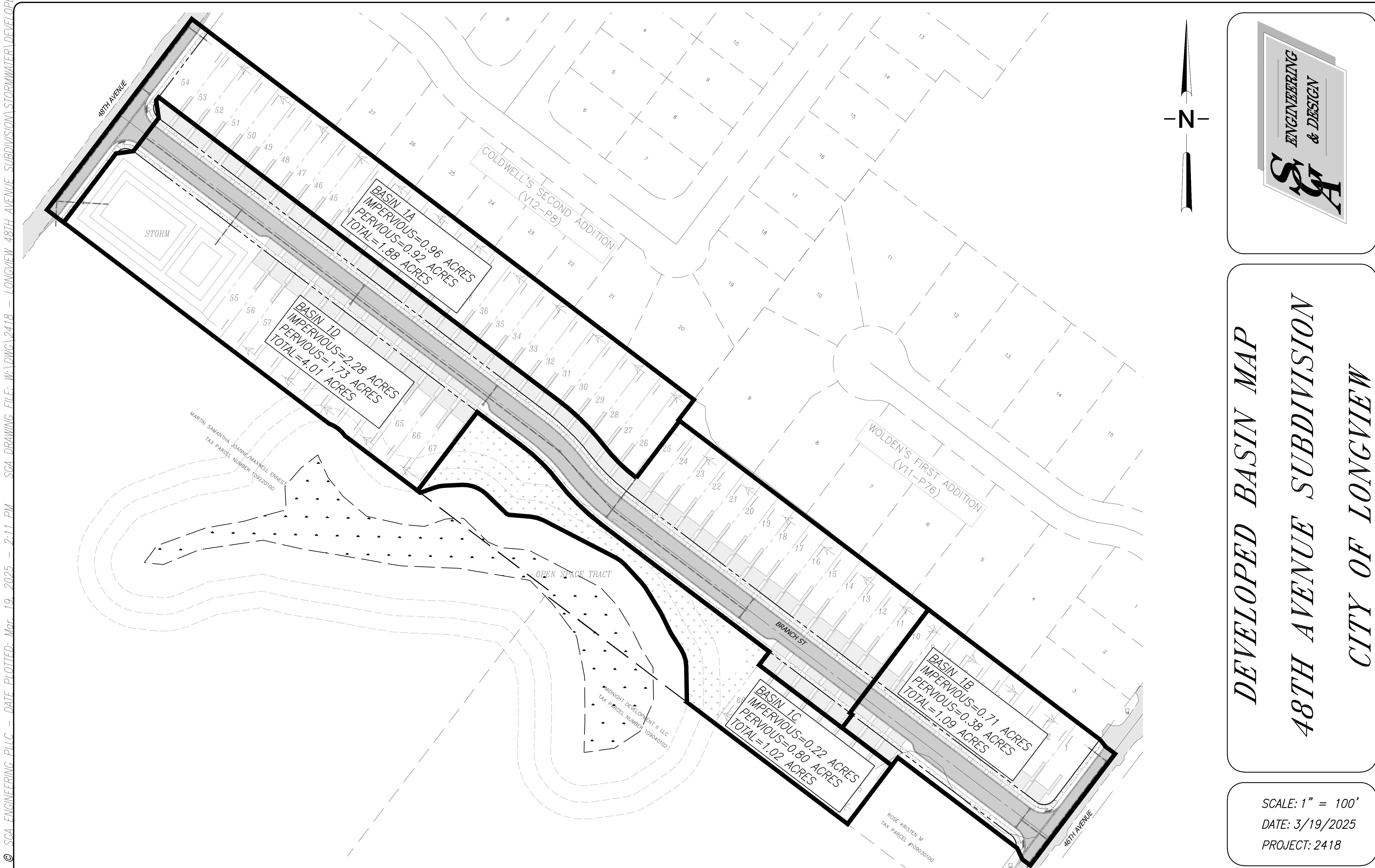

The City of Longview Washington
City of Longview
Soil Map
LEGEND
DNR SOILS
CAPLES
CENTRALIA
CLATO
COWEEMAN
GODFREY
KALAMA
KELSO
MADE LAND
MUDFLOWS A
NEWBERG
NEWBERG VA
OLEQUA
OLYMPIC
PILCHUCK
POLEPATCH
RIVERWASH
ROCKLAND
ROSE VALLE
SCHNEIDER
SEMIAHMOO
SNOHOMISH
WATER
STREET NETWORK
LONGVIEW CITY BOUNDARY
N
Site
LONE OAK RD.
PACIFIC WAY
HEIGHTS
NEVADA DR.
RD.
OCEAN BEACH HWY.
MT. SOLO RD.
38TH AVE.
OCEAN BEACH HWY.
WASHINGTON
NICHOLS BLVD.
15TH AVE.
3RD AVE.
INDUSTRIAL WAY
OREGON WAY
TENNANT WAY
KELSO AVE.
ALLEN ST.
VINE
s:/gis_data/arcvw_app/lv_dnr_soils.apr R.Bunch 11/10/09



SGA ENGINEERING & DESIGN

PRE-DEVELOPED BASIN MAP
48TH AVENUE SUBDIVISION
CITY OF LONGVIEW

SCALE: 1" = 100'
DATE: 3/19/2025
PROJECT: 2418


48TH AVENUE
46TH AVENUE
BRANCH ST
STORM
OPEN SPACE TRACT
COLDWELL'S SECOND ADDITION (V12-P8)
WOLDEN'S FIRST ADDITION (V11-P76)
MARTIN SAMANTHA JOANNE/MAXWELL ERNEST
TAX PARCEL NUMBER 109220100
MIDNIGHT DEVELOPMENT II LLC
TAX PARCEL NUMBER 109040102
ROSE KRISTEN M
TAX PARCEL #109030100
BASIN 1A
IMPERVIOUS=0.96 ACRES
PERVIOUS=0.92 ACRES
TOTAL=1.88 ACRES
BASIN 1D
IMPERVIOUS=2.28 ACRES
PERVIOUS=1.73 ACRES
TOTAL=4.01 ACRES
BASIN 1C
IMPERVIOUS=0.22 ACRES
PERVIOUS=0.80 ACRES
TOTAL=1.02 ACRES
BASIN 1B
IMPERVIOUS=0.71 ACRES
PERVIOUS=0.38 ACRES
TOTAL=1.09 ACRES
N
SGA ENGINEERING & DESIGN
DEVELOPED BASIN MAP
48TH AVENUE SUBDIVISION
CITY OF LONGVIEW
SCALE: 1" = 100'
DATE: 3/19/2025
PROJECT: 2418

Design Criteria Appendix B

NRCS Soil Type Maps	**B1**
Western Washington Runoff Curve Numbers	**B2**
“n” and “k” Values Used in Hydrograph Time Calculations	**B3**
Isopluvial Maps	**B4**

APPENDIX H – NRCS Soil Type Maps

This data is provided as a courtesy only,
and should not be the sole basis for design
(see SMMWW Volume III, Section 3.3.6 and
http://websoilsurvey.nrcs.usda.gov/app/).

Summary of Longview Soils
(Map on next page)

Soil ID #	Soil Name & Description	Hydrologic Group	Permeability (Ksat) in/hr 0 - 3' depth	3 - 6' depth	Average
17	Caples, Silty Clay Loam, 0 - 3 % Slopes	C	0.4	0.1	0.3
21 - 23	Centralia, Silt Loam, 0 - 30% Slopes	B	1.3	1.3	1.3
32	Clato, Silt Loam, 0 - 30% Slopes	B	1.3	1.3	1.3
33 - 34	Coweeman, Silt Loam, 5 - 15% Slopes	D	0.1	0.0	0.1
93 - 95	Kalama, Gravelly Loam, 8 - 60% Slopes	C	0.9	0.4	0.7
100 -103	Kelso, Silt Loam, 0 - 50% Slopes	C	1.2	0.1	0.7
141	Newberg, Fine Sandy Loam, 0 - 3% Slopes	B	6.0	13.0	9.5
142 - 145	Olequa, Silt Loam, 0 - 65% Slopes	B	1.3	1.3	1.3
146 - 150	Olympic, Silt Loam, 2 - 65% Slopes	B	1.3	1.3	1.3
160	Pilchuck, Fine Loamy Sand, 0 - 8% Slopes	A	13.0	42.5	27.8
174 - 175	Rose Valley, Silt Loam, 0 - 15% Slopes	D	0.7	0.2	0.4
188 - 191	Schneider, Very Gravelly Loam (& Rock Outcrop Complex), 5 - 90% Slopes	B	1.3	1.3	1.3
195	Semiahmoo Muck, 0 - 1% Slopes	D	1.3	0.8	1.0
199	Snohomish, Silty Clay Loam, 0 - 1% Slopes	D	0.8	1.3	1.0
	Other Soils				
5	Arents, 0-5%	B	3.5	3.3	3.4
16	Camas, Cobbly Loam, 0 - 3%	A	18.8	21.1	19.9
65	Godfrey, Silt Loam, 0 - 30% Slopes	D	0.3	0.0	0.1
76 - 80	Hazeldell, Gravelly Silt Loam, 8 - 65%	B	1.3	1.3	1.3
127	Maytown, Silt Loam, 0 - 3%	C	1.3	0.4	0.9
162 - 165	Polepatch, Loamy Sand, (Overblown, Very Cobbly, & Extremely Bouldery), 0 - 90% Slopes	A	*11*	*13*	*12*
172	Riverwash	D	*13*	*13*	*13*
208 - 210	Stella, Silt Loam, 3 - 30%	C	1.0	0.3	0.7

Table III-1.3 SCS Western Washington Runoff Curve Numbers (Published by SCS in 1982) Runoff curve numbers for selected agricultural, suburban and urban land use for Type 1A rainfall distribution, 24-hour storm duration.

LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush & grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.					
Good condition:	grass cover on ≥75% of the area	68	80	86	90
Fair condition:	grass cover on 50-75% of the area	77	85	90	92
Gravel roads & parking lots:		76	85	89	91
Dirt roads & parking lots:		72	82	87	89
Impervious surfaces, pavement, roofs etc.		98	98	98	98
Open water bodies:	lakes, wetlands, ponds etc.	100	100	100	100
Single family residential(2):		Separate curve number shall be selected for pervious & impervious portions of the site or basin			
Dwelling Unit/Gross Acre	%Impervious(3)				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
PUD's, condos, apartments, commercial businesses & industrial areas	%impervious must be computed				

(1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Sec. 4, Hydrology, Chapter 9, August 1972.
(2) Assumes roof and driveway runoff is directed into street/storm system.
(3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.

Table III-1.4 "n" AND "k" Values Used in Time Calculations for Hydrographs

"n_s" Sheet Flow Equation Manning's Values (for the initial 300 ft. of travel)	n_s
Smooth surfaces (concrete, asphalt, gravel, or bare hand packed soil) 0.011	
Fallow fields or loose soil surface (no residue)	0.05
Cultivated soil with residue cover (s≤ 0.20 ft/ft)	0.06
Cultivated soil with residue cover (s> 0.20 ft/ft)	0.17
Short prairie grass and lawns	0.15
Dense grasses	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods or forest with light underbrush	0.40
Woods or forest with dense underbrush	0.80

*Manning values for sheet flow only, from Overton and Meadows 1976 (See TR-55, 1986)

"k" Values Used in Travel Time/Time of Concentration Calculations

Shallow Concentrated Flow (After the initial 300 ft. of sheet flow, R = 0.1)	k_s
1. Forest with heavy ground litter and meadows (n = 0.10)	3
2. Brushy ground with some trees (n = 0.060)	5
3. Fallow or minimum tillage cultivation (n = 0.040)	8
4. High grass (n = 0.035)	9
5. Short grass, pasture and lawns (n = 0.030)	11
6. Nearly bare ground (n = 0.25)	13
7. Paved and gravel areas (n = 0.012)	27

Channel Flow (intermittent) (At the beginning of visible channels R = 0.2)	k_c
1. Forested swale with heavy ground litter (n = 0.10)	5
2. Forested drainage course/ravine with defined channel bed (n = 0.050)	10
3. Rock-lined waterway (n = 0.035)	15
4. Grassed waterway (n = 0.030)	17
5. Earth-lined waterway (n = 0.025)	20
6. CMP pipe (n = 0.024)	21
7. Concrete pipe (0.012)	42
8. Other waterways and pipe 0.508/n	

Channel Flow (Continuous stream, R = 0.4)	k_c
9. Meandering stream with some pools (n = 0.040)	20
10. Rock-lined stream (n = 0.035)	23
11. Grass-lined stream (n = 0.030)	27
12. Other streams, man-made channels and pipe 0.807/n**	

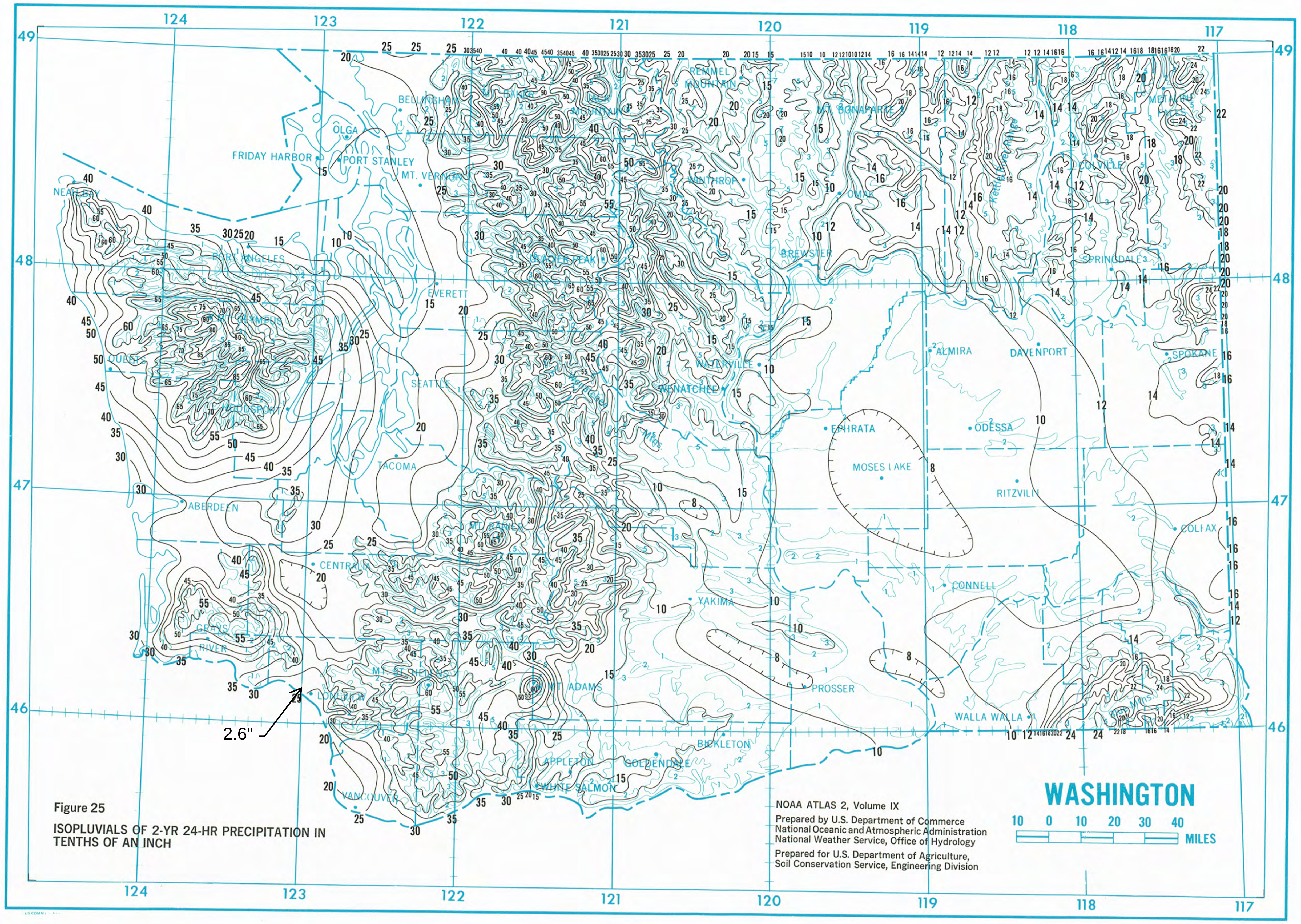


Figure 25
ISOPLUVIALS OF 2-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

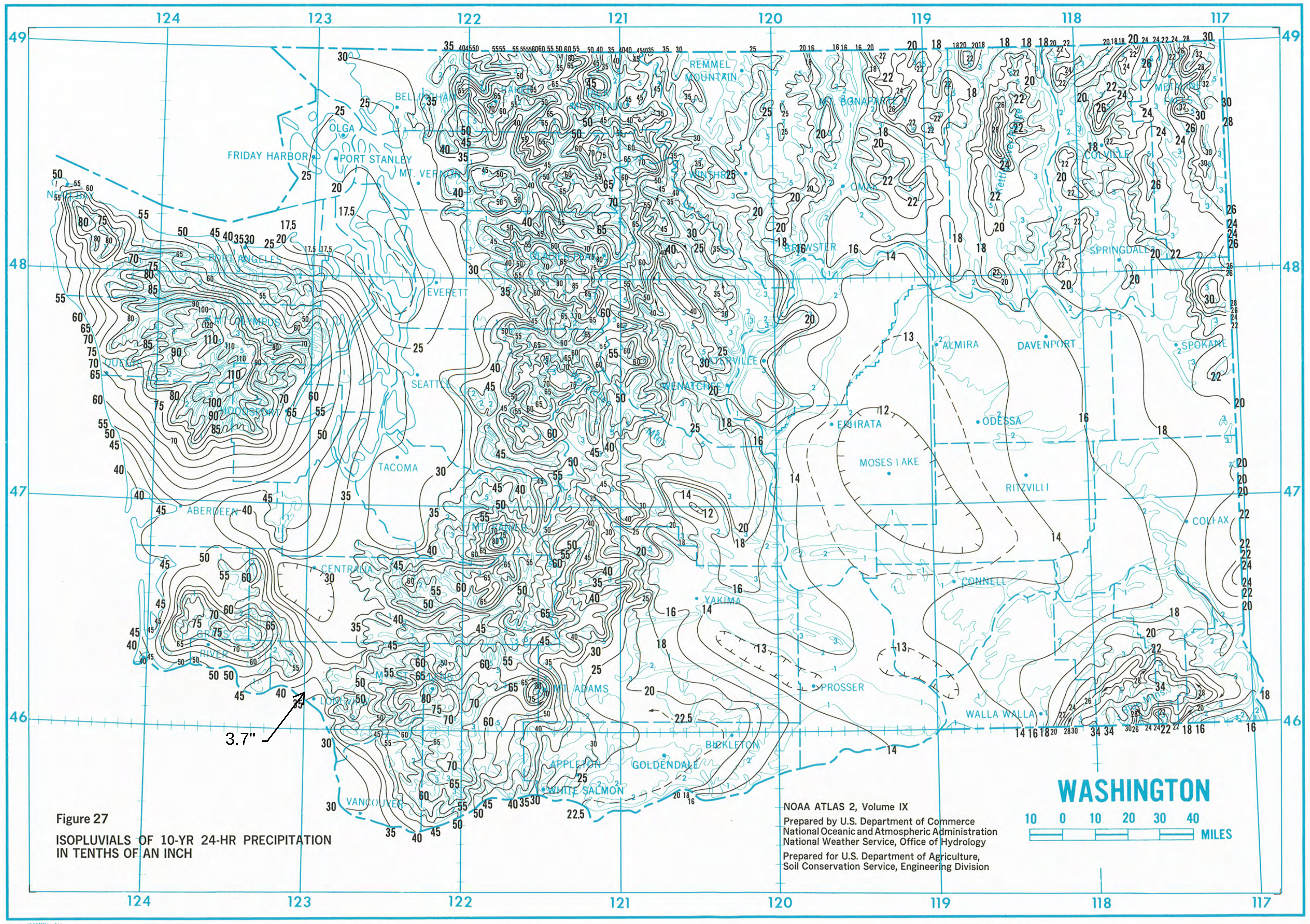


Figure 27
ISOPLUVIALS OF 10-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

NOAA ATLAS 2, Volume IX
Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

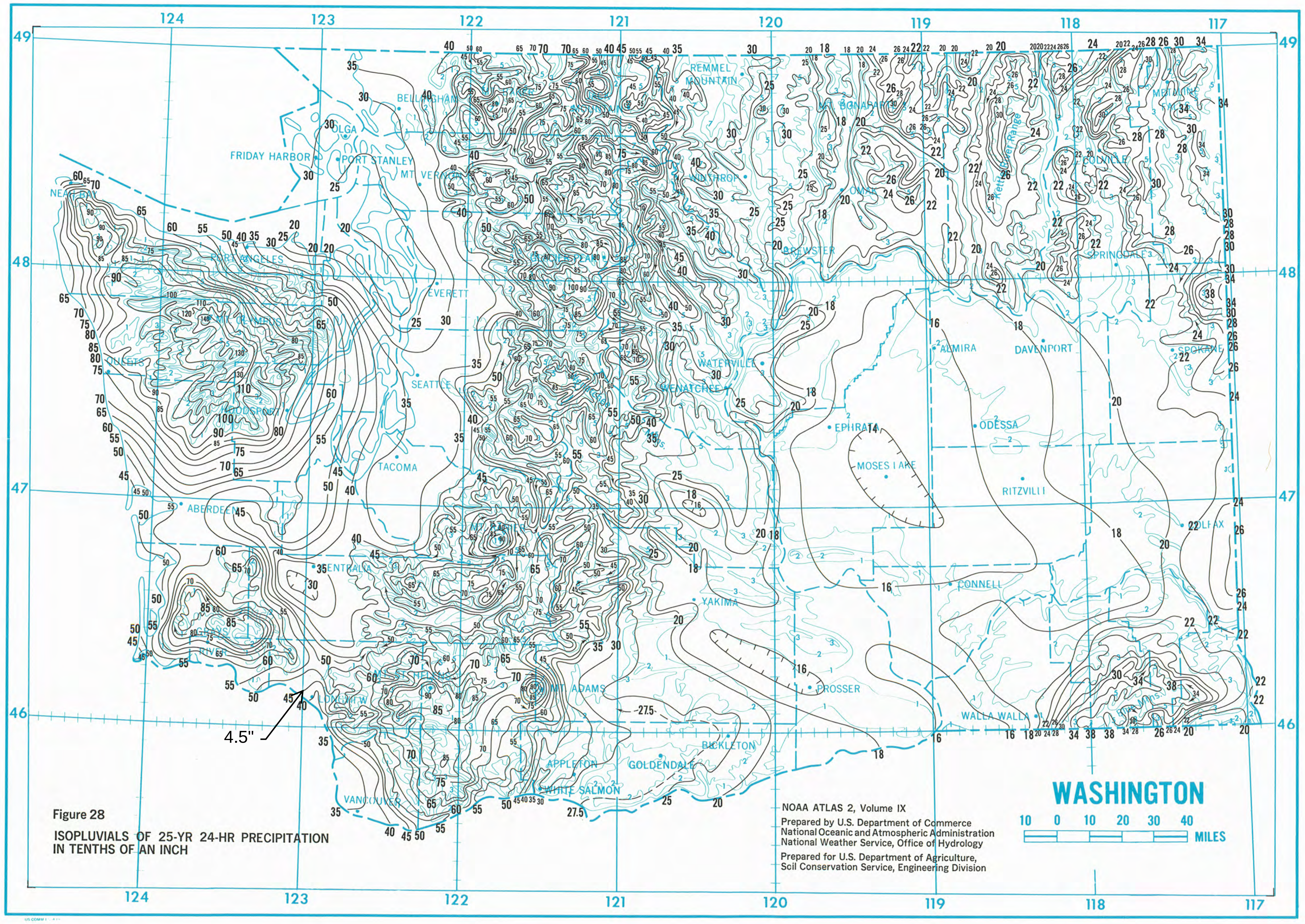


Figure 28

ISOPLUVIALS OF 25-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

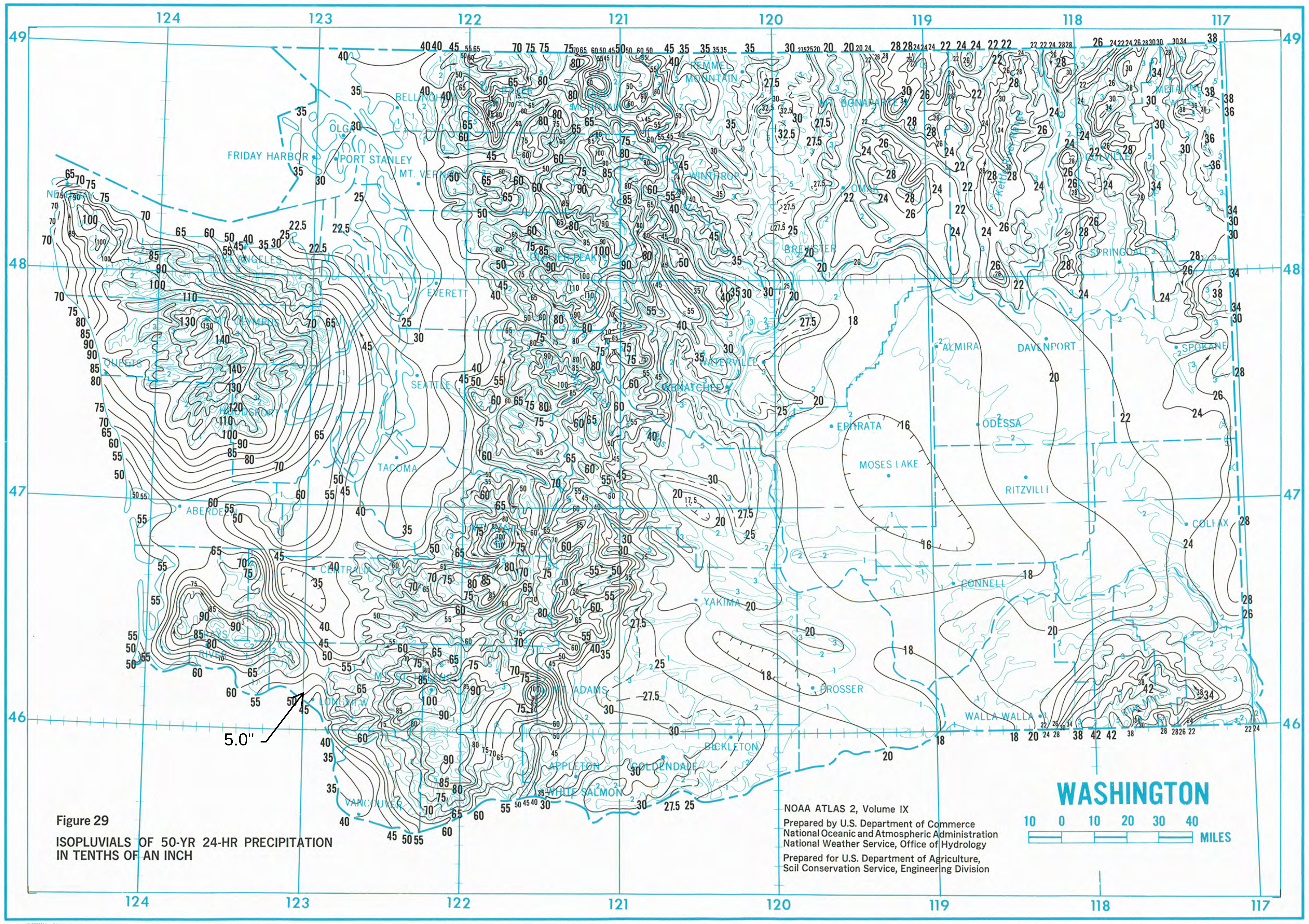


Figure 29
ISOPLUVIALS OF 50-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

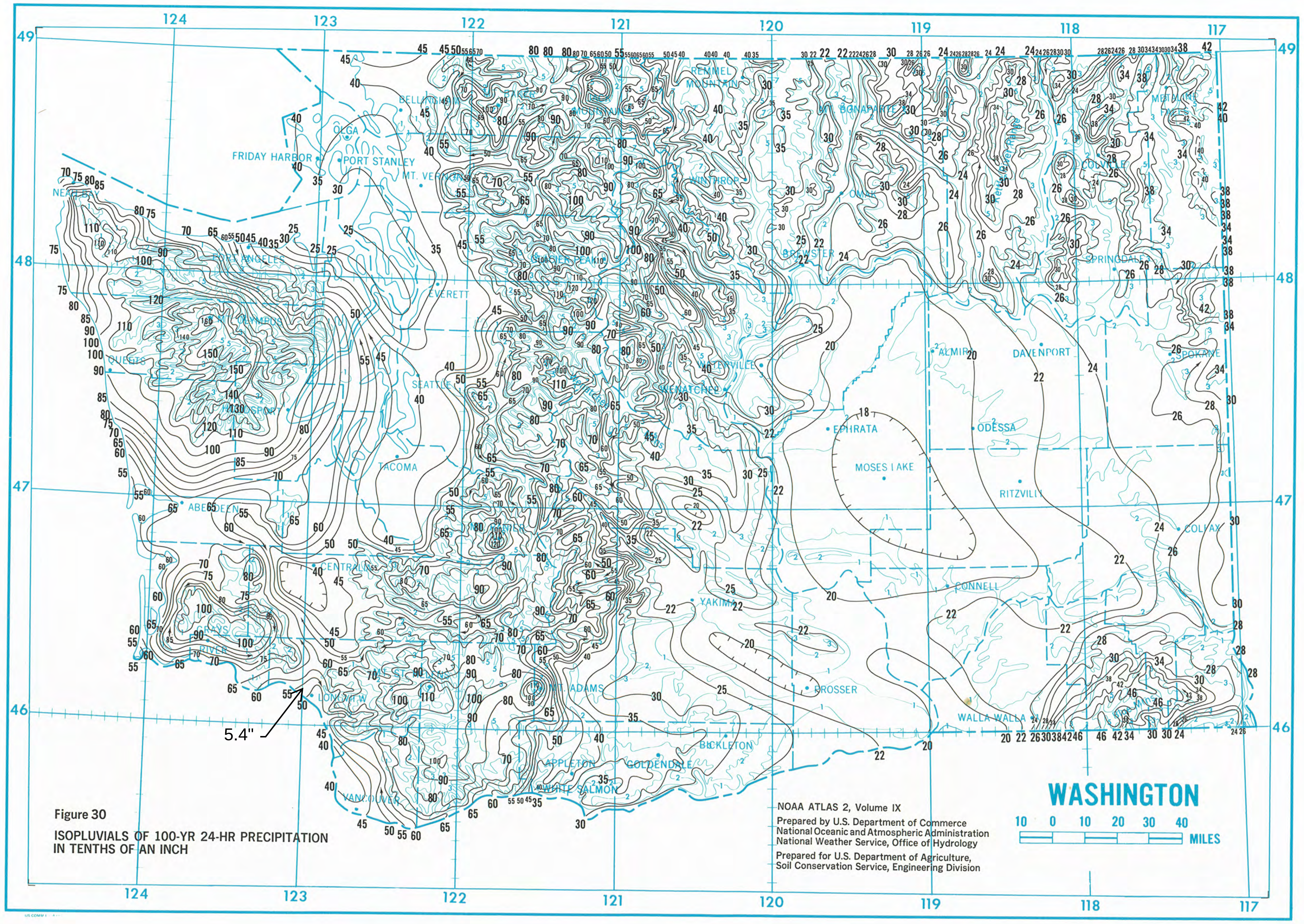


Figure 30

ISOPLUVIALS OF 100-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

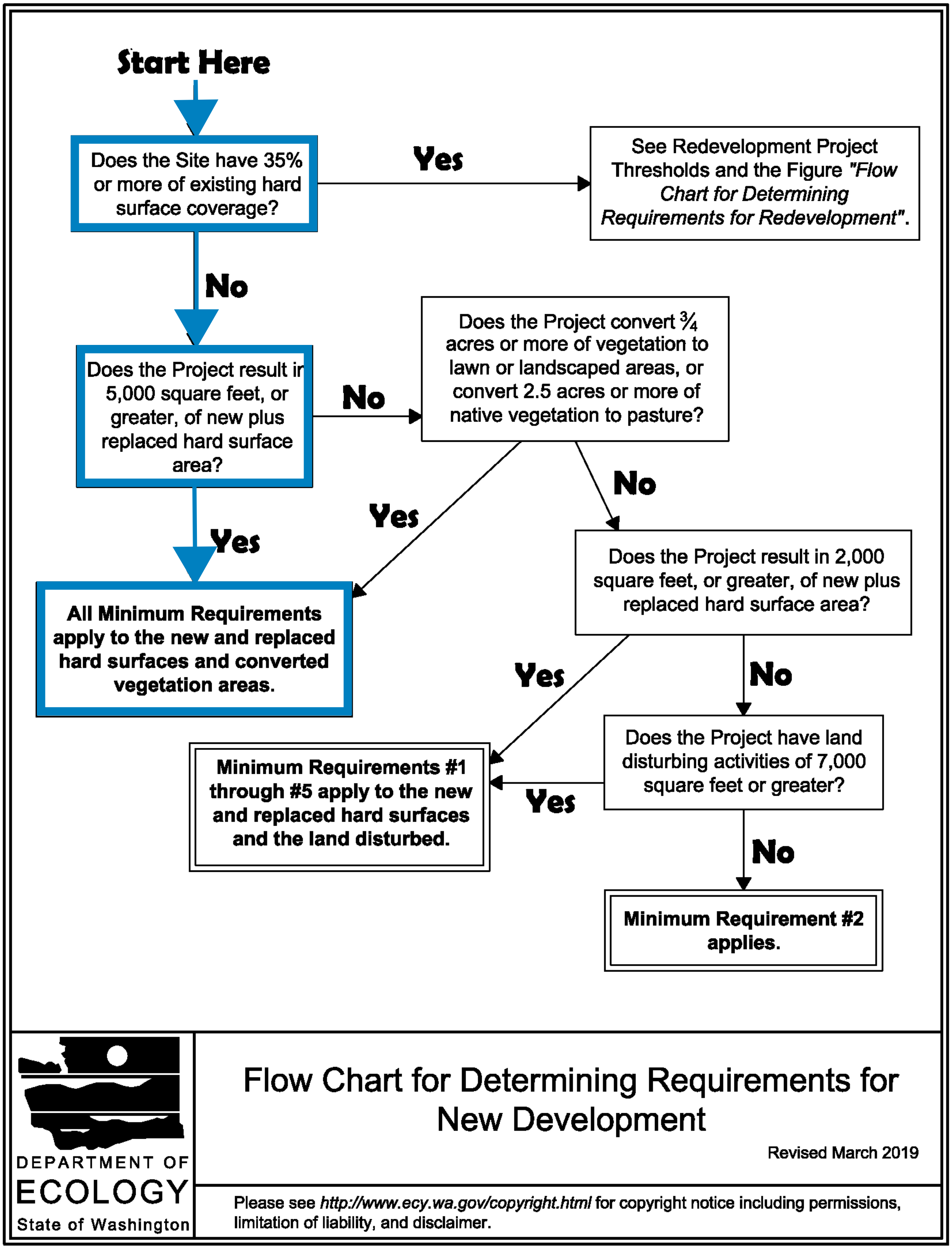
NOAA ATLAS 2, Volume IX
Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

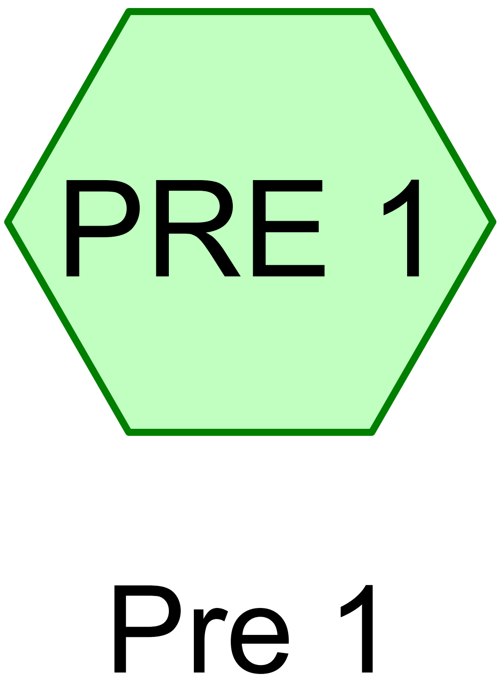
☆ U.S. GOVERNMENT PRINTING OFFICE : 1974 O - 507-860

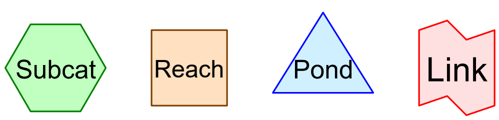
Long-Term Source Control Best Management Practices & Hydraulic Calculations Appendix C

2019 SWMMWW Figure I-3.1	**C1**
HydroCAD Predeveloped Report	**C2**
HydroCAD Wetpond Water Quality Report	**C3**
HydroCAD 25-Year Storm Report	**C4**

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







Routing Diagram for 2418 - HydroCAD
Prepared by {enter your company name here}, Printed 3/19/2025

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-YR	Type IA 24-hr		Default	24.00	1	4.50	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
8.000	85	(PRE 1)
8.000	**85**	**TOTAL AREA**

Summary for Subcatchment PRE 1: Pre 1

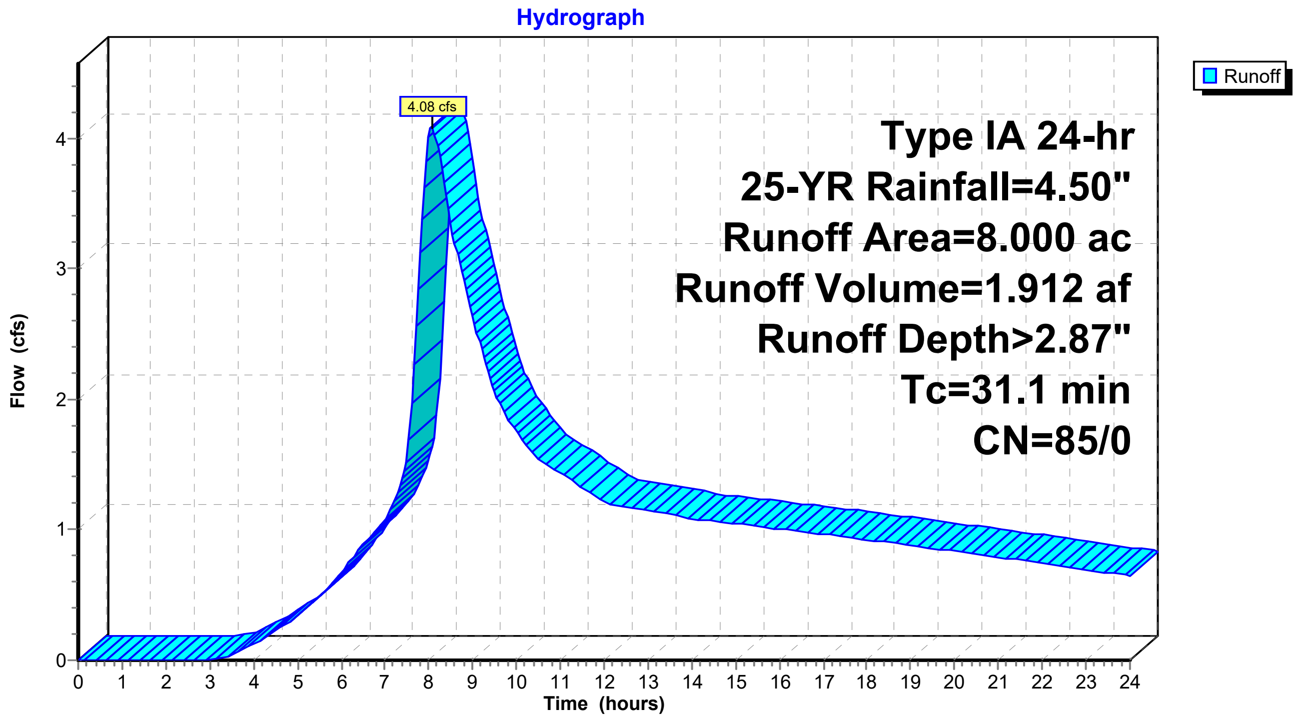
Runoff = 4.08 cfs @ 8.06 hrs, Volume= 1.912 af, Depth> 2.87"

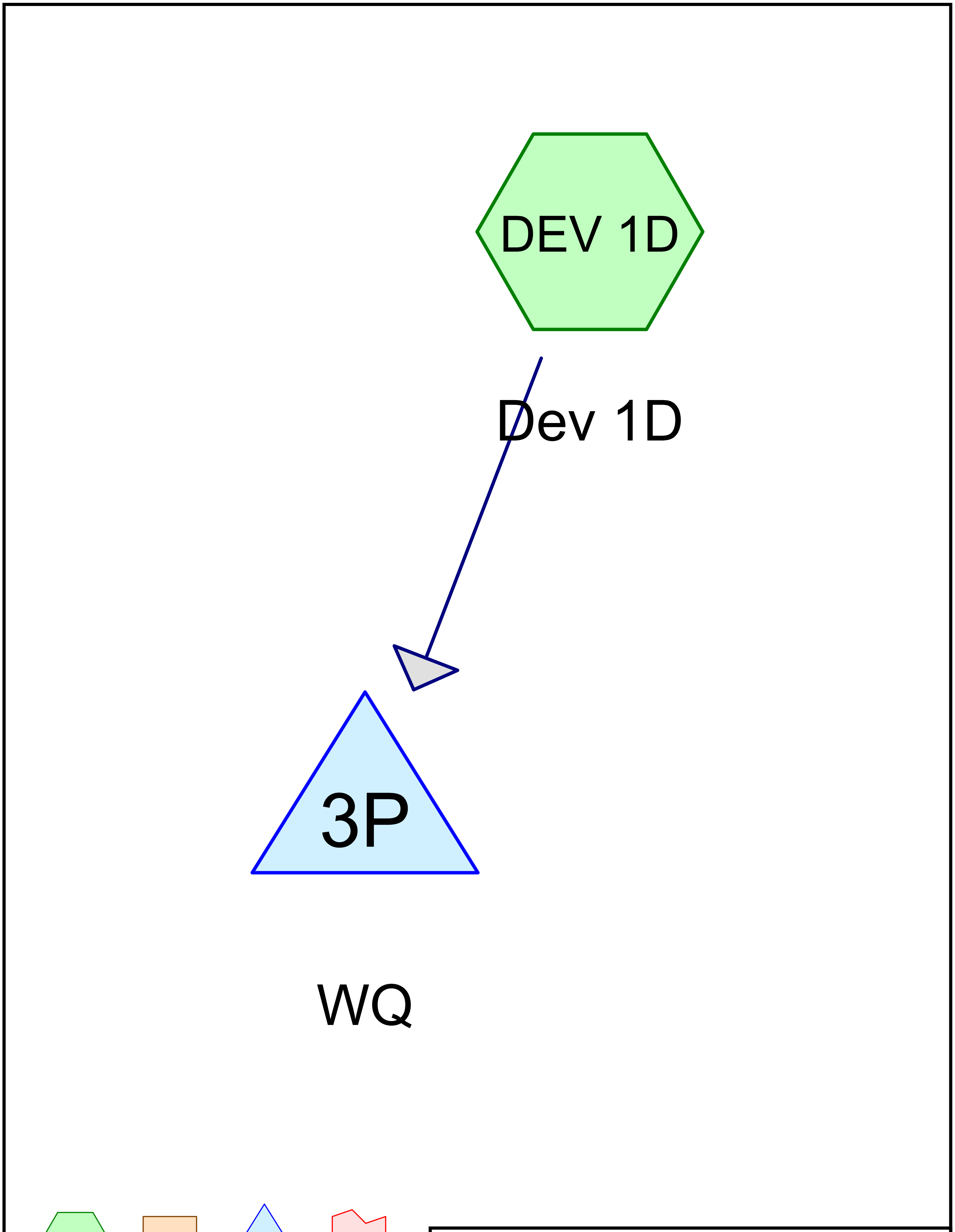
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=4.50"

	Area (ac)	CN	Description
*	8.000	85	
	8.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.1					**Direct Entry,**

Subcatchment PRE 1: Pre 1





Routing Diagram for 2418 - HydroCAD
Prepared by {enter your company name here}, Printed 3/19/2025
HydroCAD® 10.10-5a s/n 05048 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQ	Type IA 24-hr		Default	24.00	1	1.82	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.280	98	(DEV 1D)
1.730	86	(DEV 1D)
4.010	**93**	**TOTAL AREA**

Summary for Subcatchment DEV 1D: Dev 1D

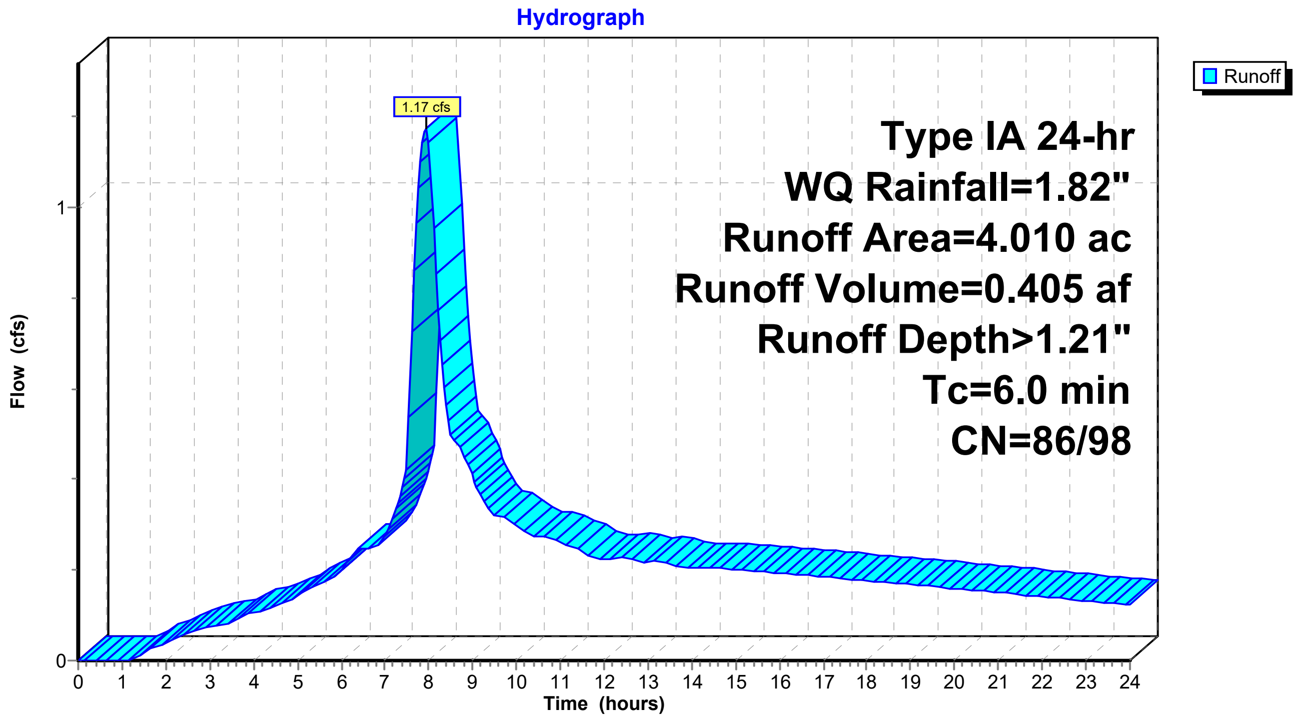
Runoff = 1.17 cfs @ 7.95 hrs, Volume= 0.405 af, Depth> 1.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.82"

	Area (ac)	CN	Description
*	2.280	98	
*	1.730	86	
	4.010	93	Weighted Average
	1.730		43.14% Pervious Area
	2.280		56.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DEV 1D: Dev 1D



Summary for Pond 3P: WQ

Inflow Area = 4.010 ac, 56.86% Impervious, Inflow Depth > 1.21" for WQ event
Inflow = 1.17 cfs @ 7.95 hrs, Volume= 0.405 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

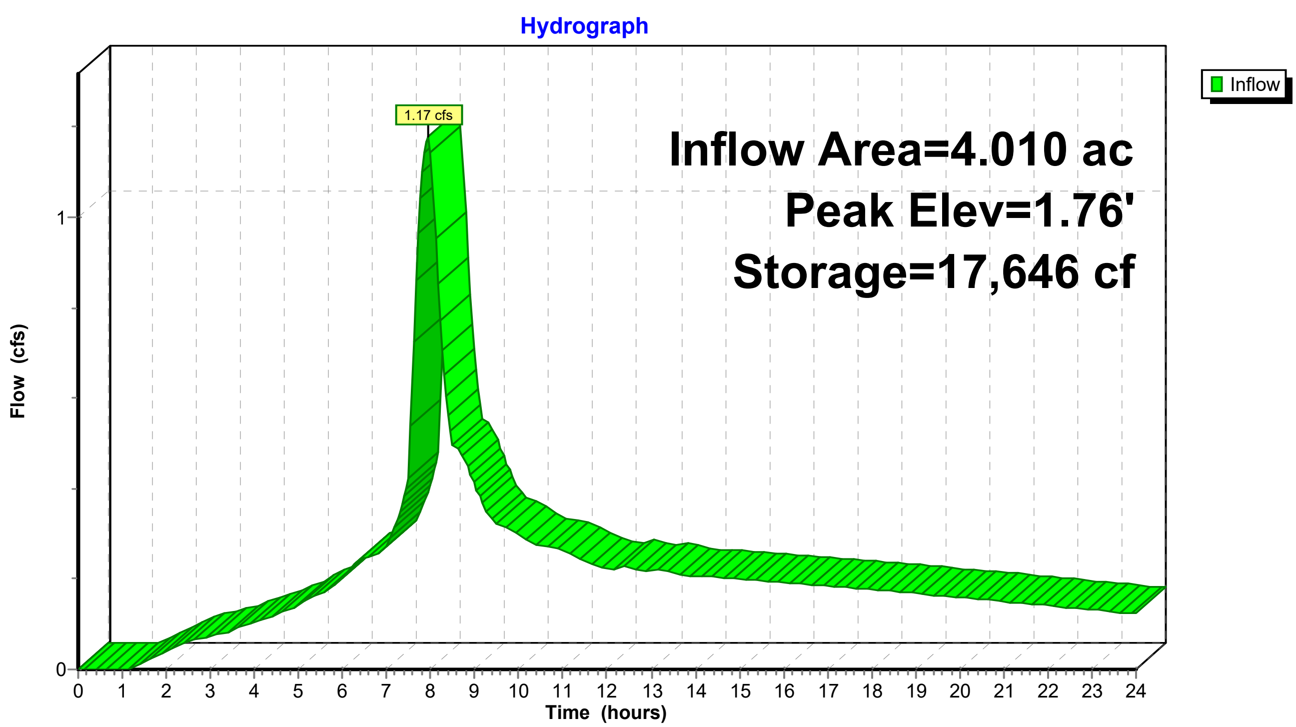
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1.76' @ 24.00 hrs Surf.Area= 9,156 sf Storage= 17,646 cf

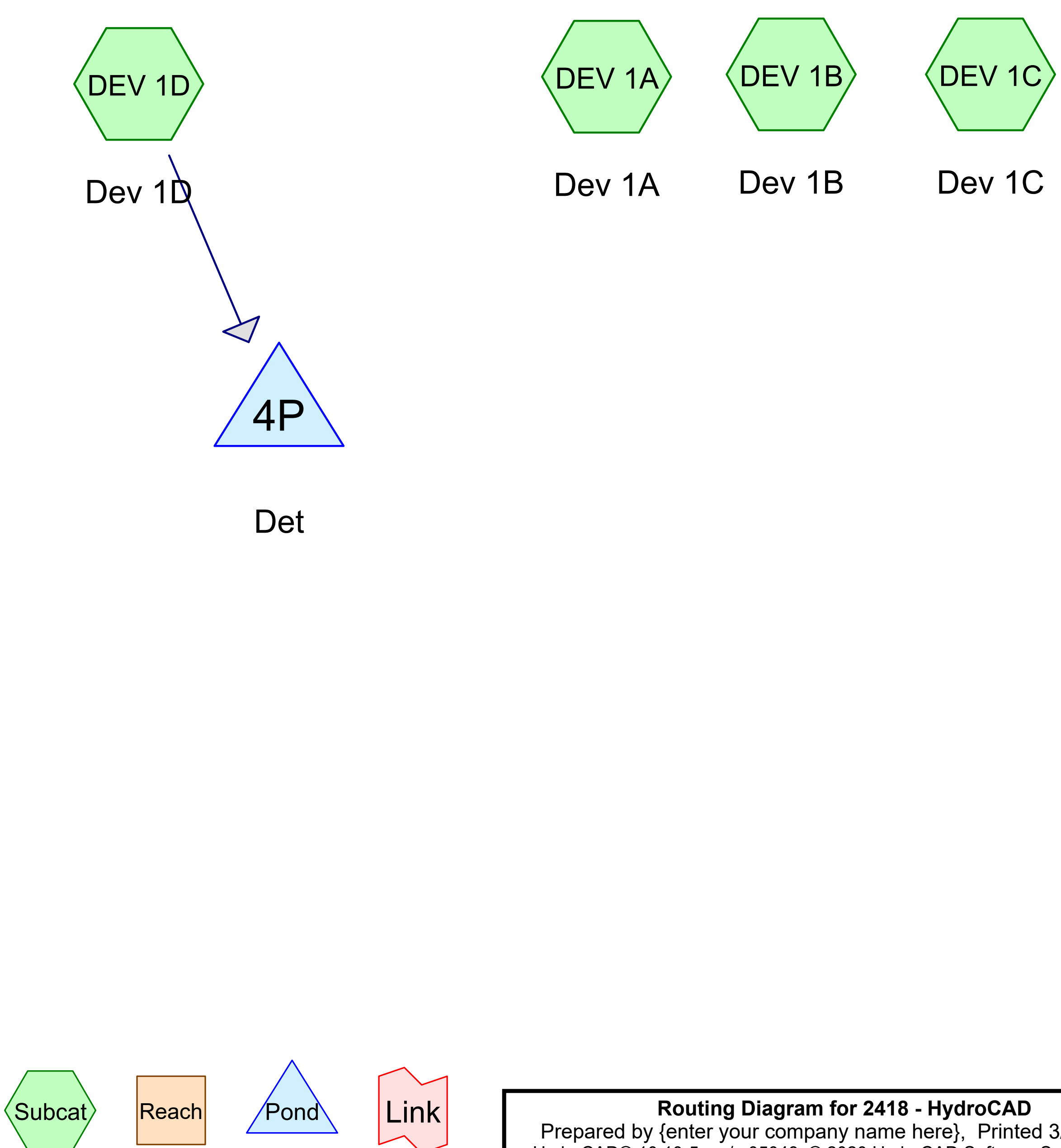
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	-1.00'	42,493 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
-1.00	1,334	0	0
0.00	6,500	3,917	3,917
1.00	7,946	7,223	11,140
2.00	9,536	8,741	19,881
3.00	11,270	10,403	30,284
4.00	13,148	12,209	42,493

Pond 3P: WQ





Routing Diagram for 2418 - HydroCAD
Prepared by {enter your company name here}, Printed 3/19/2025
HydroCAD® 10.10-5a s/n 05048 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-YR	Type IA 24-hr		Default	24.00	1	4.50	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.170	98	(DEV 1A, DEV 1B, DEV 1C, DEV 1D)
3.830	86	(DEV 1A, DEV 1B, DEV 1C, DEV 1D)
8.000	**92**	**TOTAL AREA**

Summary for Subcatchment DEV 1A: Dev 1A

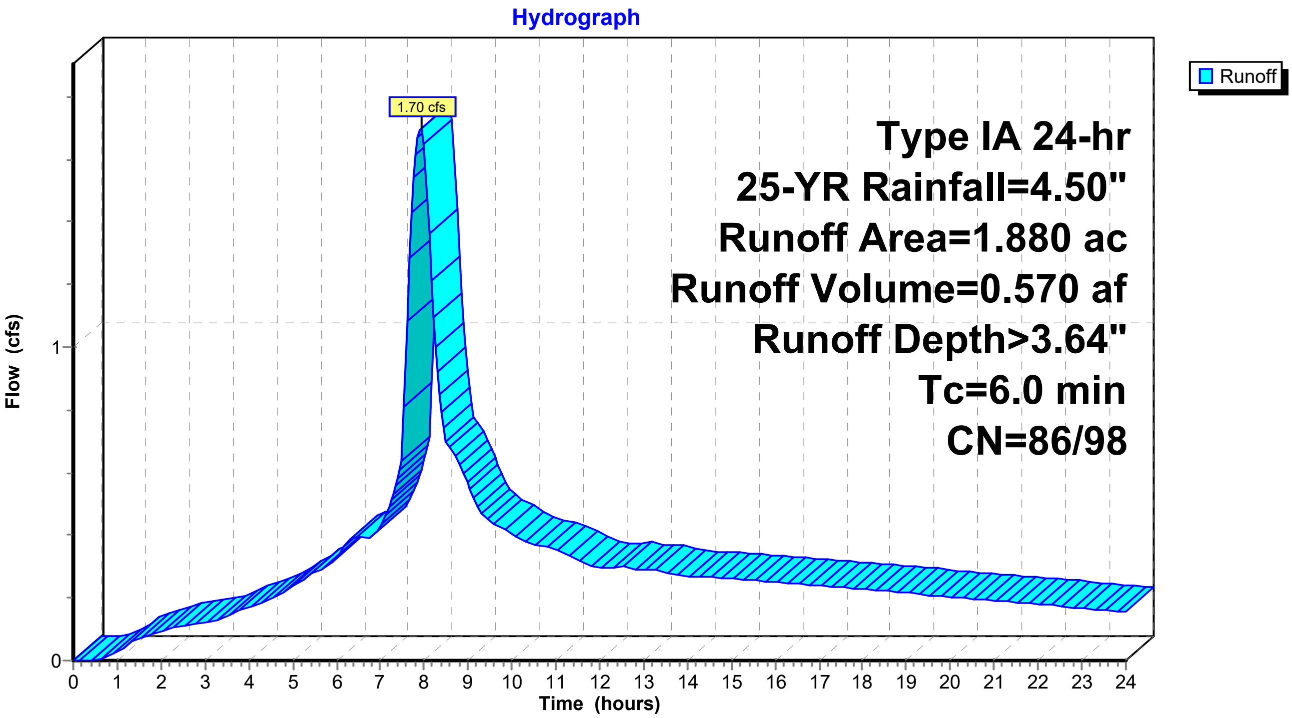
Runoff = 1.70 cfs @ 7.94 hrs, Volume= 0.570 af, Depth> 3.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=4.50"

	Area (ac)	CN	Description
*	0.960	98	
*	0.920	86	
	1.880	92	Weighted Average
	0.920		48.94% Pervious Area
	0.960		51.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DEV 1A: Dev 1A



Summary for Subcatchment DEV 1B: Dev 1B

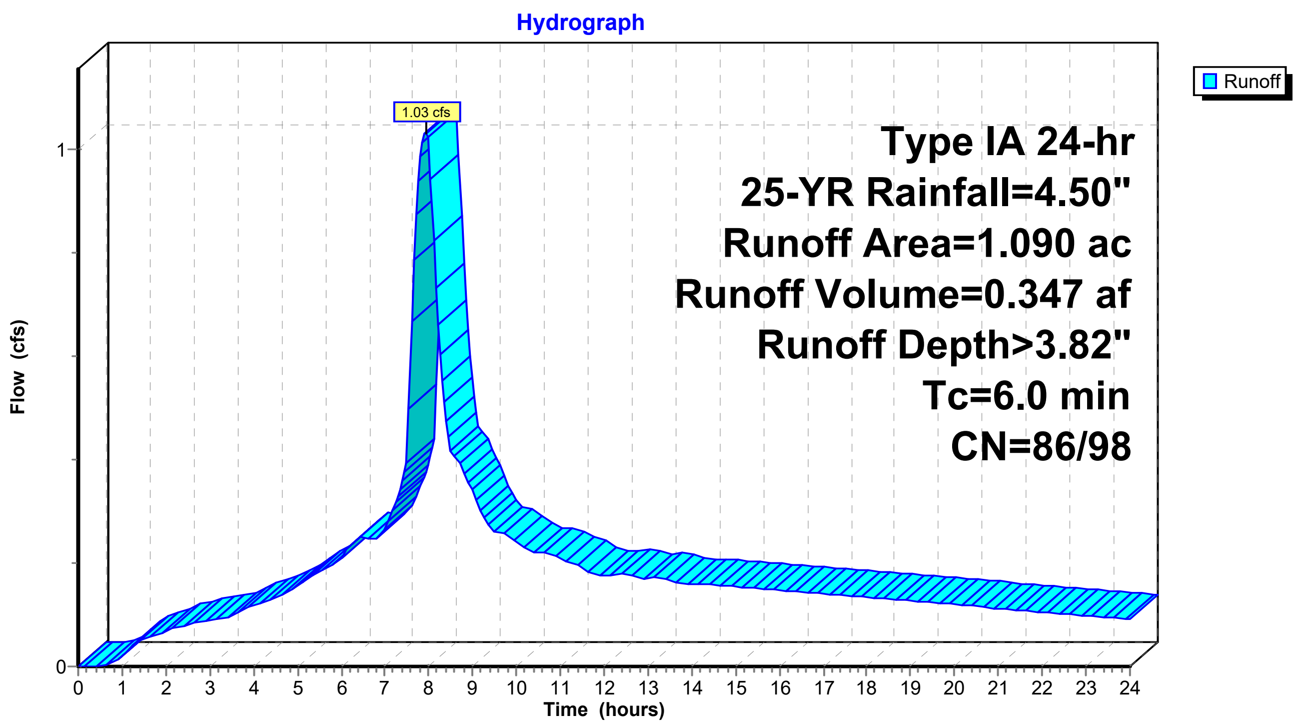
Runoff = 1.03 cfs @ 7.93 hrs, Volume= 0.347 af, Depth> 3.82"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=4.50"

	Area (ac)	CN	Description
*	0.710	98	
*	0.380	86	
	1.090	94	Weighted Average
	0.380		34.86% Pervious Area
	0.710		65.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DEV 1B: Dev 1B



Summary for Subcatchment DEV 1C: Dev 1C

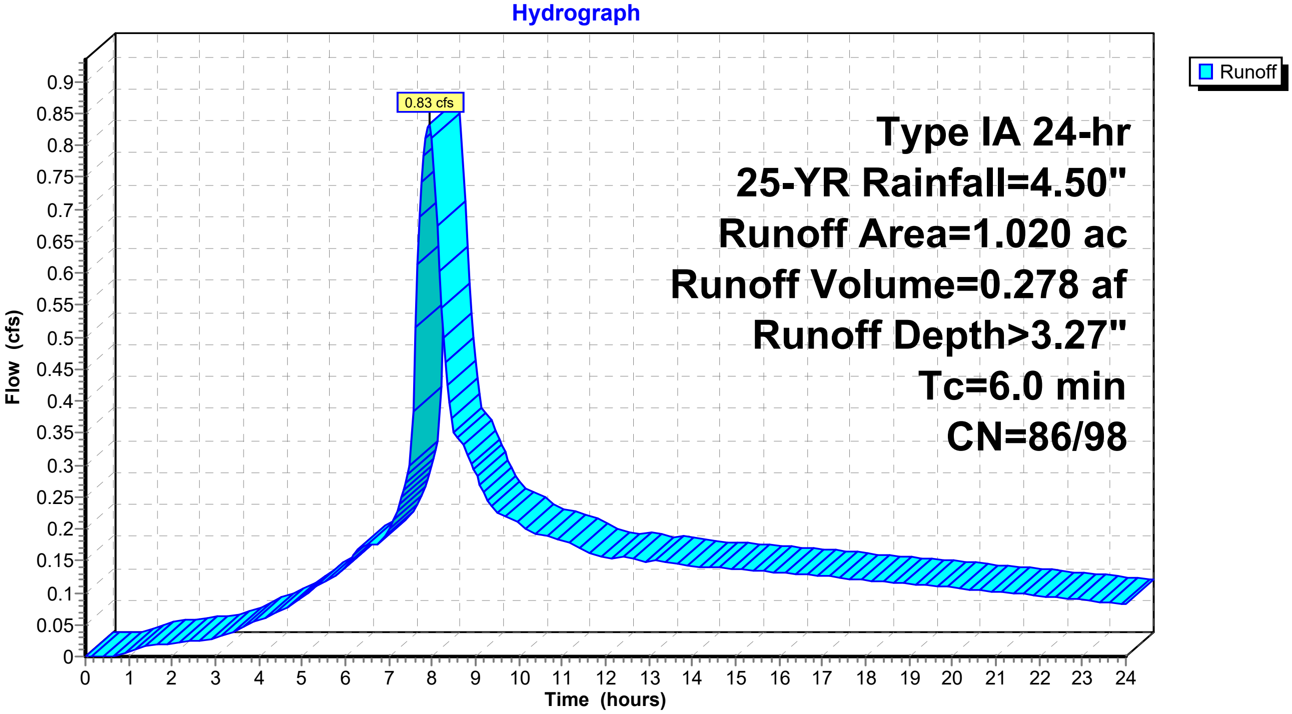
Runoff = 0.83 cfs @ 7.95 hrs, Volume= 0.278 af, Depth> 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=4.50"

	Area (ac)	CN	Description
*	0.220	98	
*	0.800	86	
	1.020	89	Weighted Average
	0.800		78.43% Pervious Area
	0.220		21.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DEV 1C: Dev 1C



Summary for Subcatchment DEV 1D: Dev 1D

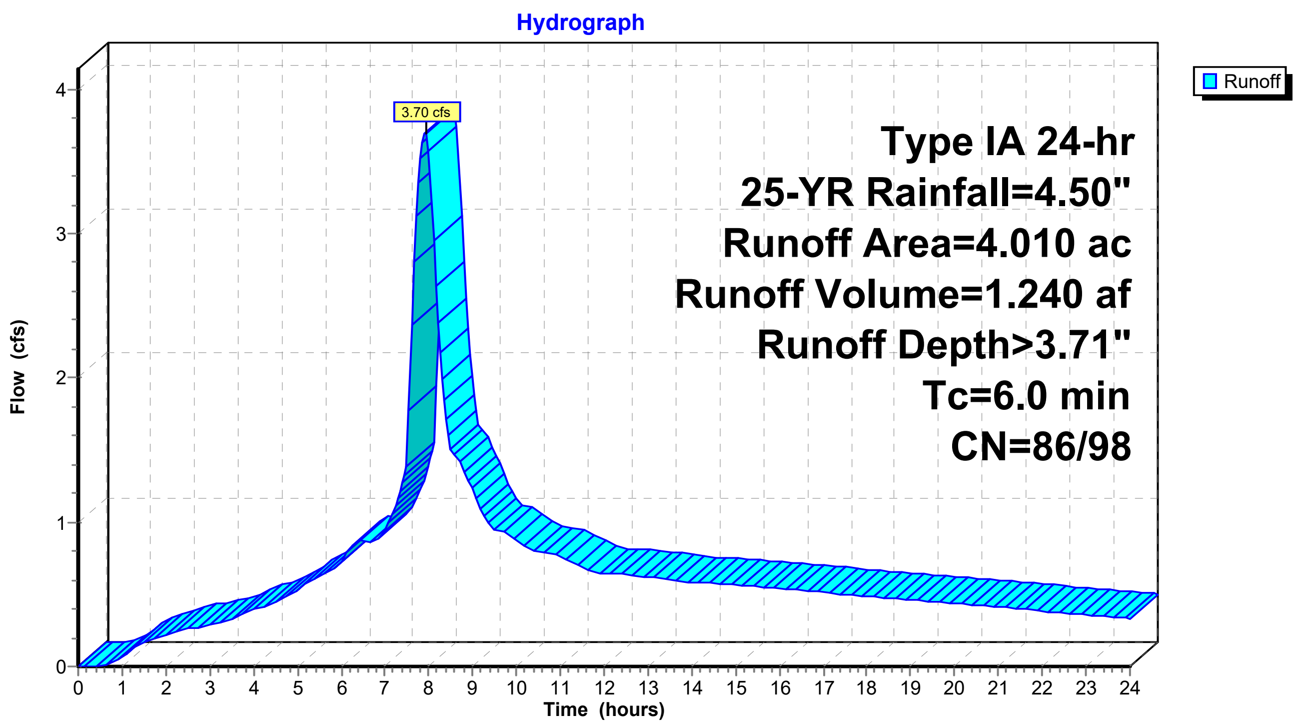
Runoff = 3.70 cfs @ 7.93 hrs, Volume= 1.240 af, Depth> 3.71"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=4.50"

	Area (ac)	CN	Description
*	2.280	98	
*	1.730	86	
	4.010	93	Weighted Average
	1.730		43.14% Pervious Area
	2.280		56.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment DEV 1D: Dev 1D



Summary for Pond 4P: Det

Inflow Area = 4.010 ac, 56.86% Impervious, Inflow Depth > 3.71" for 25-YR event
Inflow = 3.70 cfs @ 7.93 hrs, Volume= 1.240 af
Outflow = 0.51 cfs @ 17.03 hrs, Volume= 0.762 af, Atten= 86%, Lag= 545.8 min
Primary = 0.51 cfs @ 17.03 hrs, Volume= 0.762 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 5.32' @ 17.03 hrs Surf.Area= 11,397 sf Storage= 22,930 cf

Plug-Flow detention time= 417.8 min calculated for 0.762 af (61% of inflow)
Center-of-Mass det. time= 193.5 min (883.4 - 689.9)

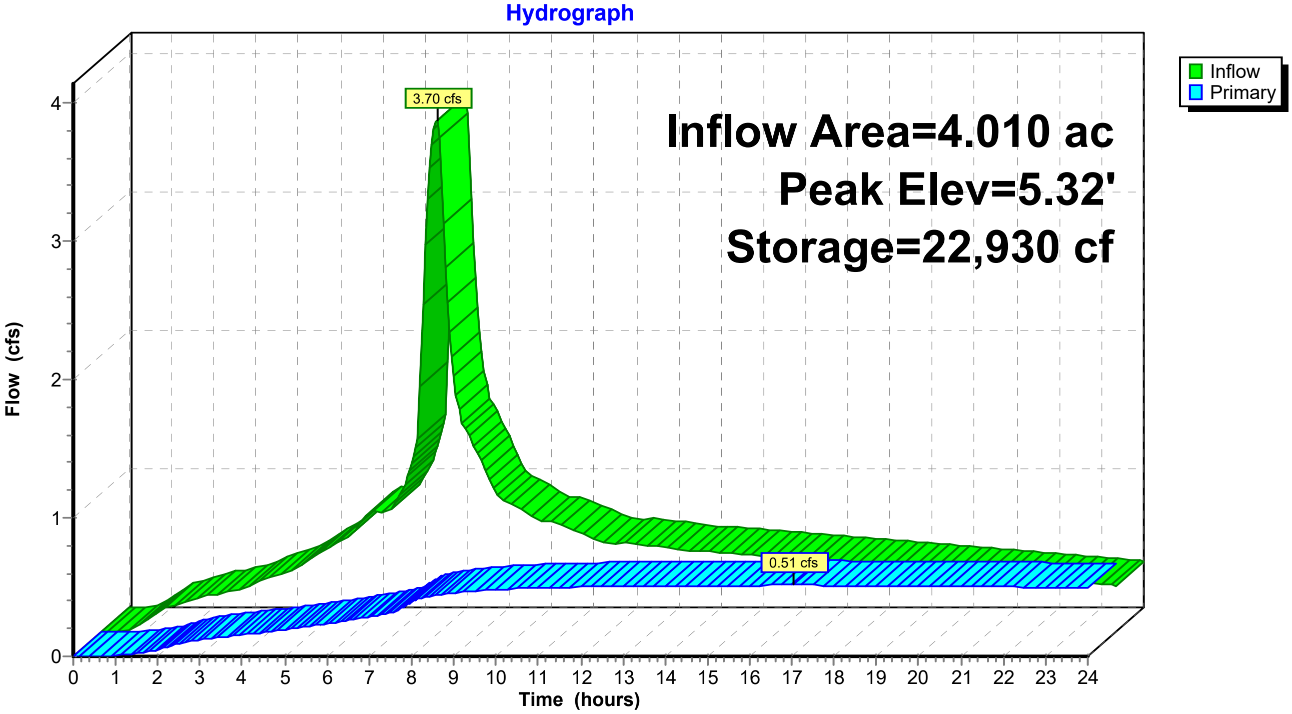
Volume	Invert	Avail.Storage	Storage Description
#1	3.05'	57,876 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 0.75

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.05	11,761	0	0
4.00	13,148	11,832	11,832
5.00	14,678	13,913	25,745
6.00	16,280	15,479	41,224
7.00	17,954	17,117	58,341
8.00	19,700	18,827	77,168

Device	Routing	Invert	Outlet Devices
#1	Primary	3.05'	**3.6" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	5.33'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.51 cfs @ 17.03 hrs HW=5.32' (Free Discharge)
├─**1=Orifice/Grate** (Orifice Controls 0.51 cfs @ 7.26 fps)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 4P: Det


Hydrograph
Inflow
Primary
3.70 cfs
0.51 cfs
Inflow Area=4.010 ac
Peak Elev=5.32'
Storage=22,930 cf
Flow (cfs)
0
1
2
3
4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

Geotechnical Report Appendix D

REDMOND GEOTECHNICAL SERVICES

Geotechnical Investigation and Consultation Services

Proposed 48th Avenue Residential Development Site

Parcel #'s 108990100, 109000100, 10910100, 109020100, 109020100, 109230100 & 109240100

2019 46th Avenue & 2025 48th Avenue

Longview (Cowlitz County), Washington

for

Hinton Development Corp.

Project No. 1209.004.G
September 6, 2024

REDMOND GEOTECHNICAL SERVICES

September 6, 2024

Ms. Nikole Hinton
Hinton Development Corp.
14010 NE 3rd Court, Suite A-106
Vancouver, Washington 98685

Dear Ms. Hinton:

Re: Geotechnical Investigation and Consultation Services,
Proposed 48th Avenue Residential Development Site,
#'s 108990100/109000100/109010100/109020100/109030100/109230100 & 109240100,
2019 46th Avenue and 2025 48th Avenue, Longview (Cowlitz County), Washington

Submitted herewith is our report entitled "Geotechnical Investigation and Consultation Services, Proposed 48th Avenue Residential Development Site, Parcel #'s 108990100/109000100/10910100/109020100/10903011/109230100 & 109240100, 2019 46th Avenue and 2025 48th Avenue, Longview (Cowlitz County), Washington". The scope of our services was outlined in our formal discussions with Ms. Nikole Hinto of Hinton Development Corp on July 18, 2024. Authorization of our services was provided by Ms. Nikole Hinton of Hinton Development Corp on August 8, 2024.

During the course of our investigation, we have kept you and/or others advised of our schedule and preliminary findings. We appreciate the opportunity to assist you with this phase of the project. Should you have any questions regarding this report, please do not hesitate to call.

Sincerely,

Daniel M. Redmond, P.E., G.E.
President/Principal Engineer

DANIEL M. REDMOND
STATE OF WASHINGTON
28831
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 3-22-26

Cc: Mr. Scott Taylor
SGA Engineering

PO Box 20547 • Portland, Oregon 97294 • Fax 503/286-7176 • Phone 503/285-0598

TABLE OF CONTENTS

	Page No.
INTRODUCTION	1
PROJECT DESCRIPTION	1
SCOPE OF WORK	2
SITE CONDITIONS	3
Regional Geology	3
Geologic Maps	3
Surface Conditions	4
Subsurface Soil Conditions	4
Groundwater	5
INFILTRATION TESTING	5
LABORATORY TESTING	6
SEISMICITY AND EARTHQUAKE SOURCES	6
Liquefaction	7
Lateral Spreading	8
Landslides	8
Surface Rupture	8
Tsunami and Seiche	8
Flooding and Erosion	9
CONCLUSIONS AND RECOMMENDATIONS	9
General	9
Site Preparation	10
Foundation Support	11

Table of Contents (continued)

Conventional Shallow Foundations 11

Floor Slab Support 12

Retaining/Below Grade Walls 13

Pavements 14

Vehicle Drive Areas 14

Pavement Subgrade, Base Course & Asphalt Materials 14

Wet Weather Grading and Soft Spot Mitigation 15

Shrink-Swell and Frost Heave 15

Excavations/Slopes 15

Surface Drainage/Groundwater 16

Design Infiltration Rates 16

Seismic Design Considerations 17

CONSTRUCTION MONITORING AND TESTING 17

CLOSURE AND LIMITATIONS 18

LEVEL OF CARE 18

REFERENCES 19

ATTACHMENTS

Figure No. 1 - Site Vicinity Map
Figure No. 2 - Site Exploration Plan
Figure No. 3 - Typical Perimeter Footing/Retaining Wall Drain Detail

APPENDIX A

Test Pit Logs and Laboratory Test Data

GEOTECHNICAL INVESTIGATION AND CONSULTATION SERVICES
PROPOSED 48TH AVENUE RESIDENTIAL DEVELOPMENT SITE
#'s 108990100/109000100/109010100/109020100/109030100/109230100 & 109240100
2019 46TH AVENUE AND 2025 48th AVENUE
LONGVIEW (COWLITZ COUNTY), WASHINGTON

INTRODUCTION

Redmond Geotechnical Services, LLC is pleased to submit to you the results of our Geotechnical Investigation and Consultation Services at the site of the proposed new 48th Avenue residential development project which is to be located at an existing residential and/or farm property which is sited to the east of 48th Avenue and west of 46th Avenue in Longview (Cowlitz County), Washington. The general location of the subject site, which encompasses seven (7) separate tax lots and a total area of approximately 8.61 acres, is shown on the Site Vicinity Map, Figure No. 1. The purpose of our geotechnical investigation services at this time was to explore the existing subsurface soils and/or groundwater conditions across the subject site and to develop and/or provide appropriate geotechnical design and construction recommendations for the proposed new single-family project.

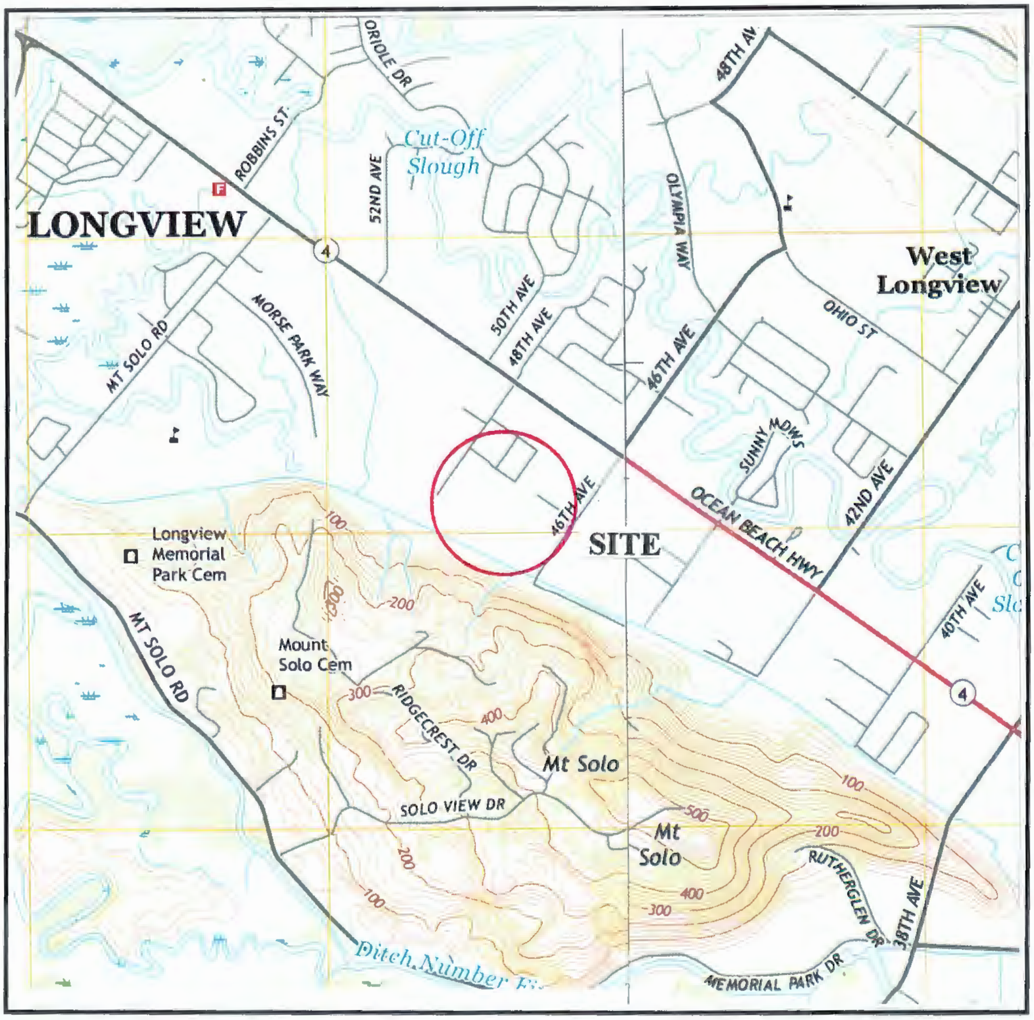
PROJECT DESCRIPTION

Based on a review of the proposed site development plan, we understand that present plans for the project will consist of the development of sixty-three (63) new single-family residential home sites (lots) which will range in size from about 3,000 to 3,900 square feet. Reportedly, the new single-family residential homes will be single- and/or two-story wood-frame structures with a raised wooden post-and-beam floor system and will range in size from about 1,200 to 1,500 square feet.

Support for the proposed new single-family residential homes will likely consist of conventional shallow continuous (strip) footings although some individual (spread) column-type footings are also possible. Structural loading information, although currently unavailable, is expected to be fairly typical and/or light for this type of single- and/or two-story wood-frame structure and should result in maximum dead plus live continuous (strip) and individual (spread) column-type footings loads on the order of about 2.0 to 3.0 kips per lineal foot (klf) and 10 to 25 kips, respectively.

Other associated improvements for the project will also include a new paved public and/or private access road as well as a possible stormwater detention facility.

Earthwork and grading operations associated with bringing the subject site and/or single-family residential property to finish design grades are presently unknown but are generally expected to result in relatively minor cuts and/or fills of about one (1) to two (2) feet.



COAL CREEK QUADRANGLE
WASHINGTON-OREGON
7.5-MINUTE SERIES

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

SITE VICINITY MAP

Project No. 1209.004.G	48TH AVENUE SUBDIVISION SITE 2019 46TH AVENUE/LONGVIEW, WA	Figure No. 1

SCOPE OF WORK

The purpose of our geotechnical studies was to evaluate the overall existing site subsurface soil and/or groundwater conditions underlying the site with regard to the proposed new single-family residential construction and/or any associated impacts or concerns with respect to the proposed residential development at the site as well as to provide appropriate geotechnical design and construction recommendations for the project. Specifically, our geotechnical investigation included the following scope of work items:

1. A detailed field reconnaissance and subsurface exploration program of the soil and ground water conditions underlying the site by means of five (5) exploratory test holes. The exploratory test holes were advanced to depths of about seven (7) to eight (8) feet beneath existing site grades with portable Geoprobe test equipment. Additionally, field infiltration testing was also performed at the time of the field work. The approximate locations of the test holes are shown on the Site Exploration Map, Figure No. 2.

2. Laboratory testing to help evaluate and identify pertinent physical and engineering properties of the subsurface soils encountered at the site relative to the planned site development and construction at the site. The laboratory testing program included tests to help evaluate the natural (field) moisture content and dry density, maximum dry density and optimum moisture content, Atterberg Limits and gradational characteristics as well as consolidation and "R"-value tests.

3. A literature review and engineering evaluation and assessment of the regional seismicity to evaluate the potential ground motion hazard(s) at the subject site. The evaluation and assessment included a review of the regional earthquake history and sources such as potential seismic sources, maximum credible earthquakes, and reoccurrence intervals as well as a discussion of the possible ground response to the selected design earthquake(s), fault rupture, landsliding, liquefaction, and tsunami and seiche flooding.

4. Engineering analyses utilizing the field and laboratory data as a basis for furnishing recommendations for foundation support of the proposed new residential structures. Recommendations include maximum design allowable contact bearing pressure(s) for lightly loaded structures, depth of footing embedment, estimates of foundation settlement, lateral soil resistance, and foundation subgrade preparation. Additionally, our report includes recommendations regarding site preparation, placement and compaction of structural fill materials, suitability of the on-site soils for use as structural fill, criteria for import fill materials, and preparation of foundation and/or concrete floor slab subgrades (if required). Further, we have provided seismic design parameters for the single-family residential project.

5. Flexible pavement design and construction recommendations for the proposed new private access drives and parking area improvements.

SITE CONDITIONS

Regional Geology

The site is located within the Kelso-Cathlamet area which was formed when the volcanic rocks of the Oregon Coast Range, originally formed as submarine islands, were added onto the North American Continent. The addition of the volcanic rocks caused inland downwarping, forming a depression in which various types of marine sedimentary rocks accumulated. Approximately 15 million years ago, these marine sediments were covered by Columbia River Basalts that flowed down the Columbia River Gorge. Later, uplift and tilting of these Columbia River Basalts, the Oregon Coast Range, and the western Cascade Range formed the trough-like character of the Kelso-Cathlamet area that we observe today. Catastrophic floods later washed into the Columbia River Basin approximately 12,000 to 15,000 years ago and deposited fine to course-grained sedimentary assemblages (Pleistocene age Flood Deposits) mapped throughout the Longview area.

Geologic Maps

Available geologic mapping of the area and/or subject site indicates that the subject site is underlain by Quaternary aged alluvium consisting of silt, sand, organic rich clay and minor amounts of gravel deposited by the Cowlitz and Columbia Rivers. This alluvium may be on the order of 150 to 200 feet in thickness and is underlain by the Troutdale Formation. The Troutdale Formation, consisting of conglomerate with minor sand and silt interbeds deposited by the Columbia River, is underlain by the Columbia River Basalts at depths ranging from approximately 400 to 800 feet. The mapping suggests that the Columbia River Basalts may be inter-fingered with the Cowlitz River Mudstones near the contact of the Troutdale Formation and underlying Columbia River Basalts.

The region is considered to be seismically active and may be affected by a large offshore subduction zone earthquake as well as smaller earthquakes that occur along local crustal faults. While faulting appears to have played a minor role in the structural development of the area, several faults are mapped in the Longview-Kelso area, the most notable being the Kelso Fault. The Kelso Fault is a large north-trending structure that extends from Kelso northward through the east side of Rocky Point. Throughout the Kelso area, basalt on the west side of the fault is in juxtaposition with sedimentary rocks on the east side of the structure. There is no evidence as to the relative movement of the walls or the inclination of the fault plane.

The available earthquake hazard mapping (Open File Report 2004-20) indicates that the site is located in an area with a relatively moderate to high earthquake hazard. OFR 2004-20 defines the relative earthquake hazard into six (6) zones, A through F, with zone F representing the highest relative hazard. The relative hazard is based on the evaluation of potential soil liquefaction, earthquake induced landsliding, and amplification of ground shaking during a seismic event. The resulting zoning indicates areas that have the greatest tendency to experience damage due to any of and/or a combination of these individual hazards.

This mapping indicates that the subject site has a relatively high liquefaction hazard, a moderate hazard (Do) of amplification of ground shaking, and a low hazard of earthquake induced landsliding. OFR 2004-20 indicates that the amplification factor for peak ground accelerations is less than or equal to 1.

Surface Conditions

The subject and/or proposed new 48th Avenue residential development property is generally irregular in shape and encompasses a total plan area of approximately 8.61 acres. The proposed new 48th Avenue residential development site is roughly bounded to the east by 46th Avenue, to the west by 48th Avenue, to the north by developed residential land and to the south by farm property. At the time of our work, the subject proposed new 48th Avenue residential development site was generally improved and contained one (1) existing single-family residential structure as well as associated site improvements within the southeasterly portion of the site while the remainder of the subject property consist of existing undeveloped farm and/or agricultural land. However, we understand that the northwesterly corner of the subject property (i.e., Parcel #109230100/2025 48th Avenue) may also have previously been developed with a residential home and/or farmhouse.

Topographically, the site is characterized as relatively flat-lying to gently sloping terrain descending downward towards the south/southwest with overall topographic relief across the site estimated at about two (2) to three (3) feet and is estimated to lie between about Elevation 8 feet and Elevation 10 feet.

Subsurface Soil Conditions

Our understanding of the overall subsurface soil and groundwater conditions underlying the site was developed by means of five (5) exploratory test holes (TH-#1 through TH-#5) advanced to a depth of about seven (7) to eight (8) feet beneath existing site grades on August 22, 2024 with portable Geoprobe equipment. The location of the exploratory test holes were located in the field by marking off distances from existing and/or known site features and are shown in relation to the existing site features and/or proposed site improvements on the Site Exploration Map, Figure No. 2. Detailed logs of the test hole explorations, presenting conditions encountered at each location explored, are presented in Appendix A, Figure No's. A-5 through A-7.

The exploratory test holes were observed by staff from Redmond Geotechnical Services, LLC who logged the test hole explorations and obtained representative samples of the subsurface soils encountered beneath the site. Additionally, the elevation of the exploratory test holes were referenced from the Coal Creek USGS Quadrangle and should be considered as approximate. All subsurface soils encountered at the site and/or within the exploratory test boring were logged and classified in general conformance with the Unified Soil Classification System (USCS) which is outlined on Figure No. A-4.

The test hole explorations revealed that the subject site is generally underlain at depth by native soil deposits comprised of lacustrine and fluvial sedimentary soil deposits of Pleistocene age.

SITE EXPLORATION PLAN

48TH AVENUE SUBDIVISION SITE
2019 46TH AVENUE/LONGVIEW, WA

Project No. 1209.004.G

LEGEND

TH-#5 Indicates approximate location of exploratory test hole

1:2,257

0 0.02 0.04 0.07 mi

0 0.03 0.06 0.11 km

Figure No. 2

Specifically, the native subsurface soils encountered across the proposed 48th Avenue residential development site consist an upper unit of topsoil materials comprised of dark brown, moist, soft, organic, sandy, clayey silt to a depth of about 12 to 14 inches. These surficial topsoil materials were inturn underlain by medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey silt to a depth of at least eight (8) feet beneath the existing site and/or surface grades. These sandy, clayey silt subgrade soils become very moist to wet at a depth of about seven (7) feet and are best characterized by relatively low to moderate strength and moderate compressibility.

Groundwater

Groundwater was generally not encountered at the time of our field work within any of the exploratory test holes (TH-#1 through TH-#5) to depths of up to eight (8) feet beneath the existing site and/or surface grades. However, the native sandy, clayey silt subgrade soils were found to be very moist to wet at a depth of about seven (7) feet beneath the existing site and/or surface grades. Additionally, due to proximity of nearby sloughs and/or waterways as well as the nearby Columbia River and/or Cowlitz River, we anticipate that groundwater will be encountered at a depth of about five (5) feet beneath existing site grades during the wet season.

As such, groundwater elevations at the site may fluctuate seasonally in accordance with rainfall conditions and will seasonally perch near surface elevations of the site during periods of prolonged and/or heavy rainfall conditions.

INFILTRATION TESTING

We previously performed one (1) field infiltration test at the site on August 22, 2024. The infiltration testing was performed in test hole TH-#3 at a depth of about three (3) feet beneath existing site grades. The subgrade soils consisted of sandy, clayey silt.

The field infiltration testing was performed in general conformance with current EPA and/or the Cowlitz County Encased Single-Sleeve Falling Head Test Method which consisted of driving a 3-inch inner diameter PVC pipe approximately 6 inches into the exposed soil horizon at the test location. Using a steady water flow, water was discharged into the pipe and allowed to penetrate the subgrade soils. The water level was adjusted over a two (2) hour period and allowed to achieve a saturated subgrade soil condition consistent with the bottom elevation of the surrounding test pit excavation. Following the required saturation period, water was again added into the pipe and the time and/or rate at which the water level dropped was monitored and recorded. Each 6-inch drop in the water level was recorded until a consistent infiltration rate was observed and/or repeated.

Based on the results of the field infiltration testing, we have found that the sandy, clayey silt subgrade soil deposits possess an ultimate infiltration rate on the order of about 0.5 inches per hour (in/hr).

LABORATORY TESTING

Representative samples of the on-site subsurface soils were collected at selected depths and intervals from the supplemental test boring explorations and returned to our laboratory for further examination and testing and/or to aid in the classification of the subsurface soils as well as to help evaluate and identify their engineering strength and compressibility characteristics. The laboratory testing consisted of visual and textural sample inspection, moisture content and dry density determinations, maximum dry density and optimum moisture content, Atterberg Limits and gradation analyses as well as consolidation and "R"-value tests. Results of the various laboratory tests are presented in the Appendix, Figure No's. A-8 through A-12.

SEISMICITY AND EARTHQUAKE SOURCES

The seismicity of the southwest Washington and northwest Oregon area, and hence the potential for ground shaking, is controlled by three separate fault mechanisms. These include the Cascadia Subduction Zone (CSZ), the mid-depth intraplate zone, and the relatively shallow crustal zone. Descriptions of these potential earthquake sources are presented below.

The CSZ is located offshore and extends from northern California to British Columbia. Within this zone, the oceanic Juan de Fuca Plate is being subducted beneath the continental North American Plate to the east. The interface between these two plates is located at a depth of approximately 15 to 20 kilometers (km). The seismicity of the CSZ is subject to several uncertainties, including the maximum earthquake magnitude and the recurrence intervals associated with various magnitude earthquakes. Anecdotal evidence of previous CSZ earthquakes has been observed within coastal marshes along the Washington and Oregon coastlines. Sequences of interlayered peat and sands have been interpreted to be the result of large Subduction zone earthquakes occurring at intervals on the order of 300 to 500 years, with the most recent event taking place approximately 300 years ago. A study by Geomatrix (1995) and/or USGS (2008) suggests that the maximum earthquake associated with the CSZ is moment magnitude (Mw) 8 to 9. This is based on an empirical expression relating moment magnitude to the area of fault rupture derived from earthquakes that have occurred within Subduction zones in other parts of the world. An Mw 9 earthquake would involve a rupture of the entire CSZ. As discussed by Geomatrix (1995) this has not occurred in other subduction zones that have exhibited much higher levels of historical seismicity than the CSZ. However, the 2008 USGS report has assigned a probability of 0.67 for a Mw 9 earthquake and a probability of 0.33 for a Mw 8.3 earthquake. For the purpose of this study an earthquake of Mw 9.0 was assumed to occur within the CSZ.

The intraplate zone encompasses the portion of the subducting Juan de Fuca Plate located at a depth of approximately 30 to 50 km below western Washington and western Oregon. Very low levels of seismicity have been observed within the intraplate zone in western Oregon and western Washington. However, much higher levels of seismicity within this zone have been recorded in Washington and California. Several reasons for this seismic quiescence were suggested in the Geomatrix (1995) study and include changes in the direction of Subduction between Oregon, Washington, and British Columbia as well as the effects of volcanic activity along the Cascade Range.

Historical activity associated with the intraplate zone includes the 1949 Olympia magnitude 7.1 and the 1965 Puget Sound magnitude 6.5 earthquakes. Based on the data presented within the Geomatrix (1995) report, an earthquake of magnitude 7.25 has been chosen to represent the seismic potential of the intraplate zone.

The third source of seismicity that can result in ground shaking within the northwest Oregon and southwest Washington area is near-surface crustal earthquakes occurring within the North American Plate. The historical seismicity of crustal earthquakes in this area is higher than the seismicity associated with the CSZ and the intraplate zone. The 1993 Scotts Mills (magnitude 5.6) and Klamath Falls (magnitude 6.0), Oregon earthquakes were crustal earthquakes.

Liquefaction

Seismic induced soil liquefaction is a phenomenon caused by a rapid increase in pore water pressure that reduces the effective stress between the soil particles to near zero. The excess buildup of pore water pressure results in the sudden loss of shear strength in a soil. In general, loose saturated granular soils with low silt and clay content and which relies on interparticle friction for strength, are the most susceptible to liquefaction until the excess pore pressure can dissipate. Soil liquefaction can cause seismically induces densification of subsurface soil which can result in settlement at the ground surface. Additionally, if the ground surface is sloped or if there is an open face such as a ravine, liquefaction can result in lateral flow (lateral spreading) of material into river channels, ground settlements and increased lateral and uplift pressures on underground structures. Buildings supported on soils that have liquefied often settle and tilt and may displace laterally. Soils located above the groundwater table cannot liquefy, but granular soils located above the water table may settle during the earthquake shaking.

We performed a liquefaction analysis for the site using data collected from the field explorations and our laboratory testing program. We considered both subduction zone and crustal earthquake scenarios. For our analysis, we modeled a subduction zone earthquake as a magnitude 9.0 event with a PGA of 0.20g. We modeled a crustal earthquake as a magnitude 6.8 event with a PGA of 0.37g. The subduction zone parameters were determined using the BC Hydro model (Abrahamson et. al. 2015) and USGS deaggregations (USGS, 2013). The crustal zone parameters were determined using ASCE 7-10 code (ASCE, 2010) and USGS deaggregations (USGS, 2013). We assumed groundwater was present at a depth of 5 feet BGS. In accordance with published literature, we assumed that fine-grained soil with a plasticity index of greater than 7 to 18 does not liquefy (Bray and Idriss, 2006). We performed independent liquefaction calculations using both SPT and CPT data from the site. We evaluated the liquefaction potential using the method proposed by Boulanger and Idriss (2014) as well as the commercial software program CLiq version 1.7 that was developed by Geologismiki and calculates liquefaction potential based on a variety of different methods.

We found that a crustal earthquake and subduction zone earthquake will produce similar results at the site. Our analysis indicates that the upper 8 feet of clayey silt has sufficient high plasticity that it is not susceptible to liquefaction. This conclusion is supported by laboratory test results that indicate the clayey silt has plasticity index value of approximately 7.

This conclusion is also supported by our engineering analysis, which indicates that the soil behaves like clay and does not liquefy. Our analysis indicates that liquefaction of the underlying medium stiff, sandy, clayey silt deposits located below a depth of about eight (8) 8 feet is also unlikely.

As such, we anticipate that the effects of any liquefaction at the site will not be significant and that liquefaction mitigation is not necessary. Additionally, in our professional opinion, seismic induced settlement caused by liquefaction will generally be less than 1.0 inches and will generally be uniform.

Lateral Spreading

As part of our seismic site hazard evaluation, we evaluated the potential for seismic induced lateral spreading at the site. However, the subject property is not located adjacent to any slopes and/or significant waterways.

In this regard, based on our evaluation and experience in the area, we anticipate that the risk of significant lateral spreading occurring at the site to be very low.

Landslides

No ancient and/or active landslides were observed or are known to be present on the subject site. Additionally, the subject property does not contain any steep slopes. As such, development of the subject site into the planned single-family residential development does not appear to present a potential geologic and/or landslide hazard provided that the site grading and development activities conform with the recommendations presented within this report.

Surface Rupture

Although the site is generally located within a region of the country known for seismic activity, no known faults exist on and/or immediately adjacent to the subject site. As such, the risk of surface rupture due to faulting is considered negligible.

Tsunami and Seiche

A tsunami, or seismic sea wave, is produced when a major fault under the ocean floor moves vertically and shifts the water column above it. A seiche is a periodic oscillation of a body of water resulting in changing water levels, sometimes caused by an earthquake. Tsunami and seiche are not considered a potential hazard at this site because the site is not near to the coast and/or there are no adjacent significant bodies of water.

Flooding and Erosion

Stream flooding is a potential hazard that should be considered in lowland areas of Cowlitz County and Longview. The FEMA (Federal Emergency Management Agency) flood maps should be reviewed as part of the design for the proposed new single-family residential structures and/or its associated site improvements. Elevations of structures on the site should be designed based upon consultants reports, FEMA (Federal Emergency Management Agency), and Cowlitz County requirements for the 100-year flood levels of any nearby creeks and/or streams such the Cowlitz and Columbia Rivers.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the results of our field explorations, laboratory testing, and engineering analyses, it is our professional opinion that the site can be developed as proposed provided that new single-family residential structure(s) and any associated site improvements described herein are designed and constructed in accordance with the recommendations contained within the following sections of this report.

The primary features of concern at the site are 1) the presence of the moderately compressible Upper sandy, clayey silt subgrade soils to depths of approximately eight (8) feet beneath existing surface grades across the site, 2) the moisture sensitivity of the near surface clayey silt subgrade soils beneath the site, and 3) the presence of the existing site and/or surface improvements across the southeasterly portion of the subject property.

In regard to the presence of the moderately compressible near surface sandy, clayey silt subgrade soils across the site, under the anticipated maximum static design continuous (strip) and individual (spread) column-type foundation loads of approximately 2 to 3 kips per lineal foot (klf) and 10 to 25 kips, respectively, as well as limits structural fill placement generally less than two (2) feet, our engineering analysis indicates that potential post-construction settlements greater than one (1) inch will not likely occur. As such, continuous (strip) and individual (spread) column footings for the support of the proposed single-family residential homes appears suitable and does not require over-excavation and/or preloading of the site.

With regard to the moisture sensitivity if the near surface clayey silt subgrade soils, we are generally of the opinion that all site grading and earthwork activities be scheduled for the drier summer months which is typically June through September.

In regard to the presence of the existing site improvements, we understand that the existing residential home will be razed from the site. In this regard, close monitoring by the Geotechnical Engineer during the site grading and earthwork operations will be required.

The following sections of this report provide specific recommendations regarding subgrade preparation and grading as well as foundation and floor slab design and construction for the new 48th Avenue residential development project.

Site Preparation

As an initial step in site preparation, we recommend that the proposed new single-family residential building area(s) and their associated structural and/or site improvement area(s) be stripped and cleared of all existing surface improvements, any existing undocumented and/or unsuitable surficial fill materials, surface debris, existing vegetation, topsoil materials, and/or any other deleterious materials present at the time of construction. In general, we envision that the site stripping to remove existing vegetation and topsoil materials will generally be about twelve (12) to fourteen (14) inches. However, localized areas requiring deeper stripping and removal may be encountered and should be evaluated and/or approved at the time of construction by the Geotechnical Engineer. The stripped and cleared materials should be properly disposed of as they are generally considered unsuitable for use/reuse as fill materials.

Following the completion of the site stripping and clearing work and prior to the placement of any new required structural fill materials and/or structural improvements, the exposed subgrade soils within the planned structural improvement area(s) should be inspected and approved by the Geotechnical Engineer and possibly proof-rolled with a half and/or fully loaded dump truck. Areas found to be soft or otherwise unsuitable should be over-excavated and removed or scarified and recompacted as structural fill. During wet and/or inclement weather conditions, proof rolling and/or scarification and recompaction as noted above may not be appropriate.

The on-site native sandy, clayey silt subgrade soils and/or existing silty and sandy fill soil materials are generally considered suitable for use/reuse as structural fill materials provided that they are free of organic materials, debris, and rock fragments in excess of about 6 inches in dimension. However, if site grading is performed during wet or inclement weather conditions, the use of the on-site native silty soil materials will be difficult at best. In this regard, during wet or inclement weather conditions, we recommend that an import structural fill material be utilized which should consist of a free-draining (clean) granular fill (sand & gravel) containing no more than about 5 percent fines. Representative samples of the materials which are to be used as structural fill materials should be submitted to the Geotechnical Engineer and/or laboratory for approval and determination of the maximum dry density and optimum moisture content for compaction.

In general, all site earthwork and grading activities should be scheduled for the drier summer months (June through September) if possible. However, if wet weather site preparation and grading is required, it is generally recommended that the stripping and clearing be accomplished with a tracked excavator utilizing a large smooth-toothed bucket working from areas yet to be excavated. Additionally, the loading of strippings into trucks and/or protection of moisture sensitive subgrade soils will also be required during wet weather grading and construction.

In this regard, we recommend that areas in which construction equipment will be traveling be protected by covering the exposed subgrade soils with a woven geotextile fabric such as Mirafi FW404 followed by at least 12 inches or more of crushed aggregate base rock. Further, the geotextile fabric should have a minimum Mullen burst strength of at least 250 pounds per square inch for puncture resistance and an apparent opening size (AOS) between the U.S. Standard No. 70 and No. 100 sieves.

All structural fill materials placed within the new single-family residential home building area(s) and the associated structural and/or site improvement area(s) should be moistened or dried as necessary to near (within 3 percent) optimum moisture conditions and compacted by mechanical means to a minimum of 92 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Additionally, all fill materials placed within three (3) lineal feet of the perimeter (limits) of the proposed new residential structures should be considered structural fill which requires a minimum degree of compaction of 92 percent. However, structural fill materials required outside of the proposed new residential building area(s) need only be compacted to a minimum of 90 percent of the maximum dry density. Structural fill materials should be placed in lifts (layers) such that when compacted do not exceed about 8 inches. All aspects of the site grading should be monitored and approved by a representative of Redmond Geotechnical Services, LLC.

Foundation Support

Based on the results of our investigation, it is our opinion that the site of the proposed new 48th Avenue residential development is generally suitable for support of the single- and/or two-story wood-frame single-family structures provided that the above site preparation and/or following foundation design recommendations are followed. However and as previous noted, construction of the proposed new single- and/or two-story wood-frame residential structures across the site under an anticipated static design load greater than 3.0 kips per lineal foot (klf) and/or 30 kips as well as site grading resulting in the placement of more than two (2) feet of structural fill is expected to result in total and/or differential settlements greater than 1-inch and 1/2-inch, respectively. In this regard, under the above anticipated site grading and foundation construction, over-excavation and/or preloading of the site does not appear to be required for the project.

The following sections of this report present specific foundation design and construction recommendations for the planned new 48th Avenue residential development structures.

Conventional Shallow Foundations

In general, conventional shallow continuous (strip) footings and individual (spread) pad footings for the proposed single- and/or two-story wood-frame single-family residential structures and supported by approved native sandy, clayey silt subgrade soil materials and/or properly placed and compacted structural fill soil materials may be designed based on an allowable contact bearing pressure of about 2,000 pounds per square foot (psf). This recommended allowable contact bearing pressure is intended for dead loads and sustained live loads and may be increased by one-third for the total of all loads including short-term wind or seismic loads.

However, as previously noted, moderately loaded (i.e., greater than 3 klf and/or 30 kips) continuous (strip) footings and individual column-type foundations constructed at the site and supported directly by the underlying native sandy, clayey silt subgrade soils may experience post-construction settlements greater than 1-inch. As such, we recommend that all moderately loaded (i.e., greater than 3 klf and 30 kips) continuous and individual column footings constructed beneath the proposed single-family residential structures be over-excavated and filled with at least 18 inches or more of properly compacted crushed aggregate structural fill and/or the proposed building site should be preloaded. Additionally, due to the moisture sensitivity of the native sandy, clayey silt subgrade soils beneath the site, we recommend that all footing excavations and bearing surfaces constructed during wet and/or inclement weather conditions be protected with at least 3 inches of compacted crushed aggregate.

In general, shallow continuous (strip) footings should have a minimum width of at least 16 inches and be embedded at least 18 inches below the lowest adjacent finish grade (includes frost protection). Individual (spread) pad footings (where required) should be embedded at least 18 inches below grade and have a minimum width of at least 24 inches. Additionally, foundations should constructed no closer than five (5) feet to the top of any permanent cut and/or fill slope.

Total and differential settlements of conventional shallow foundations constructed as recommended above and supported by approved native sandy, clayey silt subgrade soils and/or by no more than two (2) feet of properly compacted structural fill materials are expected to be well within the tolerable limits for this type of wood-frame structure and should generally be less than about 1-inch and 1/2-inch, respectively.

Allowable lateral frictional resistance between the base of the footing element and the supporting subgrade bearing soil can be expressed as the applied vertical load multiplied by a coefficient of friction of 0.30 and 0.50 for native sandy, clayey silt subgrade soils and/or import gravel fill materials, respectively. In addition, lateral loads may be resisted by passive earth pressures on footings poured "neat" against in-situ (native) subgrade soils or properly backfilled with structural fill materials based on an equivalent fluid density of 250 pounds per cubic foot (pcf) and 350 pcf, respectively. These recommended values include a factor of safety of approximately 1.5 which is appropriate due to the amount of movement required to develop full passive resistance.

Floor Slab Support

In order to provide uniform subgrade reaction beneath concrete slab-on-grade floors, we recommend that the floor slab area be underlain by a minimum of 6 inches of free-draining (less than 5 percent passing the No. 200 sieve), well-graded, crushed rock. The crushed rock should help provide a capillary break to prevent migration of moisture through the slab. Additional moisture protection, where needed, can be provided by using a 10-mil polyolefin geo-membrane sheeting such as StegoWrap.

The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Where floor slab subgrade materials are undisturbed, firm and stable and where the underslab aggregate base rock section has been prepared and compacted as recommended above, we recommend that a modulus of subgrade reaction of 250 pci be used for design.

Retaining/Below Grade Walls

Retaining and/or below grade walls should be designed to resist lateral earth pressures imposed by native soils or granular backfill materials as well as any adjacent surcharge loads. For walls which are unrestrained at the top and free to rotate about their base, we recommend that active earth pressures be computed on the basis of the following equivalent fluid densities:

Table 2: Retaining Wall Earth Pressures

Non-Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	35	30
3H:1V	60	50
2H:1V	90	80

For walls which are fully restrained at the top and prevented from rotation about their base, we recommend that at-rest earth pressures be computed on the basis of the following equivalent fluid densities:

Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	55	50
3H:1V	75	70
2H:1V	95	90

The above recommended values assume that the walls will be adequately drained to prevent the buildup of hydrostatic pressures. Where wall drainage will not be present and/or if adjacent surcharge loading is present, the above recommended values will be significantly higher.

Backfill materials behind walls should be compacted to 90 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Special care should be taken to avoid over-compaction near the walls which could result in higher lateral earth pressures than those indicated herein. In areas within three (3) to five (5) feet behind walls, we recommend the use of hand-operated compaction equipment.

Pavements

Flexible pavement design for the project was determined on the basis of projected (anticipated) traffic volume and loading conditions relative to laboratory subgrade soil strength ("R"-value) characteristics. Based on a laboratory subgrade "R"-value of 28 (Resilient Modulus = 5,000 to 10,000) and utilizing the Asphalt Institute Flexible Pavement Design Procedures and/or the American Association of State Highway and Transportation Officials (AASHTO) 1993 "Design of Pavement Structures" manual, we recommend that the asphaltic concrete pavement section(s) for the new 48th Avenue residential development areas at the site consist of the following:

	Asphaltic Concrete Thickness (inches)	Crushed Base Rock Thickness (inches)
Vehicle Drive Areas	4.0	10.0

Note: Where heavy vehicle traffic is anticipated such as those required for fire and/or garbage trucks, we recommend that the automobile drive area pavement section be increased by adding 2.0 inches of aggregate base rock. Additionally, the above recommended flexible pavement section assumes a design life of 25 years.

Pavement Subgrade, Base Course & Asphalt Materials

The above recommended pavement section(s) were based on the design assumptions listed herein and on the assumption that construction of the pavement section(s) will be completed during an extended period of reasonably dry weather.

All thicknesses given are intended to be the minimum acceptable. Increased base rock sections and the use of a woven geotextile fabric may be required during wet and/or inclement weather conditions and/or in order to adequately support construction traffic and protect the subgrade during construction. Additionally, the above recommended pavement section(s) assume that the subgrade will be prepared as recommended herein, that the exposed subgrade soils will be properly protected from rain and construction traffic, and that the subgrade is firm and unyielding at the time of paving. Further, it assumes that the subgrade is graded to prevent any ponding of water which may tend to accumulate in the base course.

Pavement base course materials should consist of well-graded 1-1/2 inch and/or 3/4-inch minus crushed base rock having less than 5 percent fine materials passing the No. 200 sieve. The base course and asphaltic concrete materials should conform to the requirements set forth in the latest edition of the Oregon Department of Transportation, Standard Specifications for Highway Construction. The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. The asphaltic concrete paving materials should be compacted to at least 92 percent of the theoretical maximum density as determined by the ASTM D-2041 (Rice Gravity) test method.

Wet Weather Grading and Soft Spot Mitigation

Construction of the proposed new paved site improvements is generally recommended during dry weather. However, during wet weather grading and construction, excavation to subgrade can proceed during periods of light to moderate rainfall provided that the subgrade remains covered with aggregate. A total aggregate thickness of 8- to 12-inches may be necessary to protect the subgrade soils from heavy construction traffic. Construction traffic should not be allowed directly on the exposed subgrade but only atop a sufficient compacted base rock thickness to help mitigate subgrade pumping. If the subgrade becomes wet and pumps, no construction traffic shall be allowed on the road alignment. Positive site drainage shall be maintained if site paving will not occur before the on-set of the wet season.

Depending on the timing for the project, any soft subgrade found during proof-rolling or by visual observations can either be removed and replaced with properly dried and compacted fill soils or removed and replaced with compacted crushed aggregate. However, and where approved by the Geotechnical Engineer, the soft area may be covered with a bi-axial geogrid and covered with compacted crushed aggregate.

Soil Shrink-Swell and Frost Heave

The results of the laboratory "R"-value tests indicate that the native subgrade soils possess a low to moderate expansion potential. As such, the exposed subgrade soils should not be allowed to completely dry and should be moistened to near optimum moisture content (plus or minus 3 percent) at the time of the placement of the crushed aggregate base rock materials. Additionally, exposure of the subgrade soils to freezing weather may result in frost heave and softening of the subgrade. As such, all subgrade soils exposed to freezing weather should be evaluated and approved by the Geotechnical Engineer prior to the placement of the crushed aggregate base rock materials.

Excavation/Slopes

Temporary excavations of up to about four (4) feet in depth may be constructed with near vertical inclinations for short periods of time provided that groundwater seepage is not present. Temporary excavations greater than about four (4) feet but less than eight (8) feet should be excavated with inclinations of at least 1 to 1 (horizontal to vertical) or properly braced/shored. Where excavations are planned to exceed about eight (8) feet, this office should be consulted. All shoring systems and/or temporary excavations including bracing as well as dewatering for the project should be the responsibility of the excavation contractor and should be made in accordance with applicable Occupational Safety and health Administration (OSHA) and state regulations.

Permanent cut and/or fill slopes, if required, should be constructed no steeper than about 2H:1V.

Depending on the time of year in which trench excavations occur, trench dewatering may be required in order to maintain dry working conditions if the invert elevations of the proposed utilities are located at and/or below the groundwater level.

If groundwater is encountered during utility excavation work, we recommend placing trench stabilization materials along the base of the excavation. Trench stabilization materials should consist of 1-foot of well-graded gravel, crushed gravel, or crushed rock with a maximum particle size of 4 inches and less than 5 percent fines passing the No. 200 sieve. The material should be free of organic matter and other deleterious material and placed in a single lift and compacted until well keyed.

Surface Drainage/Groundwater

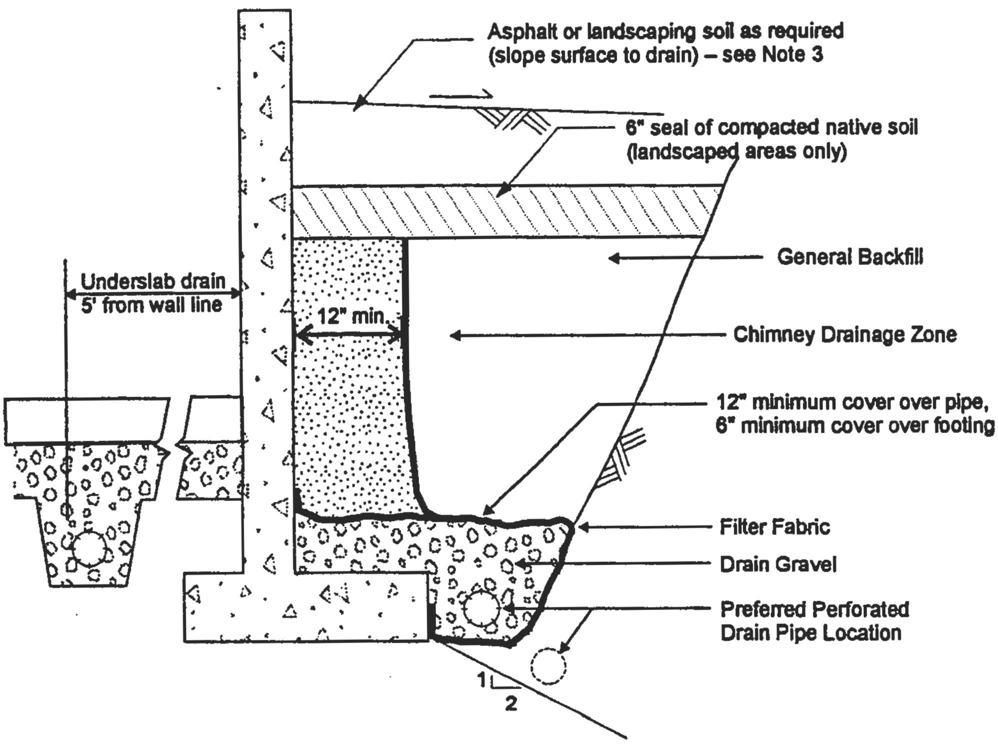
We recommend that positive measures be taken to properly finish grade the site so that drainage waters from building and/or landscaping areas as well as adjacent properties or buildings are directed away from the new single-family residential structures foundations. Any roof drains and/or subsurface drainage systems should be directed into non-perforated conduits (pipes) that carry runoff water away from any new building to a suitable outfall. Roof downspouts should not be connected to foundation drains. A minimum ground slope of about 2 percent is generally recommended in unpaved areas around the residential structure(s).

Groundwater was generally not encountered at the site within any of the exploratory test holes at the time of the field work at depth of up to eight (8) feet beneath existing site grades. However, the sandy, clayey silt subgrade soils were found to become very moist to wet at a depth of about seven (7) feet. Additionally, although groundwater elevations in the area may fluctuate seasonally and may temporarily pond/perch near the ground surface during periods of prolonged rainfall, based on our current understanding of the project, we are generally of the opinion that the observed static groundwater levels encountered during our field work are likely near to the seasonal high groundwater elevation(s) at the site.

As such, based on our current understand of the site grading required to bring the subject site to finish design grades as well as the type of structure(s) which will be constructed at the site, we are of the opinion that an underslab drainage system is not required for the proposed new residential structure(s). However, due to the presence of the near surface sandy, clayey silt subgrade soils across the site, we are of the opinion that a perimeter foundation drainage system should be considered at the site. A typical perimeter footing and/or retaining wall drain detail is shown on Figure No. 3.

Design Infiltration Rate(s)

Based on the results of our field infiltration testing at the site and the sensitivity of the subject site due to infiltration of storm water, we do not recommend storm water be infiltrated at the site. However, should infiltration of storm water be required, we recommend using an allowable infiltration rate of 0.25 inches per hour (in/hr) to design any required storm water infiltration and/or disposal system for the project. Additionally, we recommend that the Geotechnical Engineer review the storm water infiltration system proposed for construction at the site.



SCHEMATIC - NOT TO SCALE

NOTES:

1. Filter Fabric to be non-woven geotextile (Amoco 4545, Mirafi 140N, or equivalent)

2. Lay perforated drain pipe on minimum 0.5% gradient, widening excavation as required. Maintain pipe above 2:1 slope, as shown.

3. All-granular backfill is recommended for support of slabs, pavements, etc. (see text for structural fill).

4. Drain gravel to be clean, washed ¾" to 1½" gravel.

5. General backfill to be on-site gravels, or ¾""-0 or 1½"-0 crushed rock compacted to 92% Modified Proctor (AASHTO T-180).

6. Chimney drainage zone to be 12" wide (minimum) zone of clean washed, medium to coarse sand or drain gravel if protected with filter fabric. Alternatively, prefabricated drainage structures (Miradrain 6000 or similar) may be used.

TYPICAL PERIMETER FOOTING/RETAINING WALL DRAIN DETAIL		
Project No. 1209.004.G	48TH AVENUE SUBDIVISION SITE 2019 46TH AVENUE/LONGVIEW, WA	Figure No. 3

Note: A safety factor of three (3) was used to calculate the above recommended design infiltration rate for the project. Additionally, given the possible variability of the on-site silty subgrade soils across the site, we recommend consideration be given to performing a field test of the actual storm water system constructed at the site in order to confirm that the above recommended design infiltration rate is appropriate.

Seismic Design Considerations

Structures at the site should be designed to resist earthquake loading in accordance with the methodology described in the latest edition of the State of Washington Structural Specialty Code (WSSC), ASCE 7-16 and/or the latest amendments to the 2018 International Building Code (IBC). The maximum considered earthquake ground motion for short period and 1.0 period spectral response may be determined from the Washington Structural Specialty Code (WSSC), ASCE 7-16 or the 2015 National Earthquake Hazard Reduction Program (NEHRP) "Recommended Provisions for Seismic Regulations for New Buildings and Other Structures" published by the Building Seismic Safety Council. Assuming an IBC building category importance factor $I_E = 1.0$ and a seismic use group of III, we recommend a seismic design category "E" be used for design per Table 1613.5.2.

Using this information, the structural engineer can select the appropriate site coefficient values (F_a and F_v) from ASCE 7-16 or the 2018 IBC to determine the maximum considered earthquake spectral response acceleration for the project. However, we have assumed the following response spectrum for the project:

Table 3: ASCE 7-16 Seismic Design Parameters

Site Class	S_D	S_1	Fa	Fv	S_{MS}	S_{M1}	S_{DS}	S_{D1}
E	0.925	0.454	1.230	2.291	1.138	1.041	0.758	0.694

Notes: 1. S_s and S_1 were established based on the USGS 2015 mapped maximum considered earthquake spectral acceleration maps for 2% probability of exceedence in 50 years.

2. Fa and Fv were established based on ASCE 7-16 using the selected S_s and S_1 values.

CONSTRUCTION MONITORING AND TESTING

We recommend that **Redmond Geotechnical Services, LLC** be retained to provide construction monitoring and testing services during all earthwork operations for the proposed new 48th Avenue residential development. The purpose of our monitoring services would be to confirm that the site conditions reported herein are as anticipated, provide field recommendations as required based on the actual conditions encountered, document the activities of the grading contractor and assess his/her compliance with the project specifications and recommendations.

It is important that our representative meet with the contractor prior to grading to help establish a plan that will minimize costly over-excavation and site preparation work. Of primary importance will be observations made during site preparation, structural fill placement, pile driving and/or foundation excavations and construction as well as any retaining wall backfill.

CLOSURE AND LIMITATIONS

This report is intended for the exclusive use of the addressee and/or their representative(s) to use to design and construct the proposed new 48th Avenue residential structure(s) and any associated site improvements described herein as well as to prepare any related construction documents. The conclusions and recommendations contained in this report are based on site conditions as they presently exist and assume that the explorations are representative of the subsurface conditions between the explorations and/or across the study area. The data, analyses, and recommendations herein may not be appropriate for other structures and/or purposes. We recommend that parties contemplating other structures and/or purposes contact our office. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. Additionally, the above recommendations are contingent on Redmond Geotechnical Services, LLC being retained to provide all site grading inspection and construction monitoring services for the project. Redmond Geotechnical Services, LLC will not assume any responsibility and/or liability for any engineering judgment, inspection, or testing services performed by others.

It is the owners/developers responsibility for insuring that the project designers and/or contractors involved with this project implement our recommendations into the final design plans, specifications and/or construction activities for the project. Further, in order to avoid delays during construction, we recommend that the final design plans and specifications for the project be reviewed by our office to evaluate as to whether our recommendations have been properly interpreted and incorporated into the project.

If during any future site grading and construction, subsurface conditions different from those encountered in the explorations are observed or appear to be present beneath excavations, we should be advised immediately so that we may review these conditions and evaluate whether modifications of the design criteria are required. We also should be advised if significant modifications of the proposed site development are anticipated so that we may review our conclusions and recommendations.

LEVEL OF CARE

The services performed by the Geotechnical Engineer for this project have been conducted with that level of care and skill ordinarily exercised by members of the profession currently practicing in the area under similar budget and time restraints. No warranty or other conditions, either expressed or implied, is made.

REFERENCES

Adams, John, 1984, Active Deformation of the Pacific Northwest Continental Margin: Tectonics, v.3, no. 4, p. 449-472.

Applied Technology Council, ATC-13, 1985, Earthquake Damage Evaluation Data for California.

Atwater, B.F., 1992, Geologic evidence for earthquakes during the past 2000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

Atwater, B.F., 1987a, A periodic Holocene recurrence of widespread, probably coseismic Subsidence in southwestern Washington: EOS, v. 68, no. 44.

Atwater, B.F., 1987b, Evidence for great Holocene earthquakes along the outer coast of Washington State: Science, v. 236, no. 4804, pp. 942-944.

Campbell, K.W., 1990, Empirical prediction of near-surface soil and soft-rock ground motion for the Diablo Canyon Power Plant site, San Luis Obispo County, California: Dames & Moore report to Lawrence Livermore National Laboratory.

Carver, G.A., and Burke, R.M., 1987, Late Holocene paleoseismicity of the southern end of the Cascadia Subduction zone [abs.]: EOS, v. 68, no. 44, p. 1240.

Chase, R.L., Tiffin, D.L., Murray, J.W., 1975, The western Canadian continental margin: In Yorath, C.J., Parker, E.R., Glass, D.J., editors, Canada's continental margins and offshore petroleum exploration: Canadian Society of Petroleum Geologists Memoir 4, p. 701-721.

Crouse, C.B., 1991a, Ground motion attenuation equations for earthquakes on the Cascadia Subduction Zone: Earthquake Spectra, v. 7, no. 2, pp. 201-236.

Crouse, C.B., 1991b, Errata to Crouse (1991a), Earthquake Spectra, v. 7, no. 3, p. 506.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes, northern Oregon central Cascadia margin: Tectonics, v. 9, p. 1-22.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes northwest Oregon [abs]: EOS, v. 68, no. 44, p. 1469.

EERI (Earthquake Engineering Research Institute), 1993, The March 25, 1993, Scotts Mill Earthquake, Western Oregon's Wake-Up Call: EERI Newsletter, Vol. 27, No. 5, May.

Geomatrix, 1995 Seismic Design Mapping, State of Oregon: Final Report to Oregon Department of Transportation, January.

Geologic Map Series (GMS-75), Geologic Map of the Portland Quadrangle, Multnomah and Washington Counties, Oregon and Clark County, Washington dated 1991.

Geologic Map Series (GMS-79), Earthquake Hazard Maps of the Portland Quadrangle, Multnomah and Washington Counties Oregon and Clark County, Washington dated 1993.

Grant, W.C., and McLaren, D.D., 1987, Evidence for Holocene Subduction earthquakes along the northern Oregon coast [abs]: EOS v. 68, no. 44, p. 1239.

Grant, W.C., Atwater, B.F., Carver, G.A., Darienzo, M.E., Nelson, A.R., Peterson, C.D., and Vick, G.S., 1989, Radiocarbon dating of late Holocene coastal subsidence above the Cascadia Subduction zone-compilation for Washington, Oregon, and northern California, [abs]: EOS Transactions of the American Geophysical Union, v. 70, p. 1331.

IMS-1, Relative Earthquake Hazard Map of the Portland Metro Region, Clackamas, Multnomah, and Washington Counties, Oregon dated 1997.

International Conference of Building Officials (ICBO), 1994, Uniform Building Code: 1994 Edition, Whittier, CA. 1994.

Joyner, W.B., and Boore, D.M., 1998, Measurement, characterization and prediction of strong ground motion: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 43-102.

OFR 0-90-2, Earthquake Hazard Geology Maps of the Portland Metropolitan Area, Oregon dated 1990.

Riddihough, R.P., 1984, Recent movements of the Juan de Fuca plate system: Journal of Geophysical Research, v. 89, no. B8, p. 6980-6994.

Youngs, R.R., Day, S.M., and Stevens, J.L., 1998, Near field ground motions on rock for large Subduction earthquakes: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 445-462.

Appendix A

Log of Test Pits and Laboratory Test Data

APPENDIX

FIELD EXPLORATIONS AND LABORATORY TESTING

FIELD EXPLORATION

Subsurface conditions at the site under this scope of work were explored by performing five (5) exploratory test holes on August 22, 2024. The approximate location of the exploratory test holes are shown in relation to the existing site features and/or proposed new site improvements on the Site Exploration Map, Figure No. 2.

The test holes performed under this scope of work were advanced using portable Geoprobe equipment in general conformance with ASTM Methods in Vol. 4.08, D-1586-94 and D-1587-83. The test holes were advanced to depths of up to eight (8) feet beneath existing site grades. Detailed logs of the test holes are presented on the Log of Test Pits, Figure No's. A-5 through A-7 in Appendix A. The soils were classified in accordance with the Unified Soil Classification System (USCS), which is outlined on Figure No. A-4.

The exploration program was coordinated by a field engineer who monitored the exploration activity, obtained representative samples of the subsurface soils encountered, classified the soils by visual and textural examination, and maintained continuous logs of the subsurface conditions. Disturbed and/or undisturbed samples of the subsurface soils were obtained at appropriate depths and/or intervals and placed in plastic bags and/or with a thin walled ring sample.

Groundwater was generally not encountered in any of the exploratory test holes (TH-#1 through TH-#5) at the time of the field work to depths of up to eight (8) feet beneath existing site grades.

LABORATORY TESTING

Pertinent physical and engineering characteristics of the soils encountered during our subsurface investigation were evaluated by a laboratory testing program to be used as a basis for selection of soil design parameters and for correlation purposes. Selected tests were conducted on representative soil samples. The program consisted of tests to evaluate the existing (in-situ) moisture-density, maximum dry density and optimum moisture content, Atterberg Limits and gradational characteristics as well as consolidation and "R"-value tests.

Dry Density and Moisture Content Determinations

Density and moisture content determinations were performed on both disturbed and relatively undisturbed samples from the test hole explorations in general conformance with ASTM Vol. 4.08 Part D-216. The results of these tests were used to calculate existing overburden pressures and to correlate strength and compressibility characteristics of the soils. Test results are shown on the test pit logs at the appropriate sample depths.

Maximum Dry Density

One (1) Maximum Dry Density and Optimum Moisture Content test was performed on a representative sample of the upper sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-1557. This test was conducted to help establish various engineering properties for use as structural fill. The test results are presented on Figure No. A-8.

Atterberg Limits

Liquid Limit (LL) and Plastic Limit (PL) tests were performed on a representative sample of the upper sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-4318-85. The tests were conducted to facilitate classification of the soils and for correlation purposes. The test results appear on Figure No. A-9.

Gradation Analysis

Gradation analyses were performed on representative samples of the subsurface soils in accordance with ASTM Vol. 4.08 Part D-422. The test results were used to classify the soil in accordance with the Unified Soil Classification System (USCS). The test results are shown graphically on Figure No. A-10.

Consolidation Test

One (1) Consolidation test was performed on a representative sample of the sandy, clayey silt fill soil to assess the compressibility characteristics of the near surface sandy, clayey silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-2435-80.

Conventional loading increments of 100, 200, 400, ... 12,800 psf were applied after the 100 percent time of primary consolidation was identified for each loading increment. The samples were unloaded and allowed to rebound after the completion of the loading sequence. Deflection versus time readings were recorded for all load increments from 100 through 12,800 psf. The deflection corresponding to 100 percent primary consolidation was plotted on the consolidation strain versus consolidation pressure curve, which is presented on Figure No. A-11.

"R"-Value Tests

One (1) "R"-value test was performed on a remolded subgrade soil sample in accordance with ASTM Vol. 4.08 Part D-2844. The test results were used to help evaluate the subgrade soils supporting and performance capabilities when subjected to traffic loading. The test results are shown on Figure No. A-12.

The following figures are attached and complete the Appendix:

Figure No. A-4	Key To Exploratory Test Pit Logs
Figure No's. A-5 through A-7	Log of Test Pits
Figure No. A-8	Maximum Dry Density
Figure No. A-9	Atterberg Limits Test Results
Figure No. A-10	Gradation Test Results
Figure No. A-11	Consolidation Test Results
Figure No. A-12	"R"-Value Test Results

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

DEFINITION OF TERMS

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

	200		40	10	4	3/4"	3"	12"
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS	
	FINE	MEDIUM	COARSE	FINE	COARSE			

GRAIN SIZES

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT†
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

CLAYS AND PLASTIC SILTS	STRENGTH‡	BLOWS/FOOT†
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

†Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).
‡Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

REDMOND GEOTECHNICAL SERVICES
PO Box 20547 • Portland, Oregon 97294

KEY TO EXPLORATORY TEST PIT LOGS
Unified Soil Classification System (ASTM D-2487)

48TH AVENUE SUBDIVISION SITE
2019 46TH AVENUE/LONGVIEW, WA

PROJECT NO.	DATE	Figure A-4
1209.004.G	9/06/24	

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 8/22/24

SOIL DESCRIPTION

TEST PIT NO. TH-#1 ELEVATION

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
	X			18.5	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						
	X			23.3		Becomes very moist to wet
						Total Depth = 8.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#2 ELEVATION

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
					ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1209.004.G 48TH AVENUE SUBDIVISION SITE FIGURE NO. A-5

REDMOND GEOTECHNICAL SERVICES

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 8/22/24

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION TEST PIT NO. TH-#3 ELEVATION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
	X		87.9	18,7	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	TEST PIT NO. TH-#4 ELEVATION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
					ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						
						Total Depth = 7.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1209.004.G | 48TH AVENUE SUBDIVISION SITE | FIGURE NO. A-6

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 8/22/24

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION TEST PIT NO. TH-#5 ELEVATION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
	X			19.3	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						
	X			23.9		Becomes very moist to wet
						Total Depth = 8.0 feet No groundwater encountered at time of exploration
10						
15						

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	TEST PIT NO. ELEVATION
0						
5						
10						
15						

LOG OF TEST PITS

PROJECT NO. 1209.004.G | 48TH AVENUE SUBDIVISION SITE | FIGURE NO. A-7

MAXIMUM DENSITY TEST RESULTS

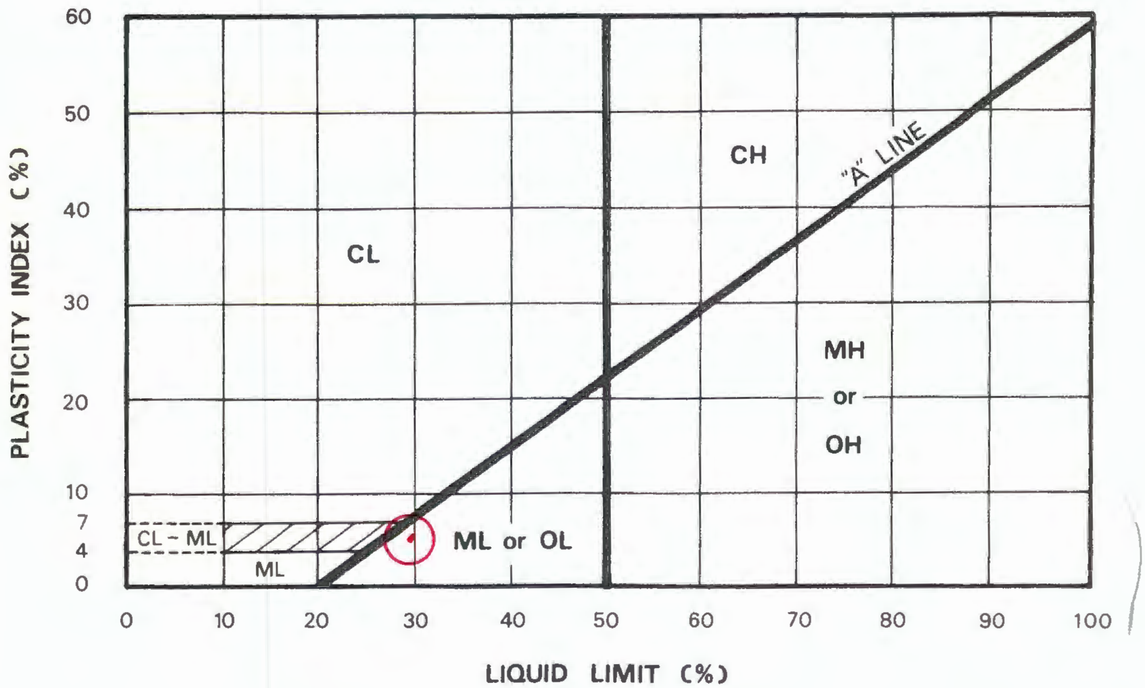
SAMPLE LOCATION	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
TH-#3 @ 2.0'	Medium to olive-brown, sandy, clayey SILT (ML)	106.4	16.5

EXPANSION INDEX TEST RESULTS

SAMPLE LOCATION	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (pcf)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (%)	EXPANSION INDEX	EXPANSIVE CLASS.

MAXIMUM DENSITY & EXPANSION INDEX TEST RESULTS

PROJECT NO.: 1209.004.G	48TH AVENUE SUBDIVISION SITE	FIGURE NO.: A-8



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
⊙	TH-#3	2.0	18.7	29.9	5.9	86.2		ML

REDMOND GEOTECHNICAL SERVICES

PO Box 20547 • Portland, Oregon 97294

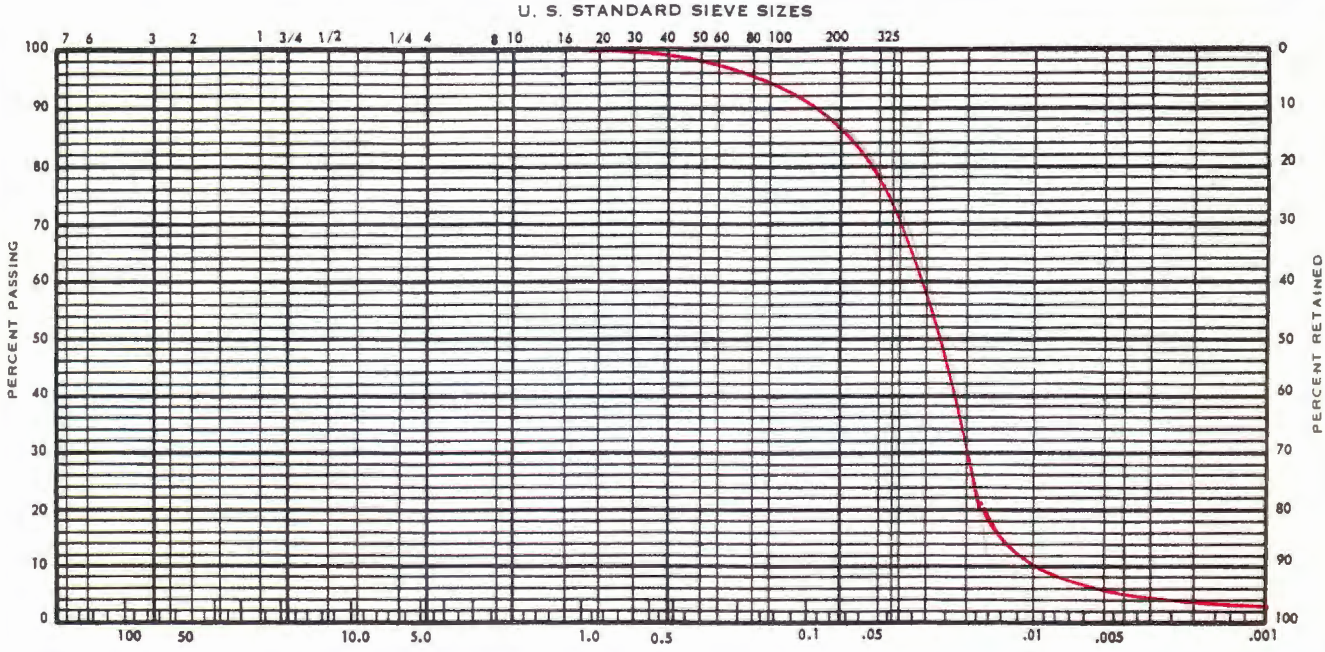
PLASTICITY CHART AND DATA

48TH AVENUE SUBDIVISION SITE
2019 46TH AVENUE/LONGVIEW, WA

PROJECT NO.	DATE	
1209.004.G	9/06/24	Figure A-9

UNIFIED SOIL CLASSIFICATION SYSTEM

(ASTM D 422-72)



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

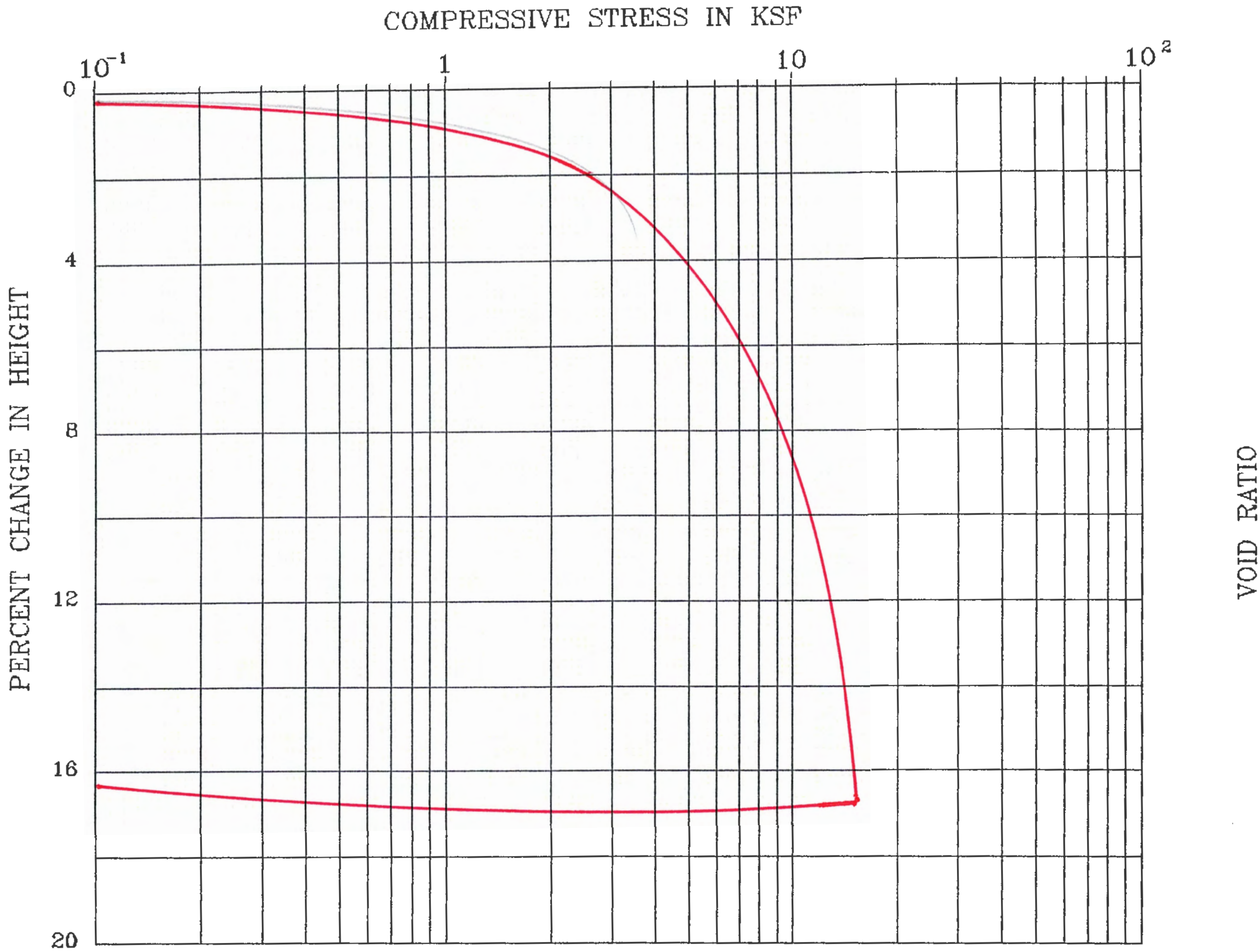
KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	ELEV. (feet)	UNIFIED SOIL CLASSIFICATION SYMBOL	SAMPLE DESCRIPTION
——	TH-#3	2.0		ML	Medium to olive-brown, sandy, clayey SILT

REDMOND GEOTECHNICAL SERVICES
PO Box 20547 • Portland, Oregon 97294

GRADATION TEST DATA

48TH AVENUE SUBDIVISION SITE
2019 46TH AVENUE/LONGVIEW, WA

PROJECT NO.	DATE	FIGURE
2019.004.G	9/06/24	A-10



BORING : TH-#3
DEPTH (ft) : 2.0
SPEC. GRAVITY : 2.5 (assumed)

DESCRIPTION : sandy, clayey SILT (ML)
LIQUID LIMIT : 29.9
PLASTIC LIMIT : 24.0

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	18.7	87.9	80.7	
FINAL	7.1	106.2	95.1	

REDMOND GEOTECHNICAL SERVICES
PO Box 20547 • Portland, Oregon 97294

CONSOLIDATION TEST DATA

48TH AVENUE SUBDIVISION SITE
2019 46TH AVENUE/LONGVIEW, WA

PROJECT NO.	DATE	Figure A-11
1209.004.G	9/06/24	

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#1

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	211	327	434
Expansion Dial (o.ooo1")	0	0	1
Expansion Pressure (psf)	0	0	3
Moisture Content (%)	22.5	18.9	14.4
Dry Density (pcf)	101.6	105.9	109.1
Resistance Value, "R"	18	30	42
"R"-Value at 300 psi Exudation Pressure = 29			

SAMPLE LOCATION:

SAMPLE DEPTH:

Specimen	A	B	C
Exudation Pressure (psi)			
Expansion Dial (0.0001")			
Expansion Pressure (psf)			
Moisture Content (%)			
Dry Density (pcf)			
Resistance Value "R"			
"R"-Value at 300 psi Exudation Pressure =			

Figure No. A-12

Maintenance Manuals Appendix E

Wetpond O&M	**E1**
Contech Stormfilter Catch Basin	**E2**

Table V-A.10: Maintenance Standards - Filter Strips

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.
	Vegetation	When the grass becomes excessively tall (greater than 10-inches); when nuisance weeds and other vegetation starts to take over.	Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3-4 inches.
	Trash and Debris Accumulation	Trash and debris accumulated on the filter strip.	Remove trash and Debris from filter.
	Erosion/Scouring	Eroded or scoured areas due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.
	Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.	Level the spreader and clean so that flows are spread evenly over entire filter width.

Table V-A.11: Maintenance Standards - Wetponds

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Water level	First cell is empty, doesn't hold water.	Line the first cell to maintain at least 4 feet of water. Although the second cell may drain, the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.
	Trash and Debris	Accumulation that exceeds 1 CF per 1000-SF of pond area.	Trash and debris removed from pond.
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material.	No clogging or blockage in the inlet and outlet piping.
	Sediment Accumulation in Pond Bottom	Sediment accumulations in pond bottom that exceeds the depth of sediment zone plus 6-inches, usually in the first cell.	Sediment removed from pond bottom.
	Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil-absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant wetland plants such as Juncus effusus (soft rush) which can uptake small concentrations of oil.
	Erosion	Erosion of the pond's side slopes and/or scouring of the pond bottom, that exceeds 6-inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4-inches or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications.
	Internal Berm	Berm dividing cells should be level.	Berm surface is leveled so that water flows evenly over entire length of berm.
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.

Table V-A.12: Maintenance Standards - Wetvaults

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash/Debris Accumulation	Trash and debris accumulated in vault, pipe or inlet/outlet (includes floatables	Remove trash and debris from vault.

StormFilter Inspection and Maintenance Procedures

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to whether or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Inspection Report

Date: Personnel:

Location: ______________________ System Size: ______________________

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: ______________________ Date: ____________

Sediment Depth on Vault Floor: ______________________

Structural Damage: ______________________

Estimated Flow from Drainage Pipes (if available): ______________________

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: ______________________

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: ______________________

☐ Minor Structural Repairs: ______________________

☐ Drainage Area Report ______________________

Excessive Oil Loading: Yes ☐ No ☐ Source: ______________________

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: ______________________

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: ______________________

Items Needing Further Work: ______________________

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

____

____

____

____

____

____

____

____

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: ____________________ Personnel: ____________________

Location: ____________________ System Size: ____________________

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: ____________________

____

____

System Observations

Months in Service:

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): ____________________

Sediment Depth on Vault Floor: ____________________

Structural Damage: ____________________

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: ____________________

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: ____________________

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: ____________________

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: ____________________

Replace Cartridges: Yes ☐ No ☐ Details: ____________________

Sediment Removed: Yes ☐ No ☐ Details: ____________________

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: ____________________

Residuals (debris, sediment) Disposal Methods: ____________________

Notes:

____

____

____

____

____

____

____

RECYCLED PAPER

CONTECH ENGINEERED SOLUTIONS

800-338-1122

www.ContechES.com

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit www.ContechES.com or call 800.338.1122.

Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

800.338.1122

www.conteches.com