City of Longview

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

Agenda

Planning Commission

Wednesday, June 4, 2025 **7:00 PM** **City Hall**

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1. **ROLL CALL**
2. **APPROVAL OF MINUTES**
   - **25-00521 Planning Commission minutes of May 7, 2025**
3. **AUDIENCE PARTICIPATION OR CORRESPONDENCE**
4. **DECLARATION OF EX-PARTE COMMUNICATIONS AND APPEARANCE OF FAIRNESS**
5. **PUBLIC HEARINGS**
   - **25-00522 PC 2025-2 3505 and 3503 Oak Street Binding Site Plan**
   - **25-00523 PC 2025-3 5431 Mt. Solo Rd. Planned Unit Development**
6. **NON-PUBLIC HEARING ITEMS**
7. **OTHER BUSINESS**
8. **PLANNER'S REPORT**
9. **ADJOURNMENT**

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Minutes

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1. ROLL CALL

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

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

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

2. APPROVAL OF MINUTES

25-00423 Planning Commission meeting minutes of April 2, 2025

A motion was made by Member Ramona Leber, seconded by Member Alison Moss, to approve the meeting minutes of April 2, 2025. .
The motion passed unanimously.

3. AUDIENCE PARTICIPATION OR CORRESPONDENCE

None at this time.

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

Read in to record.

5. PUBLIC HEARINGS

25-00424 PC 2025-1 3009 Columbia Heights Rezone

This item was previously heard at the March 5, 2025 regular Planning Commission meeting. The publisher of the legal notice had technical issues, so the item is being re-heard.
Mr. Rutikanga gave a brief review of the staff report.
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 Jerry Stinger, to recommend approval of the Darren Crookshanks Comprehensive Plan and Zoning amendment, Case # PX 2025-1, based on findings and conclusions contained in the staff report. The motion carried unanimously.

25-00425 4511 Ocean Beach Hwy Comp Plan Admendment and Zoning Designation

Mr. Rutikanaga gave the staff report.

Member Jerry Stinger asked about the transfer of fire safety responsibilities. Member Ramona Leber wondered how many property owners are involved.
Chairman Collins opened the public hearing.
Hearing no speakers, Chairman Collins closed the public hearing.

A motion was made by Member Trey Davis, seconded by Member Alison Moss to recommend approval of the comprehensive plan map amendment changing parcels 03128 and 03130 from Community Commercial to High Density Residential, subject to the analysis and findings in the staff report dated April 30, 2025.

A motion was made by Member Trey Davis, seconded by Member Alison Moss to recommend the assignment of the zoning designation R-4, High Density Residential to parcels 03128, 03130, 03132001, 03132002, 03133; and the assignment of the zoning designation Traditional Neighborhood Residential to parcels 03135, 03136, 031360330, 031360200, 03136011; subject to the analysis and findings in the staff report dated April 30th, 2025.

The motions both carried unanimously.

6. NON-PUBLIC HEARING ITEMS

None at this time.

7. OTHER BUSINESS

None at this time.

8. PLANNER'S REPORT

** 46th/48th Ave - application for a PUD subdivision*
** 54 lot subdivision in review process*
** 18 lot subdivision off Sires Lane has been applied for*

Legislative update:
** Revisions to the Board of Adjustment - housekeeping*
** Public hearing on June 12th at City Council for the MUZO and Short Subdivision items*
** Reviewing Solid Waste rates - first touch will be at the May 8th Council meeting*
- A House Bill is mandating curbside recycling and curbside composting by 2030.
** House Bill 5184 could impact how we regulate parking. It specifies a half space for multi-family units, one space for single family dwellings.It will impact Longview significantly and needs to implemented by 2029.*

9. ADJOURNMENT

The next regular Planning Commission meeting is scheduled for June 4, 2025 at 7 p.m.

With no further business to discuss, Chairman Collins adjourned the meeting at 7:47 p.m.

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Lisa Vertrees, Recorder

3505 Oak Street Manufactured Home Park Staff Report

Staff Report Date:	May 28, 2025
Property Owner:	Columbia View Group
Applicant:	Kessi Engineering
Project Summary:	Proposal for a Type B binding site plan for a 72-lot manufactured home park development on an approximately 10.38 acres.
Project Location:	The 10.38 acres site is currently configured as two lots located on Oak Street. It comprises of parcel number 053180300(1.16 acres) and parcel 05319(9.22 acres). The project site is located on the south side of Oak Street, approximately 800 feet northwest of its intersection with 34th Avenue. The site is currently developed with a single-family residence and is bordered on three sides by CDID #1 drainage ditches.
Current Zoning:	R-1 Low Density Residential
Comprehensive Plan:	Low Density Residential
Existing Land Use:	Parcel 053180300 is vacant and parcel 05319 has a single-family residence with outbuildings.
Surrounding Land Use:	Single family residential.
Staff Recommendation:	Approval of preliminary binding site plan, with conditions

1. PROJECT DESCRIPTION

The applicant Kessi Engineering is proposing a type B Binding site plan to develop a 72-lot manufactured home park on approximately 10.38 acres single family residential (R-1) zoned property. The site is mostly flat and bordered on three sides by CDID ditch and to the east by Oak Street. It contains a single-family home with several outbuildings on site, all of which will be removed as part of the proposed development. The site is currently composed of two parcels, primarily covered with grasses, blackberry bushes, and scattered coniferous and deciduous trees.

The project site will be accessed via Oak Street, a major a collector road. The lots in the manufactured home park will be accessed via a 24-foot-wide paved internal private road which will include a 4-foot-wide walkway on one side; no on-street parking would be allowed on either side. Water and sewer services will be provided by the City of Longview, with extensions of existing water lines from Oak Street and Jimmer Place, and an extension of the existing sanitary sewer main from Oak Street. Each manufactured home will be individually sub-metered, with all utilities built to City standards but privately owned and maintained by the park owner or operator. Four fire hydrants will be installed throughout the development to ensure adequate fire protection in compliance with city standards. Stormwater runoff from the development will be managed through participation in the Consolidated Diking Improvement District No. 1 (CDID) regional detention program. Adequate off-street parking will be provided for each home, and each manufactured home site will include landscaped yards with drought-resistant trees. A 15-foot easement and a 12-foot gravel access road will be dedicated to the diking district for maintenance of the ditch.

Physical development of the site has been proposed as a phased development. The applicant has proposed the project be completed in three phases as shown on the preliminary binding site plan.

Prior to final approval of the Binding Site Plan (BSP), a boundary line adjustment will be completed to consolidate the development site into a single parcel. The remaining parcel (Parcel F) will be adjusted to the south and will not be part of the manufactured home park.

2. PROCESS

The applicant is proposing a Type B Binding Site Plan, with the manufactured home park property under a single, overall ownership and sites provided for the placement of manufactured homes. Ownership of the real property will remain under a single entity unless a revised Binding Site Plan is recorded pursuant to LMC 19.90, or as hereafter amended. A note shall be placed on the final binding site plan to this effect.

The Preliminary Binding shall be approved or disapproved bythe Planning Commission during a duly noticed public hearing pursuant to LMC 19.90.050 and -.060. Upon approval of the preliminary binding site plan, the applicant will complete the conditions of approval as applicable and submit for final binding site plan approval. The final binding site plan will be reviewed for compliance with conditions of approval and then forwarded on the planning commission for review during a regular meeting for final approval and signatures prior to recording.

All subsequent construction of improvements after recording of the final binding site plan shall be in accordance with the recorded final binding site plan. Any deviation from the recorded final site plan is considered an amendment and will require additional review and re-recording of the binding site plan in accordance with LMC 19.90.100.

3. CRITICAL AREAS

No mapped critical areas appear to be on the site. The project site is bordered by a CDID ditch on three sides. CDID drainage ditches are not considered "fish and wildlife habitat conservation areas" or streams pursuant to LMC 17.10.050 and -.070.

4. SEPA AND PUBLIC NOTICE

SEPA was conducted and noticed as part of the project review. A Determination of Non-Significance (DNS) was issued on January 27th, 2025. The comment period ended on February 10th, 2025. The applicant has satisfactorily addressed the comments received during the SEPA review process.

5. LMC 19.28 STANDARDS FOR MANUFACTURED HOME PARKS

The zoning code provides standards for manufactured home parks in chapter 19.28 of the Longview Municipal Code. Consistency with the manufactured home standards are discussed below:

A. 19.28.040. Maximum Density and Minimum Park Size

(1) Density in a manufactured home park shall not exceed eight and one-half units per gross acre.
(2) Manufactured home parks shall be a minimum of one acre in size.

Staff Findings: The proposed manufactured home park will be on a site that is approximately 10.38 acres in size. For manufactured Home Parks, the allowed maximum

density per gross acre is 8.5 units per acre and with a total gross acreage of 10.38 acres, the allowed maximum density is 88.2 units. The proposed manufactured home park is below the maximum density as it proposes a total of 72 lots and exceeds the required minimum manufactured home park size, therefore satisfying the maximum density and minimum park size standards.

B. 19.28.050 Lot Width, Depth, Frontage

(1) Interior lot, 40 feet wide at the front property line and building lines.
(2) Cul-de-sac lot, 30 feet wide as measured along the front property or site line;
(3) Corner lot, 50 feet wide at the building line, provided the intersection visibility clearance standard can be met
(4) Lot depth, 60 feet
(5) All sites shall front on interior streets within the park

Staff Findings: All of the lots in the proposed manufactured home park will have a lot depth of 60 feet and 40 feet of frontage except for lots 7, 8, 28-33, and 38- 43 (total of 14 lots). The applicant has applied to utilized the shared driveway provisions provide in LMC19.77 in exchange for reduce frontage. Those 14 lots with reduced frontage will have a 20-foot shared driveway access easement.

Lot Frontage Variance Request: The applicant is requesting a variance from the required 40 feet of lot frontage as outlined in LM19.28.050. For a variance to be granted it must meet criteria outline in LMC 19.12.140. the criteria are as follows:

(1) The variance will not constitute a grant of special privileges inconsistent with the limitation upon uses of other properties in the vicinity and zone in which the property on behalf of which the application was filed is located.

The requested variance does not constitute a special privilege granted only to the applicant. In requesting the reduction, the applicant has proposed the use of shared driveways meeting the standards contained in LMC 19.70 which allows for an automatic reduction to lot frontage Other types of development would be allowed to use these provisions in their design, and the applicant is seeking the same consideration for the proposed manufactured home park.

(2) That such variance is necessary, because of special circumstances relating to the size, shape, topography, location, or surroundings of the subject property, to provide it with

use rights and privileges permitted to other properties in the vicinity and in the zone in which the subject property is located.

The subject property is bordered on three sides by the Consolidated Diking Improvement District (CDID) drainage ditches, which significantly restrict the developable area and site layout. To efficiently utilize the site while still providing adequate infrastructure, open space, and recreational areas, several lots have been designed with reduced frontage along the internal private street. Each lot maintains sufficient width to accommodate off-street parking and ensures emergency vehicle access, which are among the primary purposes of lot frontage requirements. Furthermore, all lots within the development comply with other applicable dimensional standards for manufactured home parks, including minimum setbacks from front, side, and rear property.

(3) That the granting of such variance will not be materially detrimental to the public welfare or injurious to the property or improvements in the vicinity and zone in which the subject property is situated;

Granting this variance will not be materially detrimental to the public welfare or injurious to nearby properties or improvements. Although the lot frontage is reduced, each lot is accessed via an internal private street and designed to meet all other dimensional standards, including minimum lot area, setbacks, and required off-street parking. The internal access road is entirely accessible to emergency services, pedestrians, and regular vehicles. Since the road is private, it will not impact public streets or impact the properties within the surrounding area. By following the shared driveway standards of LMC 19.70, the applicant has complied with the relevant LMC that already contemplates reduced frontage standards and their impact on the public welfare.

(4) The need for the variance is not the result of any action taken by the applicant.

The need for the variance is due to existing physical site constraints resulting from the site surrounding CDID drainage ditches and is not a result of any action taken by the applicant.

C. 19.28.060 Minimum Building Setbacks

(1) Front Setback. The minimum front yard setback for all buildings and structures shall be five feet from the front property line which abuts a private or public street within the park; provided, on corner lots, the intersection visibility clearance standard is met.

(2) Side Setback. The minimum side yard setback for manufactured homes and buildings including carports, garages and accessory buildings shall be five feet; provided, on corner lots, the intersection visibility clearance standard is met.

(3) Rear Setback. The minimum rear setback shall be 10 feet.

(4) Intersection Visibility Clearance. On a corner lot, nothing shall be erected, placed or allowed to grow in such a manner as to impede vision between a height of three and 10 feet above the centerline grades of the intersecting streets in the triangular area bounded by the street lines of the corner lot and a line joining points on said street lines 20 feet from the corner.

Staff Findings: The building envelopes illustrated on the preliminary binding site plan satisfy the setback requirements for manufactured home parks as provided above. Review for consistency with the minimum building setbacks requirements will be reviewed and approved during each individual manufactured home permit application. No corner lots are proposed, therefore the intersection visibility clearance standard does not apply.

D. 19.28.070 Manufactured Home Size, Building Height, Lot Coverage.

(1) Manufactured homes in parks shall be no less than 420 square feet in area.

(2) All buildings within a manufactured home park shall be no more than one and one-half story high or a maximum of 20 feet in height.

(3) Maximum lot coverage by homes, their carports or garages, and accessory buildings and uses shall be 50 percent

Staff Findings: Manufactured home size, building height and lot coverage will be reviewed with each individual building permit application to ensure compliance with LMC 19.28.070 requirements. No permit will be issued for individual mobile home unless it demonstrates compliance these standards.

E. 19.28.080 Fences, Hedges.

(1) Fences and hedges on individual sites shall be no higher than three feet along front property lines and no higher than six feet along side and rear property lines on interior lots and interior lot lines of corner lots. On corner lots, fences and hedges shall be no higher than three feet along front and side street property lines.

Staff Findings: individual sites fences and hedges will be reviewed and approved with each manufactured home park building permit application to ensure compliance with LMC 19.28.080 requirements. No permit will be issued for individual mobile home unless it demonstrates compliance these standards.

F. 19.28.090 Parking Provisions.

(1) Off-street parking shall meet the requirements of Chapter 19.78 LMC.

(2) In addition to the off-street parking requirements, there shall be provided at least one automobile parking space for every two home sites for use by guests, visitors, service, or delivery vehicles and shall be signed or designated as such. These spaces may be placed along the park's interior drives but shall be set back off the roadway proper and shall be within 100 feet of the lots to be served. This parking may be waived if on-street parking is provided on streets designed to accommodate side parking and two standard lanes of traffic.

Staff Findings: Each lot in the manufactured home park includes two to three dedicated parking spaces, exceeding the minimum requirement of one parking space per single-family home under LMC 19.78. The project provides a total of 108 additional parking spaces beyond the code requirement, effectively accommodating visitor and guest parking needs. Additionally, seven designated guest-only parking spaces are also proposed.

G. 19.28.100 Screening and Landscaping.

(1) A sight-obscuring fence at least six feet high shall be constructed around the entire manufactured home development. The fence shall be appealing from inside and outside of the development. This may be accomplished by several alternatives: wood board fencing, chain link fencing with evergreen hedges of such species, height and placement so as to become an effective sight screen within two years of planting, or some similar form of ornamental fencing and landscaping combinations.

(2) Home sites and common areas shall be landscaped and maintained so as to enhance the livability, residential character, and aesthetics of the park. Such landscaping shall consist of substantial evergreen and deciduous trees mixed with shrubbery and ground covers, all installed concurrent with property development and prior to tenant or owner occupancy. Vegetated stormwater management facilities such as bioretention areas and planters, conveyance swales and dispersion areas can be used to satisfy this requirement.

(3) The applicant shall follow land preparation practices which will leave, as much as is feasible, existing trees, vegetation, and other natural features.

Staff Findings: A six-foot sight obscuring fence will be constructed around the perimeter of the entire site to provide visual screening and enhance privacy for both residents and neighboring properties. All home sites and recreational areas will be landscaped. As part of the application submittal, the applicant submitted a landscaping plan for homes sites and recreational areas and facilities. The plan proposes landscaping for all home site to include grass, ground cover, and a diverse mix of evergreen and deciduous trees to enhance the visual appeal and livability of the development.

While the project will require grading and removal of some vegetation to accommodate infrastructure, internal roads, and home site development, the applicant has incorporated landscaping features to enhance the site's livability and character. final clearing and grading will be reviewed with civil construction plans to ensure proper land preparation are being adhered to.

H. 19.28.110 Recreation Areas and Facilities.

(1) The following recreation areas and/or facilities shall be provided by home parks:

(a) An outdoor play area with a variety of playground equipment. A minimum of 100 square feet of play area will be provided per home lot or site. The play area shall be protected from all streets, driveways, and parking areas by a fence at least 30 inches in height. Access to the area will be safe and minimize conflicts between pedestrians and vehicle traffic.

(b) A heated indoor recreation facility combined with a portion of the outdoor play area described in subsection (1)(a) of this section, both with a variety of play equipment and areas for use by park residents. A minimum of 25 square feet of floor area per mobile

home lot or site will be provided for the indoor facility, and a minimum of 50 square feet of ground area per unit will be provided for the outdoor play area.

(2) If the park does not accommodate children less than 14 years of age, an indoor facility with recreation and community equipment shall be provided for use by residents. A minimum of 20 square feet of floor area per lot or site will be provided for the building. Equipment installed or made available will be appropriate to the user population: pool, ping-pong, or card tables, a community kitchen with eating and entertaining facilities, swimming pool, sauna, and so forth.

Staff Findings: The park is designed to accommodate children under the age of 14 and includes common recreation space totaling 8,921 square feet over three open space tracts, exceeding the minimum requirement of 100 square feet per lot. The play area will feature a variety of playground equipment to support active recreation, and the area will be protected from all streets, house driveways, and parking areas by a fence at least 30 inches in height.

I. 19.28.150 Streets, Lighting, and Sidewalks.

(1) Manufactured home parks shall meet LMC 19.80.130 standards, except that streets and street lighting may be private. Public street pavement widths and sidewalks, if provided, need meet only local access standards of Chapter 12.50 LMC. Private streets with parking on one side shall have a minimum pavement width of 32 feet with a right-of-way width of 40 feet. Private street with no on-street parking shall have a minimum pavement width of 24 feet and a right-of-way width of 32 feet. Curbs and sidewalks are recommended, and their need and type will be determined during site plan review. At a minimum, a four-foot-wide walkway will be striped or similarly designated along at least one side of each street. All dedicated improvements, in any case, shall meet Chapter 19.80 LMC standard.

Staff Findings: The proposed manufactured home park includes a 20-foot-wide private street with a four-foot-wide walkway along one side of the street (total of 24'). No on-street parking is proposed on either side. According to LMC 19.80.130, private streets within manufactured home parks that do not allow on-street parking are required to have a minimum pavement width of 24 feet and a right-of-way width of 32 feet. While the proposed pavement width complies with the standard, the applicant is proposing a 24-foot right-of-way (RoW), which does not meet the required minimum. To address this, the applicant has submitted a variance request seeking relief from the 32-foot RoW requirement for private streets in manufactured home park.

Variance request: The applicant is requesting a variance from the required private street right-of -way of 32 feet as outlined in LM19.28.150. for a variance to be granted it must meet criteria outline in LMC 19.12.140. the criteria are as follows:

(1) The variance will not constitute a grant of special privileges inconsistent with the limitation upon uses of other properties in the vicinity and zone in which the property on behalf of which the application was filed is located.

The requested variance does not constitute a special privilege. Other manufactured home parks or residential developments in similar zoning districts may request and receive variances when unique site constraints exist and the proposed design meets or exceeds other safety and access standards.

(2) That such variance is necessary, because of special circumstances relating to the size, shape, topography, location, or surroundings of the subject property, to provide it with use rights and privileges permitted to other properties in the vicinity and in the zone in which the subject property is located.

The subject property is bordered on three sides by the Consolidated Diking Improvement District (CDID) drainage ditches, resulting in an oddly shaped property which restricts developable area and site layout options. These physical constraints limit the applicant's ability to follow traditional design and still reach a number of units that makes the project financially feasible. Expanding the RoW width would compromise other essential site elements such as housing layout and open space.

(3) That the granting of such variance will not be materially detrimental to the public welfare or injurious to the property or improvements in the vicinity and zone in which the subject property is situated;

Given the proposed (RoW) includes a 24-foot-wide paved surface, which meets the minimum fire access width required by the Fire Code, meeting adequate emergency and service vehicle access requirements. In addition, a designated pedestrian walkway is provided along one side of the private street to support safe and convenient pedestrian circulation within the development. By not allowing on-street parking, the design minimizes potential access conflicts which enhances safety and ensures that access for emergency responders remains unobstructed at all times.

(4) The need for the variance is not the result of any action taken by the applicant.

The need for the variance is due to existing physical site constraints resulting from the site surrounding CDID drainage ditches and is not a result of any action taken by the applicant.

J. 19.28160 Stormwater

Stormwater management shall conform to Chapter 17.80 LMC and all other applicable statutes.

Staff Findings: The project will utilize the consolidated diking district (CDID) detention program for stormwater runoff control. This program offers developers an alternative to constructing and maintaining individual on-site detention facilities by allowing them to purchase credits to use the diking district offsite detention facilities. Runoff from the development will be treated in accordance with state and local regulations and delivered to the adjacent CDID ditch. The participation in the CDID detention program complies with the stormwater management requirements of LMC chapter 17.80. Prior to final binding site plan recording, the applicant will be required to complete the appropriate agreement(s) with CDID.

K. 19.28.170 Utilities

All utilities shall be shown on the site plan, installed underground within the park, meet all applicable building, plumbing, electrical, health, and engineering codes and standards and be subject to approval by the city engineer and building official. Utilities at the home site shall have the ability to be capped when a home is not on site.

Staff Findings: A preliminary utility plan has been submitted and identifies the proposed utility connections for the project. The development will connect to an existing 6-inch public water line along Oak Street and install a new 8-inch water line extension from Jimmer Place to ensure adequate water service throughout the site. Additionally, the sanitary sewer main will be extended from Oak Street to serve all manufactured home lots within the development. Each manufactured home will be individually sub-metered for water usage. All utility infrastructure within the park will be constructed to City of Longview standards but will remain private and be owned and maintained by the park owner or operator. A Final engineering review and approval will be required to ensure all utility improvements are constructed in compliance with applicable City .

6. LMC 19.90.080 Binding Site Plan Approval Criteria

To grant approval of a preliminary binding site plan, the applicant must demonstrate compliance with all of the following criteria:

(1) Appropriate provisions to the extent necessary to mitigate an impact of the development have been made for transportation, water, storm drainage, erosion control and sanitary sewage disposal methods that are consistent with the city's current ordinances, standards and plans.

Staff Findings: A traffic study prepared by H. Lee & Associates, dated March 20, 2025, has been completed by the applicant.The study reviewed potential traffic counts and potential impacts to five nearby intersections. The study concluded that there would be minimal impacts to nearby intersections and that no off-site physical traffic mitigations are required. The project's water will extend water lines of Jimmer Pl and Oak Street as well as extension of existing sewer main off Oak Street to city in accordance with city standards. The project will participate in the CDID detention program for Stormwater management which complies with city stormwater management standards.

2) Appropriate provisions have been made for but not limited to public health, safety and general welfare.

Staff Findings: The project will be served by public water and sanitary sewer systems operated by the City of Longview, ensuring safe and reliable access to potable water and wastewater disposal for all future homes. The internal street network includes a minimum of 24 feet of paved width, meeting fire department access and turnaround standards, and incorporates fire hydrant placement in accordance with Fire Code spacing requirements. To promote pedestrian safety, a four-foot-wide sidewalk or walkway will be provided along at least one side of each internal street. Additionally, the development includes a dedicated recreational area, as required by code, to support the physical well-being of future residents.

The project proposes one access point from Oak Street to serve the entre development. Per LMC 12.60 developments with 30 or more dwelling units are required to have at least two ingress/egress points to ensure adequate emergency access, subject to approval by city fire marshal and city engineer. As part of the review process, the city marshal and city engineer approved the single point of access under the following conditions:

- The minimum paved roadway width throughout the development would be 24 feet, wider than the required 20 feet width as outlined per LMC Chapter 18.
- There would be no parking allowed on either side of the roadway throughout the development.
- Signage denoting NO PARKING would be installed throughout the development on both sides of the roadway.
- Four fire hydrants will be required specific locations to be determined.
- Fire flow in the amount of 1,000 gallons per minute for 1 hour duration will be required as per LMC Chapter 18

The conditions above have been included in the conditions of approval for the proposed manufactured home park.

(3) Appropriate provisions have been made for proposed streets, alleys and public ways, utilities and other improvements that are consistent with the city's current ordinances, standards and plans, and Department of Health and/or Washington State Department of Transportation standards and plans, where applicable.

Staff Findings: the appropriate provisions have been made for streets, utilities, and other required improvements for the proposed 72-lot manufactured home park. Internal access to all home sites will be provided by a 24-foot-wide paved private road designed to meet fire department access and turnaround standards, including a designated four-foot pedestrian walkway on one side of each street. Although the right-of-way width is less than the 32 feet required by LMC 19.80.130, the applicant has requested a variance due to site constraints.

All home sites will be served by public water and sanitary sewer systems operated by the City of Longview, and utility extensions from Oak Street and Jimmer Place will provide adequate service c to the development. Stormwater runoff will be managed through the Consolidated Diking Improvement District (CDID) Regional Detention Program, which provides off-site detention facilities consistent with city standards.

(4) Appropriate provisions to the extent necessary to mitigate an impact of the development have been made for open space, parks, schools, dedications, easements and reservations.

The project includes approximately 8,921 square feet of designated open space and recreational areas located within Tracts B, C, and D. These areas will be improved with playground equipment and enclosed with fencing, exceeding the minimum recreational space requirements outlined in LMC 19.28.

All utilities will be constructed in accordance with City of Longview engineering standards; however, they will remain private and will be owned and maintained by the park owner/developer, as a result, public utility easements are not required.

A 15-foot easement and a 12-foot-wide gravel access road will be dedicated to the Consolidated Diking Improvement District (CDID) to ensure continued access for maintenance of the adjacent drainage ditches that border the site on three sides. Additionally, a 5-foot right-of-way will be dedicated to the City along the project frontage, and the appropriate dedication process will be followed to record this dedication.

(5) The design of the proposed binding site plan has taken into consideration the physical features of the site, including but not limited to: topography, soil conditions, susceptibility to flooding, inundation or swamp conditions, steep slopes or unique natural features such as wildlife habitat or wetlands;

The physical characteristics of the site have been considered in the design of the proposed binding site plan. The subject property is predominantly flat and does not

contain mapped critical areas, such as designated wildlife habitat or wetlands. The site is surrounded by Consolidated Diking Improvement District (CDID) drainage ditches on three sides. In order to mitigate potential impacts and maintain the functionality of the ditches, the site configuration has been designed with appropriate setbacks and easements for CDID maintenance. The CDID Regional Detention Program will be used to manage stormwater from the development, thereby ensuring that the development is consistent with stormwater discharge requirements and that flood risk is mitigated. An infiltration testing analysis was submitted with the application materials to evaluate the soil conditions on the project site. The findings of the report were used to inform and guide the project design, ensuring that appropriate measures were incorporated based on the identified soil conditions.

(6) Compliance with the following:

(a) State requirements including those set forth in Chapter 58.17 RCW;

Bindings site plans are an allowed alternative method of subdivision. The proposed binding site plan complies with Chapter 58.17 RCW by demonstrating orderly division of land for lease or sale and providing for necessary improvements including access, utilities, and fire protection.

(b) Longview parks and recreation plan;

The project proposes a recreational area consistent with the City standards for recreational facilities. The city parks department review the proposed recreational area and expressed no concerns.

(c) Longview zoning ordinance, except when a variance, amendment, or waiver is approved by the city.

The proposed development is located within the Low-Density Residential District R-1) and is consistent with the uses and density and allowed in the zone along with satisfying the manufactured home park development standards. The applicant has submitted a variance request to allow a reduced right-of-way width for private streets and minimum required street frontage, as permitted through the variance process outlined in the zoning code.

(d) Cowlitz County shoreline master program.

The site is not located within a shoreline jurisdiction as defined by the Shoreline Management Act; therefore, no shoreline regulations apply.

(e) Other plans and programs as the city has adopted;

The project will comply with the International Fire Code, building code, and all other applicable local and state construction standards.

(f) The standards of this chapter and this title; the International Fire Code and other adopted codes; and

The project complies with the standards outlined in LMC 19.90. Upon construction of above-ground structures, each manufactured home will be reviewed for compliance with the International Building Code, fire code as well as other applicable codes adopted by the City.

(g) Plans and specifications adopted by the public works department including those set forth in Chapter LMC12.50

Public improvements, including water, sewer, and street sections, are designed in accordance with the City's adopted engineering standards and LMC Chapter 12.50. Utility extensions and half street frontage improvements are included in the civil plan set and will be reviewed for compliance with city standards prior to final approval.

7. COMPREHENSIVE PLAN POLICIES AND GOALS

The proposed Mint Valley Manufactured Home Park is located within the R-1 Residential District, which aligns with the Low-Density Residential designation in the City's Comprehensive Plan. The Low-Density Residential designation supports the development of manufactured home parks.

Relevant goals, objectives, and policies in the Comprehensive Plan highlight the importance of manufactured home parks as a strategy for promoting infill development and the efficient use of large residential parcels. These developments are recognized for their role in expanding housing options within existing urban areas and adding on to the city affordable housing stock.

Additionally, Table 3-16 on page 55 of the Comprehensive Plan identifies a projected need for at least 100 additional manufactured home lots by the year 2040 to accommodate anticipated population growth. Since the Comprehensive Plan was last updated in 2019, the city has approved one manufactured home park consisting of 24 lots. The proposed 72-lot manufactured home park would significantly contribute toward meeting this identified housing need, bringing the city closer to fulfilling the 2040 target for manufactured housing development. The proposed development directly supports this housing need and aligns with the City's long-term planning goals.

Low Density Residential

The low-density residential classification designates areas intended primarily for single-family dwellings. Manufactured housing parks designed according to firm standards for screening, buffering, parking, recreational area, distance between units, and other matters may be appropriate when deemed compatible with adjacent property by the City or County planning

commissions and local legislative bodies. Home occupations may be acceptable. The recommended density is up to six dwelling units per gross acre.

Goal LU-E Amend the Longview Municipal Code Title 19 – Zoning to provide regulations and standards that allow for a wide range of housing choices to meet the changing needs of the community.

Objective LU-E.1 Develop regulations to govern infill in residential areas with large lots.

Policy LU-D.3.3 Recognize the role of mobile and manufactured housing as an important component of Longview's single-family housing stock by allowing for their continuation in zoning regulations and by providing flexible and effective development regulations that will allow the upgrading and modernizing of existing mobile home parks.

Policy HO A.6.1: Increase the supply of quality housing stock and encourage a range of housing options that meet the need for low, medium, and high-density housing types.

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	661	4.0	641	4.2	794	100
Total Units	**16,380**	**100.0**	**16,539**	**100.0**	**18,912**	**2,374**

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

8. CONCLUSION

The proposed 72-lot Mint Valley Manufactured Home Park binding site plan largely satisfies the applicable requirements of the Longview Municipal Code (LMC), including zoning, manufactured home park standards, utilities, stormwater management, recreation, and site design. The applicant has requested variances to those elements of the project that do not outright meet the requirements of LMC, discussed above. The project is consistent with the Comprehensive Plan's Low Density Residential designation and advances city of Longview housing goals outlined in the comprehensive plan by contributing to the needed supply of manufactured and affordable housing within the city. All necessary infrastructure will be provided, including water, sewer, fire

protection, stormwater treatment via participation in the CDID regional detention program, and adequate off-street and guest parking. The project also includes provisions for open space, recreation, screening, landscaping, and pedestrian circulation intended to enhance neighborhood livability.

Along with the application, the applicant has requested variances to lot frontage requirements and road width, and has demonstrated that the proposed reductions will function adequately. Additional consideration for the maximum number of lots served by a single access point has been reviewed by the City Engineer and Fire Marshal, and adequate provisions for fire safety have been provided to mitigate this request.

Each individual manufactured homes placed within the park will undergo review as part of the building permit process. During this review, City staff will ensure that the proposed home placement complies with applicable building codes, zoning regulations, and development standards, including but not limited to setbacks, utility connections, and fire safety access.

9. CONDITIONS OF APPROVAL

Based on the analysis of the issues and findings of fact, staff recommends approval of the Mint Valley Manufactured Home Park preliminary binding site plan, subject to the following conditions of approval:

Community Development

1. Prior to recording, the applicant shall submit a final binding site plan incorporating all conditions of approval, easements, and tract designations. The final binding site plan shall be a survey completed by a surveyor licensed in the State of Washington, and include all appropriate plat notes and conditions of development on its face. Additional supplementary documentation necessary to show compliance with the conditions of approval shall be submitted along with the final binding site plan, including but not limited to CC&Rs, maintenance agreements, and easements.

2. The project is proposed to be developed in three phases. Each phase shall be constructed as a standalone unit of development and include all elements necessary for that phase to stand alone including completion of necessary road, utility, landscaping, and other improvements; provided that multiple phases may be constructed at once. No placement of any manufactured home in a phase shall be permitted until all elements of development have been reviewed, permitted, constructed, and granted final approval for the related phase. Additional temporary fire apparatus turnarounds will be required for Phases 1 and 2 to provide for emergency service needs, subject to Fire Marshal and City Engineer review and approval.

3. A boundary line adjustment shall be completed prior to final binding site plan submittal consolidating the entirety of the park on a single parcel and excluding parcel F from the overall development as shown on the preliminary binding site plan.

4. Covenants and private easements to ensure continued maintenance of park grounds, common areas, private roads and utilities shall be provided to the City prior to final binding site plan approval and recording. The developer shall create and record covenants, conditions & restrictions (CC&R) or a private maintenance agreement, subject to City review that clearly assigns responsibility for the ongoing maintenance, repair, and replacement of all private utilities, internal access roads, and common recreation areas prior to final approval.

5. All manufactured home placement shall be installed in accordance with the manufactured home parks standards outlined in LMC 19.28.130, including all applicable setback requirements. The applicant shall demonstrate the type and design for skirting at time of manufactured home placement application, Per LMC 19.28.130, (5) Skirting shall be securely attached between the home and the ground on all sides within 30 days of home installation. Skirting materials shall consist of materials which are compatible with design of the home and enhance its appearance.

6. The applicant shall work with the Longview post office to determine the most appropriate location for mailboxes to serve the development. Mailbox location(s) shall be shown on the final binding site plan.

7. The applicant shall provide a 5-foot right of way dedication to the City of Longview along Oak street fronting the subject property. The dedication shall be shown on the final binding site plan and be accompanied by necessary supporting documentation to complete the dedication, as determined by the City.

8. A minimum of four fire hydrants shall be installed in locations approved by the Fire Marshal and equally spaced not to exceed 500 feet as measured along fronting streets and fire apparatus access roadways, provided that additional hydrants may be necessitated to ensure adequate fire coverage is provided to all units in the park. The hydrant locations shall be approved by the City Fire Marshal and shown on the final binding site plan prior to final approval.

9. No parking will be allowed on either side of the private roadway throughout the development. Signage denoting 'NO PARKING' is to be installed on both sides of the roadway throughout. A restriction shall be placed on the final binding site plan stating that no off-street parking is allowed at any time along either side of the internal street network.

10. Prior to and development and/or construction on site, the applicant shall submit for the necessary permits, including final engineering design. Any construction, filling, grading, or development activity occurring subsequent to this application shall be in accordance with the city's adopted codes and referenced standards. Additional specific requirements may be made during the city's individual permit review process.

11. Installation of water mains, sewer mains, and hydrants will require final design and permit review and approval from Community Development, the Fire Marshal, and/or the Public Works department, as appropriate. Plan submittals shall be made on forms in conformance with the City of Longview standard plans and specifications. All utilities shall be installed underground and constructed per City of Longview engineering standards.

12. Individual water and sewer service lines shall have proper horizontal separation per the IBC and Longview Building Code.

13. If required by the City Engineer, lighting for intersections shall be provided per LMC 19.28.150. All internal security or safety lighting shall be hooded and placed in a manner that does not cause light or glare to trespass onto any neighboring properties.

14. The project will be utilizing the CDID #1 Regional Detention Program to satisfy stormwater requirements. Evidence of payment and acceptance by CDID #1 shall be provided prior to final binding site plan approval.

15. Any changes to the approved preliminary site plan or final binding site plan will require additional City review pursuant to Chapter 19.90.

16. Individual lot addresses will be determined during final binding site plan review and shall be shown on the face of the final binding site plan.

17. The following signature blocks shall be included on the final binding site plan:

a. Notary block and signature line for the landowner(s)
b. City of Longview Planning Commission Chairman
c. City of Longview Engineer
d. Surveyor's certificate
e. Auditor's certificate

18. The following notes shall be placed on the final binding site plan:

a. "The purpose of this binding site plan is to establish a manufactured home park with sites for lease for the placement of manufactured home only pursuant to Type B binding site plan requirements of LMC 19.28 and 19.90. Ownership of the real property will remain under ownership by a single entity unless a revised binding site plan is recorded pursuant to LMC 19.90 or as amended."

b. *"No parking is allowed on the internal private street shown n the face of this binding site plan."*
c. *"Park owners shall be responsible for the ongoing maintenance and operation of any stormwater facility and/or stormwater transmission lines within this development."*

10.RECOMMENDATIONS

Variance Requests

Staff recommends approval of the following variances, subject to the findings and conclusions in this staff report:

1. Reduction of lot frontage requirements for Lots 7, 8, 28-33, and 38- 43 as shown on the preliminary binding site plan.

2. Reduction of right-of-way width for the internal private street from 32 feet to 24 feet as shown on the preliminary binding site plan.

Preliminary Binding Site Plan

Staff recommends approval of the Mint Valley Manufactured Home Park Type B Preliminary Binding Site Plan for the development of 72 manufactured home lots on approximately 10.38 acres located at 3505 Oak Street, subject to the findings and conclusions in this report; and subject to approval of the requested variances to lot width and right-of-way width.

EXHIBITS:

A. Preliminary Binding Site Plan
B. Preliminary Landscaping plan
C. Preliminary Engineering civil plan
D. Stormwater report
E. Infiltration testing report analysis
F. Traffic Study

Mint Valley

BINDING SITE PLAN - TYPE B

LOCATED IN THE CITY OF LONGVIEW, WASHINGTON

MHP - MANUFACTURED HOME PARK

STREET & FIRE REQUIREMENTS FROM CITY FIRE & ENGINEERING

CITY FIRE AND CITY ENGINEERING AGREE (REFER TO MINT VALLEY EMAIL FROM JON DUNAWAY & KEN HASH 10-12-2023 PER 6. BELOW) THAT THERE ARE PRACTICAL DIFFICULTIES AND TOPOGRAPHICAL LIMITATIONS IN DEVELOPING THIS LAND. IN THE INTEREST OF MAKING POSSIBLE THIS TYPE OF HOUSING TO BE DEVELOPED AT THIS LOCATION, THE CITY AGREED AND APPROVED THAT THE PROPOSED DEVELOPMENT WOULD BE ABLE TO BE CONSTRUCTED WITH ONE INGRESS / EGRESS POINT SUBJECT TO THE FOLLOWING:

1. THE MINIMUM PAVED ROADWAY WIDTH THROUGHOUT THE DEVELOPMENT IS 24 FEET, WIDER THAN THE REQUIRED WIDTH AS OUTLINED PER LMC CHAPTER 18;
2. THERE WOULD BE NO PARKING ALLOWED ON EITHER SIDE OF THE ROADWAY THROUGHOUT THE DEVELOPMENT;
3. SIGNAGE DENOTING NO PARKING WOULD BE INSTALLED THROUGHOUT THE DEVELOPMENT ON BOTH SIDES OF THE ROADWAY;
4. 4 FIRE HYDRANTS REQUIRED - SPECIFIC LOCATIONS TO BE DETERMINED DURING FINAL REVIEW;
5. FIRE FLOW IN THE AMOUNT OF 1,000 GALLONS PER MINUTE FOR 1 HOUR DURATION WILL BE REQUIRED AS PER LMC CHAPTER 18;
6. SEE PROJECT EXHIBITS FOR MORE INFO._(REFER TO MINT VALLEY EMAIL FROM JON DUNAWAY & KEN HASH, 10-12-2023)

DEVELOPMENT STANDARDS

19.28.150 STREETS, LIGHTING, AND WALKWAYS IN MHP

INTERNAL PRIVATE STREETS TO BE 24' WIDE PAVED STREET FIRE ACCESS WITH A PAINTED STRIPED 5' WIDE WALKWAY ON ONE SIDE. "NO PARKING" TO BE SIGNED ON BOTH SIDES OF ALL STREETS.

PRIVATE STREETS FIRE ACCESS

NO PARKING SIGNS TO BE POSTED ON BOTH SIDES OF ALL STREET TO PROVIDE 24' OF TOTAL FIRE ACCESS WIDTH. ADEQUATE AND REASONABLE FIRE ACCESS TO THE SITE IS PROVIDED. ALSO THE SITE IS UNUSUALLY TOPOGRAPHICALLY CONSTRAINED FOR ACCESS POINTS DUE TO THE DRAINAGE DITCH AROUND MUCH OF THE SITE. STANDARDS HAVE BEEN MET TO THE EXTENT POSSIBLE.

OFF STREET PARKING

EACH LOT WILL HAVE 3 PRIVATE OFF-STREET PARKING SPACES (WITH JUST EIGHT LOTS WITH 2 SPACES) OFF-STREET PARKING SPACES AT THE FRONT OF EACH HOME.

PROVIDED OFF STREET PARKING FAR EXCEEDS OFF STREET PARKING STANDARDS PER LMC 19.78(18) MANUFACTURED HOME PARKS WHICH REQUIRES ONE PARKING SPACE PER HOME. SINCE ONE OR TWO EXTRA ADDITIONAL PARKING SPACES ARE PROVIDED PER LOT, THE ADDITIONAL GUEST PARKING REQUIREMENT OF ONE SPACE FOR EVERY TWO HOMES IS MET AND CONSIDERED SATISFIED. IN ADDITION, ANOTHER 8 GUEST SPACES ARE PROVIDED ON TRACT E. SEE NARRATIVE FOR MORE SPECIFIC PARKING DETAILS AND INFORMATION.

19.28.060 MINIMUM BUILDING SETBACKS - MANUFACTURED HOME PARKS.

ALL SETBACKS SHALL BE MEASURED FROM THE NEAREST CORNER OR WALL TO THE APPROPRIATE PROPERTY OR SITE LINE.

1. FRONT SETBACK. THE MINIMUM FRONT YARD SETBACK FOR ALL BUILDINGS AND STRUCTURES SHALL BE FIVE FEET FROM THE FRONT PROPERTY LINE.
2. REAR SETBACK. THE MINIMUM REAR SETBACK SHALL BE 10 FEET TO THE REAR PROPERTY LINE.

19.90.010 PURPOSE.

THE PURPOSE OF A BINDING SITE PLAN IS TO PROVIDE AN ALTERNATIVE METHOD OF LAND DIVISION AS PROVIDED FOR IN RCW 58.17.035 FOR THE SALE OR LEASE OF COMMERCIAL AND INDUSTRIAL PROPERTIES, CONDOMINIUMS, AND MANUFACTURED HOME PARKS. A BINDING SITE PLAN INCLUDES A SURVEY TOGETHER WITH COVENANTS DETAILING THE PERFORMANCE OR NONPERFORMANCE OF CERTAIN ACTS OR THE USE OR NON-USE OF PROPERTY. THE OPTION TO SUBDIVIDE PROPERTY IN ACCORDANCE WITH STANDARD SUBDIVISION PROCEDURES PROVIDED IN CHAPTER 19.80 LMC IS ALSO AVAILABLE. (ORD. 3091 § 2, 2009).

"TYPE B BINDING SITE PLAN" MEANS A BINDING SITE PLAN PROPOSED FOR THE SALE OR LEASE OF RESIDENTIAL PROPERTY EITHER IN A MANUFACTURED HOME PARK, RECREATIONAL VEHICLE PARK OR CONDOMINIUMS. TYPE B BINDING SITE PLANS ARE APPROVED BY THE PLANNING COMMISSION AFTER AN OPEN-RECORD HEARING. (ORD. 3395 § 6, 2019; ORD. 3161 § 5, 2011; ORD. 3091 § 2, 2009).

PROJECT PHASING

THIS PROJECT WILL BE CONSTRUCTED IN EITHER ONE SINGLE PHASE, TWO PHASES OR UP TO THREE PHASES.
PHASE 1 - THE FIRST 150' OF PRIVATE STREET WITH A TEMPORARY HAMMERHEAD TURNAROUND AT THE END ON ADJACENT FUTURE LOTS 5 & 68.
PHASE 2 - THE NEXT SECTION OF PRIVATE STREET FROM PH 1 UP TO TRACT D INCLUDING A HAMMERHEAD TURNAROUND AT TRACT D.
PHASE 3 - ALL REMAINING LOTS AROUND THE LOOP. EACH PHASE WILL BE DESIGNED TO MEET REQUIRED STANDARDS FOR THAT PHASE. ALTERNATIVELY, THE PHASES 1+2 OR PHASES 1+2+3 MAY BE CONSTRUCTED CONCURRENTLY.

CONSTRUCTION TRAFFIC - ALL SITE CONSTRUCTION TRAFFIC ACCESS MUST USE ONLY 36TH AVE FOR CONSTRUCTION ACCESS ROUTE.

LMC SECTION 19.77.050 :DRIVEWAYS AND JOINT USAGE DRIVEWAYS. URBAN DRIVEWAYS AND JOINT USAGE DRIVEWAYS SERVING ONE OR TWO LOTS HAVE THE MINIMUM PAVED WIDTH OF 12 FEET WITHIN A MINIMUM 20 FOOT WIDE SHARED DRIVEWAY ACCESS EASEMENT. THE STANDARD ACCESS EASEMENT WIDTH IS 20 FEET FOR ONE OR SERVING ONE OR TWO LOTS. A MIN 12 FOOT WIDE PAVED AC DRIVEWAY WILL STILL BE PROVIDED FOR 1 OR 2 LOTS AS REQUIRED PER CODE. ALL LOTS HAVE FUNCTIONAL DRIVEWAY ACCESS AND AT LEAST 2 PARKING SPACES.

SITE DATA AND AREA SUMMARY

GROSS SITE TOTAL AREA =	452,225 SF,	10.38 AC
PROPOSED PRIVATE STREET TRACT A (PVT.) =	42,160 SF,	0.97 AC
TRACT B+C+D PARK RECREATION AREA =	8,921 SF,	0.20 AC
TRACT E EXTRA PARKING AREA =	1,893 SF,	0.04 AC
TRACT G EXTRA PARKING AREA =	1,292 SF,	0.03 AC
BLA PARCEL F (BLA FROM EX PARCEL 05319) =	7,095 SF,	0.16 AC
TOTAL LOT AREA =	390,864 SF,	8.97 AC
AREA FROM CL OF DITCH TO TOP OF BANK =	89,142 SF,	2.05 AC
NUMBER OF NEW LOTS =	72	
AVERAGE LOT AREA =	5,428 SF	

ALLOWED MAX DENSITY 10.38 AC X 8.5 UNITS PER GROSS ACRE = 88 UNITS MAX

PARCEL NUMBERS:
05319: 50,947 SF, 1.16 ACRES
PARCEL-X: 11,359 SF, 0.26 ACRES
053180300: 401,308 SF, 9.22 ACRES. THIS EX. PARCEL 05139 TO BE BLA'D INTO PARCEL F.
THE EX. 3503 HOUSE TO BE REPLACED, REMOVED OR RELOCATED ONTO THIS BLA PARCEL F (#05319).
BLA TO BE DONE CONCURRENTLY & JUST PRIOR TO FINAL BSP APPROVAL.
TOTAL EXISTING AREA = 452,255 SF = 10.38 ACRES

SITE ADDRESS :
3503 & 3505 OAK STREET
LONGVIEW, WA 98632
EX 3503 HOUSE TO BE REMOVED & REPLACED WITH NEW HOUSE ON PARCEL F
TRACT E AND G TO BE ADDITIONAL PARKING OR OPEN SPACE

SITE LOCATION:
LOCATED ON THE SOUTH SIDE OF OAK STREET
APPROXIMATELY 800' NORTHWEST OF THE INTERSECTION WITH 34TH AVENUE
LOCATED IN THE NE 1/4 OF SECTION 30, T8N, R2W, W.M. LONGVIEW, WA

RECREATION AREA TO BE OUTDOOR PLAY AREA (MIN 72 X 100 = 7200 SF) ON TRACTS B, C AND D TOTAL 8921 SF
CHILD PLAY STRUCTURE TO BE PROVIDED ON TRACT D. SEE NARRATIVE FOR DETAILS
A MINIMUM 30 INCH TALL FENCE WILL BE INSTALLED ALONG THE EXTERIOR BOUNDARIES OF OF TRACT C AND D TO PROVIDE SEPARATION FROM ALL STREETS, HOUSE DRIVEWAYS, AND PARKING AREAS .

CDID#1 NOTES ROAD #3 : FOR DITCH TOP OF BANK QCD DEDICATING ONE-HALF OF THE DITCH TO CDID#1 (OWNERSHIP), 15-FT EASEMENT FROM TOP OF THE BANK TO CDID#1 (EASEMENT), AND 12-FT GRAVEL ACCESS ROAD (SEE C-8)

LENGTH OF TOP OF BANK: 2890LF
LENGTH OF DITCH ALONG PARCEL F: 195LF
LENGTH OF DITCH ALONG 3507 OAK ST: 190LF

VICINITY MAP

SCALE: NTS

TYPICAL LOT WIDTH:
40 FEET FOR INTERIOR STREET AT 20' FRONT SETBACK LINE, EXCEPT ON BENDS OR CORNERS OR AS NOTED.

TYPICAL LOT DEPTH:
60 FEET MIN. OR AS NOTED

SETBACKS:
MIN. FRONT SETBACK - 5 FEET
MIN. SIDE YARD SETBACK - 5 FEET
MIN FRONT PARKING SETBACK - 20 FEET FROM EDGE OF STREET
REAR YARD SETBACKS - 10 FEET

PRESENT USE:
THE SITE IS A SINGLE-FAMILY RESIDENTIAL HOUSE ON 3 EXISTING LEGAL LOTS OF RECORD.

EXISTING STREETS:
THE SITE WILL ACCESS FROM OAK AVENUE. THE PROPERTY IS BORDERED ON THREE SIDES BY THE CDID #1 DITCH. THE ADJACENT PROPERTIES ARE SINGLE FAMILY RESIDENCES.

PARCEL F DRIVEWAY TO HAVE FIRST 50' PAVED.

EXISTING ZONING:
R-1 RESIDENTIAL

SANITARY SEWER SERVICE:
CITY OF LONGVIEW

WATER SERVICE:
CITY OF LONGVIEW

ELECTRICAL SERVICE:
COWLITZ PUD

WELLS OR SEPTICS:
NONE KNOWN

WATER - MIN. 6" PRIVATE WATER MAIN WITH HYDRANTS EVERY 500' MIN.

4 HYDRANTS ARE SHOWN

CIVIL ENGINEER & APPLICANT:
KESSI ENGINEERING & CONSULTING
JAMES KESSI,PE
6400 NE HWY 99 #G169
VANCOUVER, WA 98665
(360) 991-9300
james.kessi@gmail.com

OWNER
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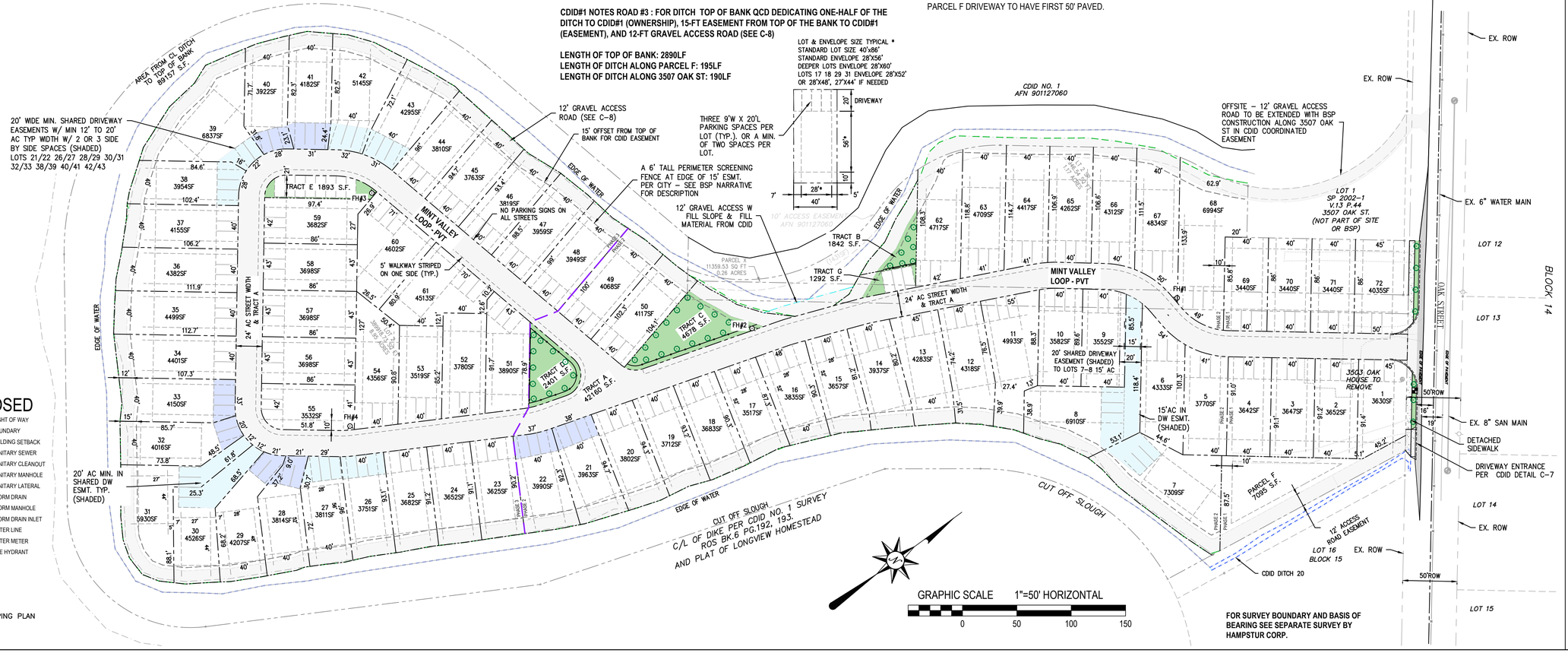
6400 NE HIGHWAY 99 STE G169
VANCOUVER, WA 98665
999north@gmail.com
360-448-5633

SURVEYOR:
HAMPSTUR CORP.
PHIL GUSTIN, PLS
1813 BAKER WAY, KELSO, WA 98626
(360) 423-8166
pgust@hampstur.com



LEGEND - PROPOSED

- PROPOSED RIGHT OF WAY
- PROPOSED BOUNDARY
- PROPOSED BUILDING SETBACK
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY CLEANOUT
- PROPOSED SANITARY MANHOLE
- PROPOSED SANITARY LATERAL
- PROPOSED STORM DRAIN
- PROPOSED STORM MANHOLE
- PROPOSED STORM DRAIN INLET
- PROPOSED WATER LINE
- PROPOSED WATER METER
- PROPOSED FIRE HYDRANT

LANDSCAPE LEGEND:

- LOT TREES
- STREET TREES
- GRASS LANDSCAPED YARD
- SEE TREE PLAN & LANDSCAPING PLAN

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KESSI ENGINEERING & CONSULTING

REVISIONS
1
2
3
4
5

DRAWN BY: T.F.
DESIGNED BY: J.K.
CHECKED BY: J.K.

PROJECT #155
DATE: 5/26/2025

MINT VALLEY
BINDING SITE PLAN

MV BSP

APPENDIX D

Geotech Report

MINT VALLEY – OAK STREET

D-1 Geotech Report – Infiltration Testing

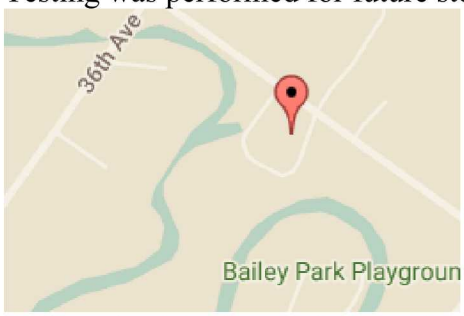
James Kessi PE
Kessi Engineering and Consulting
360-991-9300
james.kessi@gmail.com

22 October 2024

Re: Infiltration testing for 3503 Oak Street, Longview, WA

Dear Mr. Kessi,

Field Investigation:
Rapid Soil Solutions (RSS) has performed a total of four (4) infiltration tests at the above-mentioned site. Figure 1 shows the project site location. RSS found fine-grained Alluvial Deposits, Qal, such as silt. Testing was performed for future storm water design.



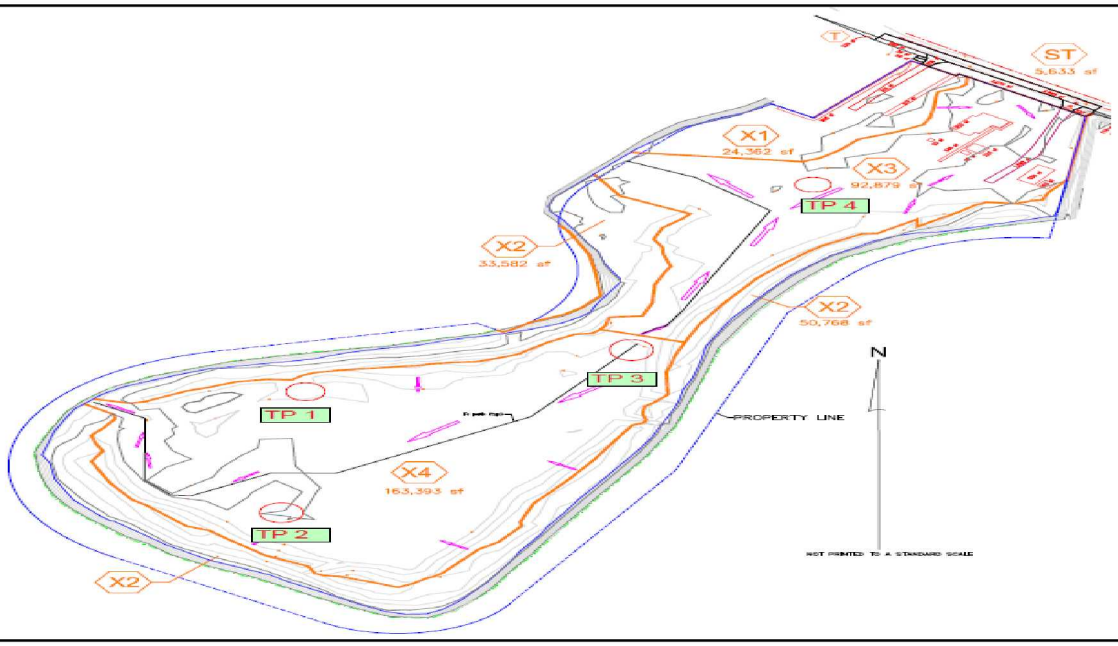
Infiltration Testing and ground water depth
Infiltration testing was performed as per the City of Longview Storm Water Manual 2016. Testing took place in four hand auger borings. The test was run a total of three times. A summary of the results with the testing depths is shown below. Ground water is found around 56in measured near TP #4.

Location	Depth (ft)	Rate (in/hr.)
TP # 1	2	5.875
TP #2	2	6
TP #3	1.5	5
TP #4	1.5	22

The analysis, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of explorations. Any questions regarding this report please contact me at the below number or email.
Sincerely,

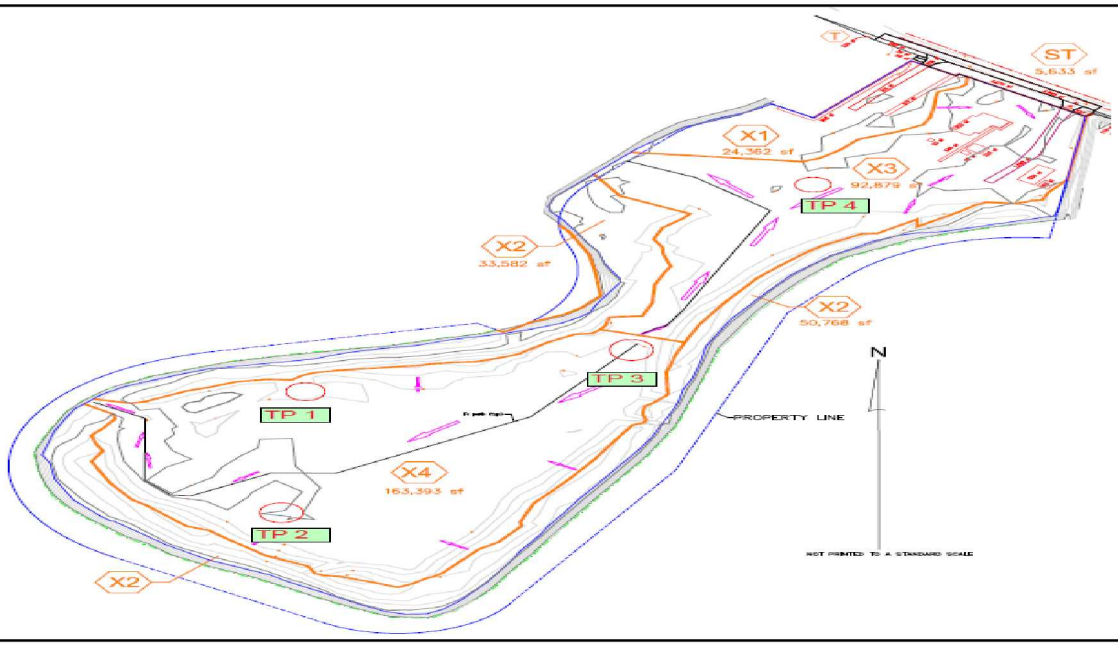
Mia Mahedy, PE GE.

Rapid Soil Solutions Infiltration Test Results



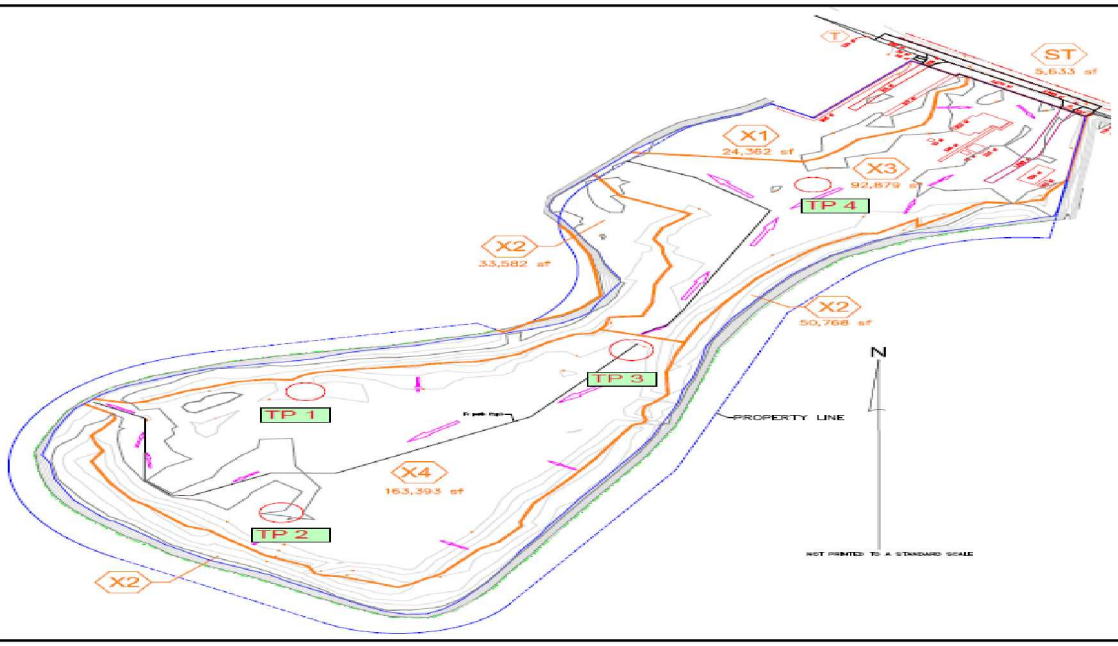
Preliminary Information			
Location:	3503 Oak St, Longview, WA.	**Performed By: (Supervised by Mia Mahedy, PE, GE)**	Rick Sands
Date & Time:	10-18-24	**Instrument Used:**	3 inch hand auger
Weather:	55, showers	**Depth:**	2 ft
TP 1			
6 inches	Topsoil		
6 inches-2ft	Dry to damp, tan, grey, light orange, clayey silt, medium stiffness		
Time	**Measurement (inches)**	**Level Refilled To (inches)**	**Rate (inches/hour)**
10:15	13 5/8		
10:35	9.5		
10:55	8 3/8		
11:15	7 7/8	13.75	
11:35	9 5/8		
11:55	8 5/8		
12:15	6 5/8	13 1/8	
12:35	9 7/8		
12:55	7 7/8		
1:15	7		
Site Infiltration Rate (inches/hour)			**5.875 in/hr.**

Rapid Soil Solutions Infiltration Test Results



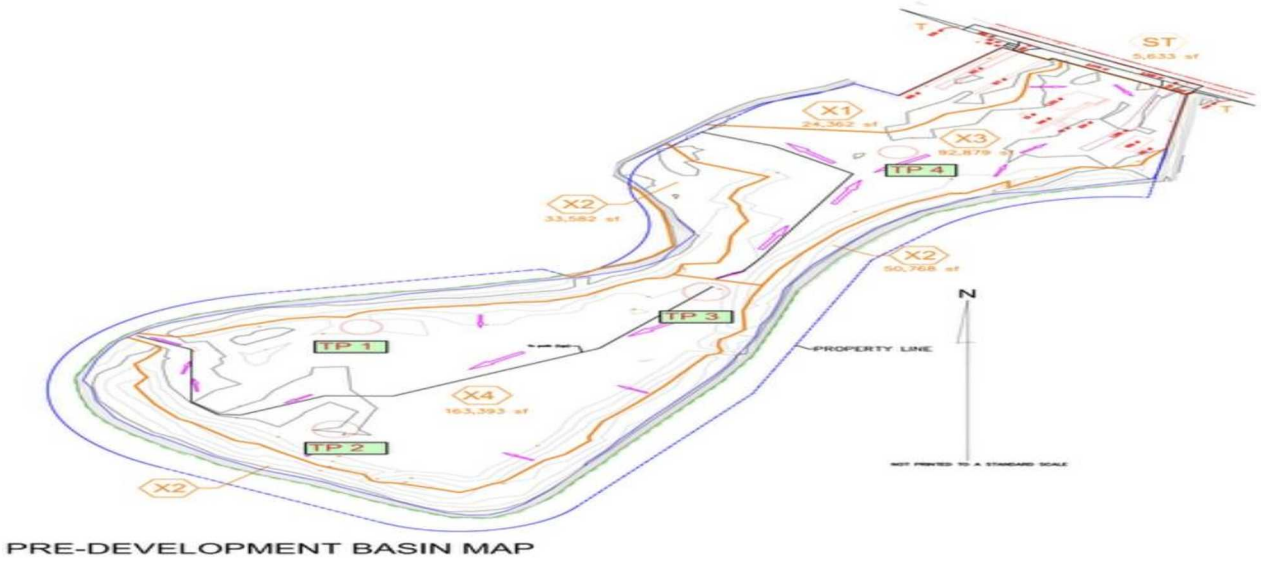
Preliminary Information			
Location:	3503 Oak St, Longview, WA.	**Performed By: (Supervised by Mia Mahedy, PE, GE)**	Rick Sands
Date & Time:	10-18-24	**Instrument Used:**	3 inch hand auger
Weather:	55, showers	**Depth:**	2 ft
TP 2			
6 inches	Topsoil		
6 inches-2ft	Dry to damp, tan, grey, light orange, clayey silt, medium stiffness		
Time	**Measurement (inches)**	**Level Refilled To (inches)**	**Rate (inches/hour)**
10:15	13.25		
10:35	10		
10:55	8.25		
11:15	7	14.25	
11:35	10		
11:55	8.75		
12:15	7 5/8	13	
12:35	9 3/8		
12:55	7.75		
1:15	7		
Site Infiltration Rate (inches/hour)			**6 in/hr.**

Rapid Soil Solutions Infiltration Test Results



Preliminary Information			
Location:	3503 Oak St, Longview, WA.	**Performed By: (Supervised by Mia Mahedy, PE, GE)**	Rick Sands
Date & Time:	10-16-24	**Instrument Used:**	3-inch hand auger
Weather:	62, cloudy	**Depth:**	1.5 ft
TP 3			
12 inches	Topsoil		
12 inches-1.5ft	Dry to damp, tan, grey, light orange, clayey silt, medium stiffness		
Time	**Measurement (inches)**	**Level Refilled To (inches)**	**Rate (inches/hour)**
12:45	13.75		
1:05	8 5/8		
1:25	7.75		
1:45	6.25	15 3/8	
2:05	12.5		
2:25	10.75		
2:45	8 7/8	15 1/8	
3:05	11 7/8		
3:25	11.25		
3:45	10 1/8		
Site Infiltration Rate (inches/hour)			**5 in/hr.**

Rapid Soil Solutions Infiltration Test Results



PRE-DEVELOPMENT BASIN MAP

Preliminary Information			
Location:	3503 Oak St, Longview, WA.	**Performed By: (Supervised by Mia Mahedy, PE, GE)**	Rick Sands
Date & Time:	10-16-24	**Instrument Used:**	3 inch hand auger
Weather:	62, cloudy	**Depth:**	2 ft
TP 4			
6 inches	Topsoil		
6 inches-2ft	Dry to damp, tan, grey, light orange, clayey silt, medium stiffness		
Time	**Measurement (inches)**	**Level Refilled To (inches)**	**Rate (inches/hour)**
12:45	12 3/8		
1:05	1.25		
1:25	0	14.25	
1:45	1.75		
2:05	0	13.25	
2:25	3 7/8		
2:45	0		
Site Infiltration Rate (inches/hour)			**22 in/hr.**

---------- Forwarded message ---------
From: **Mia Mahedy** <mia@rapidsoilsolutions.com>
Date: Fri, Oct 25, 2024 at 10:36 AM
Subject: Re: Oak St Mint Valley Longview Infiltration & Soils Report and invoice 10-22-2024
To: James Kessi <james.kessi@gmail.com>

James, we went back this morning. Water is at 56in. Also it may come up as to 48in the soils were rusty starting at 4ft.

Mint Valley

TREE AND LANDSCAPING PLAN

LOCATED IN THE CITY OF LONGVIEW, WASHINGTON

TREE & LANDSCAPING PLAN
FOR LOTS – TYPICAL

LOT TREES LANDSCAPE NOTES:

1. PLANT TREES: IN PLANTER STRIP PLANT AT ONE TREE PER LOT IN FRONT AND ONE TREE IN REAR YARD AVERAGE. PLANT CLERODENDRUM TRICHOTOM, RUBUS CALYCINOIDES, OR ACER BUERGERANUM (TRIDENT MAPLE) OR EQUIVALENT DROUGHT RESISTANT VARIETIES FOR MAX 4' PLANTER AREA. USE BARE ROOT OR MIN 1" CALIPER.
2. USE DROUGHT RESISTANT TREE IN PLANTER STRIP AND PROVIDE POLY ROPYLENE WEED BARRIER UNDER ALL DECORATIVE ROCK AND TREE ROOT BARRIER, AT 0.08" OR 2MM THICK, ABUTTING SIDEWALK EDGES AND CURB NEAR TREE. IN LIMITED AREAS GROUNDCOVER MAY BE NATURAL DECORATIVE ROCK OR BARKCHIPS.
3. BEHIND CURB OR IN PLANTER STRIP BETWEEN CURB AND SIDEWALK, INSTALL DECORATIVE ROUND ROCK WITH WEED MATTING, OR PLANT NATIVE & DROUGHT RESISTANT GRASS LAWN,. SHRUBS, GROUNDCOVER, TURF, AND/OR SHRUBS AT THE DISCRETION OF THE DEVELOPER, IN PLANTER STRIP AND IN YARDS.

LANDSCAPE LEGEND:

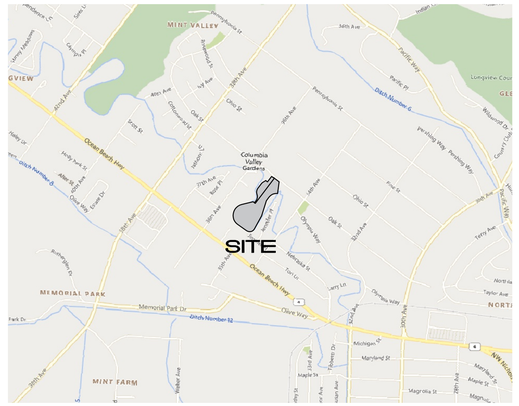
LOT TREES SEE NOTE 1
STREET TREES SEE NOTE 1
GRASS LANDSCAPED YARD

LANDSCAPING

TREES – DROUGHT RESISTANT TREES TO BE PLANTED IN TRACTS B, C, AND D AS SHOWN AT ABOUT 15' SPACING. AT LEAST ONE REPLACEMENT TREE WILL HAVE TO BE PLANTED FOR EACH TREE REMOVED ON THE SITE. THESE TRACTS ARE ALSO TO BE PLANTED WITH GRASS.

A 6' TALL PERIMETER SCREENING FENCE WILL BE PROVIDED AROUND THE ENTIRE SITE ALONG THE EDGE OF THE 15' EASEMENT.

RECREATION AREA TO BE OUTDOOR PLAY AREA (MIN 72 X 100 = 7200 SF) ON TRACTS C AND D TOTAL 8921 SF
CHILD PLAY STRUCTURE TO BE PROVIDED ON TRACT D. SEE NARRATIVE FOR DETAILS
A MINIMUM 30 INCH TALL FENCE WILL BE INSTALLED ALONG THE EXTERIOR BOUNDARIES OF OF TRACT C AND D TO PROVIDE SEPARATION FROM ALL STREETS, HOUSE DRIVEWAYS, AND PARKING AREAS .



VICINITY MAP
SCALE: NTS

CIVIL ENGINEER & APPLICANT:
KESSI ENGINEERING & CONSULTING
JAMES KESSI,PE
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VANCOUVER, WA 98665
(360) 991-9300
james.kessi@gmail.com

OWNER
COLUMBIA VIEW GROUP LLC
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VANCOUVER, WA 98665
999north@gmail.com
360-448-5633

SURVEYOR:
HAMPSTUR CORP.
PHIL GUSTIN, PLS
1813 BAKER WAY, KELSO, WA 98626
(360) 423-8166
pgust@hampstur.com

FOR SURVEY BOUNDARY AND BASIS OF BEARING SEE SEPARATE SURVEY BY HAMPSTUR CORP.

KESSI ENGINEERING
PLANNING CIVIL ENGINEERING
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6400 NE HWY 99 #G-169 VANCOUVER, WA 98665
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KESSI ENGINEERING & CONSULTING

REVISIONS
1
2
3
4
5

DRAWN BY: T.F.
DESIGNED BY: J.K.
CHECKED BY: J.K.

PROJECT #155
DATE: 5/13/2025

MINT VALLEY
TREE PLAN & LANDSCAPING PLAN

MV TREE & LS

REPORT

Mint Valley Mobile Park
Traffic Impact Study

March 20, 2025

H. Lee & Associates, PLLC

MINT VALLEY MOBILE PARK
TRAFFIC IMPACT STUDY

Prepared for:

James Kessi, P.E.
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March 20, 2025

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SECTION I
STUDY SUMMARY

INTRODUCTION

This traffic impact analysis has been prepared to assess transportation impacts related to the proposed Mint Valley Mobile Park in Longview, Washington. The project site is located at 3503 and 3505 Oak Street and is comprised of parcels 053180300 and 05319. Figure 1 shows the project vicinity.

Project Description

The proposed project is the development of a 72-unit mobile home park. Access to the project site will be from Oak Street. One single-family detached home exists on-site and will be retained on-site. Figure 2 shows the project site plan.

Scope of Traffic Impact Study

The scope of the traffic impact study was developed based known traffic impact study requirements and correspondence with City of Longview staff. From this information, the following intersections were determined to require analysis:

- 36th Avenue/Oak Street
- 34th Avenue/Oak Street
- 36th Avenue/Ocean Beach Highway (SR-4)
- 34th Avenue/Ocean Beach Highway (SR-4)
- Oak Street/Project Access

The remainder of this report presents the following analysis:

- Existing A.M. and P.M. peak hour traffic conditions in the project study area.
- The 2030 "Without Project" condition was analyzed to establish the future baseline condition for the City of Longview. The 2030 "Without Project" condition traffic volumes were derived by using a two (2) percent compounded, annual growth factor and adding traffic generated by "in process" developments. The "in-process" traffic volumes were obtained from the city staff.
- Trip generation estimates for the proposed development were developed from rates published in Trip Generation, 11th Edition" (Institute of Transportation Engineers, 2021).
- Trip distribution and assignment of project-generated trips.

- The 2030 "With Project" condition was analyzed to determine the project traffic impacts for the City of Longview.

SUMMARY OF FINDINGS

The following are the findings and recommendations from the traffic analysis:

Findings

The following are the findings from the traffic analysis:

- The proposed development is expected to generate 513 daily, 28 A.M. peak hour (6 in, 22 out), and 42 P.M. peak hour (26 in, 16 out) net new trips.

- All of the study area intersections are projected to meet level of service standards for the 2030 "Without Project" and 2030 "With Project" conditions.

- Based on field measurements conducted by H. Lee & Associates, PLLC (HLA), the Oak Street/Project Access intersection should be able to meet the sight distance requirements as long as any existing vegetation within the sight distance triangles are properly maintained after construction and no obstructions are placed within the sight distance triangles that could impede a driver's vision. Because the northbound project access approach has not been designed or constructed yet, the corner sight distance should be reconfirmed at the final engineering/construction stage of development to assure that any design/construction element does not preclude the necessary corner sight distance requirement.

- Turn lane warrants at the project access intersection were not conducted due to low traffic volumes, good levels of service, and acceptable accident rates in the 2030 "With Project" condition.

- Preliminary signal warrants are not met for the 8-hour, 4-hour, or peak hour conditions at any of the study area intersections in the 2030 "With Project" condition.

Recommendations

- Based on the traffic impact analysis documented in this report, no physical, off-site mitigation would be needed.

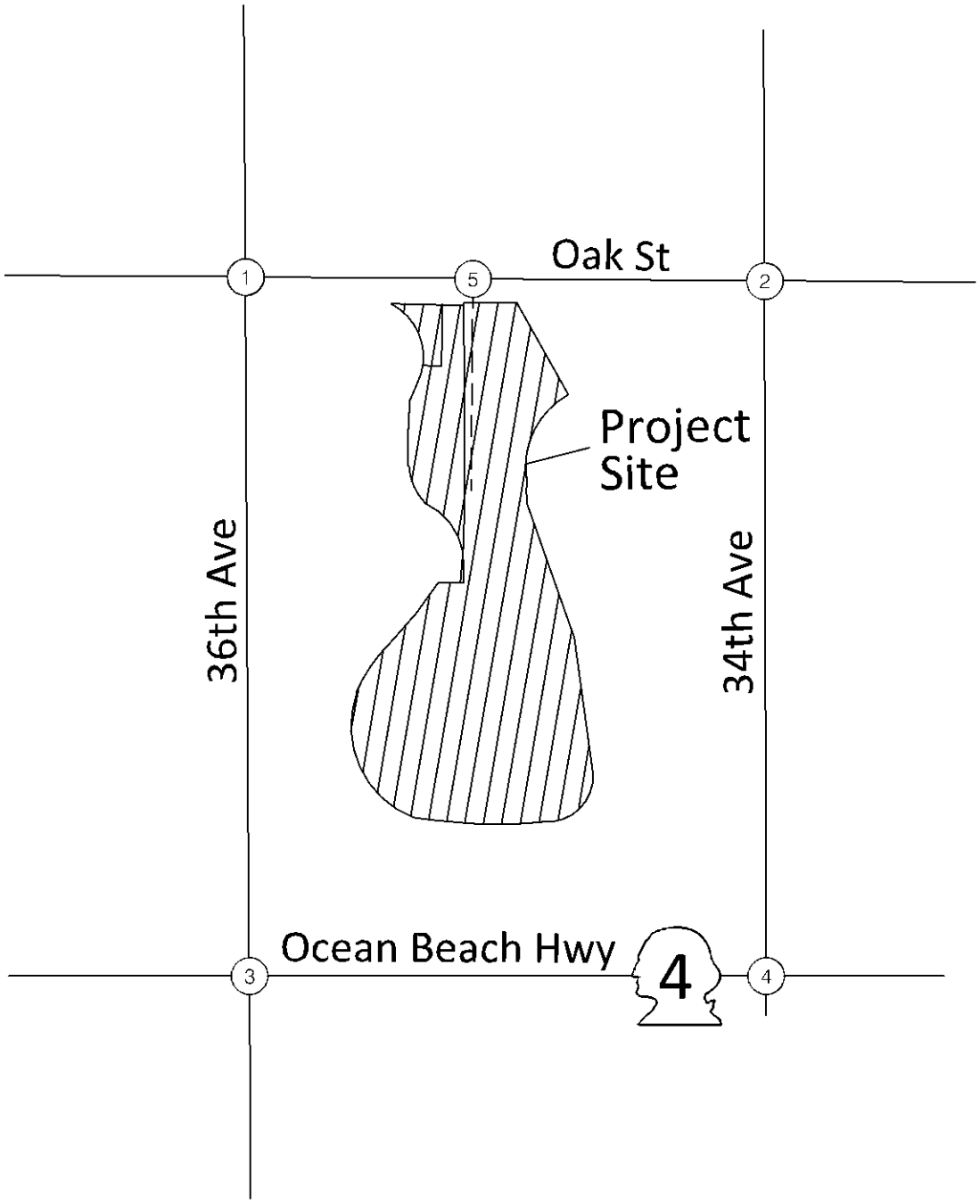


FIGURE 1
Site Vicinity Map

NOT TO SCALE

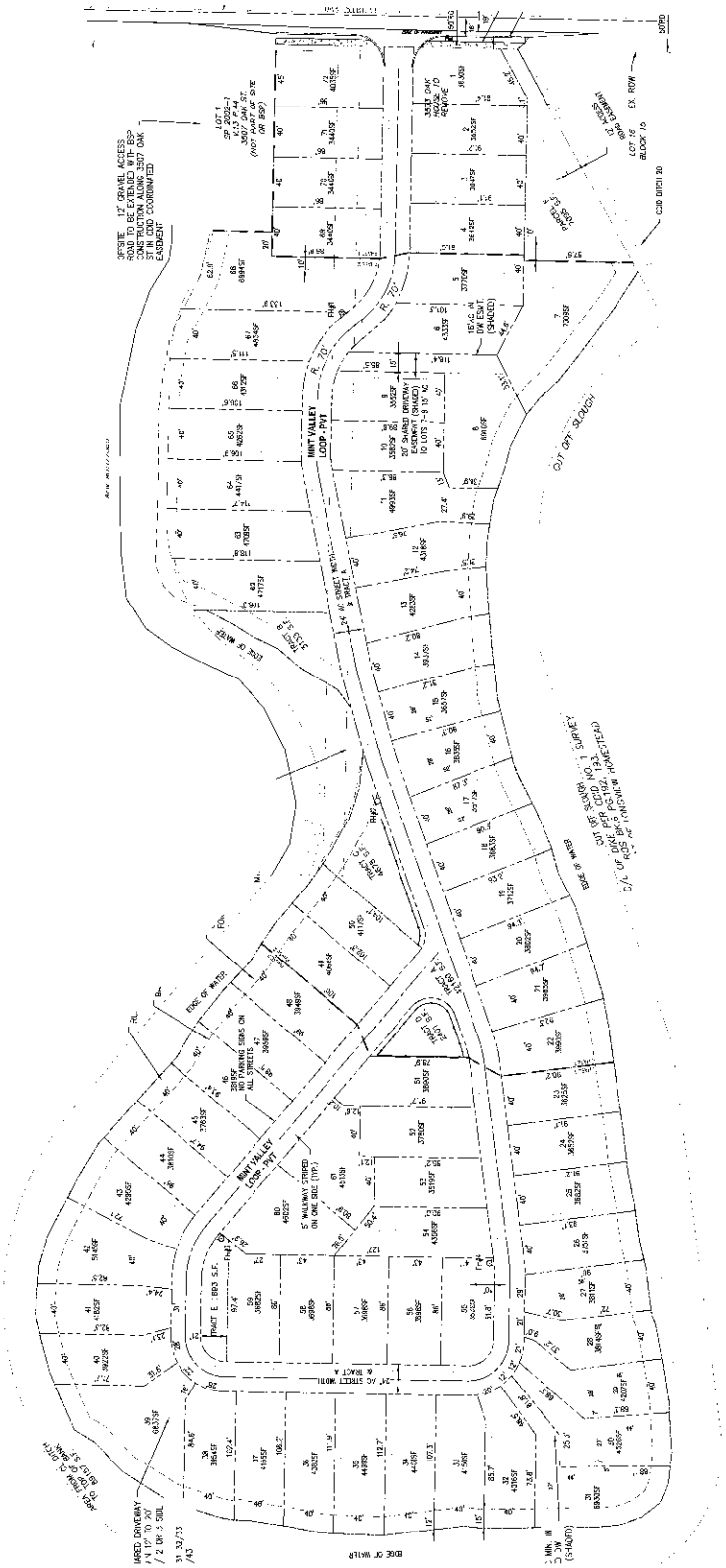


FIGURE 2
Site Plan

NO TO SCALE

SECTION II
EXISTING CONDITIONS

SITE CONDITION AND ADJACENT LAND USE

One single-family detached home exists on-site and will be retained on-site. Residential uses surround the project site.

TRANSPORTATION FACILITIES

The following provides a description of the existing street system in the study area including a description of street classifications and characteristics.

Oak Street: Oak Street is a two-lane urban collector roadway. The posted speed limit is 25 mph.

Ocean Beach Highway (SR-4): Ocean Beach Highway (SR-4) is a four-to-five lane principal arterial and state route. Sidewalks exist along both sides of the roadway. East of 32nd Avenue the posted speed limit is 35 mph. West of 32nd Avenue the posted speed limit is 40 mph.

34th Avenue: 36th Avenue is a two-lane urban local access roadway. The posted speed limit is 25 mph.

36th Avenue: 36th Avenue is a two-lane urban local access roadway. The posted speed limit is 25 mph.

As part of this study, levels of service analyses were performed for the following intersections:

- 36th Avenue/Oak Street
- 34th Avenue/Oak Street
- 36th Avenue/Ocean Beach Highway (SR-4)
- 34th Avenue/Ocean Beach Highway (SR-4)
- Oak Street/Project Access

All of the study area intersections are unsignalized and stop sign controlled. Figure 3 shows the lane configuration and traffic control at the study area intersections.

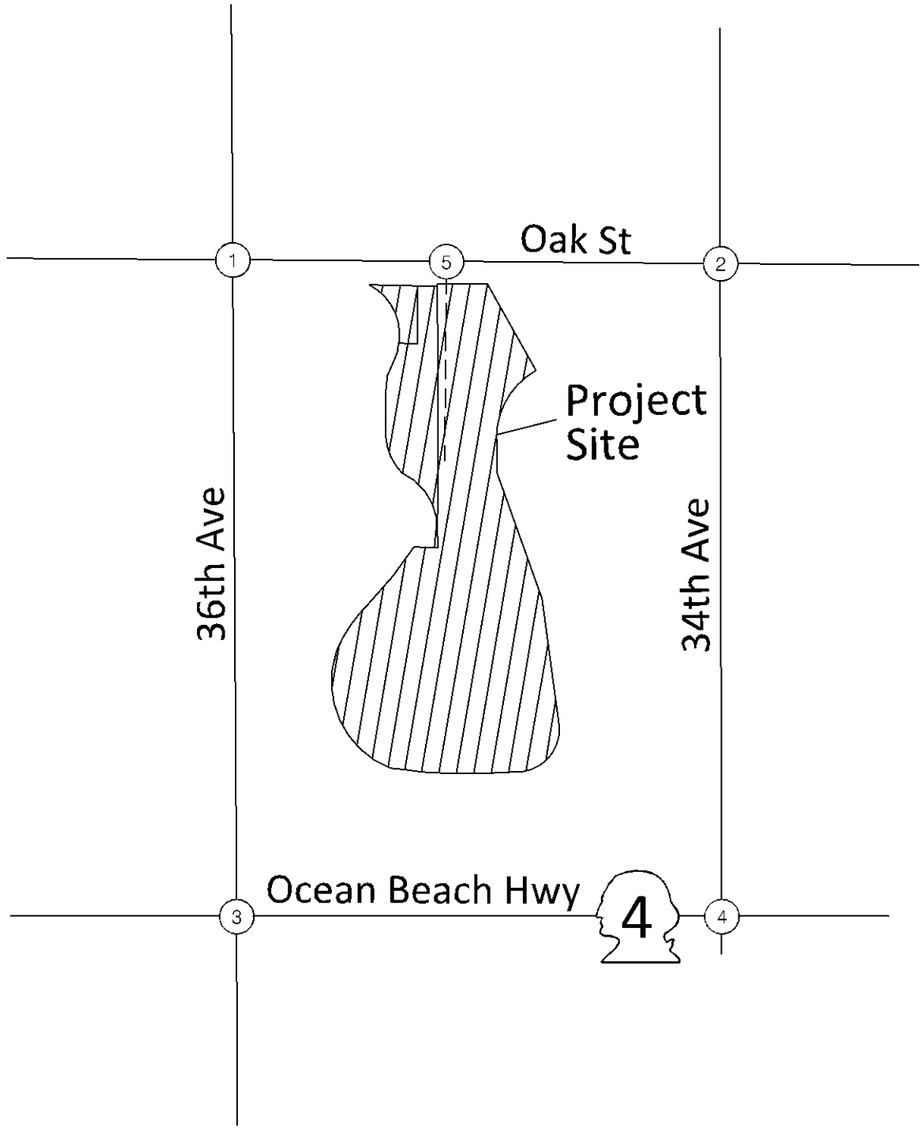
EXISTING TRAFFIC VOLUMES

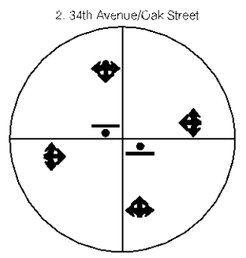
A.M. and P.M. peak hour traffic counts were obtained at the study area intersections by HLA in March 2025. Per the HCM, peak 15-minute traffic volumes were multiplied by four (4) to arrive at the peak hour traffic volumes. With this methodology of developing peak hour traffic volumes, the peak hour factor (PHF) is set to 1.00 because the peaking has already occurred by multiplying the peak 15-minute traffic volume by four (4). The existing condition traffic volumes are presented in Figure 4. The existing traffic counts can be referenced in Appendix A.

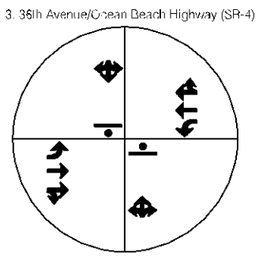
EXISTING LEVELS OF SERVICE

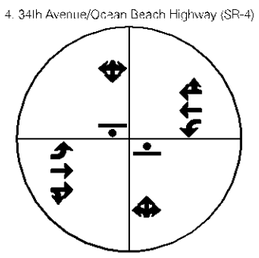
Based on the traffic volumes in Figure 4 and the existing lane configurations presented in Figure 3, peak hour traffic operations were analyzed at the study area intersections using the methodologies outlined in the Highway Capacity Manual (HCM) 7th Edition. According to the HCM, there are six levels of service (LOS) by which the operational performance of an intersection may be described. These levels of service range between LOS "A" which indicates a relatively free-flowing condition and LOS "F" which indicates operational breakdown.

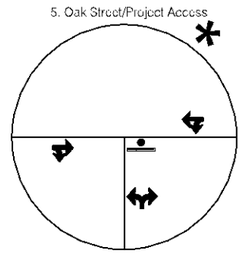
Typically for signalized intersections the LOS standard is LOS D or better. Typically for unsignalized intersections the LOS standard is LOS E or better, unless signal warrants are met. If signal warrants are met, then the standard is LOS D or better. For unsignalized intersections, the level of service and delay reported is by approach or conflicting movement.









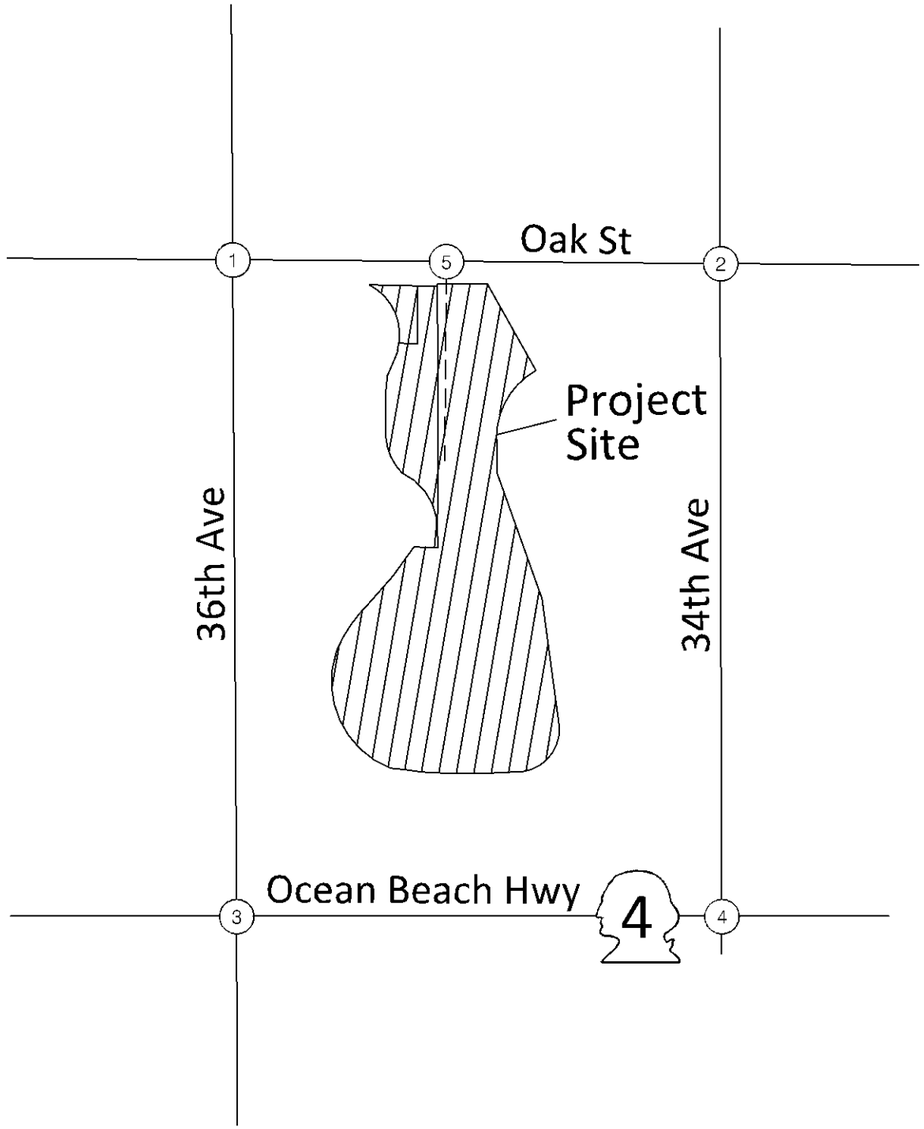


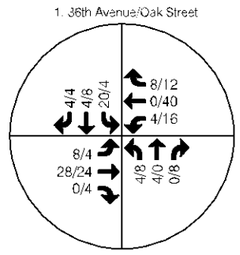
LEGEND

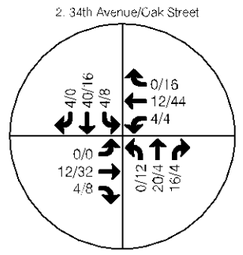
- Lane Usage
- Traffic Signal
- Stop Sign
- * 2030 "With Project" Lane Configuration and Traffic Control

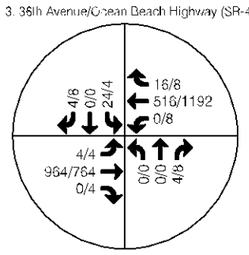
NOT TO SCALE

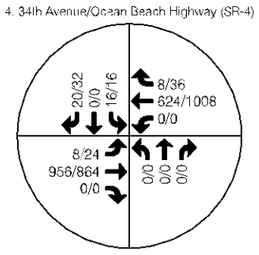
FIGURE 3
Existing Lane Configuration and Traffic Control

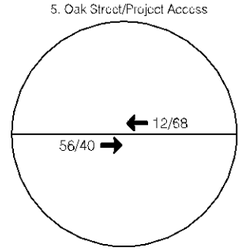












LEGEND

128/200 A.M./P.M. Peak Hour Traffic Volume

NOT TO SCALE

FIGURE 4
Existing A.M. and P.M.
Peak Hour Traffic Volumes

Existing A.M. and P.M. peak hour levels of service at the study area intersections are summarized in Table 1. As shown in Table 1, all of the study area intersections are operating at acceptable levels of service of LOS C or better in the existing condition. Appendix B contains the level of service worksheets for the existing conditions.

Table 1. Existing Levels of Service

	A.M. Peak Hour		P.M. Peak Hour	
Unsignalized Intersection	LOS	Average Delay (sec)	LOS	Average Delay (sec)
36th Avenue/Oak Street				
Northbound Approach	A	9.2	A	8.9
Southbound Approach	A	9.1	A	9.4
Eastbound Left	A	7.3	A	7.3
Westbound Left	A	7.3	A	7.3
34th Avenue/Oak Street				
Northbound Approach	A	9.0	A	9.2
Southbound Approach	A	9.4	A	9.5
Eastbound Left	A	0.0	A	0.0
Westbound Left	A	7.2	A	7.3
36th Avenue/Ocean Beach Highway (SR-4)				
Northbound Approach	B	11.8	B	10.9
Southbound Approach	C	17.0	C	18.7
Eastbound Left	A	8.5	A	11.2
Westbound Left	A	0.0	A	9.3
34th Avenue/Ocean Beach Highway (SR-4)				
Northbound Approach	A	0.0	A	0.0
Southbound Approach	B	14.2	C	18.1
Eastbound Left	A	8.8	B	10.5
Westbound Left	A	0.0	A	0.0

ACCIDENT HISTORY

Accident data was obtained from the Washington State Department of Transportation (WSDOT) for the five-year, eleven-month, and twenty-day period between January 1, 2019 and December 20, 2024. The data includes total crashes and crashes by severity (i.e., fatality, injury, or property damage only). The accident analysis is summarized in Table 2 for the study area intersections. Appendix C contains the accident data.

Generally, an accident rate of less than 1.00 accidents per million entering vehicles is considered acceptable and no further analysis is necessary. As shown in Table 2, all of the accident rates at the study area intersections are below 1.00 accidents per million entering vehicles, so no further analysis was conducted.

Table 2. Summary of Traffic Accident History at Intersections in the Study Area

Intersection	Average Annual Accidents				acc/mev[2]
	PDO[1]	Injury	Fatal	Total	
36th Avenue/Oak Street	0.0	0.0	0.0	0.0	0.00
34th Avenue/Oak Street	0.5	0.0	0.0	0.5	0.74
36th Avenue/Ocean Beach Highway (SR-4)	0.7	0.0	0.0	0.7	0.08
34th Avenue/Ocean Beach Highway (SR-4)	1.2	0.3	0.0	1.5	0.16
36th Avenue/Oak Street	0.0	0.0	0.0	0.0	0.00
Oak Street/Project Access	0.0	0.0	0.0	0.0	0.00

[1] PDO = property damage only

[2] acc/mev = accidents per million entering vehicles

EXISTING PUBLIC TRANSIT SERVICE

RiverCities Transit provides public transit service in Kelso and Longview, WA. Currently there are no routes that provide service adjacent to the project site. The closest route to the project site is Route #33, which provides service approximately 0.35 miles southwest of the project site at the 38th Avenue/Ocean Beach Highway intersection.

NON-MOTORIZED TRANSPORTATION

No sidewalks or bike lanes exist adjacent to the site.

PLANNED TRANSPORTATION IMPROVEMENTS

A review of the City of Longview's Transportation Improvement Plan, 2022-2027, revealed that there are no funded projects in the study area.

A review of the Cowlitz County's Six-Year Transportation Improvement Program (TIP), 2025-2030, revealed that there are no funded projects in the study area.

SECTION III
TRAFFIC IMPACT ANALYSIS

ANALYSIS METHODOLOGY

The A.M. and P.M. peak hour traffic impacts generated by the proposed Mint Valley Mobile Park were analyzed as follows:

- The 2030 "Without Project" condition was analyzed to establish the future baseline condition for the City of Longview. The 2030 "Without Project" condition traffic volumes were derived by using a two (2) percent compounded, annual growth factor and adding traffic generated by "in process" developments. The "in-process" traffic volumes were obtained from the city staff.

- Trip generation estimates for the proposed development were developed from rates published in Trip Generation, 11th Edition" (Institute of Transportation Engineers, 2021).

- Trip distribution and assignment of project-generated trips.

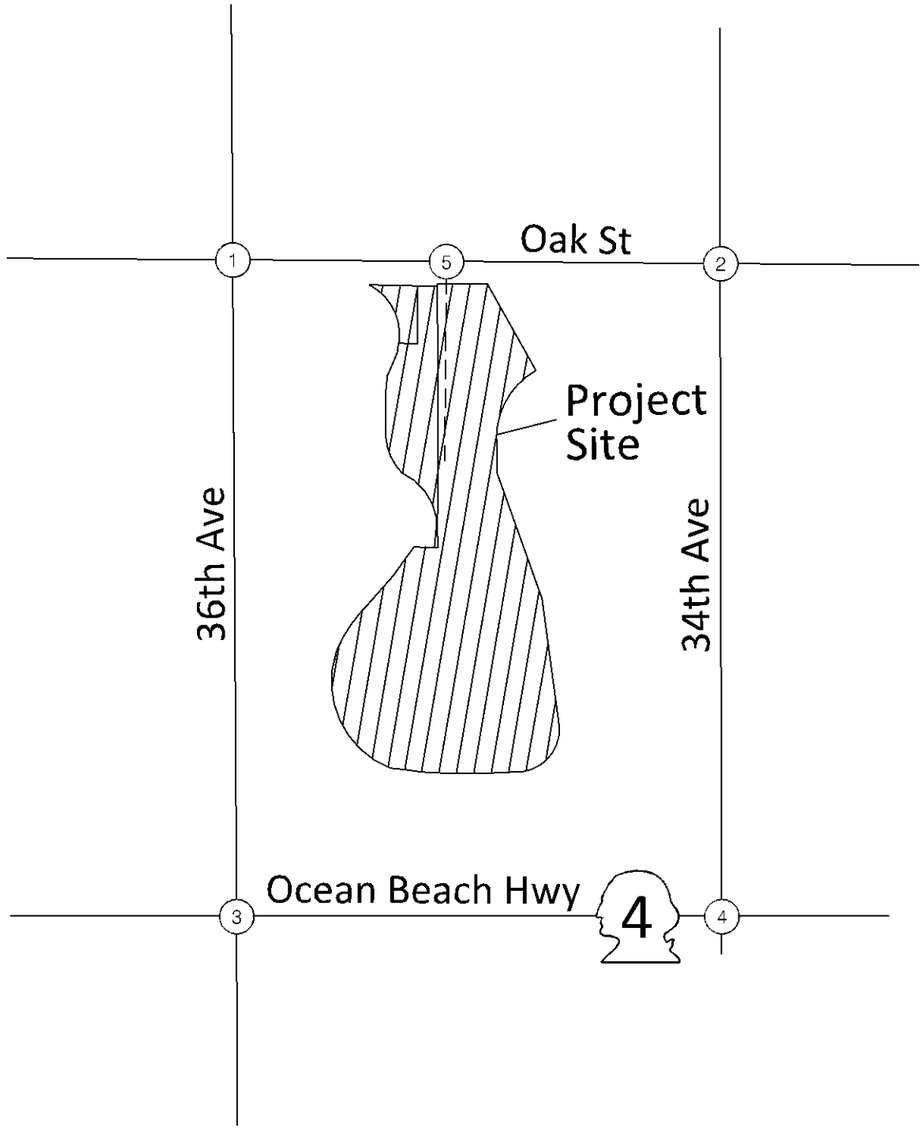
- The 2030 "With Project" condition was analyzed to determine the project traffic impacts for the City of Longview.

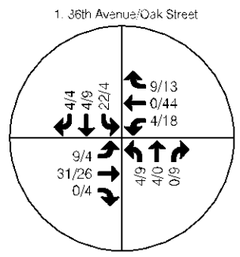
The remainder of this section contains a detailed discussion of the methodology summarized above and the analysis results.

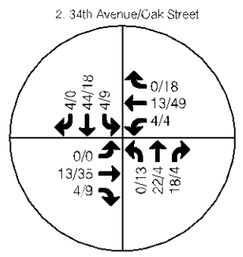
2030 "WITHOUT PROJECT" TRAFFIC VOLUMES AND LEVELS OF SERVICE

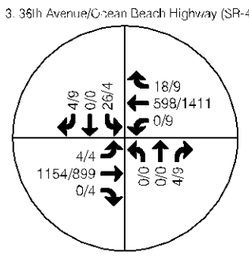
The 2030 "Without Project" condition was analyzed to establish the baseline for the concurrency analysis and to define a baseline by which project impacts could be determined. The 2030 "Without Project" condition traffic volumes were derived by using a two (2) percent compounded, annual growth factor and adding traffic generated by "in process" developments. The "in-process" traffic volumes were obtained from the city staff. Appendix D contains the "in-process" worksheets. Figure 5 shows the 2030 "Without Project" traffic volumes.

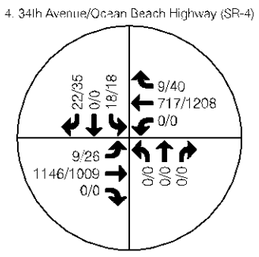
Levels of service were calculated at the study area intersections with the 2030 "Without Project" traffic volumes shown in Figure 5 and the lane configurations shown earlier in Figure 3. Appendix E contains the level of service worksheets for the 2030 "Without Project" condition.

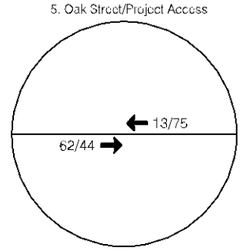












LEGEND

128/200 A.M./P.M. Peak Hour Traffic Volume

NOT TO SCALE

FIGURE 5
2030 "Without Project"
A.M. and P.M. Peak Hour Traffic Volumes

The 2030 "Without Project" A.M. and P.M. peak hour levels of service at the study area intersections are summarized in Table 3. As shown in Table 3, all of the study area intersections are projected to operate at acceptable levels of service of LOS C or better in the 2030 "Without Project" condition.

Table 3. 2030 "Without Project" Levels of Service

	A.M. Peak Hour		P.M. Peak Hour	
Unsignalized Intersection	LOS	Average Delay (sec)	LOS	Average Delay (sec)
36th Avenue/Oak Street				
Northbound Approach	A	9.2	A	9.0
Southbound Approach	A	9.2	A	9.5
Eastbound Left	A	7.3	A	7.3
Westbound Left	A	7.3	A	7.3
34th Avenue/Oak Street				
Northbound Approach	A	9.0	A	9.3
Southbound Approach	A	9.5	A	9.6
Eastbound Left	A	0.0	A	0.0
Westbound Left	A	7.2	A	7.3
36th Avenue/Ocean Beach Highway (SR-4)				
Northbound Approach	B	12.8	B	11.5
Southbound Approach	C	19.7	C	22.3
Eastbound Left	A	8.7	B	12.6
Westbound Left	A	0.0	A	9.8
34th Avenue/Ocean Beach Highway (SR-4)				
Northbound Approach	A	0.0	A	0.0
Southbound Approach	C	15.9	C	22.7
Eastbound Left	A	9.1	B	11.7
Westbound Left	A	0.0	A	0.0

DEVELOPMENT PLANS

As previously stated, the project is the development of a 72-unit mobile home park. Access to the project site will be from Oak Street. One single-family detached home exists on-site and will be retained on-site. As previously shown, Figure 2 shows the project site plan.

TRIP GENERATION

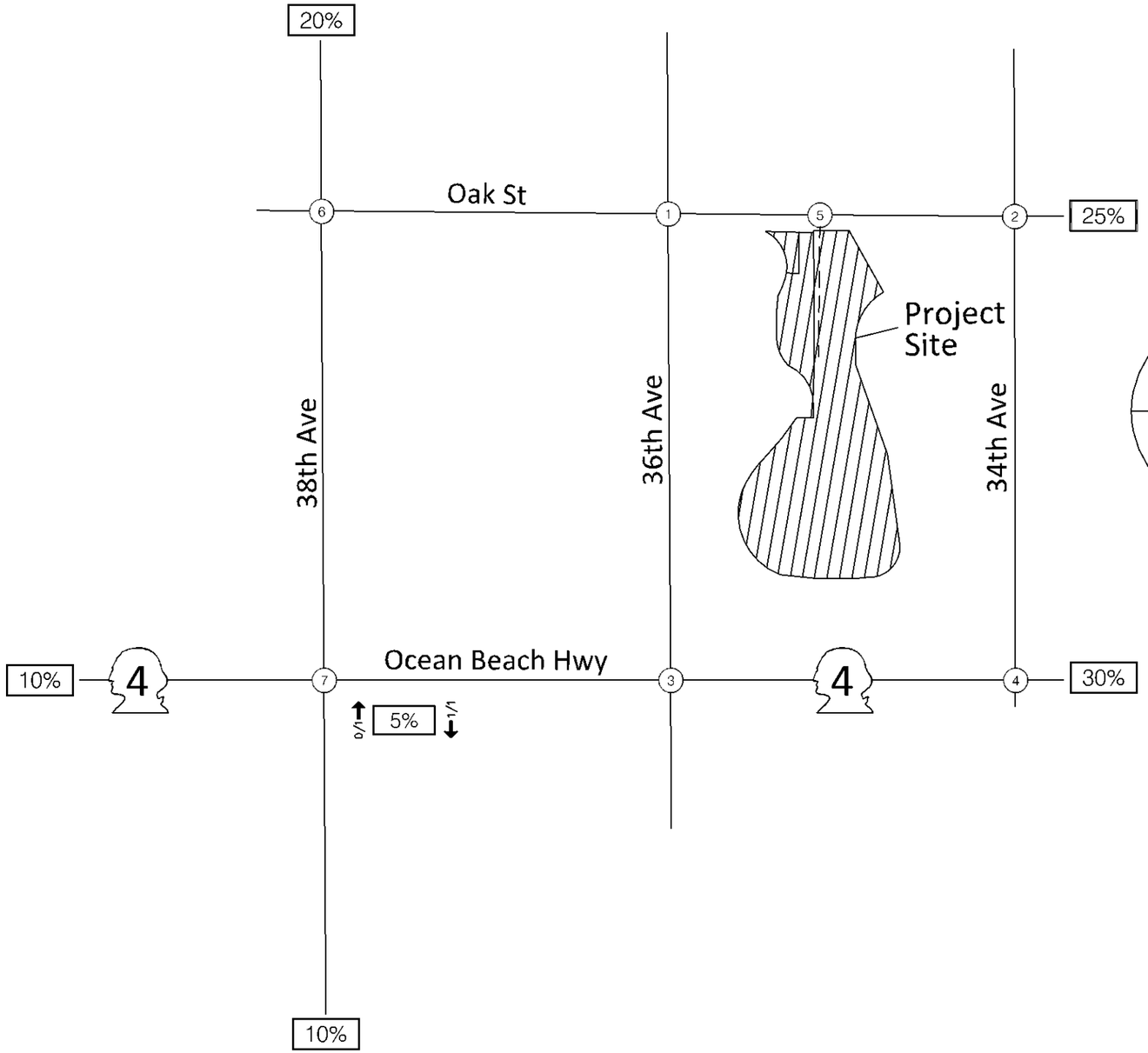
Estimates of daily, A.M. peak hour, and P.M. peak hour trips generated by the proposed project were developed from rates published in "Trip Generation, 11th Edition" (Institute of Transportation Engineers, 2021). The proposed development is expected to generate 513 daily, 28 A.M. peak hour (6 in, 22 out), and 42 P.M. peak hour (26 in, 16 out) net new trips. Table 4 summarizes the trip generation.

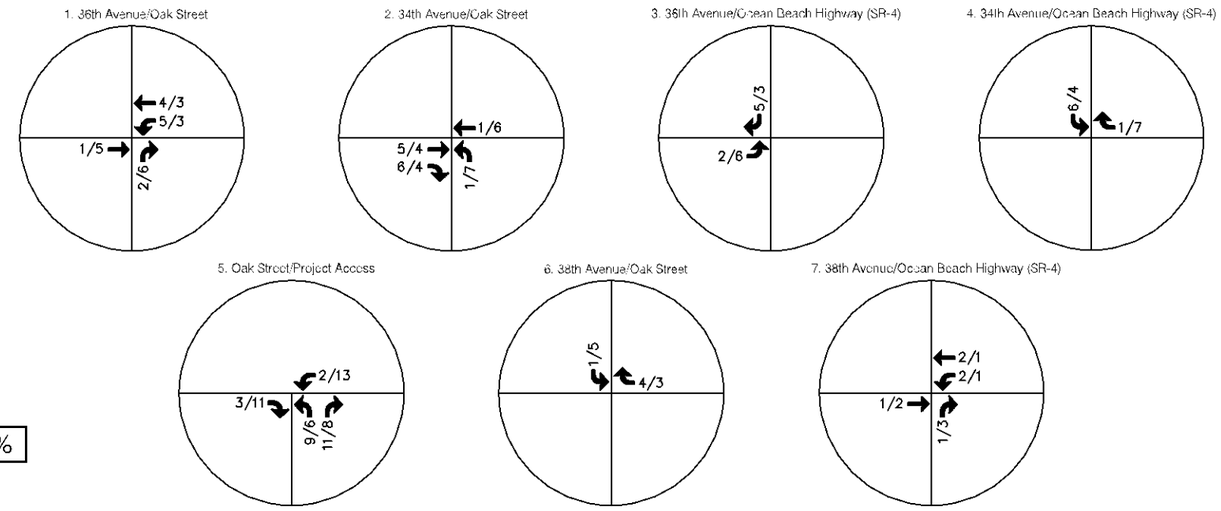
Table 4. Trip Generation for Mint Valley Mobile Park

	Amount	Average Daily	A.M. Peak			P.M. Peak		
			In	Out	Total	In	Out	Total
Mobile Home Park (ITE Code 240)								
Rate per dwelling unit		7.12	0.08	0.31	0.39	0.36	0.22	0.58
Trips	72 units	513	6	22	28	26	16	42

TRIP DISTRIBUTION AND ASSIGNMENT

A generalized trip distribution for the A.M. and P.M. peak hours was developed from the existing traffic counts, locations of employment areas, commercial/shopping centers, locations of schools, and logical travel paths to and from major travel corridors. Figure 6 shows the resulting trip distribution pattern and assignment of the net project-generated trips.





LEGEND

128/200 A.M./P.M. Peak Hour Traffic Volume

10% Peak Hour Trip Distribution

NOT TO SCALE

FIGURE 2
Trip Distribution and Assignment
Traffic Volumes

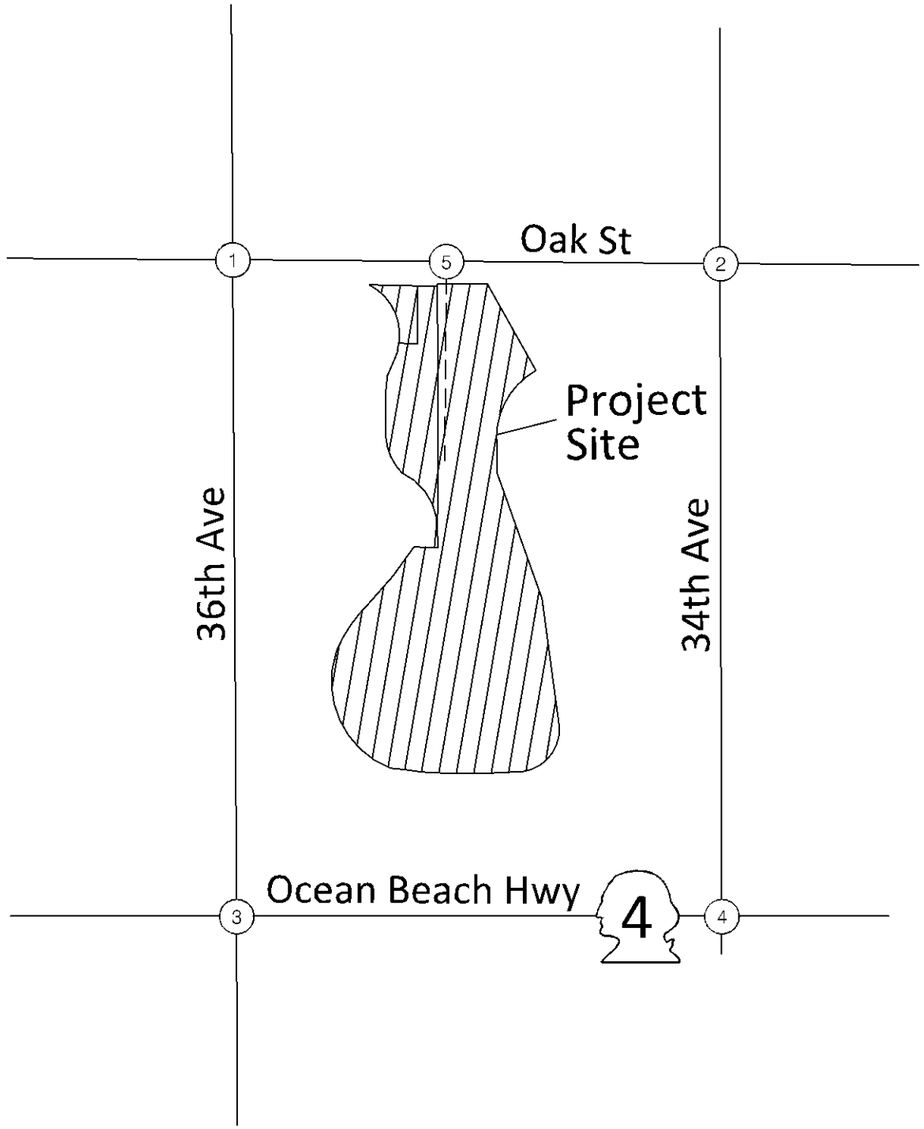
2030 "WITH PROJECT" TRAFFIC VOLUMES AND LEVELS OF SERVICE

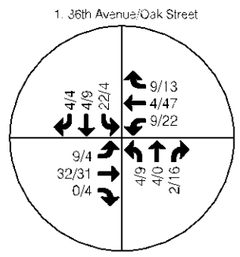
The traffic volumes shown in Figures 5 and 6 were combined to arrive at the 2030 "With Project" A.M. and P.M. peak hour traffic volumes. Figure 7 shows the 2030 "With Project" traffic volumes. Levels of service were calculated at the study area intersections with the 2030 "With Project" traffic volumes shown in Figure 7 and the lane configurations shown earlier in Figure 3. Appendix F contains the level of service worksheets for the 2030 "With Project" condition.

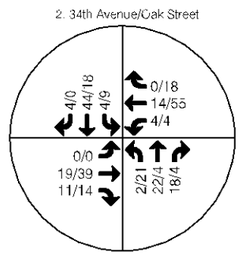
The 2030 "With Project" A.M. and P.M. peak hour levels of service at the study area intersections are summarized in Table 5. As shown in Table 5, all of the study area intersections are projected to operate at acceptable levels of service of LOS C or better in the 2030 "With Project" condition.

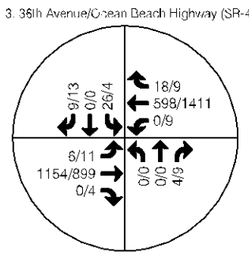
Table 5. 2030 "With Project" Levels of Service

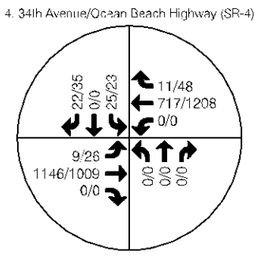
	A.M. Peak Hour		P.M. Peak Hour	
Unsignalized Intersection	LOS	Average Delay (sec)	LOS	Average Delay (sec)
36th Avenue/Oak Street				
Northbound Approach	A	9.1	A	8.9
Southbound Approach	A	9.6	A	9.6
Eastbound Left	A	7.3	A	7.3
Westbound Left	A	7.3	A	7.3
34th Avenue/Oak Street				
Northbound Approach	A	9.1	A	9.4
Southbound Approach	A	9.6	A	9.7
Eastbound Left	A	0.0	A	0.0
Westbound Left	A	7.3	A	7.3
36th Avenue/Ocean Beach Highway (SR-4)				
Northbound Approach	B	12.8	B	11.5
Southbound Approach	C	18.7	C	20.8
Eastbound Left	A	8.8	B	12.7
Westbound Left	A	0.0	A	9.8
34th Avenue/Ocean Beach Highway (SR-4)				
Northbound Approach	A	0.0	A	0.0
Southbound Approach	C	19.1	C	24.9
Eastbound Left	A	9.3	B	11.7
Westbound Left	A	0.0	A	0.0
Oak Street/Project Access				
Northbound Approach	A	8.8	A	8.9
Westbound Left	A	7.3	A	7.3

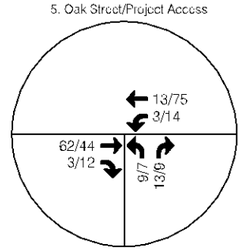












LEGEND

128/200 A.M./P.M. Peak Hour Traffic Volume

NOT TO SCALE

FIGURE 7
2030 "With Project"
A.M. and P.M. Peak Hour Traffic Volumes

SITE ACCESS CORNER SIGHT DISTANCE

The minimum corner sight distance was analyzed at the proposed Oak Street/Project Access intersection based on the current "A Policy on Geometric Design of Highways and Streets," as published by AASHTO (American Association of State Highway and Transportation Officials." The most recent edition of this reference is the 2018 – 7th Edition. From AASHTO, the following intersection sight distances are relevant to the project's site access intersection:

- Case B1 – left turn from minor road
- Case B2 – right turn from minor road
- Case F – left from major road

The required sight distance for Case B1 based on a posted speed limit of 25 mph along Oak Street is 280 feet. This requirement can be found in Table 9-7 of the "A Policy on Geometric Design of Highways and Streets," page 9-46.

The required sight distance for Case B2 based on a posted speed limit of 25 mph along Oak Street is 240 feet. This requirement can be found in Table 9-9 of the "A Policy on Geometric Design of Highways and Streets," page 9-48.

The required sight distance for Case F based on a posted speed limit of 25 mph along the Oak Street is 205 feet. This requirement can be found in Table 9-17 of the "A Policy on Geometric Design of Highways and Streets," page 9-57.

Based on field measurements conducted by H. Lee & Associates, PLLC (HLA), the project access intersection should be able to meet the sight distance requirements as long as any existing vegetation within the sight distance triangle are properly maintained after construction and no obstructions are placed within the sight distance triangle that could impede a driver's vision. Because the access into the project site is not built yet, the sight distance should be re-verified in the final engineering/construction stages of development.

LANE WARRANT ANALYSIS

Turn lane warrants at the Oak Street/Project Access intersection were not conducted due to low traffic volumes, good levels of service, and acceptable accident rates in the 2030 "With Project" condition.

PRELIMINARY SIGNAL WARRANT ANALYSIS

PTV Vistro provides a preliminary signal warrant analysis tool based on MUTCD signal warrant standards within their levels of service software. HLA conducted preliminary signal warrant analyses at the study area intersections for the 2030 "With Project" condition per the PTV Vistro software. Preliminary signal warrants are not met for the 8-hour, 4-hour, or peak hour conditions at any of the study area intersections. Appendix F contains the preliminary signal warrant analysis worksheets from PTV Vistro for the 2030 "With Project" condition.

CONCLUSIONS

The following are the findings and recommendations from the traffic analysis:

Findings

The following are the findings from the traffic analysis:

- The proposed development is expected to generate 513 daily, 28 A.M. peak hour (6 in, 22 out), and 42 P.M. peak hour (26 in, 16 out) net new trips.

- All of the study area intersections are projected to meet level of service standards for the 2030 "Without Project" and 2030 "With Project" conditions.

- Based on field measurements conducted by H. Lee & Associates, PLLC (HLA), the Oak Street/Project Access intersection should be able to meet the sight distance requirements as long as any existing vegetation within the sight distance triangles are properly maintained after construction and no obstructions are placed within the sight distance triangles that could impede a driver's vision. Because the northbound project access approach has not been designed or constructed yet, the corner sight distance should be reconfirmed at the final engineering/construction stage of development to assure that any design/construction element does not preclude the necessary corner sight distance requirement.

- Turn lane warrants at the project access intersection were not conducted due to low traffic volumes, good levels of service, and acceptable accident rates in the 2030 "With Project" condition.

- Preliminary signal warrants are not met for the 8-hour, 4-hour, or peak hour conditions at any of the study area intersections in the 2030 "With Project" condition.

Recommendations

- Based on the traffic impact analysis documented in this report, no physical, off-site mitigation would be needed.

APPENDIX A

TRAFFIC COUNTS

Intersection: 36th Avenue/Oak Street Date: 03/13/25

AM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
7:00 - 7:15 AM	0	1	0	0	1	1	2	0	1	0	0	0	0	1	0	0	7
7:15 - 7:30 AM	0	4	0	1	0	1	0	0	5	4	1	1	0	4	0	0	19
7:30 - 7:45 AM	1	1	5	1	2	0	1	0	0	1	1	0	0	7	2	1	21
7:45 - 8:00 AM	0	1	3	0	2	1	0	1	3	0	0	0	0	4	0	0	14
8:00 - 8:15 AM	1	1	1	0	0	1	2	0	2	2	0	0	0	2	1	0	13
8:15 - 8:30 AM	0	2	1	0	0	1	0	0	0	2	1	0	0	5	0	0	12
8:30 - 8:45 AM	0	3	1	0	0	0	1	0	0	3	2	1	2	3	0	0	15
8:45 - 9:00 AM	1	1	0	0	0	5	1	0	1	2	0	0	0	6	1	0	18
Peak 15 Minutes																	
7:30 - 7:45 AM	1	1	5	1	2	0	1	0	0	1	1	0	0	7	2	1	21
Hourly Total by 15 minutes																	
7:00 - 8:00 AM	1	7	8	2	5	3	3	1	9	5	2	1	0	16	2	1	61
7:15 - 8:15 AM	2	7	9	2	4	3	3	1	10	7	2	1	0	17	3	1	67
7:30 - 8:30 AM	2	5	10	1	4	3	3	1	5	5	2	0	0	18	3	1	60
7:45 - 8:45 AM	1	7	6	0	2	3	3	1	5	7	3	1	2	14	1	0	54
8:00 - 9:00 AM	2	7	3	0	0	7	4	0	3	9	3	1	2	16	2	0	58
Peak Hour Based On Peak 15 Minute																	
	4	4	20	4	8	0	4	0	0	4	4	0	0	28	8	4	84
Peak Hour Factor																	1.00
Peak 15 Min % Trucks		14%				0%				0%				11%			

Intersection: 36th Avenue/Oak Street Date: 03/13/25

PM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
4:00 - 4:15 PM	0	0	0	0	1	6	3	0	2	3	0	0	2	8	1	0	26
4:15 - 4:30 PM	0	5	2	0	2	6	0	0	1	3	1	0	0	7	1	0	28
4:30 - 4:45 PM	0	0	1	0	2	5	3	0	3	1	0	0	0	6	2	0	23
4:45 - 5:00 PM	1	2	1	0	3	10	4	0	2	0	2	0	1	6	1	0	33
5:00 - 5:15 PM	1	0	0	0	2	3	0	0	1	1	0	0	1	3	1	0	13
5:15 - 5:30 PM	0	0	1	0	2	8	2	0	0	1	0	0	0	3	0	0	17
5:30 - 5:45 PM	0	2	2	0	0	5	0	0	0	0	1	0	3	2	2	0	17
5:45 - 6:00 PM	0	1	1	0	0	1	3	0	2	2	0	0	0	3	0	0	13
Peak 15 Minutes																	
4:45 - 5:00 PM	1	2	1	0	3	10	4	0	2	0	2	0	1	6	1	0	33
Hourly Total by 15 minutes																	
4:00 - 5:00 PM	1	7	4	0	8	27	10	0	8	7	3	0	3	27	5	0	110
4:15 - 5:15 PM	2	7	4	0	9	24	7	0	7	5	3	0	2	22	5	0	97
4:30 - 5:30 PM	2	2	3	0	9	26	9	0	6	3	2	0	2	18	4	0	86
4:45 - 5:45 PM	2	4	4	0	7	26	6	0	3	2	3	0	5	14	4	0	80
5:00 - 6:00 PM	1	3	4	0	4	17	5	0	3	4	1	0	4	11	3	0	60
Peak Hour Based On Peak 15 Minute																	
	4	8	4	0	12	40	16	0	8	0	8	0	4	24	4	0	132
Peak Hour Factor																	1.00
Peak 15 Min % Trucks		0%				0%				0%				0%			

Intersection: 34th Avenue/Oak Street Date: 03/13/25

AM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
7:00 - 7:15 AM	0	0	2	0	0	2	1	0	2	3	1	1	1	1	0	0	13
7:15 - 7:30 AM	0	1	0	0	0	1	2	0	3	5	0	0	1	8	1	1	22
7:30 - 7:45 AM	0	1	2	1	0	3	0	0	0	1	0	0	0	14	0	0	21
7:45 - 8:00 AM	0	4	1	0	1	2	0	0	1	4	0	0	1	9	1	1	24
8:00 - 8:15 AM	0	4	0	2	2	3	1	1	2	2	0	1	0	6	1	0	21
8:15 - 8:30 AM	1	3	1	0	0	0	0	0	3	4	0	0	0	7	0	0	19
8:30 - 8:45 AM	1	10	1	1	0	3	1	0	4	5	0	0	1	3	0	0	29
8:45 - 9:00 AM	0	2	0	0	0	3	0	0	1	4	1	0	2	4	1	0	18
Peak 15 Minutes																	
8:30 - 8:45 AM	1	10	1	1	0	3	1	0	4	5	0	0	1	3	0	0	29
Hourly Total by 15 minutes																	
7:00 - 8:00 AM	0	6	5	1	1	8	3	0	6	13	1	1	3	32	2	2	80
7:15 - 8:15 AM	0	10	3	3	3	9	3	1	6	12	0	1	2	37	3	2	88
7:30 - 8:30 AM	1	12	4	3	3	8	1	1	6	11	0	1	1	36	2	1	85
7:45 - 8:45 AM	2	21	3	3	3	8	2	1	10	15	0	1	2	25	2	1	93
8:00 - 9:00 AM	2	19	2	3	2	9	2	1	10	15	1	1	3	20	2	0	87
Peak Hour Based On Peak 15 Minute																	
	4	40	4	4	0	12	4	0	16	20	0	0	4	12	0	0	116
Peak Hour Factor																	1.00
Peak 15 Min % Trucks		8%				0%				0%				0%			

Intersection: 34th Avenue/Oak Street Date: 03/13/25

PM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
4:00 - 4:15 PM	2	2	0	0	1	9	2	0	4	4	1	0	1	6	2	0	34
4:15 - 4:30 PM	3	0	2	0	1	9	1	0	1	1	0	0	2	7	1	0	28
4:30 - 4:45 PM	2	4	1	0	1	9	1	0	0	2	0	0	2	9	1	0	32
4:45 - 5:00 PM	0	4	2	0	4	11	1	0	1	1	3	0	2	8	0	0	37
5:00 - 5:15 PM	0	3	0	0	0	7	0	0	1	2	0	0	1	4	1	0	19
5:15 - 5:30 PM	0	3	0	0	0	13	2	0	0	2	2	0	0	4	0	0	26
5:30 - 5:45 PM	0	2	0	0	0	7	1	0	2	2	0	0	0	5	0	0	19
5:45 - 6:00 PM	0	3	2	0	0	5	2	0	1	0	0	0	0	4	3	0	20
Peak 15 Minutes																	
4:45 - 5:00 PM	0	4	2	0	4	11	1	0	1	1	3	0	2	8	0	0	37
Hourly Total by 15 minutes																	
4:00 - 5:00 PM	7	10	5	0	7	38	5	0	6	8	4	0	7	30	4	0	131
4:15 - 5:15 PM	5	11	5	0	6	36	3	0	3	6	3	0	7	28	3	0	116
4:30 - 5:30 PM	2	14	3	0	5	40	4	0	2	7	5	0	5	25	2	0	114
4:45 - 5:45 PM	0	12	2	0	4	38	4	0	4	7	5	0	3	21	1	0	101
5:00 - 6:00 PM	0	11	2	0	0	32	5	0	4	6	2	0	1	17	4	0	84
Peak Hour Based On Peak 15 Minute																	
	0	16	8	0	16	44	4	0	4	4	12	0	8	32	0	0	148
Peak Hour Factor																	1.00
Peak 15 Min % Trucks		0%				0%				0%				0%			

Intersection: 36th Avenue/Ocean Beach Highway (SR-4) Date: 03/13/25

AM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
7:00 - 7:15 AM	1	0	2	0	0	49	0	3	1	0	1	0	0	161	2	11	217
7:15 - 7:30 AM	2	0	10	1	3	70	1	7	1	0	0	0	1	216	2	8	306
7:30 - 7:45 AM	1	0	11	0	2	95	0	7	0	0	1	0	0	269	3	3	382
7:45 - 8:00 AM	0	0	3	0	1	126	0	2	1	0	1	0	0	193	3	4	328
8:00 - 8:15 AM	3	0	2	1	1	106	0	5	1	0	0	0	1	184	3	3	301
8:15 - 8:30 AM	0	0	5	0	1	116	0	4	0	0	0	0	0	181	2	3	305
8:30 - 8:45 AM	1	0	6	1	4	129	0	16	1	0	0	0	0	241	1	3	383
8:45 - 9:00 AM	3	0	3	1	3	116	0	3	0	0	0	0	1	199	1	3	326
Peak 15 Minutes																	
8:30 - 8:45 AM	1	0	6	1	4	129	0	16	1	0	0	0	0	241	1	3	383
Hourly Total by 15 minutes																	
7:00 - 8:00 AM	4	0	26	1	6	340	1	19	3	0	3	0	1	839	10	26	1,233
7:15 - 8:15 AM	6	0	26	2	7	397	1	21	3	0	2	0	2	862	11	18	1,317
7:30 - 8:30 AM	4	0	21	1	5	443	0	18	2	0	2	0	1	827	11	13	1,316
7:45 - 8:45 AM	4	0	16	2	7	477	0	27	3	0	1	0	1	799	9	13	1,317
8:00 - 9:00 AM	7	0	16	3	9	467	0	28	2	0	0	0	2	805	7	12	1,315
Peak Hour Based On Peak 15 Minute																	
	4	0	24	4	16	516	0	64	4	0	0	0	0	964	4	12	1,532
Peak Hour Factor																	1.00
Peak 15 Min % Trucks		14%				12%				0%				1%			

Intersection: 36th Avenue/Ocean Beach Highway (SR-4) Date: 03/13/25

PM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
4:00 - 4:15 PM	1	0	4	0	5	258	0	1	1	0	0	0	2	206	4	2	481
4:15 - 4:30 PM	2	0	5	0	5	245	0	0	0	1	0	0	0	198	5	1	461
4:30 - 4:45 PM	3	0	3	0	3	220	0	3	0	0	0	0	1	182	3	3	415
4:45 - 5:00 PM	2	0	1	0	2	221	0	1	1	0	0	0	1	195	4	1	427
5:00 - 5:15 PM	1	0	2	0	2	272	1	0	4	0	0	0	1	166	10	1	459
5:15 - 5:30 PM	2	0	1	0	2	298	2	1	2	0	0	0	1	191	1	1	500
5:30 - 5:45 PM	1	0	3	0	5	238	3	1	3	0	0	0	0	206	1	2	460
5:45 - 6:00 PM	4	0	3	0	5	245	2	0	2	0	0	0	0	172	3	2	436
Peak 15 Minutes																	
5:15 - 5:30 PM	2	0	1	0	2	298	2	1	2	0	0	0	1	191	1	1	500
Hourly Total by 15 minutes																	
4:00 - 5:00 PM	8	0	13	0	15	944	0	5	2	1	0	0	4	781	16	7	1,784
4:15 - 5:15 PM	8	0	11	0	12	958	1	4	5	1	0	0	3	741	22	6	1,762
4:30 - 5:30 PM	8	0	7	0	9	1,011	3	5	7	0	0	0	4	734	18	6	1,801
4:45 - 5:45 PM	6	0	7	0	11	1,029	6	3	10	0	0	0	3	758	16	5	1,846
5:00 - 6:00 PM	8	0	9	0	14	1,053	8	2	11	0	0	0	2	735	15	6	1,855
Peak Hour Based On Peak 15 Minute																	
	8	0	4	0	8	1192	8	4	8	0	0	0	4	764	4	4	2,000
Peak Hour Factor																	1.00
Peak 15 Min % Trucks		0%				0%				0%				1%			

Intersection: 34th Avenue/Ocean Beach Highway (SR-4) Date: 03/18/25

AM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
7:00 - 7:15 AM	1	0	8	0	2	55	0	2	0	0	0	0	0	165	3	8	234
7:15 - 7:30 AM	1	0	5	0	4	79	1	9	0	0	0	0	0	244	0	9	334
7:30 - 7:45 AM	5	0	7	0	1	101	0	10	0	0	0	0	0	289	3	3	406
7:45 - 8:00 AM	0	0	2	0	3	119	0	4	1	0	0	0	0	256	5	5	386
8:00 - 8:15 AM	3	0	8	1	2	104	0	3	0	0	0	0	1	196	4	7	318
8:15 - 8:30 AM	4	0	3	1	3	117	0	13	0	0	0	0	0	169	1	5	297
8:30 - 8:45 AM	4	0	7	0	4	123	0	6	0	0	0	0	0	205	1	3	344
8:45 - 9:00 AM	5	0	4	2	2	156	0	8	0	0	0	0	0	239	2	11	408
Peak 15 Minutes																	
8:45 - 9:00 AM	5	0	4	2	2	156	0	8	0	0	0	0	0	239	2	11	408
Hourly Total by 15 minutes																	
7:00 - 8:00 AM	7	0	22	0	10	354	1	25	1	0	0	0	0	954	11	25	1,360
7:15 - 8:15 AM	9	0	22	1	10	403	1	26	1	0	0	0	1	985	12	24	1,444
7:30 - 8:30 AM	12	0	20	2	9	441	0	30	1	0	0	0	1	910	13	20	1,407
7:45 - 8:45 AM	11	0	20	2	12	463	0	26	1	0	0	0	1	826	11	20	1,345
8:00 - 9:00 AM	16	0	22	4	11	500	0	30	0	0	0	0	1	809	8	26	1,367
Peak Hour Based On Peak 15 Minute																	
	20	0	16	8	8	624	0	32	0	0	0	0	0	956	8	44	1,632
Peak Hour Factor																	1.00
Peak 15 Min % Trucks		22%				5%				0%				5%			

Intersection: 34th Avenue/Ocean Beach Highway (SR-4) Date: 03/18/25

PM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
4:00 - 4:15 PM	5	0	4	1	5	256	0	6	0	0	0	0	0	194	3	4	467
4:15 - 4:30 PM	7	0	3	0	5	270	0	5	0	0	0	0	0	195	5	1	485
4:30 - 4:45 PM	4	0	3	0	5	249	0	4	0	0	0	0	0	218	6	2	485
4:45 - 5:00 PM	9	0	5	0	6	269	0	0	0	0	0	0	0	188	2	3	479
5:00 - 5:15 PM	10	0	5	0	3	269	1	0	0	0	0	0	0	183	4	0	475
5:15 - 5:30 PM	8	0	4	0	9	252	0	0	0	0	0	0	0	216	6	1	495
5:30 - 5:45 PM	2	0	7	0	4	241	0	3	0	0	0	0	0	189	3	2	446
5:45 - 6:00 PM	4	0	1	0	2	254	0	0	0	0	0	0	0	148	7	1	416
Peak 15 Minutes																	
5:15 - 5:30 PM	8	0	4	0	9	252	0	0	0	0	0	0	0	216	6	1	495
Hourly Total by 15 minutes																	
4:00 - 5:00 PM	25	0	15	1	21	1,044	0	15	0	0	0	0	0	795	16	10	1,916
4:15 - 5:15 PM	30	0	16	0	19	1,057	1	9	0	0	0	0	0	784	17	6	1,924
4:30 - 5:30 PM	31	0	17	0	23	1,039	1	4	0	0	0	0	0	805	18	6	1,934
4:45 - 5:45 PM	29	0	21	0	22	1,031	1	3	0	0	0	0	0	776	15	6	1,895
5:00 - 6:00 PM	24	0	17	0	18	1,016	1	3	0	0	0	0	0	736	20	4	1,832
Peak Hour Based On Peak 15 Minute																	
	32	0	16	0	36	1008	0	0	0	0	0	0	0	864	24	4	1,980
Peak Hour Factor																	1.00
Peak 15 Min % Trucks	0%				0%				0%				0%				

Intersection: Oak Street/Project Access Date: 03/13/25

AM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
7:00 - 7:15 AM	0	0	0	0	0	4	0	0	0	0	0	0	0	2	0	0	6
7:15 - 7:30 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	10	0	1	11
7:30 - 7:45 AM	0	0	0	0	0	3	0	0	0	0	0	0	0	14	0	0	17
7:45 - 8:00 AM	0	0	0	0	0	3	0	1	0	0	0	0	0	11	0	1	14
8:00 - 8:15 AM	0	0	0	0	0	3	0	0	0	0	0	0	0	7	0	0	10
8:15 - 8:30 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	7	0	0	8
8:30 - 8:45 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	4	0	0	5
8:45 - 9:00 AM	0	0	0	0	0	6	0	0	0	0	0	0	0	7	0	0	13
Peak 15 Minutes																	
7:30 - 7:45 AM	0	0	0	0	0	3	0	0	0	0	0	0	0	14	0	0	17
Hourly Total by 15 minutes																	
7:00 - 8:00 AM	0	0	0	0	0	11	0	1	0	0	0	0	0	37	0	2	48
7:15 - 8:15 AM	0	0	0	0	0	10	0	1	0	0	0	0	0	42	0	2	52
7:30 - 8:30 AM	0	0	0	0	0	10	0	1	0	0	0	0	0	39	0	1	49
7:45 - 8:45 AM	0	0	0	0	0	8	0	1	0	0	0	0	0	29	0	1	37
8:00 - 9:00 AM	0	0	0	0	0	11	0	0	0	0	0	0	0	25	0	0	36
Peak Hour Based On Peak 15 Minute																	
	0	0	0	0	0	12	0	0	0	0	0	0	0	56	0	0	68
Peak Hour Factor																	1.00
Peak 15 Min % Trucks		0%				0%				0%				0%			

Intersection: Oak Street/Project Access Date: 03/13/25

PM Peak Hour Turning Movement Volumes

	SB				WB				NB				EB				
Time	SBR	SBT	SBL	Trucks	WBR	WBT	WBL	Trucks	NBR	NBT	NBL	Trucks	EBR	EBT	EBL	Trucks	Total
15 Minute Totals																	
4:00 - 4:15 PM	0	0	0	0	0	10	0	0	0	0	0	0	0	9	0	0	19
4:15 - 4:30 PM	0	0	0	0	0	8	0	0	0	0	0	0	0	10	0	0	18
4:30 - 4:45 PM	0	0	0	0	0	10	0	0	0	0	0	0	0	12	0	0	22
4:45 - 5:00 PM	0	0	0	0	0	17	0	0	0	0	0	0	0	10	0	0	27
5:00 - 5:15 PM	0	0	0	0	0	5	0	0	0	0	0	0	0	6	0	0	11
5:15 - 5:30 PM	0	0	0	0	0	12	0	0	0	0	0	0	0	4	0	0	16
5:30 - 5:45 PM	0	0	0	0	0	5	0	0	0	0	0	0	0	5	0	0	10
5:45 - 6:00 PM	0	0	0	0	0	4	0	0	0	0	0	0	0	7	0	0	11
Peak 15 Minutes																	
4:45 - 5:00 PM	0	0	0	0	0	17	0	0	0	0	0	0	0	10	0	0	27
Hourly Total by 15 minutes																	
4:00 - 5:00 PM	0	0	0	0	0	45	0	0	0	0	0	0	0	41	0	0	86
4:15 - 5:15 PM	0	0	0	0	0	40	0	0	0	0	0	0	0	38	0	0	78
4:30 - 5:30 PM	0	0	0	0	0	44	0	0	0	0	0	0	0	32	0	0	76
4:45 - 5:45 PM	0	0	0	0	0	39	0	0	0	0	0	0	0	25	0	0	64
5:00 - 6:00 PM	0	0	0	0	0	26	0	0	0	0	0	0	0	22	0	0	48
Peak Hour Based On Peak 15 Minute																	
	0	0	0	0	0	68	0	0	0	0	0	0	0	40	0	0	108
Peak Hour Factor																	1.00
Peak 15 Min % Trucks		0%				0%				0%				0%			

APPENDIX B

EXISTING LEVELS OF SERVICE

Intersection Level Of Service Report
Intersection 1: 36th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.6
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.005

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	4	4	0	20	4	4	8	28	0	4	0	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	14.00	14.00	14.00	11.00	11.00	11.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	4	0	20	4	4	8	28	0	4	0	8
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	0	5	1	1	2	7	0	1	0	2
Total Analysis Volume [veh/h]	4	4	0	20	4	4	8	28	0	4	0	8
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.02	0.00	0.00	0.01			0.00		
d_M, Delay for Movement [s/veh]	8.93	9.38		9.14	9.59	8.57	7.32			7.26		
Movement LOS	A	A		A	A	A	A	A		A		A
95th-Percentile Queue Length [veh/ln]	0.03	0.03		0.10	0.10	0.10	0.01	0.01		0.01		0.01
95th-Percentile Queue Length [ft/ln]	0.69	0.69		2.40	2.40	2.40	0.33	0.33		0.20		0.20
d_A, Approach Delay [s/veh]	9.16			9.12			1.63			2.42		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	4.96											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 2: 34th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.047

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	20	16	4	40	4	0	12	4	4	12	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	8.00	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	20	16	4	40	4	0	12	4	4	12	0
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	5	4	1	10	1	0	3	1	1	3	0
Total Analysis Volume [veh/h]	0	20	16	4	40	4	0	12	4	4	12	0
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.02	0.01	0.00	0.05	0.00	0.00			0.00		
d_M, Delay for Movement [s/veh]		9.34	8.51	9.27	9.52	8.67				7.23		
Movement LOS		A	A	A	A	A		A	A	A	A	
95th-Percentile Queue Length [veh/ln]		0.12	0.12	0.18	0.18	0.18		0.00	0.00	0.01	0.01	
95th-Percentile Queue Length [ft/ln]		2.97	2.97	4.42	4.42	4.42		0.00	0.00	0.17	0.17	
d_A, Approach Delay [s/veh]	8.97			9.43			0.00			1.81		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	6.93											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 3: 36th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	18.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.080

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	4	24	0	4	4	964	0	0	516	16
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	14.00	14.00	14.00	1.00	1.00	1.00	12.00	12.00	12.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	4	24	0	4	4	964	0	0	516	16
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	1	6	0	1	1	241	0	0	129	4
Total Analysis Volume [veh/h]	0	0	4	24	0	4	4	964	0	0	516	16
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.01	0.08	0.00	0.01	0.00			0.00		
d_M, Delay for Movement [s/veh]			11.77	18.01		11.19	8.48					
Movement LOS			B	C		B	A	A			A	A
95th-Percentile Queue Length [veh/ln]			0.02	0.28		0.28	0.01	0.00			0.00	0.00
95th-Percentile Queue Length [ft/ln]			0.56	6.97		6.97	0.29	0.00			0.00	0.00
d_A, Approach Delay [s/veh]	11.77			17.04			0.04			0.00		
Approach LOS	B			C			A			A		
d_I, Intersection Delay [s/veh]	0.36											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 4: 34th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	18.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.055

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		1	0		0
Exit Pocket Length [ft]									100.00			
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	0	16	0	20	8	956	0	0	624	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	16	0	20	8	956	0	0	624	8
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	4	0	5	2	239	0	0	156	2
Total Analysis Volume [veh/h]	0	0	0	16	0	20	8	956	0	0	624	8
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.05	0.00	0.03	0.01			0.00		
d_M, Delay for Movement [s/veh]				18.08		11.02	8.78					
Movement LOS				C		B	A	A			A	A
95th-Percentile Queue Length [veh/ln]				0.27		0.27	0.03	0.00			0.00	0.00
95th-Percentile Queue Length [ft/ln]				6.83		6.83	0.63	0.00			0.00	0.00
d_A, Approach Delay [s/veh]				14.16			0.07			0.00		
Approach LOS				B			A			A		
d_I, Intersection Delay [s/veh]	0.36											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 1: 36th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.010

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	8	0	8	4	8	4	4	24	4	16	40	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	8	0	8	4	8	4	4	24	4	16	40	12
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	2	1	2	1	1	6	1	4	10	3
Total Analysis Volume [veh/h]	8	0	8	4	8	4	4	24	4	16	40	12
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.01	0.00	0.01	0.00	0.00			0.01		
d_M, Delay for Movement [s/veh]	9.36		8.48	9.33	9.76	8.58	7.30			7.27		
Movement LOS	A		A	A	A	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.05		0.05	0.06	0.06	0.06	0.01	0.01	0.01	0.03	0.03	0.03
95th-Percentile Queue Length [ft/ln]	1.30		1.30	1.45	1.45	1.45	0.17	0.17	0.17	0.70	0.70	0.70
d_A, Approach Delay [s/veh]	8.92			9.36			0.91			1.71		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	3.32											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 2: 34th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.7
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.020

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	12	4	4	8	16	0	0	32	8	4	44	16
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	12	4	4	8	16	0	0	32	8	4	44	16
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	1	2	4	0	0	8	2	1	11	4
Total Analysis Volume [veh/h]	12	4	4	8	16	0	0	32	8	4	44	16
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.01	0.00	0.01	0.02	0.00	0.00			0.00		
d_M, Delay for Movement [s/veh]	9.28	9.67	8.55	9.24	9.68					7.28		
Movement LOS	A	A	A	A	A			A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.07	0.07	0.07	0.09	0.09			0.00	0.00	0.01	0.01	0.01
95th-Percentile Queue Length [ft/ln]	1.75	1.75	1.75	2.26	2.26			0.00	0.00	0.18	0.18	0.18
d_A, Approach Delay [s/veh]	9.21			9.53			0.00			0.45		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.99											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 3: 36th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	28.7
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.026

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	8	4	0	8	4	764	4	8	1192	8
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	8	4	0	8	4	764	4	8	1192	8
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	2	1	0	2	1	191	1	2	298	2
Total Analysis Volume [veh/h]	0	0	8	4	0	8	4	764	4	8	1192	8
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.01	0.03	0.00	0.02	0.01			0.01		
d_M, Delay for Movement [s/veh]			10.88	28.73		13.61	11.22			9.25		
Movement LOS			B	D		B	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]			0.04	0.14		0.14	0.02	0.00	0.00	0.03	0.00	0.00
95th-Percentile Queue Length [ft/ln]			0.98	3.40		3.40	0.52	0.00	0.00	0.71	0.00	0.00
d_A, Approach Delay [s/veh]	10.88			18.65			0.06			0.06		
Approach LOS	B			C			A			A		
d_I, Intersection Delay [s/veh]	0.21											
Intersection LOS	D											

Intersection Level Of Service Report
Intersection 4: 34th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	26.1
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.085

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		1	0		0
Exit Pocket Length [ft]									100.00			
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	0	16	0	32	24	864	0	0	1008	36
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	16	0	32	24	864	0	0	1008	36
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	4	0	8	6	216	0	0	252	9
Total Analysis Volume [veh/h]	0	0	0	16	0	32	24	864	0	0	1008	36
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.09	0.00	0.06	0.04			0.00		
d_M, Delay for Movement [s/veh]				26.06		14.06	10.54					
Movement LOS				D		B	B	A			A	A
95th-Percentile Queue Length [veh/ln]				0.52		0.52	0.11	0.00			0.00	0.00
95th-Percentile Queue Length [ft/ln]				12.88		12.88	2.77	0.00			0.00	0.00
d_A, Approach Delay [s/veh]				18.06			0.28			0.00		
Approach LOS				C			A			A		
d_I, Intersection Delay [s/veh]	0.57											
Intersection LOS	D											

APPENDIX C

ACCIDENT DATA

CITY STREETS

34TH AVE @ OAK ST

36TH AVE @ OAK ST - *No Reported Crashes*

OAK ST FROM 34TH AVE TO 36TH AVE

STATE ROUTES

SR 4 (aka Ocean Beach Hwy, MP 58.23 - 58.27) @ 34TH AVE

SR 4 (aka Ocean Beach Hwy, MP 57.98 - 58.02) @ 36TH AVE

OFFICER REPORTED CRASHES THAT OCCURRED*at OR in the vicinity of* MULTIPLE INTERSECTIONS & ROAD SEGMENT IN LONGVIEW

01/01/2019 - *available 2024*

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.

JURISDICTION	COUNTY	CITY	PRIMARY TRAFFICWAY	BLOCK NUMBER	INTERSECTING TRAFFICWAY	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	MILEPOST	A / B	SR ONLY HISTORY / SUSPENSE IND	REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	# FAT	# VEH	# PED	# BIKES	VEHICLE 1 TYPE	VEHICLE 2 TYPE	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITION	LIGHTING CONDITION	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 ACTION	VEHICLE 2 ACTION	VEHICLE 1 COMPASS DIRECTION FROM	VEHICLE 1 COMPASS DIRECTION TO	VEHICLE 2 COMPASS DIRECTION FROM	VEHICLE 2 COMPASS DIRECTION TO	MV DRIVER CONTRIBUTING CIRCUMSTANCE 1 (UNIT 1)	MV DRIVER CONTRIBUTING CIRCUMSTANCE 2 (UNIT 1)	MV DRIVER CONTRIBUTING CIRCUMSTANCE 3 (UNIT 1)	MV DRIVER CONTRIBUTING CIRCUMSTANCE 1 (UNIT 2)	MV DRIVER CONTRIBUTING CIRCUMSTANCE 2 (UNIT 2)	FIRST INJPACT LOCATION (City, County & Misc Trafficways - 2010 forward)	WA STATE PLANE SOUTH - X 2010 - FORWARD	WA STATE PLANE SOUTH - Y 2010 - FORWARD
City Street	Cowlitz	Longview	34TH AVE	2400		202	F	NE	OAK ST			No	EF22573	##########	05:40	No Apparent Injury	0	0	2	0	0	Pickup,Panel Truck or Vanette under 10,000 lb	Pickup,Panel Truck or Vanette under 10,000 lb	Not at Intersection and Not Related	Clear	Dry	Dark-Street Lights Off	One parked--one moving	Going Straight Ahead	Legally Parked, Unoccupied	North	South			Other Contributing Circ Not Listed			None		Past the Outside Shoulder of Primary Trafficway	1014521.49	309711.27
City Street	Cowlitz	Longview	34TH AVE	2400		204	F	NE	OAK ST			No	EA04057	##########	13:08	No Apparent Injury	0	0	2	0	0	Pickup,Panel Truck or Vanette under 10,000 lb	Passenger Car	Not at Intersection and Not Related	Overcast	Wet	Daylight	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Slowing	South	North	South	North	Other Contributing Circ Not Listed	Racing		Other Contributing Circ Not Listed	Racing	Lane of Primary Trafficway	1014522.81	309713.01
City Street	Cowlitz	Longview	36TH AVE	2200		274	F	NE	OCEAN BEACH HWY			No	EB90490	##########	08:50	No Apparent Injury	0	0	2	0	0	Passenger Car	Pickup,Panel Truck or Vanette under 10,000 lb	Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	One parked--one moving	Going Straight Ahead	Legally Parked, Unoccupied	West	East			Inattention			None		Outside Shoulder of Primary Trafficway	1012437.07	309140.65
City Street	Cowlitz	Longview	OAK ST	3300		49	F	SE	34TH AVE			No	EC97080	##########	15:10	No Apparent Injury	0	0	1	0	0	Truck & Trailer		Not at Intersection and Not Related	Clear	Dry	Daylight	Over Roadway Power Lines	Going Straight Ahead		East	West			Other Contributing Circ Not Listed					Lane of Primary Trafficway	1014438.48	309521.25
State Route	Cowlitz	Longview	004							57.99		No	EA79164	##########	16:19	No Apparent Injury	0	0	2	0	0	Passenger Car	Passenger Car	Not at Intersection and Not Related	Raining	Wet	Daylight	From same direction both going straight both moving rear end	Going Straight Ahead	Slowing	West	East	West	East	None			None		Lane 2 Increasing Milepost	1012212.86	308969.39
State Route	Cowlitz	Longview	004							58.00		No	ED16397	##########	22:31	No Apparent Injury	0	0	2	0	0	Passenger Car	Passenger Car	At Intersection and Related	Clear	Dry	Dark-Street Lights On	From opposite direction - one left turn - one straight	Going Straight Ahead	Making Left Turn	East	West	West	North	Other Contributing Circ Not Listed			None		Lane 2 Decreasing Milepost	1012274.65	308926.35
State Route	Cowlitz	Longview	004							58.01		No	EA24667	##########	21:07	No Apparent Injury	0	0	2	0	0	Pickup,Panel Truck or Vanette under 10,000 lb	Passenger Car	At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-Street Lights On	Entering at angle	Stopped at Signal or Stop Sign	Making Right Turn	Vehicle Stopped	Vehicle Stopped	West	South	None			Operating Defective Equipment	Exceeding Reas. Safe Speed	Intersecting Road Increasing Milepost	1012276.72	308921.04
State Route	Cowlitz	Longview	004							58.23		No	EC76262	##########	20:37	No Apparent Injury	0	0	1	0	0	Passenger Car		Not at Intersection and Not Related	Clear	Dry	Dark-Street Lights Off	Linear Curb	Going Straight Ahead		East	West			Under Influence of Alcohol					Right Shoulder Decreasing Milepost	1013243.7	308188.93
State Route	Cowlitz	Longview	004							58.25		No	ED68427	##########	16:49	No Apparent Injury	0	0	2	0	0	Passenger Car	Pickup,Panel Truck or Vanette under 10,000 lb	At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Making Left Turn	Going Straight Ahead	North	East	West	East	Did Not Grant RW to Vehicle			None		Lane 1 Increasing Milepost	1013323.61	308129.13
State Route	Cowlitz	Longview	004							58.25		No	ED20569	##########	15:20	No Apparent Injury	0	0	1	0	0	Pickup,Panel Truck or Vanette under 10,000 lb		At Intersection and Not Related	Sleet or Hail or Freezing Rain	Ice	Dusk	Utility Box	Going Straight Ahead		East	West			Exceeding Reas. Safe Speed	Unknown Distraction				Past Right Shoulder Decreasing Milepost	1013327.19	308133.54
State Route	Cowlitz	Longview	004							58.25		No	ED12067	##########	15:58	Unknown	0	0	2	0	0	Pickup,Panel Truck or Vanette under 10,000 lb	Pickup,Panel Truck or Vanette under 10,000 lb	At Intersection and Related	Raining	Wet	Daylight	Entering at angle	Making Left Turn	Going Straight Ahead	North	East	East	West	Improper Turn/Merge			None		Lane 2 Decreasing Milepost	1013327.19	308133.54
State Route	Cowlitz	Longview	004							58.25		No	ED83027	##########	00:51	Possible Injury	1	0	2	0	0	Pickup,Panel Truck or Vanette under 10,000 lb	Pickup,Panel Truck or Vanette under 10,000 lb	At Intersection and Related	Clear	Dry	Dark Street Lights On	From same direction one right turn one straight	Going Straight Ahead	Making Right Turn	East	West	East	North	Follow Too Closely			None		Lane 1 Decreasing Milepost	1013327.19	308133.54
State Route	Cowlitz	Longview	004							58.25		No	ED82549	##########	11:36	Possible Injury	1	0	2	0	0	Passenger Car	Passenger Car	At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Making Left Turn	Going Straight Ahead	North	East	East	West	Improper Turn/Merge	Did Not Grant RW to Vehicle		None		Lane 2 Decreasing Milepost	1013327.19	308133.54
State Route	Cowlitz	Longview	004							58.26		No	ED16396	##########	11:22	No Apparent Injury	0	0	1	0	0	Pickup,Panel Truck or Vanette under 10,000 lb		Not at Intersection and Not Related	Overcast	Wet	Daylight	Vehicle Strikes Deer	Going Straight Ahead		West	East			None					Lane 2 Increasing Milepost	1013340.53	308098.89
State Route	Cowlitz	Longview	004							58.26		No	ED53055	##########	16:14	No Apparent Injury	0	0	2	0	0	Pickup,Panel Truck or Vanette under 10,000 lb	School Bus	Not at Intersection and Not Related	Overcast	Dry	Daylight	From opposite direction all others	Changing Lanes	Going Straight Ahead	West	East	East	West	Under Influence of Alcohol	Exceeding Reas. Safe Speed	Operating Recklessly or Aggressively	None		Lane 2 Decreasing Milepost	1013360.42	308100.41
State Route	Cowlitz	Longview	004							58.27		No	3122737	##########	10:19	No Apparent Injury	0	0	3	0	0	Passenger Car	Pickup,Panel Truck or Vanette under 10,000 lb	Not at Intersection and Not Related	Clear	Dry	Daylight	Fence	Going Straight Ahead	Legally Parked, Unoccupied	West	East	Vehicle Stopped		Under Influence of Alcohol	Inattention		None		Past Right Shoulder Increasing Milepost	1013403.57	308068.19

0

APPENDIX D

2030 "WITHOUT PROJECT" LEVELS OF SERVICE

PLOT DATE: 10.05.24 FILE 24-19flow.dwg

CHARBONNEAU ENGINEERING LLC

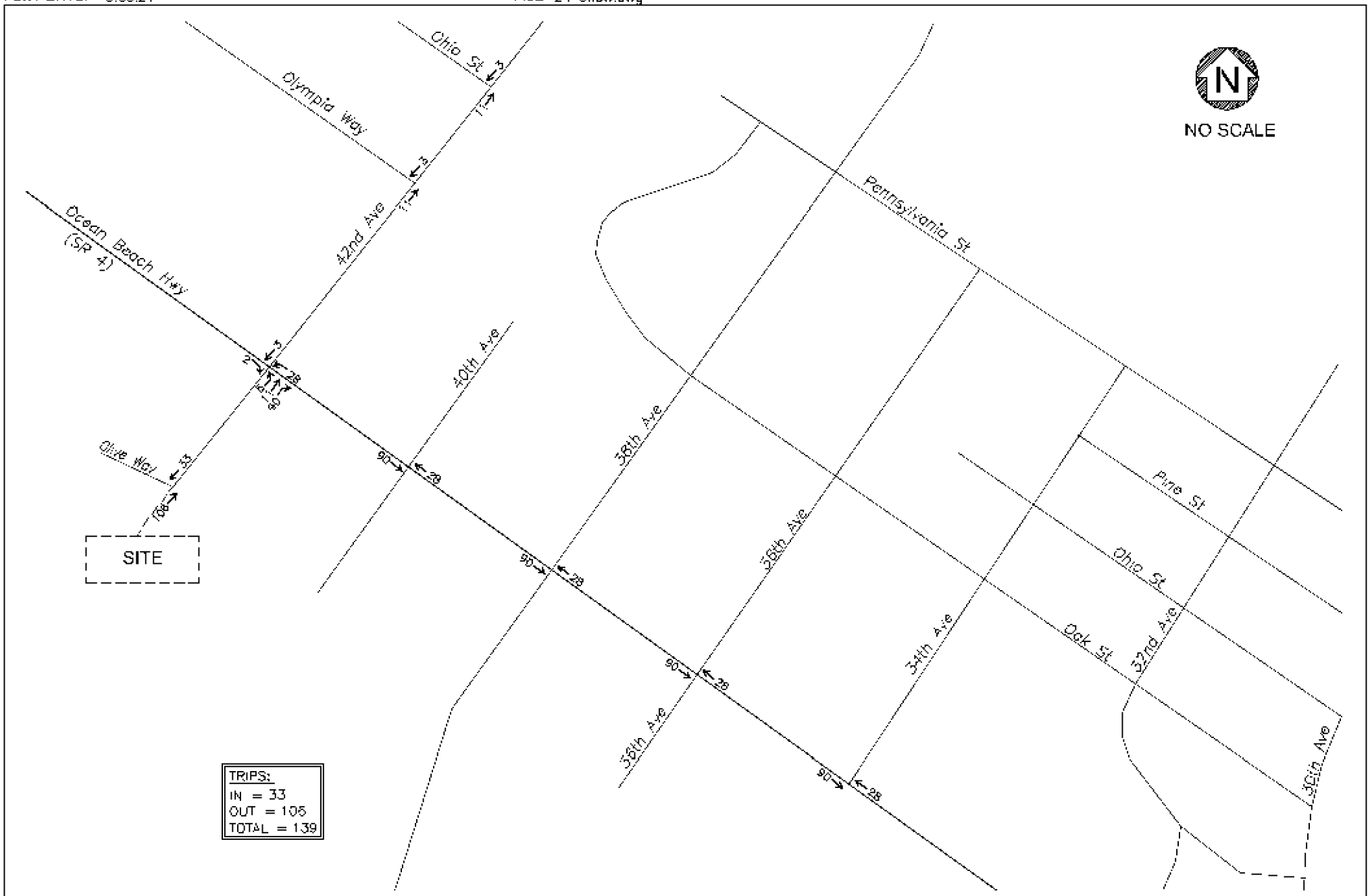
PROJECT: 24-19

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

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

FIGURE 3

PLOT DATE: 10.05.24 FILE 24-19flow.dwg



CHARBONNEAU ENGINEERING LLC

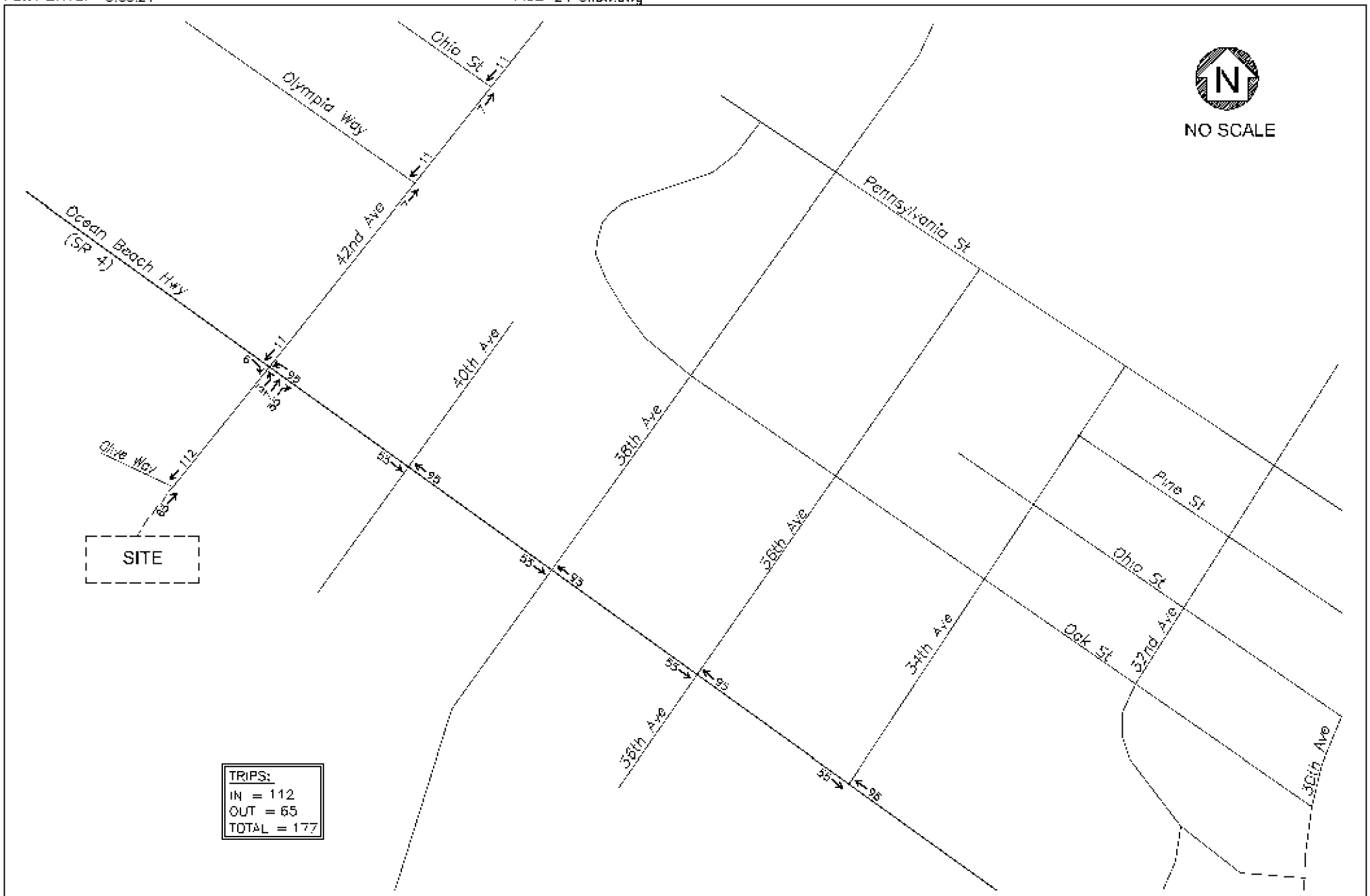
PROJECT: 24-19

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

PLOT DATE: 10.08.24 FILE 24-19flow.dwg



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

APPENDIX E

IN-PROCESS

Intersection Level Of Service Report
Intersection 1: 36th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.6
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.005

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	4	4	0	22	4	4	9	31	0	4	0	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	14.00	14.00	14.00	11.00	11.00	11.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	4	0	22	4	4	9	31	0	4	0	9
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	0	6	1	1	2	8	0	1	0	2
Total Analysis Volume [veh/h]	4	4	0	22	4	4	9	31	0	4	0	9
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.02	0.01	0.00	0.01			0.00		
d_M, Delay for Movement [s/veh]	8.96	9.42		9.18	9.64	8.59	7.33			7.26		
Movement LOS	A	A		A	A	A	A	A		A		A
95th-Percentile Queue Length [veh/ln]	0.03	0.03		0.10	0.10	0.10	0.02	0.02		0.01		0.01
95th-Percentile Queue Length [ft/ln]	0.70	0.70		2.60	2.60	2.60	0.38	0.38		0.20		0.20
d_A, Approach Delay [s/veh]	9.19			9.16			1.65			2.24		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	4.87											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 2: 34th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.6
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.052

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	22	18	4	44	4	0	13	4	4	13	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	8.00	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	22	18	4	44	4	0	13	4	4	13	0
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	6	5	1	11	1	0	3	1	1	3	0
Total Analysis Volume [veh/h]	0	22	18	4	44	4	0	13	4	4	13	0
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.03	0.02	0.00	0.05	0.00	0.00			0.00		
d_M, Delay for Movement [s/veh]		9.36	8.53	9.34	9.55	8.70				7.24		
Movement LOS		A	A	A	A	A		A	A	A	A	
95th-Percentile Queue Length [veh/ln]		0.13	0.13	0.19	0.19	0.19		0.00	0.00	0.01	0.01	
95th-Percentile Queue Length [ft/ln]		3.32	3.32	4.84	4.84	4.84		0.00	0.00	0.17	0.17	
d_A, Approach Delay [s/veh]		8.99			9.47			0.00			1.70	
Approach LOS		A			A			A			A	
d_I, Intersection Delay [s/veh]	6.99											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 3: 36th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	20.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.103

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	4	26	0	4	4	1154	0	0	598	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	14.00	14.00	14.00	1.00	1.00	1.00	12.00	12.00	12.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	4	26	0	4	4	1154	0	0	598	18
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	1	7	0	1	1	289	0	0	150	5
Total Analysis Volume [veh/h]	0	0	4	26	0	4	4	1154	0	0	598	18
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.01	0.10	0.00	0.01	0.00			0.00		
d_M, Delay for Movement [s/veh]			12.81	20.84		12.10	8.74					
Movement LOS			B	C		B	A	A			A	A
95th-Percentile Queue Length [veh/ln]			0.03	0.36		0.36	0.01	0.00			0.00	0.00
95th-Percentile Queue Length [ft/ln]			0.65	9.07		9.07	0.31	0.00			0.00	0.00
d_A, Approach Delay [s/veh]	12.81			19.68			0.03			0.00		
Approach LOS	B			C			A			A		
d_I, Intersection Delay [s/veh]	0.37											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 4: 34th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	20.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.073

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		1	0		0
Exit Pocket Length [ft]									100.00			
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	0	18	0	22	9	1146	0	0	717	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	18	0	22	9	1146	0	0	717	9
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	5	0	6	2	287	0	0	179	2
Total Analysis Volume [veh/h]	0	0	0	18	0	22	9	1146	0	0	717	9
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.07	0.00	0.03	0.01			0.00		
d_M, Delay for Movement [s/veh]				20.84		11.80	9.10					
Movement LOS				C		B	A	A			A	A
95th-Percentile Queue Length [veh/ln]				0.36		0.36	0.03	0.00			0.00	0.00
95th-Percentile Queue Length [ft/ln]				8.98		8.98	0.77	0.00			0.00	0.00
d_A, Approach Delay [s/veh]				15.87			0.07			0.00		
Approach LOS				C			A			A		
d_I, Intersection Delay [s/veh]	0.37											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 1: 36th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.012

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	9	0	9	4	9	4	4	26	4	18	44	13
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	0	9	4	9	4	4	26	4	18	44	13
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	2	1	2	1	1	7	1	5	11	3
Total Analysis Volume [veh/h]	9	0	9	4	9	4	4	26	4	18	44	13
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.01	0.00	0.01	0.00	0.00			0.01		
d_M, Delay for Movement [s/veh]	9.45		8.50	9.42	9.84	8.61	7.31			7.28		
Movement LOS	A		A	A	A	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.06		0.06	0.06	0.06	0.06	0.01	0.01	0.01	0.03	0.03	0.03
95th-Percentile Queue Length [ft/ln]	1.49		1.49	1.57	1.57	1.57	0.17	0.17	0.17	0.79	0.79	0.79
d_A, Approach Delay [s/veh]	8.97			9.45			0.86			1.75		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	3.35											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 2: 34th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.023

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	13	4	4	9	18	0	0	35	9	4	49	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	13	4	4	9	18	0	0	35	9	4	49	18
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	1	2	5	0	0	9	2	1	12	5
Total Analysis Volume [veh/h]	13	4	4	9	18	0	0	35	9	4	49	18
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.01	0.00	0.01	0.02	0.00	0.00			0.00		
d_M, Delay for Movement [s/veh]	9.36	9.74	8.57	9.32	9.76					7.29		
Movement LOS	A	A	A	A	A			A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.07	0.07	0.07	0.10	0.10			0.00	0.00	0.01	0.01	0.01
95th-Percentile Queue Length [ft/ln]	1.87	1.87	1.87	2.59	2.59			0.00	0.00	0.18	0.18	0.18
d_A, Approach Delay [s/veh]	9.28			9.61			0.00			0.41		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.97											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 3: 36th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	37.6
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.035

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	9	4	0	9	4	899	4	9	1411	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	9	4	0	9	4	899	4	9	1411	9
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	2	1	0	2	1	225	1	2	353	2
Total Analysis Volume [veh/h]	0	0	9	4	0	9	4	899	4	9	1411	9
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.02	0.04	0.00	0.02	0.01			0.01		
d_M, Delay for Movement [s/veh]			11.53	37.59		15.47	12.55			9.79		
Movement LOS			B	E		C	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]			0.05	0.19		0.19	0.03	0.00	0.00	0.04	0.00	0.00
95th-Percentile Queue Length [ft/ln]			1.22	4.65		4.65	0.63	0.00	0.00	0.90	0.00	0.00
d_A, Approach Delay [s/veh]	11.53			22.28			0.06			0.06		
Approach LOS	B			C			A			A		
d_I, Intersection Delay [s/veh]	0.23											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 4: 34th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	34.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.127

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		1	0		0
Exit Pocket Length [ft]									100.00			
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	0	18	0	35	26	1009	0	0	1208	40
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	18	0	35	26	1009	0	0	1208	40
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	5	0	9	7	252	0	0	302	10
Total Analysis Volume [veh/h]	0	0	0	18	0	35	26	1009	0	0	1208	40
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.13	0.00	0.08	0.05			0.00		
d_M, Delay for Movement [s/veh]				33.96		16.96	11.68					
Movement LOS				D		C	B	A			A	A
95th-Percentile Queue Length [veh/ln]				0.76		0.76	0.14	0.00			0.00	0.00
95th-Percentile Queue Length [ft/ln]				19.05		19.05	3.61	0.00			0.00	0.00
d_A, Approach Delay [s/veh]				22.73			0.29			0.00		
Approach LOS				C			A			A		
d_I, Intersection Delay [s/veh]	0.65											
Intersection LOS	D											

APPENDIX F

2030 "WITH PROJECT" LEVELS OF SERVICE

Intersection Level Of Service Report
Intersection 1: 36th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.7
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.005

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	4	4	2	22	4	4	9	32	0	9	4	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	14.00	14.00	14.00	11.00	11.00	11.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	4	4	2	22	4	4	9	32	0	9	4	9
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	1	6	1	1	2	8	0	2	1	2
Total Analysis Volume [veh/h]	4	4	2	22	4	4	9	32	0	9	4	9
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.03	0.01	0.00	0.01			0.01		
d_M, Delay for Movement [s/veh]	9.07	9.53	8.48	9.31	9.75	8.61	7.33			7.27		
Movement LOS	A	A	A	A	A	A	A	A		A	A	A
95th-Percentile Queue Length [veh/ln]	0.03	0.03	0.03	0.11	0.11	0.11	0.02	0.02		0.02	0.02	0.02
95th-Percentile Queue Length [ft/ln]	0.86	0.86	0.86	2.67	2.67	2.67	0.38	0.38		0.43	0.43	0.43
d_A, Approach Delay [s/veh]	9.14			9.28			1.61			2.98		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	4.87											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 2: 34th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.6
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.053

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	2	22	18	4	44	4	0	19	11	4	14	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	8.00	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2	22	18	4	44	4	0	19	11	4	14	0
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	6	5	1	11	1	0	5	3	1	4	0
Total Analysis Volume [veh/h]	2	22	18	4	44	4	0	19	11	4	14	0
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.03	0.02	0.00	0.05	0.00	0.00			0.00		
d_M, Delay for Movement [s/veh]	9.32	9.43	8.59	9.41	9.64	8.71				7.26		
Movement LOS	A	A	A	A	A	A		A	A	A	A	
95th-Percentile Queue Length [veh/ln]	0.14	0.14	0.14	0.20	0.20	0.20		0.00	0.00	0.01	0.01	
95th-Percentile Queue Length [ft/ln]	3.55	3.55	3.55	4.92	4.92	4.92		0.00	0.00	0.17	0.17	
d_A, Approach Delay [s/veh]	9.07			9.55			0.00			1.61		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	6.38											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 3: 36th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	20.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.103

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	4	26	0	9	6	1154	0	0	598	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	14.00	14.00	14.00	1.00	1.00	1.00	12.00	12.00	12.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	4	26	0	9	6	1154	0	0	598	18
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	1	7	0	2	2	289	0	0	150	5
Total Analysis Volume [veh/h]	0	0	4	26	0	9	6	1154	0	0	598	18
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.01	0.10	0.00	0.01	0.01			0.00		
d_M, Delay for Movement [s/veh]			12.81	20.91		12.10	8.75					
Movement LOS			B	C		B	A	A			A	A
95th-Percentile Queue Length [veh/ln]			0.03	0.39		0.39	0.02	0.00			0.00	0.00
95th-Percentile Queue Length [ft/ln]			0.65	9.84		9.84	0.47	0.00			0.00	0.00
d_A, Approach Delay [s/veh]	12.81			18.65			0.05			0.00		
Approach LOS	B			C			A			A		
d_I, Intersection Delay [s/veh]	0.42											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 4: 34th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	24.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.117

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		1	0		0
Exit Pocket Length [ft]									100.00			
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	0	25	0	22	9	1146	0	0	717	11
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	22.00	22.00	22.00	5.00	5.00	5.00	5.00	5.00	5.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	25	0	22	9	1146	0	0	717	11
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	6	0	6	2	287	0	0	179	3
Total Analysis Volume [veh/h]	0	0	0	25	0	22	9	1146	0	0	717	11
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.12	0.00	0.04	0.01			0.00		
d_M, Delay for Movement [s/veh]				24.03		13.39	9.27					
Movement LOS				C		B	A	A			A	A
95th-Percentile Queue Length [veh/ln]				0.54		0.54	0.03	0.00			0.00	0.00
95th-Percentile Queue Length [ft/ln]				13.54		13.54	0.80	0.00			0.00	0.00
d_A, Approach Delay [s/veh]				19.05			0.07			0.00		
Approach LOS				C			A			A		
d_I, Intersection Delay [s/veh]	0.51											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 5: Oak Street/Project Access

Control Type:	Two-way stop	Delay (sec / veh):	9.0
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.010

Intersection Setup

Name						
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]						
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]						
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name						
Base Volume Input [veh/h]	9	13	62	3	3	13
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	13	62	3	3	13
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	3	16	1	1	3
Total Analysis Volume [veh/h]	9	13	62	3	3	13
Pedestrian Volume [ped/h]						

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]			
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median			

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.01			0.00	
d_M, Delay for Movement [s/veh]	8.99	8.66			7.33	
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.07	0.07	0.00	0.00	0.01	0.01
95th-Percentile Queue Length [ft/ln]	1.74	1.74	0.00	0.00	0.13	0.13
d_A, Approach Delay [s/veh]	8.80		0.00		1.37	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.09					
Intersection LOS	A					

Signal Warrants Report For Intersection 1: 36th Avenue/Oak Street

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	N, S
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	E	W	N	S
1	22	41	30	10
2	21	40	29	10
3	21	39	29	10
4	20	36	27	9
5	17	32	24	8
6	17	32	23	8
7	17	32	23	8
8	15	29	21	7
9	15	28	21	7
10	15	28	20	7
11	13	24	18	6
12	12	23	17	6
13	12	22	16	5
14	9	16	12	4
15	9	16	12	4
16	6	11	8	3
17	4	7	5	2
18	4	7	5	2
19	2	4	3	1
20	1	2	2	1
21	1	1	1	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	63	1	30	No	No	No	No	No	No	No	No	No	No
2	1	61	1	29	No	No	No	No	No	No	No	No	No	No
3	1	60	1	29	No	No	No	No	No	No	No	No	No	No
4	1	56	1	27	No	No	No	No	No	No	No	No	No	No
5	1	49	1	24	No	No	No	No	No	No	No	No	No	No
6	1	49	1	23	No	No	No	No	No	No	No	No	No	No
7	1	49	1	23	No	No	No	No	No	No	No	No	No	No
8	1	44	1	21	No	No	No	No	No	No	No	No	No	No
9	1	43	1	21	No	No	No	No	No	No	No	No	No	No
10	1	43	1	20	No	No	No	No	No	No	No	No	No	No
11	1	37	1	18	No	No	No	No	No	No	No	No	No	No
12	1	35	1	17	No	No	No	No	No	No	No	No	No	No
13	1	34	1	16	No	No	No	No	No	No	No	No	No	No
14	1	25	1	12	No	No	No	No	No	No	No	No	No	No
15	1	25	1	12	No	No	No	No	No	No	No	No	No	No
16	1	17	1	8	No	No	No	No	No	No	No	No	No	No
17	1	11	1	5	No	No	No	No	No	No	No	No	No	No
18	1	11	1	5	No	No	No	No	No	No	No	No	No	No
19	1	6	1	3	No	No	No	No	No	No	No	No	No	No
20	1	3	1	2	No	No	No	No	No	No	No	No	No	No
21	1	2	1	1	No	No	No	No	No	No	No	No	No	No
22	1	0	1	0	No	No	No	No	No	No	No	No	No	No
23	1	0	1	0	No	No	No	No	No	No	No	No	No	No
24	1	0	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	N	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	9.3	9.1
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:04	0:01
Delay Condition Met	No	No
Volume on Minor Street Approach During Same Hour	30	10
High Minor Volume Condition Met	No	No
Total Entering Volume on All Approaches During Same Hour	103	103
Number of Approaches on Intersection	4	4
Total Volume Condition Met	No	No
Warrant Met for Approach	No	No
Warrant Met for Intersection	**No**	

Signal Warrants Report For Intersection 2: 34th Avenue/Oak Street

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	N, S
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	E	W	N	S
1	18	30	52	42
2	17	29	50	41
3	17	29	49	40
4	16	27	46	37
5	14	24	41	33
6	14	23	41	33
7	14	23	40	32
8	13	21	36	29
9	12	21	36	29
10	12	20	35	29
11	11	18	31	25
12	10	17	29	23
13	10	16	28	23
14	7	12	21	17
15	7	12	21	17
16	5	8	15	12
17	3	5	8	7
18	3	5	8	7
19	2	3	5	4
20	1	2	3	2
21	1	1	2	1
22	0	0	1	0
23	0	0	1	0
24	0	0	1	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	48	1	52	No	No	No	No	No	No	No	No	No	No
2	1	46	1	50	No	No	No	No	No	No	No	No	No	No
3	1	46	1	49	No	No	No	No	No	No	No	No	No	No
4	1	43	1	46	No	No	No	No	No	No	No	No	No	No
5	1	38	1	41	No	No	No	No	No	No	No	No	No	No
6	1	37	1	41	No	No	No	No	No	No	No	No	No	No
7	1	37	1	40	No	No	No	No	No	No	No	No	No	No
8	1	34	1	36	No	No	No	No	No	No	No	No	No	No
9	1	33	1	36	No	No	No	No	No	No	No	No	No	No
10	1	32	1	35	No	No	No	No	No	No	No	No	No	No
11	1	29	1	31	No	No	No	No	No	No	No	No	No	No
12	1	27	1	29	No	No	No	No	No	No	No	No	No	No
13	1	26	1	28	No	No	No	No	No	No	No	No	No	No
14	1	19	1	21	No	No	No	No	No	No	No	No	No	No
15	1	19	1	21	No	No	No	No	No	No	No	No	No	No
16	1	13	1	15	No	No	No	No	No	No	No	No	No	No
17	1	8	1	8	No	No	No	No	No	No	No	No	No	No
18	1	8	1	8	No	No	No	No	No	No	No	No	No	No
19	1	5	1	5	No	No	No	No	No	No	No	No	No	No
20	1	3	1	3	No	No	No	No	No	No	No	No	No	No
21	1	2	1	2	No	No	No	No	No	No	No	No	No	No
22	1	0	1	1	No	No	No	No	No	No	No	No	No	No
23	1	0	1	1	No	No	No	No	No	No	No	No	No	No
24	1	0	1	1	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	N	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	9.6	9.1
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:08	0:06
Delay Condition Met	No	No
Volume on Minor Street Approach During Same Hour	52	42
High Minor Volume Condition Met	No	No
Total Entering Volume on All Approaches During Same Hour	142	142
Number of Approaches on Intersection	4	4
Total Volume Condition Met	No	No
Warrant Met for Approach	No	No
Warrant Met for Intersection	**No**	

Signal Warrants Report For Intersection 3: 36th Avenue/Ocean Beach Highway (SR-4)

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S, N
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	E	W	S	N
1	616	1160	4	35
2	598	1125	4	34
3	585	1102	4	33
4	548	1032	4	31
5	487	916	3	28
6	480	905	3	27
7	474	893	3	27
8	431	812	3	25
9	425	800	3	24
10	419	789	3	24
11	363	684	2	21
12	339	638	2	19
13	333	626	2	19
14	246	464	2	14
15	246	464	2	14
16	172	325	1	10
17	99	186	1	6
18	99	186	1	6
19	55	104	0	3
20	31	58	0	2
21	18	35	0	1
22	6	12	0	0
23	6	12	0	0
24	6	12	0	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	3	1776	1	35	No	No	No	No	No	No	No	No	No	No
2	3	1723	1	34	No	No	No	No	No	No	No	No	No	No
3	3	1687	1	33	No	No	No	No	No	No	No	No	No	No
4	3	1580	1	31	No	No	No	No	No	No	No	No	No	No
5	3	1403	1	28	No	No	No	No	No	No	No	No	No	No
6	3	1385	1	27	No	No	No	No	No	No	No	No	No	No
7	3	1367	1	27	No	No	No	No	No	No	No	No	No	No
8	3	1243	1	25	No	No	No	No	No	No	No	No	No	No
9	3	1225	1	24	No	No	No	No	No	No	No	No	No	No
10	3	1208	1	24	No	No	No	No	No	No	No	No	No	No
11	3	1047	1	21	No	No	No	No	No	No	No	No	No	No
12	3	977	1	19	No	No	No	No	No	No	No	No	No	No
13	3	959	1	19	No	No	No	No	No	No	No	No	No	No
14	3	710	1	14	No	No	No	No	No	No	No	No	No	No
15	3	710	1	14	No	No	No	No	No	No	No	No	No	No
16	3	497	1	10	No	No	No	No	No	No	No	No	No	No
17	3	285	1	6	No	No	No	No	No	No	No	No	No	No
18	3	285	1	6	No	No	No	No	No	No	No	No	No	No
19	3	159	1	3	No	No	No	No	No	No	No	No	No	No
20	3	89	1	2	No	No	No	No	No	No	No	No	No	No
21	3	53	1	1	No	No	No	No	No	No	No	No	No	No
22	3	18	1	0	No	No	No	No	No	No	No	No	No	No
23	3	18	1	0	No	No	No	No	No	No	No	No	No	No
24	3	18	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	S	N
Total Stopped Delay Per Vehicle on Minor Approach (s)	12.8	18.6
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:00	0:10
Delay Condition Met	No	No
Volume on Minor Street Approach During Same Hour	4	35
High Minor Volume Condition Met	No	No
Total Entering Volume on All Approaches During Same Hour	1815	1815
Number of Approaches on Intersection	4	4
Total Volume Condition Met	Yes	Yes
Warrant Met for Approach	No	No
Warrant Met for Intersection	**No**	

Signal Warrants Report For Intersection 4: 34th Avenue/Ocean Beach Highway (SR-4)

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S, N
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	E	W	S	N
1	728	1155	0	47
2	706	1120	0	46
3	692	1097	0	45
4	648	1028	0	42
5	575	912	0	37
6	568	901	0	37
7	561	889	0	36
8	510	809	0	33
9	502	797	0	32
10	495	785	0	32
11	430	681	0	28
12	400	635	0	26
13	393	624	0	25
14	291	462	0	19
15	291	462	0	19
16	204	323	0	13
17	116	185	0	8
18	116	185	0	8
19	66	104	0	4
20	36	58	0	2
21	22	35	0	1
22	7	12	0	0
23	7	12	0	0
24	7	12	0	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	3	1883	1	47	No	No	No	No	No	No	No	Yes	No	No
2	3	1826	1	46	No	No	No	No	No	No	No	Yes	No	No
3	3	1789	1	45	No	No	No	No	No	No	No	Yes	No	No
4	3	1676	1	42	No	No	No	No	No	No	No	Yes	No	No
5	3	1487	1	37	No	No	No	No	No	No	No	No	No	No
6	3	1469	1	37	No	No	No	No	No	No	No	No	No	No
7	3	1450	1	36	No	No	No	No	No	No	No	No	No	No
8	3	1319	1	33	No	No	No	No	No	No	No	No	No	No
9	3	1299	1	32	No	No	No	No	No	No	No	No	No	No
10	3	1280	1	32	No	No	No	No	No	No	No	No	No	No
11	3	1111	1	28	No	No	No	No	No	No	No	No	No	No
12	3	1035	1	26	No	No	No	No	No	No	No	No	No	No
13	3	1017	1	25	No	No	No	No	No	No	No	No	No	No
14	3	753	1	19	No	No	No	No	No	No	No	No	No	No
15	3	753	1	19	No	No	No	No	No	No	No	No	No	No
16	3	527	1	13	No	No	No	No	No	No	No	No	No	No
17	3	301	1	8	No	No	No	No	No	No	No	No	No	No
18	3	301	1	8	No	No	No	No	No	No	No	No	No	No
19	3	170	1	4	No	No	No	No	No	No	No	No	No	No
20	3	94	1	2	No	No	No	No	No	No	No	No	No	No
21	3	57	1	1	No	No	No	No	No	No	No	No	No	No
22	3	19	1	0	No	No	No	No	No	No	No	No	No	No
23	3	19	1	0	No	No	No	No	No	No	No	No	No	No
24	3	19	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	4	0	0

Warrant 3 Condition A

Orientation	S	N
Total Stopped Delay Per Vehicle on Minor Approach (s)	40	19.1
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:00	0:14
Delay Condition Met	No	No
Volume on Minor Street Approach During Same Hour	0	47
High Minor Volume Condition Met	No	No
Total Entering Volume on All Approaches During Same Hour	1930	1930
Number of Approaches on Intersection	4	4
Total Volume Condition Met	Yes	Yes
Warrant Met for Approach	No	No
Warrant Met for Intersection	**No**	

Signal Warrants Report For Intersection 5: Oak Street/Project Access

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	S
1	16	65	22
2	16	63	21
3	15	62	21
4	14	58	20
5	13	51	17
6	12	51	17
7	12	50	17
8	11	46	15
9	11	45	15
10	11	44	15
11	9	38	13
12	9	36	12
13	9	35	12
14	6	26	9
15	6	26	9
16	4	18	6
17	3	10	4
18	3	10	4
19	1	6	2
20	1	3	1
21	0	2	1
22	0	1	0
23	0	1	0
24	0	1	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	81	1	22	No	No	No	No	No	No	No	No	No	No
2	1	79	1	21	No	No	No	No	No	No	No	No	No	No
3	1	77	1	21	No	No	No	No	No	No	No	No	No	No
4	1	72	1	20	No	No	No	No	No	No	No	No	No	No
5	1	64	1	17	No	No	No	No	No	No	No	No	No	No
6	1	63	1	17	No	No	No	No	No	No	No	No	No	No
7	1	62	1	17	No	No	No	No	No	No	No	No	No	No
8	1	57	1	15	No	No	No	No	No	No	No	No	No	No
9	1	56	1	15	No	No	No	No	No	No	No	No	No	No
10	1	55	1	15	No	No	No	No	No	No	No	No	No	No
11	1	47	1	13	No	No	No	No	No	No	No	No	No	No
12	1	45	1	12	No	No	No	No	No	No	No	No	No	No
13	1	44	1	12	No	No	No	No	No	No	No	No	No	No
14	1	32	1	9	No	No	No	No	No	No	No	No	No	No
15	1	32	1	9	No	No	No	No	No	No	No	No	No	No
16	1	22	1	6	No	No	No	No	No	No	No	No	No	No
17	1	13	1	4	No	No	No	No	No	No	No	No	No	No
18	1	13	1	4	No	No	No	No	No	No	No	No	No	No
19	1	7	1	2	No	No	No	No	No	No	No	No	No	No
20	1	4	1	1	No	No	No	No	No	No	No	No	No	No
21	1	2	1	1	No	No	No	No	No	No	No	No	No	No
22	1	1	1	0	No	No	No	No	No	No	No	No	No	No
23	1	1	1	0	No	No	No	No	No	No	No	No	No	No
24	1	1	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	8.8
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:03
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	22
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	103
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	**No**

Intersection Level Of Service Report
Intersection 1: 36th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	10.0
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.012

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	9	0	16	4	9	4	4	31	4	22	47	13
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	0	16	4	9	4	4	31	4	22	47	13
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	0	4	1	2	1	1	8	1	6	12	3
Total Analysis Volume [veh/h]	9	0	16	4	9	4	4	31	4	22	47	13
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.02	0.00	0.01	0.00	0.00			0.01		
d_M, Delay for Movement [s/veh]	9.60		8.54	9.59	9.95	8.63	7.32			7.29		
Movement LOS	A		A	A	A	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.08		0.08	0.06	0.06	0.06	0.01	0.01	0.01	0.04	0.04	0.04
95th-Percentile Queue Length [ft/ln]	2.04		2.04	1.61	1.61	1.61	0.17	0.17	0.17	0.97	0.97	0.97
d_A, Approach Delay [s/veh]	8.92			9.56			0.75			1.96		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	3.53											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 2: 34th Avenue/Oak Street

Control Type:	Two-way stop	Delay (sec / veh):	9.9
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.005

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	0		0	0		0
Entry Pocket Length [ft]												
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name												
Base Volume Input [veh/h]	21	4	4	9	18	0	0	39	14	4	55	18
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	21	4	4	9	18	0	0	39	14	4	55	18
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	1	1	2	5	0	0	10	4	1	14	5
Total Analysis Volume [veh/h]	21	4	4	9	18	0	0	39	14	4	55	18
Pedestrian Volume [ped/h]												

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median				

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.03	0.01	0.00	0.01	0.02	0.00	0.00			0.00		
d_M, Delay for Movement [s/veh]	9.50	9.86	8.65	9.41	9.85					7.30		
Movement LOS	A	A	A	A	A			A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.11	0.11	0.11	0.11	0.11			0.00	0.00	0.01	0.01	0.01
95th-Percentile Queue Length [ft/ln]	2.67	2.67	2.67	2.64	2.64			0.00	0.00	0.18	0.18	0.18
d_A, Approach Delay [s/veh]	9.43			9.70			0.00			0.38		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	3.04											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 3: 36th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	37.9
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.035

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		0	0		0
Exit Pocket Length [ft]												
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	9	4	0	13	11	899	4	9	1411	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	9	4	0	13	11	899	4	9	1411	9
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	2	1	0	3	3	225	1	2	353	2
Total Analysis Volume [veh/h]	0	0	9	4	0	13	11	899	4	9	1411	9
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.02	0.04	0.00	0.03	0.02			0.01		
d_M, Delay for Movement [s/veh]			11.53	37.92		15.56	12.67			9.79		
Movement LOS			B	E		C	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]			0.05	0.22		0.22	0.07	0.00	0.00	0.04	0.00	0.00
95th-Percentile Queue Length [ft/ln]			1.22	5.56		5.56	1.75	0.00	0.00	0.90	0.00	0.00
d_A, Approach Delay [s/veh]	11.53			20.82			0.15			0.06		
Approach LOS	B			C			A			A		
d_I, Intersection Delay [s/veh]	0.29											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 4: 34th Avenue/Ocean Beach Highway (SR-4)

Control Type:	Two-way stop	Delay (sec / veh):	35.2
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.162

Intersection Setup

Name											
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0		0	0		0	1		0	1		0
Entry Pocket Length [ft]							100.00			100.00		
No. of Lanes in Exit Pocket	0		0	0		0	0		1	0		0
Exit Pocket Length [ft]									100.00			
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			No			No		

Volumes

Name												
Base Volume Input [veh/h]	0	0	0	23	0	35	26	1009	0	0	1208	48
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	0	23	0	35	26	1009	0	0	1208	48
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	0	6	0	9	7	252	0	0	302	12
Total Analysis Volume [veh/h]	0	0	0	23	0	35	26	1009	0	0	1208	48
Pedestrian Volume [ped/h]	0			0								

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]				
Two-Stage Gap Acceptance	No	Yes		
Number of Storage Spaces in Median		1		

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.16	0.00	0.08	0.05			0.00		
d_M, Delay for Movement [s/veh]				35.24		18.17	11.73					
Movement LOS				E		C	B	A			A	A
95th-Percentile Queue Length [veh/ln]				0.93		0.93	0.15	0.00			0.00	0.00
95th-Percentile Queue Length [ft/ln]				23.22		23.22	3.64	0.00			0.00	0.00
d_A, Approach Delay [s/veh]				24.94			0.29			0.00		
Approach LOS				C			A			A		
d_I, Intersection Delay [s/veh]	0.75											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 5: Oak Street/Project Access

Control Type:	Two-way stop	Delay (sec / veh):	9.4
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.008

Intersection Setup

Name						
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]						
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]						
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name						
Base Volume Input [veh/h]	7	9	44	12	14	75
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	7	9	44	12	14	75
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	2	11	3	4	19
Total Analysis Volume [veh/h]	7	9	44	12	14	75
Pedestrian Volume [ped/h]						

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]			
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median			

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.01			0.01	
d_M, Delay for Movement [s/veh]	9.38	8.58			7.32	
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.05	0.05	0.00	0.00	0.02	0.02
95th-Percentile Queue Length [ft/ln]	1.31	1.31	0.00	0.00	0.59	0.59
d_A, Approach Delay [s/veh]	8.93		0.00		1.15	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.52					
Intersection LOS	A					

Signal Warrants Report For Intersection 1: 36th Avenue/Oak Street

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	N, S
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	E	W	N	S
1	82	39	17	25
2	80	38	16	24
3	78	37	16	24
4	73	35	15	22
5	65	31	13	20
6	64	30	13	20
7	63	30	13	19
8	57	27	12	18
9	57	27	12	17
10	56	27	12	17
11	48	23	10	15
12	45	21	9	14
13	44	21	9	14
14	33	16	7	10
15	33	16	7	10
16	23	11	5	7
17	13	6	3	4
18	13	6	3	4
19	7	4	2	2
20	4	2	1	1
21	2	1	1	1
22	1	0	0	0
23	1	0	0	0
24	1	0	0	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	121	1	25	No	No	No	No	No	No	No	No	No	No
2	1	118	1	24	No	No	No	No	No	No	No	No	No	No
3	1	115	1	24	No	No	No	No	No	No	No	No	No	No
4	1	108	1	22	No	No	No	No	No	No	No	No	No	No
5	1	96	1	20	No	No	No	No	No	No	No	No	No	No
6	1	94	1	20	No	No	No	No	No	No	No	No	No	No
7	1	93	1	19	No	No	No	No	No	No	No	No	No	No
8	1	84	1	18	No	No	No	No	No	No	No	No	No	No
9	1	84	1	17	No	No	No	No	No	No	No	No	No	No
10	1	83	1	17	No	No	No	No	No	No	No	No	No	No
11	1	71	1	15	No	No	No	No	No	No	No	No	No	No
12	1	66	1	14	No	No	No	No	No	No	No	No	No	No
13	1	65	1	14	No	No	No	No	No	No	No	No	No	No
14	1	49	1	10	No	No	No	No	No	No	No	No	No	No
15	1	49	1	10	No	No	No	No	No	No	No	No	No	No
16	1	34	1	7	No	No	No	No	No	No	No	No	No	No
17	1	19	1	4	No	No	No	No	No	No	No	No	No	No
18	1	19	1	4	No	No	No	No	No	No	No	No	No	No
19	1	11	1	2	No	No	No	No	No	No	No	No	No	No
20	1	6	1	1	No	No	No	No	No	No	No	No	No	No
21	1	3	1	1	No	No	No	No	No	No	No	No	No	No
22	1	1	1	0	No	No	No	No	No	No	No	No	No	No
23	1	1	1	0	No	No	No	No	No	No	No	No	No	No
24	1	1	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	N	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	9.6	8.9
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:02	0:03
Delay Condition Met	No	No
Volume on Minor Street Approach During Same Hour	17	25
High Minor Volume Condition Met	No	No
Total Entering Volume on All Approaches During Same Hour	163	163
Number of Approaches on Intersection	4	4
Total Volume Condition Met	No	No
Warrant Met for Approach	No	No
Warrant Met for Intersection	**No**	

Signal Warrants Report For Intersection 2: 34th Avenue/Oak Street

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	N, S
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	E	W	N	S
1	77	53	27	29
2	75	51	26	28
3	73	50	26	28
4	69	47	24	26
5	61	42	21	23
6	60	41	21	23
7	59	41	21	22
8	54	37	19	20
9	53	37	19	20
10	52	36	18	20
11	45	31	16	17
12	42	29	15	16
13	42	29	15	16
14	31	21	11	12
15	31	21	11	12
16	22	15	8	8
17	12	8	4	5
18	12	8	4	5
19	7	5	2	3
20	4	3	1	1
21	2	2	1	1
22	1	1	0	0
23	1	1	0	0
24	1	1	0	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	130	1	29	No	No	No	No	No	No	No	No	No	No
2	1	126	1	28	No	No	No	No	No	No	No	No	No	No
3	1	123	1	28	No	No	No	No	No	No	No	No	No	No
4	1	116	1	26	No	No	No	No	No	No	No	No	No	No
5	1	103	1	23	No	No	No	No	No	No	No	No	No	No
6	1	101	1	23	No	No	No	No	No	No	No	No	No	No
7	1	100	1	22	No	No	No	No	No	No	No	No	No	No
8	1	91	1	20	No	No	No	No	No	No	No	No	No	No
9	1	90	1	20	No	No	No	No	No	No	No	No	No	No
10	1	88	1	20	No	No	No	No	No	No	No	No	No	No
11	1	76	1	17	No	No	No	No	No	No	No	No	No	No
12	1	71	1	16	No	No	No	No	No	No	No	No	No	No
13	1	71	1	16	No	No	No	No	No	No	No	No	No	No
14	1	52	1	12	No	No	No	No	No	No	No	No	No	No
15	1	52	1	12	No	No	No	No	No	No	No	No	No	No
16	1	37	1	8	No	No	No	No	No	No	No	No	No	No
17	1	20	1	5	No	No	No	No	No	No	No	No	No	No
18	1	20	1	5	No	No	No	No	No	No	No	No	No	No
19	1	12	1	3	No	No	No	No	No	No	No	No	No	No
20	1	7	1	1	No	No	No	No	No	No	No	No	No	No
21	1	4	1	1	No	No	No	No	No	No	No	No	No	No
22	1	2	1	0	No	No	No	No	No	No	No	No	No	No
23	1	2	1	0	No	No	No	No	No	No	No	No	No	No
24	1	2	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	N	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	9.7	9.4
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:04	0:04
Delay Condition Met	No	No
Volume on Minor Street Approach During Same Hour	27	29
High Minor Volume Condition Met	No	No
Total Entering Volume on All Approaches During Same Hour	186	186
Number of Approaches on Intersection	4	4
Total Volume Condition Met	No	No
Warrant Met for Approach	No	No
Warrant Met for Intersection	**No**	

Signal Warrants Report For Intersection 3: 36th Avenue/Ocean Beach Highway (SR-4)

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S, N
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	E	W	S	N
1	1429	914	9	17
2	1386	887	9	16
3	1358	868	9	16
4	1272	813	8	15
5	1129	722	7	13
6	1115	713	7	13
7	1100	704	7	13
8	1000	640	6	12
9	986	631	6	12
10	972	622	6	12
11	843	539	5	10
12	786	503	5	9
13	772	494	5	9
14	572	366	4	7
15	572	366	4	7
16	400	256	3	5
17	229	146	1	3
18	229	146	1	3
19	129	82	1	2
20	71	46	0	1
21	43	27	0	1
22	14	9	0	0
23	14	9	0	0
24	14	9	0	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	3	2343	1	17	No	No	No	No	No	No	No	No	No	No
2	3	2273	1	16	No	No	No	No	No	No	No	No	No	No
3	3	2226	1	16	No	No	No	No	No	No	No	No	No	No
4	3	2085	1	15	No	No	No	No	No	No	No	No	No	No
5	3	1851	1	13	No	No	No	No	No	No	No	No	No	No
6	3	1828	1	13	No	No	No	No	No	No	No	No	No	No
7	3	1804	1	13	No	No	No	No	No	No	No	No	No	No
8	3	1640	1	12	No	No	No	No	No	No	No	No	No	No
9	3	1617	1	12	No	No	No	No	No	No	No	No	No	No
10	3	1594	1	12	No	No	No	No	No	No	No	No	No	No
11	3	1382	1	10	No	No	No	No	No	No	No	No	No	No
12	3	1289	1	9	No	No	No	No	No	No	No	No	No	No
13	3	1266	1	9	No	No	No	No	No	No	No	No	No	No
14	3	938	1	7	No	No	No	No	No	No	No	No	No	No
15	3	938	1	7	No	No	No	No	No	No	No	No	No	No
16	3	656	1	5	No	No	No	No	No	No	No	No	No	No
17	3	375	1	3	No	No	No	No	No	No	No	No	No	No
18	3	375	1	3	No	No	No	No	No	No	No	No	No	No
19	3	211	1	2	No	No	No	No	No	No	No	No	No	No
20	3	117	1	1	No	No	No	No	No	No	No	No	No	No
21	3	70	1	1	No	No	No	No	No	No	No	No	No	No
22	3	23	1	0	No	No	No	No	No	No	No	No	No	No
23	3	23	1	0	No	No	No	No	No	No	No	No	No	No
24	3	23	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	S	N
Total Stopped Delay Per Vehicle on Minor Approach (s)	11.5	20.8
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:01	0:05
Delay Condition Met	No	No
Volume on Minor Street Approach During Same Hour	9	17
High Minor Volume Condition Met	No	No
Total Entering Volume on All Approaches During Same Hour	2369	2369
Number of Approaches on Intersection	4	4
Total Volume Condition Met	Yes	Yes
Warrant Met for Approach	No	No
Warrant Met for Intersection	**No**	

Signal Warrants Report For Intersection 4: 34th Avenue/Ocean Beach Highway (SR-4)

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S, N
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets	
	E	W	S	N
1	1256	1035	0	58
2	1218	1004	0	56
3	1193	983	0	55
4	1118	921	0	52
5	992	818	0	46
6	980	807	0	45
7	967	797	0	45
8	879	725	0	41
9	867	714	0	40
10	854	704	0	39
11	741	611	0	34
12	691	569	0	32
13	678	559	0	31
14	502	414	0	23
15	502	414	0	23
16	352	290	0	16
17	201	166	0	9
18	201	166	0	9
19	113	93	0	5
20	63	52	0	3
21	38	31	0	2
22	13	10	0	1
23	13	10	0	1
24	13	10	0	1

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	3	2291	1	58	No	No	No	No	No	No	Yes	Yes	No	No
2	3	2222	1	56	No	No	No	No	No	No	Yes	Yes	No	No
3	3	2176	1	55	No	No	No	No	No	No	Yes	Yes	No	No
4	3	2039	1	52	No	No	No	No	No	No	Yes	Yes	No	No
5	3	1810	1	46	No	No	No	No	No	No	No	Yes	No	No
6	3	1787	1	45	No	No	No	No	No	No	No	Yes	No	No
7	3	1764	1	45	No	No	No	No	No	No	No	Yes	No	No
8	3	1604	1	41	No	No	No	No	No	No	No	No	No	No
9	3	1581	1	40	No	No	No	No	No	No	No	No	No	No
10	3	1558	1	39	No	No	No	No	No	No	No	No	No	No
11	3	1352	1	34	No	No	No	No	No	No	No	No	No	No
12	3	1260	1	32	No	No	No	No	No	No	No	No	No	No
13	3	1237	1	31	No	No	No	No	No	No	No	No	No	No
14	3	916	1	23	No	No	No	No	No	No	No	No	No	No
15	3	916	1	23	No	No	No	No	No	No	No	No	No	No
16	3	642	1	16	No	No	No	No	No	No	No	No	No	No
17	3	367	1	9	No	No	No	No	No	No	No	No	No	No
18	3	367	1	9	No	No	No	No	No	No	No	No	No	No
19	3	206	1	5	No	No	No	No	No	No	No	No	No	No
20	3	115	1	3	No	No	No	No	No	No	No	No	No	No
21	3	69	1	2	No	No	No	No	No	No	No	No	No	No
22	3	23	1	1	No	No	No	No	No	No	No	No	No	No
23	3	23	1	1	No	No	No	No	No	No	No	No	No	No
24	3	23	1	1	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	4	7	0	0

Warrant 3 Condition A

Orientation	S	N
Total Stopped Delay Per Vehicle on Minor Approach (s)	61.4	24.9
Number of Lanes on Minor Street Approach	1	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:00	0:24
Delay Condition Met	No	No
Volume on Minor Street Approach During Same Hour	0	58
High Minor Volume Condition Met	No	No
Total Entering Volume on All Approaches During Same Hour	2349	2349
Number of Approaches on Intersection	4	4
Total Volume Condition Met	Yes	Yes
Warrant Met for Approach	No	No
Warrant Met for Intersection	**No**	

Signal Warrants Report For Intersection 5: Oak Street/Project Access

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	S
Speed > 40mph	No
Population < 10,000	No
Warrant Factor	100%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	S
1	89	56	16
2	86	54	16
3	85	53	15
4	79	50	14
5	70	44	13
6	69	44	12
7	69	43	12
8	62	39	11
9	61	39	11
10	61	38	11
11	53	33	9
12	49	31	9
13	48	30	9
14	36	22	6
15	36	22	6
16	25	16	4
17	14	9	3
18	14	9	3
19	8	5	1
20	4	3	1
21	3	2	0
22	1	1	0
23	1	1	0
24	1	1	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	145	1	16	No	No	No	No	No	No	No	No	No	No
2	1	140	1	16	No	No	No	No	No	No	No	No	No	No
3	1	138	1	15	No	No	No	No	No	No	No	No	No	No
4	1	129	1	14	No	No	No	No	No	No	No	No	No	No
5	1	114	1	13	No	No	No	No	No	No	No	No	No	No
6	1	113	1	12	No	No	No	No	No	No	No	No	No	No
7	1	112	1	12	No	No	No	No	No	No	No	No	No	No
8	1	101	1	11	No	No	No	No	No	No	No	No	No	No
9	1	100	1	11	No	No	No	No	No	No	No	No	No	No
10	1	99	1	11	No	No	No	No	No	No	No	No	No	No
11	1	86	1	9	No	No	No	No	No	No	No	No	No	No
12	1	80	1	9	No	No	No	No	No	No	No	No	No	No
13	1	78	1	9	No	No	No	No	No	No	No	No	No	No
14	1	58	1	6	No	No	No	No	No	No	No	No	No	No
15	1	58	1	6	No	No	No	No	No	No	No	No	No	No
16	1	41	1	4	No	No	No	No	No	No	No	No	No	No
17	1	23	1	3	No	No	No	No	No	No	No	No	No	No
18	1	23	1	3	No	No	No	No	No	No	No	No	No	No
19	1	13	1	1	No	No	No	No	No	No	No	No	No	No
20	1	7	1	1	No	No	No	No	No	No	No	No	No	No
21	1	5	1	0	No	No	No	No	No	No	No	No	No	No
22	1	2	1	0	No	No	No	No	No	No	No	No	No	No
23	1	2	1	0	No	No	No	No	No	No	No	No	No	No
24	1	2	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	S
Total Stopped Delay Per Vehicle on Minor Approach (s)	8.9
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:02
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	16
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	161
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	**No**

STORMWATER TECHNICAL INFORMATION REPORT - TIR

For MINT VALLEY

FOR A BINDING SITE PLAN &
MANUFACTURED HOME PARK
3503 & 3505 OAK STREET, LONGVIEW, WA

DATE: 11-17-2024

PREPARED BY
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November 17, 2024

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REFERENCES

"Longview Stormwater Management Ordinance" (Ord. 3349 § 1, 2017)

2019 edition of the Stormwater Management Manual for Western Washington.

SECTION A - PROJECT OVERVIEW

Site Information:

The property presently consists of two lots, parcel numbers 05319, and 053180300 and is located in a portion of the NE ¼ of Section 30, Township 8 North, Range 2 West of the Willamette Meridian, Cowlitz County, Washington. Site address: 3503 Oak Street, Longview, WA 98632.

The property is currently developed as a single residential lot with one residence and several outbuildings. The site topography is generally flat and generally slopes east and west to the CDID#1 Upper Slough. There are no areas of runoff onto this site from the adjoining property to the west. There is however, a small amount of runoff onto this site from the Oak St. right of way along the site frontage.

There are no existing storm systems onsite and there are no known drain tiles for agricultural purposes on this property. If any tiles are found, they will be routed to the proposed storm system for conveyance. There are also no critical areas known to exist on the site.

Present Condition

Presently, most site runoff moves slowly as sheet flow and infiltrates for the majority of the storm events or slowly eventually makes its way into CDID#1 Upper Slough.

Developed Condition

For the developed condition, there will be 73 lots. Most of the lots will be graded to slope toward the slough. However, the yard area remaining apart from drives and roofs will be covered with about 6 or more inches of permeable gravel. Modeling indicates that flow from the site will infiltrate in this permeable gravel area (about 2.717 ac.) so flows will be dissipated via infiltration.

Applicable Minimum Requirements:

According to "Longview Stormwater Management Ordinance" (Ord. 3349 § 1, 2017), Minimum Requirements (1-9) apply.

The Mint Valley Manufactured Home Park proposal does contain one threshold discharge area (TDA) as defined by DOE as there is proposed surface runoff to offsite from onsite. The project site is subject to meeting minimum requirements 1 – 9 due to the amount of new impervious surfaces proposed for development of the site.

Summary

Water Quality Treatment - For water quality treatment, a standard mechanical cartridge system like ~~a~~ PerkFilter or Contech StormFilter will be used and sizing documentation has been provided.

Infiltration Testing - There was a site Geotech and Soils Infiltration Testing Report with 4 tests with results ranging from 5 inches per hour to 22 inches per hour for infiltration on the site. Infiltration is the method for stormwater disposal from the lots on the site. Groundwater levels were found to be about 5 feet below ground surface which is adequate for the proposed design. See the infiltration testing report in Appendix D for detailed information.

Flow Control met with Infiltration – Flow control and Minimum Requirement #7 is met through infiltration of site water. Thus, detention facilities are not needed or proposed. Instead, site water

from the lots will be infiltrated into the pervious yard areas that will have about 6 inches of added gravel layer pervious thickness. Site water from the site around the units is detained to allow time for yard water to infiltrate in the soil below the gravel ~~yards~~. Surface water from traffic surfaces will also be collected and be water quality treated prior to infiltration or release. The end result for Flow Control is that with the infiltration of lot water across the site that the net release of water from the site after development for the 100 year Post development condition rate is less than the 100 year pre-development condition rate.

As noted in MR#7 below, Infiltration below the proposed pervious gravel surfaces on each lot yard area provides sufficient infiltration and Flow Control to an extent that meets the 25-yr and 100-yr volume criteria for both City of Longview and CDID#1. Since the post Developed condition rates are less than the existing rates for the 25-yr and 100-yr events, then no additional detention is required above what is provided with onsite infiltration of the yard areas in the post developed site condition. Thus, no use of CDID regional detention is necessary, and no fee-in-lieu is needed.

SECTION B - MINIMUM REQUIREMENTS

According to Table B.1 below and the Longview Municipal Code 17.80, Minimum Requirements 1-6 & 8-9 apply.

Table B.1 - Summary of Land Disturbing Activities

The defined existing site boundary area is 10.38 acres (large portion is CDID#1 slough)

- About 2.0 ac is part of the slough and channel bank areas

1. Amount of Existing Impervious surface	3,081 sf (Oak St.) 6,602 sf (site)
2. Amount of New Impervious surface	Street = 42,094 sf Roofs = 114,464 sf Drives = 49,303 Gravel = 118,353 Access Gravel = 32,540
3. Amount of Replaced Impervious surface	Approx. 1,300 sf
4. Amount of Native Vegetation converted to lawn or landscaping	None
5. Amount of Native Vegetation converted to pasture	None
6. Amount of Native Vegetation converted to pervious access area	None
7. Total amount of land-disturbing activity	Approx. 8.38 acres

Minimum Requirement #1 - Preparation of Stormwater Site Plans

This report and the Final Engineering Plans will contain adequate detail to construct theproposed stormwater facilities, and all information required for compliance with the 2019 Stormwater Management Manual for Western Washington (DOE 2019 SMMWW).

Minimum Requirement #2 - Construction Stormwater Pollution Prevention

A detailed erosion control plan will be included in the Final Engineering plans, and a Stormwater Pollution Prevention Plan will be submitted with the Final TIR (as a separate document).

Minimum Requirement #3 - Source Control of Pollution

In conformance with the requirements of City of Longview "Longview Stormwater Management Ordinance" (Ord. 3349 § 1, 2017), no prohibited discharges are planned to be released from the site. Best Management Practices (BMPs) will be designed and called out on the SWPPP and the Erosion Control Plans and Details to control sediment-laden runoff from leaving the site and impacting any neighboring properties and City of Longview storm systems, including State waters. In addition, BMPs will be implemented as necessary to prevent pollutants from coming into contact with stormwater during construction.

The proposed development does not include any of the activities listed in Volume IV, II 3.2.
Construction Source Control BMPs (DOE 2019 SMMWW). There are no long-term pollution risks associated with the project that necessitate a separate source control plan.

The BMPs that may apply to land disturbance would be BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots and BMPs for Urban Streets.

However, the City of Longview also requires source control BMPs for the development after the development has been stabilized and occupied. Typically, this is presented in the Maintenance and Operations Manual for the site, but this portion is addressed in the TIR as well.

Source Control Measures to Reduce Pollution after Site is Stabilized and Occupied

The most effective way to maintain a water quality facility is to prevent the pollutants from entering the facility in the first place. Common pollutants include sediment, trash and debris, chemicals, petwastes, runoff from stored materials, illicit discharges into the storm drainage system and many others. A comprehensive maintenance program will include measures to address these potential contaminants, and will save money and time in the long run. Key points to consider in a maintenance program include:

- Educate property owners/residents to be aware of how their actions might impact water quality, and how they can help reduce maintenance costs.
- Keep properties, streets and parking lots (driveways) free from trash and debris.
- Ensure the proper disposal of hazardous wastes and chemicals.
- Plan lot care to minimize the use of chemicals and pesticides.
- Sweep paved surfaces and put the sweepings in a compost pile – not back on the drive or other lot areas
- Be aware of automobiles leaking fluids. Use absorbents, such as cat litter, to soak up drippings – dispose of properly.

- Replace disturbed and bare areas to maintain gravel layer thickness and stabilization.
- Clean out the upstream components of the storm drainage system, including inlets, storm sewers and outfalls. Maintain WQ filter systems.
- Do not store materials outdoors (including landscaping materials) unless they are properly protected from stormwater runoff.

Minimum Requirement #4 - Preservation of Natural Drainage Systems and Outfalls

The present site does not have any natural drainage systems or outfalls of significance as the runoff is generally runoff from overland sheet flow that mostly infiltrates on the site. The development proposes to treat runoff from potential pollutant sources (private street and parking at each lot). Surface infiltration will occur throughout the site due to the addition of gravel and some sand/soil mix.

Minimum Requirement #5 - On-Site Stormwater Management

Compliance is typically met with the List #3 Approach as follows:

Surface Type: Lawn and Landscaped Areas

There are no proposed landscaped areas. Rather yard areas will act as pervious surfaces will be covered with about 3 to 12 inches of gavel. Some existing soil may be augmented by adding imported sand if needed

Mixing existing site soil with imported sand is expected to provide equal or better conditions for rainfall absorption than BMP T5.13 Post-Construction Soil Quality and Depth.

Surface Type: Roofs

BMP T5.10A: Downspout Full Infiltration

- ❖ This BMP has been determined to be infeasible in particular due to the area for disposal is serving to infiltrate direct rainfall on the surface.

BMP T5.10B: Downspout Dispersion Systems

- ❖ This BMP has been determined to be infeasible in particular due to the area for disposal is serving to infiltrate direct rainfall on the surface.

BMP T5.10C: Perforated Stub-out Systems

- ❖ This BMP has been determined to be infeasible since reduction in flow rates and volumes are a design requirement.

Surface Type: Other Hard Surfaces

BMP T5.12: Sheet Flow Dispersion or
BMP T5.11: Concentrated Flow Dispersion

- ❖ These BMPs have been determined to be infeasible since they are for impervious areas with steeper slopes than this proposed

site.

In lieu of these, the following modified BMP is being proposed:

- **<u>Modified</u> BMP T7.40: Compost-Amended Vegetated Filter Strips (CAVFS) Modified**

  Since the lot area will be covered with gravel (no vegetation), the proposed amended soil system differs. The top layer of gravel over the amended soil serves to impede the flow that has dispersed quickly through the surface and allow it to infiltrate in the yard areas. Therefore, application of this design approach provides release rate flow reduction and runoff volume reduction for the site that will meet CDID#1 volume requirements. See App C, C-7.Application of this BMP also meets some goals related to BMP T5.21 – Better Site Design.

Minimum Requirement #6 - Runoff Treatment Analysis and Design

Basic treatment is required for all stormwater runoff from pollution generating surfaces. These surfaces are the proposed private street and any runoff onto it from the lots, parcels, or private drives serving several lots. The frontage improvements, which will also include existing pavement to the centerline of Oak Street, will also be subject to treatment.

The following BMP is proposed - V-10 Manufactured Treatment Device

GENERAL USE LEVEL DESIGNATION FOR BASIC AND PHOSPHORUS TREATMENT For Oldcastle Infrastructure PerkFilter™ (with ZPC Filter Media)

Ecology's Decision: Based on Oldcastle's application submissions, including the Draft Technical Evaluation Report, dated April 2010, Ecology hereby issues the following use level designations:

1. General use level designation (GULD) for the PerkFilter™ for basic treatment:

- Using a zeolite-perlite-carbon (ZPC) filter media as specified by Oldcastle.
- Sized at hydraulic loading rate of no more than 1.5 gpm/ft² of media surface area, per Table 1.

Table 1. Design Flowrate per Cartridge

Effective Cartridge Height (inches) = 12 and 6.8 Cartridge Flowrate (gpm/cartridge

Effective Cartridge Height (inches) = 18 and 10.2 Cartridge Flowrate (gpm/cartridge

2. General use level designation (GULD) for the PerkFilter™ for phosphorus treatment:

- Using a zeolite-perlite-carbon (ZPC) filter media as specified by Oldcastle.

- Sized at hydraulic loading rate of no more than 1.5 gpm/ft² of media surface area, per Table 1.

3. Ecology approves PerkFilter™ units for treatment at the hydraulic loading rates shown in Table 1, and sized based on the water quality design flow rate for an off-line system. The internal weir in the inlet chamber functions as a bypass to route flow in excess of the water quality design flow rate around the treatment chamber. Calculate the water quality design flow rate using the following procedures: ‘

   - Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology approved continuous runoff model.

: From Table1 the equivalent cfs treatment flow rates are 0.015 cfs for 6.8 gpm and 0.23 cfs for 10.2 gpm. The following table is based on these cfs rates.

Oldcastle Perk Filter™				
Cartridge Size Height (in)	**1 Unit Allowable Rate (cfs)**	**2 Unit Allowable Rate (cfs)**	**3 Unit Allowable Rate (cfs)**	**4 Unit Allowable Rate (cfs)**
12"	0.015	0.030	0.045	0.061
18"	0.023	0.045	0.068	0.091
12" + 12"	0.030	0.061	0.091	0.121
18" + 12"	0.038	0.076	0.114	0.152

Areas Requiring Water Quality Treatment:

Private Street (subasin areas N-1, N-2, S-1, and S-2)

The private street has two low points and each will collect the runoff from the street and sidewalk areas for treatment

Oak Street frontage (subbasin areas F-1 and F-2)

Generally, the only change to the frontage will be widening and installation of curb and gutter along the site frontage and extending to each end for the transition back to existing pavement width. The majority of this half street runoff will be conveyed by gutter flow to onsite piping leading to water quality media filter systems noted above prior to release to the slough.

Proposed water Quality Systems – using Perkfilter

The offline WQ rate for CB#1 is 0.065 cfs
– requires 1- (18” + 12”) stack height (0.076 cfs capacity)

The offline WQ rate for CB#3 is 0.035 cfs
– requires 1-18” cartridge (0.045 cfs capacity)

See Appendix C-6 for WQ flow rates (per MGSFlood analysis).
See Appendix B Post-development Basin Map – WQ Treatment

Remaining Areas (roofs, drives, and gravel surfaces) & Additional WQ Treatment

The proposed gravel on the existing excavated soil surface for each lot will provide infiltration and also WQ treatment due to the high cation exchange capacity of the site soils. Infiltration will occur similar to the CAVFS design approach which includes treatment (due the cation capacity of the native soil) for the runoff from storm events that fully infiltrate.

Minimum Requirement #7 – Flow Control

Infiltration below the proposed pervious gravel surfaces on each lot yard area provides sufficient infiltration and Flow Control to an extent that meets the 25-yr and 100-yr volume criteria for both City of Longview and CDID#1. Since the post Developed condition rates are less than the existing rates for the 25-yr and 100-yr events, then no additional detention is required above what is provided with onsite infiltration of the yard areas in the post developed site condition. Thus, no use of CDID regional detention is necessary, and no fee-in-lieu is required.

The end result is that for Flow Control and MR#7 is met with the infiltration of lot water across the site that the net release of water from the site after development for the 25 year and 100 year Post development condition rate is less than the 25 year and 100 year pre-development condition rate.

Table B-2 Compare 100-yr pre-runoff volume and post 100-yr runoff volume for HCAD 24-Hour Single Event Model:

HCAD SUMMARY RESULTS (24-hr time span - but runoff from event extends beyond 24-hr period)

Description	Total Area (ac)	Peak Runoff Volume (ac-ft)	Remarks
100-yr Existing Pre Condition	8.524	3.043 3.201 at 37 hrs	Both pre & post conditions include runoff from frontage
100-yr Post Developed Site Condition	**2.015**	**0.966** **0.972 at 26 hrs**	Post peak runoff volume Reduced by 97,095 cu ft or 2.229 ac-ft

These results indicate that the released runoff 100-yr Post Developed Condition volume does not increase due to development. Therefore, the site developed post condition meets the CDID#1 requirement and since there is no increase in 100-yr runoff volume, then no charge for detention is required. Additional runoff analysis information follows.

Table B-3 Runoff Volume Summaries

SUBCAT ID	25-yr Peak Rate (cfs)	25-yr Runoff Volume (ac-ft)	100-yr Peak Rate (cfs)	100-yr Runoff Volume (ac-ft)
T-X (Pre Developed)	2.90*	2.011	4.84	3.201
S (Post) Developed)	**1.73**	**0.672**	**2.48**	**0.972**

*4.24 cfs per continuous model (existing modeled as SG 3)
See App C-7 for the evaluation of the pre and post volume comparison (continuous modeling with MGSFlood).

Table B-4 Peak Runoff Rate Summaries

Events for Reach T-X: Total for site and frontage

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-yr - county	1.11	1.11	**0.000**	**0**
10-yr - B to B county	3.57	3.57	0.000	0
10-yr - county	2.11	2.11	0.000	0
25-yr-county	2.90	2.90	0.000	0
100-yr-county	**4.84**	**4.84**	0.000	0

Events for Reach S: Total from site and Oak St

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-yr - county	0.96	0.96	**0.000**	**0**
10-yr - B to B county	1.41	1.41	0.000	0
10-yr - county	1.41	1.41	0.000	0
25-yr-county	1.73	1.73	0.000	0
100-yr-county	**2.48**	**2.48**	0.000	0

A continuous model MGSFlood was also evaluated.

Table B-5 MGSFlood Analysis Results – (for a continuous model results)
also See App C-7 for the evaluation of the pre and post volume comparison (continuous modeling with MGSFlood).

----------SCENARIO: PREDEVELOPED

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 798.72
Inflow Volume Including PPT-Evap (ac-ft): 798.72
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 798.72
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

Note: This analysis routes the roof areas, drives areas, and gravel areas into the infiltration systems* on each lot.

*** The amount of runoff infiltrated for the 55-yr span is estimated to be from drives, roofs, and gravel = 1,045 ac-ft.**

----------SCENARIO: POSTDEVELOPED

********** Link: Discharge PO **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 288.31
Inflow Volume Including PPT-Evap (ac-ft): 288.31
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 288.31
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.148	2-Year	0.803
5-Year	2.341	5-Year	1.110
10-Year	2.615	10-Year	1.247
25-Year	4.239	25-Year	1.704
50-Year	7.773	50-Year	2.497
100-Year	**	100-Year	**

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

Minimum Requirement #8 - Wetlands Protection

There are no wetlands onsite, so this MR does not apply.

Minimum Requirement #9 - Operation and Maintenance

The public facilities located within the public right of way will be owned and maintained by the City. The private property owner will provide maintenance for private collection, treatment, and infiltration systems that serve the site as well as any water that drains to the site from public sources.

A Stormwater Facility System Operations and Maintenance Manual will be included in an Appendix with the Final TIR.

SECTION C - CONVEYANCE SYSTEMS ANALYSIS AND DESIGN

The only proposed main piping systems are at the proposed street to intercept and convey runoff from the two low points to water quality treatment structures.

See Minimum Requirement #7 Flow Control above and App C-5 for the 100-yr event summary for flow release from these two storm systems.

SECTION D - ADDITIONAL REQUIREMENTS

Off-Site Analysis

The project site will have two discharge points from the site. An off-site analysis is not warranted since the stormwater discharges are into the CDID#1 upper slough and there is no net increase in site runoff volume in the developed condition.

Closed Depression Analysis

Not applicable.

Other Permits

The following permits will be required for the project:

- Underground Injection Control (UIC) registration is not required since there are no proposed underground pipe systems that distribute and release runoff for infiltration.
- A General Stormwater Permit is required, since there is proposed runoff from the site. A SWPPP will be provided with the final plans and TIR.
- If necessary, CDID#1 Encroachment Permits for two stormwater pipe discharge locations will be obtained.

Special Reports and Studies

None

STORMWATER TECHNICAL INFORMATION REPORT - TIR

For MINT VALLEY

FOR A BINDING SITE PLAN &
MANUFACTURED HOME PARK
3503 & 3505 OAK STREET, LONGVIEW, WA

DATE: 11-17-2024

PREPARED BY
Kessi Engineering & Consulting – James Kessi P.E.
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November 17, 2024

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SECTION A - PROJECT OVERVIEW

Site Information:

The property presently consists of two lots, parcel numbers 05319, and 053180300 and is located in a portion of the NE ¼ of Section 30, Township 8 North, Range 2 West of the Willamette Meridian, Cowlitz County, Washington. Site address: 3503 Oak Street, Longview, WA 98632.

The property is currently developed as a single residential lot with one residence and several outbuildings. The site topography is generally flat and generally slopes east and west to the CDID#1 Upper Slough. There are no areas of runoff onto this site from the adjoining property to the west. There is however, a small amount of runoff onto this site from the Oak St. right of way along the site frontage.

There are no existing storm systems onsite and there are no known drain tiles for agricultural purposes on this property. If any tiles are found, they will be routed to the proposed storm system for conveyance. There are also no critical areas known to exist on the site.

Present Condition

Presently, most site runoff moves slowly as sheet flow and infiltrates for the majority of the storm events or slowly eventually makes its way into CDID#1 Upper Slough.

Developed Condition

For the developed condition, there will be 73 lots. Most of the lots will be graded to slope toward the slough. However, the yard area remaining apart from drives and roofs will be covered with about 6 or more inches of permeable gravel. Modeling indicates that flow from the site will infiltrate in this permeable gravel area (about 2.717 ac.) so flows will be dissipated via infiltration.

Applicable Minimum Requirements:

According to "Longview Stormwater Management Ordinance" (Ord. 3349 § 1, 2017), Minimum Requirements (1-9) apply.

The Mint Valley Manufactured Home Park proposal does contain one threshold discharge area (TDA) as defined by DOE as there is proposed surface runoff to offsite from onsite. The project site is subject to meeting minimum requirements 1 – 9 due to the amount of new impervious surfaces proposed for development of the site.

Summary

Water Quality Treatment - For water quality treatment, a standard mechanical cartridge system like ~~a~~ PerkFilter or Contech StormFilter will be used and sizing documentation has been provided.

Infiltration Testing - There was a site Geotech and Soils Infiltration Testing Report with 4 tests with results ranging from 5 inches per hour to 22 inches per hour for infiltration on the site. Infiltration is the method for stormwater disposal from the lots on the site. Groundwater levels were found to be about 5 feet below ground surface which is adequate for the proposed design. See the infiltration testing report in Appendix D for detailed information.

Flow Control met with Infiltration – Flow control and Minimum Requirement #7 is met through infiltration of site water. Thus, detention facilities are not needed or proposed. Instead, site water

from the lots will be infiltrated into the pervious yard areas that will have about 6 inches of added gravel layer pervious thickness. Site water from the site around the units is detained to allow time for yard water to infiltrate in the soil below the gravel ~~yards~~. Surface water from traffic surfaces will also be collected and be water quality treated prior to infiltration or release. The end result for Flow Control is that with the infiltration of lot water across the site that the net release of water from the site after development for the 100 year Post development condition rate is less than the 100 year pre-development condition rate.

As noted in MR#7 below, Infiltration below the proposed pervious gravel surfaces on each lot yard area provides sufficient infiltration and Flow Control to an extent that meets the 25-yr and 100-yr volume criteria for both City of Longview and CDID#1. Since the post Developed condition rates are less than the existing rates for the 25-yr and 100-yr events, then no additional detention is required above what is provided with onsite infiltration of the yard areas in the post developed site condition. Thus, no use of CDID regional detention is necessary, and no fee-in-lieu is needed.

SECTION B - MINIMUM REQUIREMENTS

According to Table B.1 below and the Longview Municipal Code 17.80, Minimum Requirements 1-6 & 8-9 apply.

Table B.1 - Summary of Land Disturbing Activities

The defined existing site boundary area is 10.38 acres (large portion is CDID#1 slough)

- About 2.0 ac is part of the slough and channel bank areas

1. Amount of Existing Impervious surface	3,081 sf (Oak St.) 6,602 sf (site)
2. Amount of New Impervious surface	Street = 42,094 sf Roofs = 114,464 sf Drives = 49,303 Gravel = 118,353 Access Gravel = 32,540
3. Amount of Replaced Impervious surface	Approx. 1,300 sf
4. Amount of Native Vegetation converted to lawn or landscaping	None
5. Amount of Native Vegetation converted to pasture	None
6. Amount of Native Vegetation converted to pervious access area	None
7. Total amount of land-disturbing activity	Approx. 8.38 acres

Minimum Requirement #1 - Preparation of Stormwater Site Plans

This report and the Final Engineering Plans will contain adequate detail to construct theproposed stormwater facilities, and all information required for compliance with the 2019 Stormwater Management Manual for Western Washington (DOE 2019 SMMWW).

Minimum Requirement #2 - Construction Stormwater Pollution Prevention

A detailed erosion control plan will be included in the Final Engineering plans, and a Stormwater Pollution Prevention Plan will be submitted with the Final TIR (as a separate document).

Minimum Requirement #3 - Source Control of Pollution

In conformance with the requirements of City of Longview "Longview Stormwater Management Ordinance" (Ord. 3349 § 1, 2017), no prohibited discharges are planned to be released from the site. Best Management Practices (BMPs) will be designed and called out on the SWPPP and the Erosion Control Plans and Details to control sediment-laden runoff from leaving the site and impacting any neighboring properties and City of Longview storm systems, including State waters. In addition, BMPs will be implemented as necessary to prevent pollutants from coming into contact with stormwater during construction.

The proposed development does not include any of the activities listed in Volume IV, II 3.2.
Construction Source Control BMPs (DOE 2019 SMMWW). There are no long-term pollution risks associated with the project that necessitate a separate source control plan.

The BMPs that may apply to land disturbance would be BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots and BMPs for Urban Streets.

However, the City of Longview also requires source control BMPs for the development after the development has been stabilized and occupied. Typically, this is presented in the Maintenance and Operations Manual for the site, but this portion is addressed in the TIR as well.

Source Control Measures to Reduce Pollution after Site is Stabilized and Occupied

The most effective way to maintain a water quality facility is to prevent the pollutants from entering the facility in the first place. Common pollutants include sediment, trash and debris, chemicals, petwastes, runoff from stored materials, illicit discharges into the storm drainage system and many others. A comprehensive maintenance program will include measures to address these potential contaminants, and will save money and time in the long run. Key points to consider in a maintenance program include:

- Educate property owners/residents to be aware of how their actions might impact water quality, and how they can help reduce maintenance costs.
- Keep properties, streets and parking lots (driveways) free from trash and debris.
- Ensure the proper disposal of hazardous wastes and chemicals.
- Plan lot care to minimize the use of chemicals and pesticides.
- Sweep paved surfaces and put the sweepings in a compost pile – not back on the drive or other lot areas
- Be aware of automobiles leaking fluids. Use absorbents, such as cat litter, to soak up drippings – dispose of properly.

- Replace disturbed and bare areas to maintain gravel layer thickness and stabilization.
- Clean out the upstream components of the storm drainage system, including inlets, storm sewers and outfalls. Maintain WQ filter systems.
- Do not store materials outdoors (including landscaping materials) unless they are properly protected from stormwater runoff.

Minimum Requirement #4 - Preservation of Natural Drainage Systems and Outfalls

The present site does not have any natural drainage systems or outfalls of significance as the runoff is generally runoff from overland sheet flow that mostly infiltrates on the site. The development proposes to treat runoff from potential pollutant sources (private street and parking at each lot). Surface infiltration will occur throughout the site due to the addition of gravel and some sand/soil mix.

Minimum Requirement #5 - On-Site Stormwater Management

Compliance is typically met with the List #3 Approach as follows:

Surface Type: Lawn and Landscaped Areas

There are no proposed landscaped areas. Rather yard areas will act as pervious surfaces will be covered with about 3 to 12 inches of gavel. Some existing soil may be augmented by adding imported sand if needed

Mixing existing site soil with imported sand is expected to provide equal or better conditions for rainfall absorption than BMP T5.13 Post-Construction Soil Quality and Depth.

Surface Type: Roofs

BMP T5.10A: Downspout Full Infiltration

- ❖ This BMP has been determined to be infeasible in particular due to the area for disposal is serving to infiltrate direct rainfall on the surface.

BMP T5.10B: Downspout Dispersion Systems

- ❖ This BMP has been determined to be infeasible in particular due to the area for disposal is serving to infiltrate direct rainfall on the surface.

BMP T5.10C: Perforated Stub-out Systems

- ❖ This BMP has been determined to be infeasible since reduction in flow rates and volumes are a design requirement.

Surface Type: Other Hard Surfaces

BMP T5.12: Sheet Flow Dispersion or
BMP T5.11: Concentrated Flow Dispersion

- ❖ These BMPs have been determined to be infeasible since they are for impervious areas with steeper slopes than this proposed

site.

In lieu of these, the following modified BMP is being proposed:

- **<u>Modified</u> BMP T7.40: Compost-Amended Vegetated Filter Strips (CAVFS) Modified**

  Since the lot area will be covered with gravel (no vegetation), the proposed amended soil system differs. The top layer of gravel over the amended soil serves to impede the flow that has dispersed quickly through the surface and allow it to infiltrate in the yard areas. Therefore, application of this design approach provides release rate flow reduction and runoff volume reduction for the site that will meet CDID#1 volume requirements. See App C, C-7.Application of this BMP also meets some goals related to BMP T5.21 – Better Site Design.

Minimum Requirement #6 - Runoff Treatment Analysis and Design

Basic treatment is required for all stormwater runoff from pollution generating surfaces. These surfaces are the proposed private street and any runoff onto it from the lots, parcels, or private drives serving several lots. The frontage improvements, which will also include existing pavement to the centerline of Oak Street, will also be subject to treatment.

The following BMP is proposed - V-10 Manufactured Treatment Device

GENERAL USE LEVEL DESIGNATION FOR BASIC AND PHOSPHORUS TREATMENT For Oldcastle Infrastructure PerkFilter™ (with ZPC Filter Media)

Ecology's Decision: Based on Oldcastle's application submissions, including the Draft Technical Evaluation Report, dated April 2010, Ecology hereby issues the following use level designations:

1. General use level designation (GULD) for the PerkFilter™ for basic treatment:

   - Using a zeolite-perlite-carbon (ZPC) filter media as specified by Oldcastle.
   - Sized at hydraulic loading rate of no more than 1.5 gpm/ft² of media surface area, per Table 1.

Table 1. Design Flowrate per Cartridge

Effective Cartridge Height (inches) = 12 and 6.8 Cartridge Flowrate (gpm/cartridge

Effective Cartridge Height (inches) = 18 and 10.2 Cartridge Flowrate (gpm/cartridge

2. General use level designation (GULD) for the PerkFilter™ for phosphorus treatment:

   - Using a zeolite-perlite-carbon (ZPC) filter media as specified by Oldcastle.

- Sized at hydraulic loading rate of no more than 1.5 gpm/ft² of media surface area, per Table 1.

3. Ecology approves PerkFilter™ units for treatment at the hydraulic loading rates shown in Table 1, and sized based on the water quality design flow rate for an off-line system. The internal weir in the inlet chamber functions as a bypass to route flow in excess of the water quality design flow rate around the treatment chamber. Calculate the water quality design flow rate using the following procedures: ‘

   - Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology approved continuous runoff model.

: From Table1 the equivalent cfs treatment flow rates are 0.015 cfs for 6.8 gpm and 0.23 cfs for 10.2 gpm. The following table is based on these cfs rates.

Oldcastle Perk Filter™				
Cartridge Size Height (in)	**1 Unit Allowable Rate (cfs)**	**2 Unit Allowable Rate (cfs)**	**3 Unit Allowable Rate (cfs)**	**4 Unit Allowable Rate (cfs)**
12"	0.015	0.030	0.045	0.061
18"	0.023	0.045	0.068	0.091
12" + 12"	0.030	0.061	0.091	0.121
18" + 12"	0.038	0.076	0.114	0.152

Areas Requiring Water Quality Treatment:

Private Street (subasin areas N-1, N-2, S-1, and S-2)

The private street has two low points and each will collect the runoff from the street and sidewalk areas for treatment

Oak Street frontage (subbasin areas F-1 and F-2)

Generally, the only change to the frontage will be widening and installation of curb and gutter along the site frontage and extending to each end for the transition back to existing pavement width. The majority of this half street runoff will be conveyed by gutter flow to onsite piping leading to water quality media filter systems noted above prior to release to the slough.

Proposed water Quality Systems – using Perkfilter

The offline WQ rate for CB#1 is 0.065 cfs
– requires 1- (18” + 12”) stack height (0.076 cfs capacity)

The offline WQ rate for CB#3 is 0.035 cfs
– requires 1-18” cartridge (0.045 cfs capacity)

See Appendix C-6 for WQ flow rates (per MGSFlood analysis).
See Appendix B Post-development Basin Map – WQ Treatment

Remaining Areas (roofs, drives, and gravel surfaces) & Additional WQ Treatment

The proposed gravel on the existing excavated soil surface for each lot will provide infiltration and also WQ treatment due to the high cation exchange capacity of the site soils. Infiltration will occur similar to the CAVFS design approach which includes treatment (due the cation capacity of the native soil) for the runoff from storm events that fully infiltrate.

Minimum Requirement #7 – Flow Control

Infiltration below the proposed pervious gravel surfaces on each lot yard area provides sufficient infiltration and Flow Control to an extent that meets the 25-yr and 100-yr volume criteria for both City of Longview and CDID#1. Since the post Developed condition rates are less than the existing rates for the 25-yr and 100-yr events, then no additional detention is required above what is provided with onsite infiltration of the yard areas in the post developed site condition. Thus, no use of CDID regional detention is necessary, and no fee-in-lieu is required.

The end result is that for Flow Control and MR#7 is met with the infiltration of lot water across the site that the net release of water from the site after development for the 25 year and 100 year Post development condition rate is less than the 25 year and 100 year pre-development condition rate.

Table B-2 Compare 100-yr pre-runoff volume and post 100-yr runoff volume for HCAD 24-Hour Single Event Model:

HCAD SUMMARY RESULTS (24-hr time span - but runoff from event extends beyond 24-hr period)

Description	Total Area (ac)	Peak Runoff Volume (ac-ft)	Remarks
100-yr Existing Pre Condition	8.524	3.043 3.201 at 37 hrs	Both pre & post conditions include runoff from frontage
100-yr Post Developed Site Condition	**2.015**	**0.966** **0.972 at 26 hrs**	Post peak runoff volume Reduced by 97,095 cu ft or 2.229 ac-ft

These results indicate that the released runoff 100-yr Post Developed Condition volume does not increase due to development. Therefore, the site developed post condition meets the CDID#1 requirement and since there is no increase in 100-yr runoff volume, then no charge for detention is required. Additional runoff analysis information follows.

Table B-3 Runoff Volume Summaries

SUBCAT ID	25-yr Peak Rate (cfs)	25-yr Runoff Volume (ac-ft)	100-yr Peak Rate (cfs)	100-yr Runoff Volume (ac-ft)
T-X (Pre Developed)	2.90*	2.011	4.84	3.201
S (Post) Developed)	**1.73**	**0.672**	**2.48**	**0.972**

*4.24 cfs per continuous model (existing modeled as SG 3)
See App C-7 for the evaluation of the pre and post volume comparison (continuous modeling with MGSFlood).

Table B-4 Peak Runoff Rate Summaries

Events for Reach T-X: Total for site and frontage

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-yr - county	1.11	1.11	**0.000**	**0**
10-yr - B to B county	3.57	3.57	0.000	0
10-yr - county	2.11	2.11	0.000	0
25-yr-county	2.90	2.90	0.000	0
100-yr-county	**4.84**	**4.84**	0.000	0

Events for Reach S: Total from site and Oak St

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-yr - county	0.96	0.96	**0.000**	**0**
10-yr - B to B county	1.41	1.41	0.000	0
10-yr - county	1.41	1.41	0.000	0
25-yr-county	1.73	1.73	0.000	0
100-yr-county	**2.48**	**2.48**	0.000	0

A continuous model MGSFlood was also evaluated.

Table B-5 MGSFlood Analysis Results – (for a continuous model results)
also See App C-7 for the evaluation of the pre and post volume comparison (continuous modeling with MGSFlood).

----------SCENARIO: PREDEVELOPED

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 798.72
Inflow Volume Including PPT-Evap (ac-ft): 798.72
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 798.72
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

Note: This analysis routes the roof areas, drives areas, and gravel areas into the infiltration systems* on each lot.

*** The amount of runoff infiltrated for the 55-yr span is estimated to be from drives, roofs, and gravel = 1,045 ac-ft.**

----------SCENARIO: POSTDEVELOPED

********** Link: Discharge PO **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 288.31
Inflow Volume Including PPT-Evap (ac-ft): 288.31
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 288.31
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.148	2-Year	0.803
5-Year	2.341	5-Year	1.110
10-Year	2.615	10-Year	1.247
25-Year	4.239	25-Year	1.704
50-Year	7.773	50-Year	2.497
100-Year	**	100-Year	**

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

Minimum Requirement #8 - Wetlands Protection

There are no wetlands onsite, so this MR does not apply.

Minimum Requirement #9 - Operation and Maintenance

The public facilities located within the public right of way will be owned and maintained by the City. The private property owner will provide maintenance for private collection, treatment, and infiltration systems that serve the site as well as any water that drains to the site from public sources.

A Stormwater Facility System Operations and Maintenance Manual will be included in an Appendix with the Final TIR.

SECTION C - CONVEYANCE SYSTEMS ANALYSIS AND DESIGN

The only proposed main piping systems are at the proposed street to intercept and convey runoff from the two low points to water quality treatment structures.

See Minimum Requirement #7 Flow Control above and App C-5 for the 100-yr event summary for flow release from these two storm systems.

SECTION D - ADDITIONAL REQUIREMENTS

Off-Site Analysis

The project site will have two discharge points from the site. An off-site analysis is not warranted since the stormwater discharges are into the CDID#1 upper slough and there is no net increase in site runoff volume in the developed condition.

Closed Depression Analysis

Not applicable.

Other Permits

The following permits will be required for the project:

- Underground Injection Control (UIC) registration is not required since there are no proposed underground pipe systems that distribute and release runoff for infiltration.
- A General Stormwater Permit is required, since there is proposed runoff from the site. A SWPPP will be provided with the final plans and TIR.
- If necessary, CDID#1 Encroachment Permits for two stormwater pipe discharge locations will be obtained.

Special Reports and Studies

None

APPENDIX A

MISCELLANEOUS SUPPORT DATA

MINT VALLEY

A-1 VICINITY LOCATION MAP

A-2 AERIAL MAP WITH PARCEL DATA

A-3 DIKING DISTRICT MAP

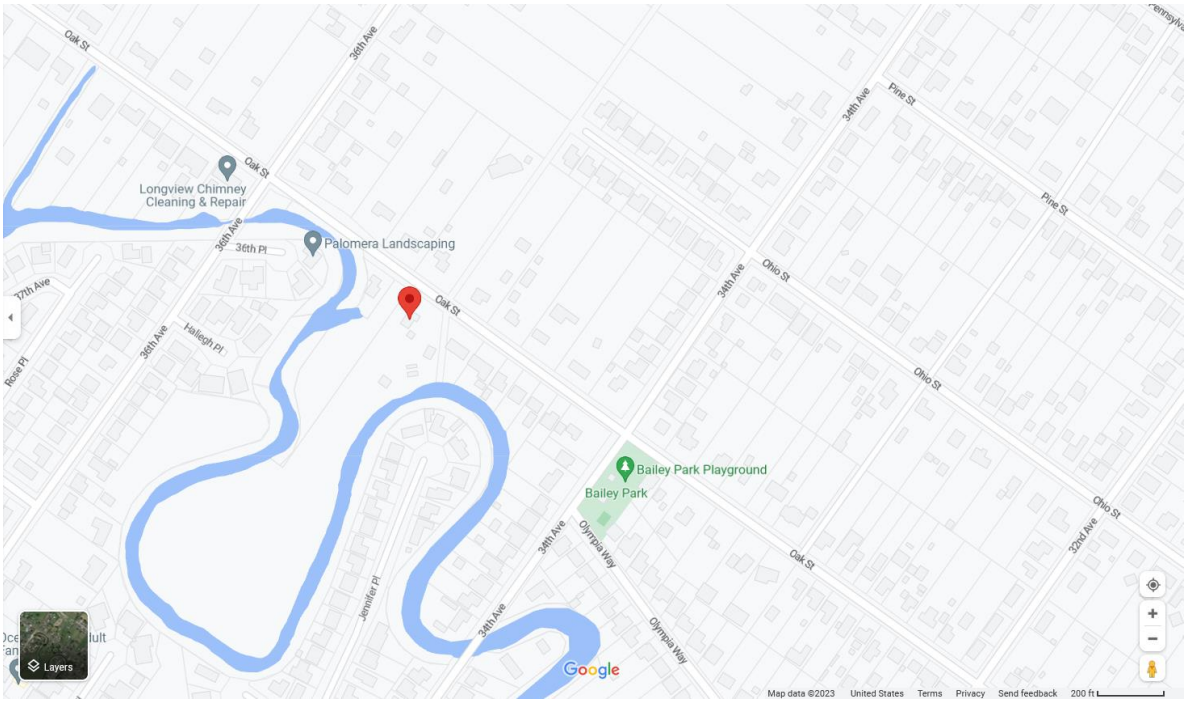
A-4 CONTOUR MAP - SURVEY

A-5 SOIL TYPE MAP AND DATA

A-6 RAINFALL DEPTH DATA

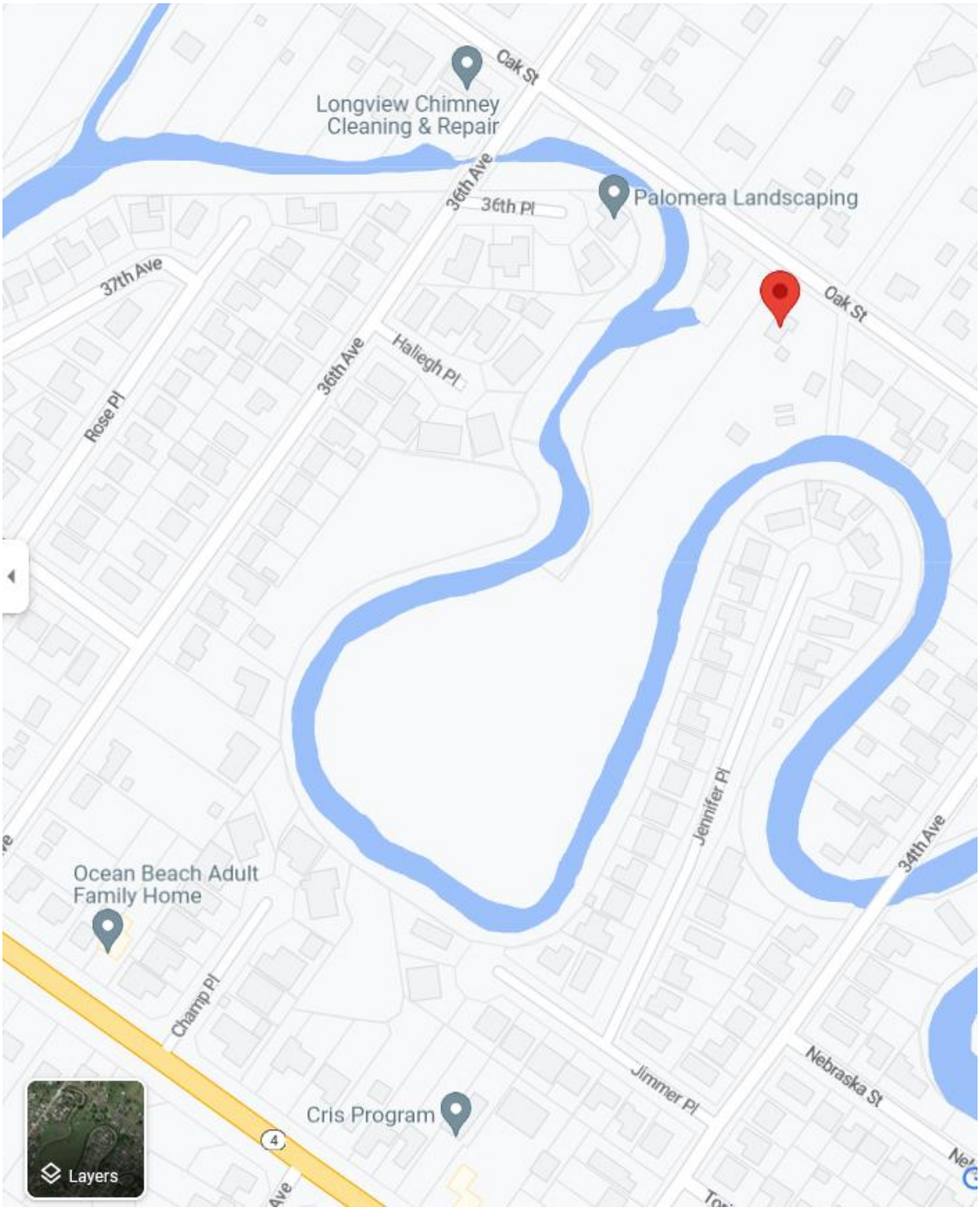
A-7 CN OR RCN SELECTION

3503 Oak St



LOCATION MAP

3503 Oak St.


Oak St
Longview Chimney
Cleaning & Repair
36th Ave
36th Pl
Palomera Landscaping
37th Ave
Oak St
Haliegh Pl
36th Ave
Rose Pl
Jennifer Pl
34th Ave
Ocean Beach Adult
Family Home
Champ Pl
Jimmer Pl
Nebraska St
Cris Program
4
Layers

City of Longview

3/9/2021, 8:46:05 AM

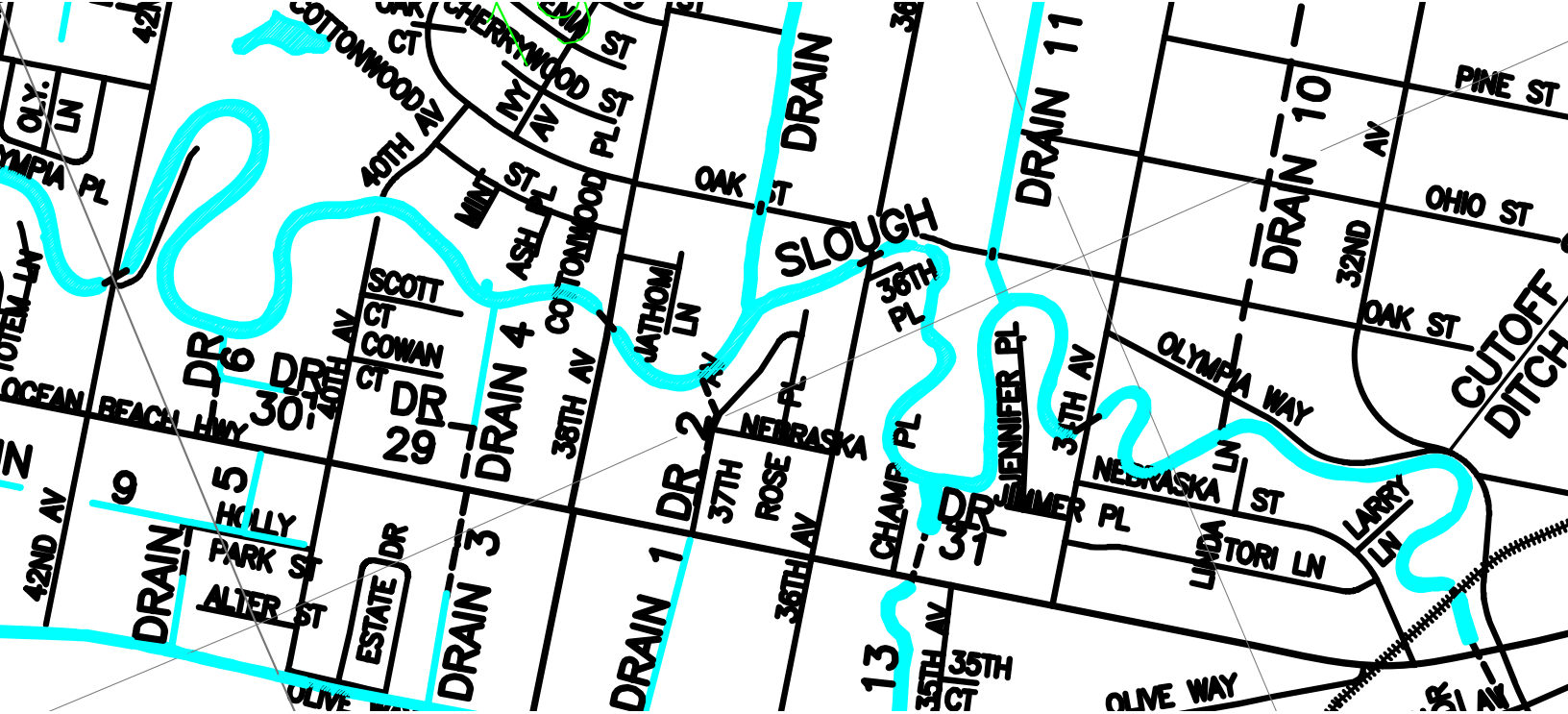
1:4,514

0 145 290 580 ft

0 40 80 160 m

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, City of Longview, WA - GIS Section, Esri, HERE, Garmin, (c) OpenStreetMap contributors, City of Longview, GIS Sectoin, Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN,

City of Longview does not guarantee the accuracy, timeliness, adequacy, completeness or usefulness of any information. The City of Longview provides this information on an "as-is" basis without warranty of any kind.


COTTONWOOD CT
COTTONWOOD AV
CHERRYWOOD AV
CHERRYWOOD PL
ST
MINT ST
ASH ST
OAK ST
DRAIN
SLOUGH
DRAIN 11
DRAIN 10
PINE ST
OHIO ST
32ND AV
OAK ST
CUTOFF DITCH
OLYMPIA WAY
OLYMPIA PL
OLY. LN
SCOTT CT
COWAN CT
40TH AV
DR 30
DR 29
DR 6
DRAIN 4
COTTONWOOD
JATHOM LN
36TH AV
DR 2
NEBRASKA PL
37TH
ROSE
36TH AV
DR 1
DRAIN 3
DRAIN 1
OCEAN BEACH HWY
42ND AV
DRAIN 9
HOLLY
PARK ST
ALTER ST
ESTATE DR
OLIVE
36TH PL
CHAMP PL
JENNIFER PL
35TH AV
DR 35
DR 31
NEBRASKA LN
ST
LARRY LN
LINDA TORI LN
13
35TH CT
35TH
OLIVE WAY

BASIS OF BEARING
GEODETIC (TRUE)
BASED ON GPS DATA
TAKEN NEAR THE SW CORNER OF Lot 2
of SP 2002-1

DATUM: NAVD '88

LEGEND

- CORNER FOUND AND TIED
- CALCULATED POSITION
- ( ) RECORD DATA
- SANITARY SEWER MANHOLE
- WATER METER
- UTILITY POLE (WITHIN I.O')
- TREE
- EXISTING FENCE LINE

50 0 50 100

Scale: 1 inch = 50 feet

BLOCK 14
LOT 12
LOT 13
LOT 14
LOT 15
LOT 16
LOT 17
LOT 18
BLOCK 15
OAK STREET
34TH AVE
50'
EDGE OF PAVEMENT
OAK STREET
MH 3+40
SSMH RIM: 7.08
8" SE-INV: -2.52
MH 0+00 LAT 8
SSMH RIM: 6.23
8" SE-INV: -3.47
PROJECT TBM
#8-8 REBAR & CAP
N: 1,538,672.788
E: 1,705,979.208
EL: 10.00 (NAVD 88)
LOT 1
LOT 1 SP 2002-1 V13 P44
LOT 2 SP 2002-1 V13 P44 1.8 ACS
LOT 2
8.9 ACS
17.19'
GRAVEL
GRAVEL
BUILDING
BUILDING
BUILDING

Map Unit Legend

Cowlitz County, Washington (WA015)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
17	Caples silty clay loam, 0 to 3 percent slopes	12.5	77.8%
199	Snohomish silty clay loam, 0 to 1 percent slopes	3.6	22.2%
Totals for Area of Interest		**16.1**	**100.0%**

LOCATION CAPLES WA
Established Series
Rev. RFP/RJE/TLA
06/2005

CAPLES SERIES

The Caples series consists of very deep, somewhat poorly drained soils formed in alluvium. Caples soils are on nearly level floodplains and low terraces. The average annual precipitation is about 45 inches and the average annual temperature is about 52 F.

TAXONOMIC CLASS: Fine, mixed, superactive, nonacid, mesic Fluvaquentic Endoaquepts

TYPICAL PEDON: Caples silty clay loam - pasture. (Colors are for moist soil unless otherwise noted.)

Ap1--0 to 4 inches; dark brown (10YR 3/3) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine granular and subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and medium and few coarse roots; many worm casts; moderately acid; abrupt smooth boundary.

Ap2--4 to 9 inches; dark brown (10YR 3/3) light silty clay loam, grayish brown (10YR 5/2) dry; many moderate distinct strong brown (7.5YR 5/8) and gray (10YR 6/1) redox concentrations and depletions, strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) dry; strong fine subangular blocky and moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium and few coarse roots; few medium and coarse tubular pores; moderately acid; abrupt smooth boundary. (The A horizon has a combined thickness of 7 to 9 inches.)

Bg1--9 to 25 inches; gray (5Y 5/1) silty clay loam, gray (5Y 6/1) dry; many fine prominent yellowish red (5YR 5/6) and dark reddish brown (2.5YR 3/4) redox concentrations, strong brown (7.5YR 5/6) and dark reddish brown (2.5YR 3/4) dry; moderate coarse prismatic and moderate medium and moderate fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; many fine and medium roots; common medium tubular pores; moderately acid; clear smooth boundary.

Bg2--25 to 39 inches; grayish brown (2.5Y 5/2) silty clay loam, light brownish gray (2.5Y 6/2) dry; many medium prominent dark reddish brown (5YR 3/2), reddish brown (5YR 4/4) and strong brown (7.5YR 5/6) redox concentrations, dark reddish brown (5YR 2/2), yellowish red (5YR 5/6) and reddish yellow (5YR 6/6) dry; moderate coarse prismatic and weak thick platy structure; very hard, firm, moderately sticky and moderately plastic; common fine and medium roots; few medium, fine and coarse tubular pores; moderately acid; abrupt smooth boundary. (Combined thickness of the Bg horizon is 24 to 35 inches)

Cg1--39 to 44 inches; dark gray (5Y 4/1) silty clay loam, gray (5Y6/1) dry; few fine prominent brown (7.5YR 4/4) redox concentrations along old root channels, reddish yellow (7.5YR 6/8) dry; massive; very hard, firm, moderately sticky and moderately plastic; few fine roots; common coarse tubular pores; moderately acid; clear smooth boundary. (4 to 7 inches thick)

Cg2--44 to 77 inches; gray (N5/) silty clay loam, gray (5Y 6/1)dry; few fine prominent brown (7.5YR 4/4) redox concentrations along old root channels; strong brown (7.5YR 5/8) dry; massive; very hard, firm, very sticky and moderately plastic; few fine roots; common coarse tubular pores; moderately acid.

TYPE LOCATION: Cowlitz County, Washington; approximately 5 miles west of Longview in Willow Grove on the Gordon Enbusk farm; 500 feet north of Willow Grove Road and 170 feet west of silo; 1,500 feet west and 1,060 feet north of the southeast corner, sec. 16, T. 8 N. R.3 W.

RANGE IN CHARACTERISTICS: The mean annual soil temperature is 50 to 53 degrees F. The solum is 30 to 40 inches thick. The particle-size control section averages 35 to 45 percent clay and 0 to 5 percent coarse fragments. The soils are slightly acid to strongly acid throughout.

The A horizon has value of 2 or 3 moist, value of 4 or 5 dry, and chroma of 1 to 3 moist and dry.

The Bg horizon has hue of 10YR, 2.5Y or 5Y; value of 4 or 5 moist; and chroma of 1 or 2 moist and dry. Texture is silty clay or silty clay loam.

The Cg horizon has hue of 2.5Y, 5Y, or neutral, value of 4 through 6 moist, 5 through 7 dry, and chroma of 0 through 2 moist and dry. Texture is silty clay or silty clay loam. In some pedons, the C horizon has lenses of sandy loam, loamy sand, or sand 1/2 to 3 inches thick and is sandy loam or loamy sand below depths of 40 inches.

COMPETING SERIES: These are the Godfrey, Occidental and Wunabuna soils. Godfrey soils have surface colors value of 3 to 5 moist and 5 to 7 dry. Occidental soils have a mean annual soil temperature of 54 to 59 degrees F. Wunabuna soils have buried organic material at depths of 16 to 40 inches.

GEOGRAPHIC SETTING: Caples soils are on flood plains and low terraces at elevations of less than 40 feet. Slopes are 0 to 3 percent. The soils formed in alluvium from mixed basic material. The climate is characterized by warm dry summers and cool wet winters. The average January temperature is 38 degrees F, and in July it is 65 degrees F. The average annual temperature is 52 degrees F. The average frost-free season is 165 to 195 days. The average annual precipitation is 38 to 50 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Cloquato, Newberg, and Snohomish soils which have less than 35 percent clay in the particle-size control section.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow and very slow runoff; slow permeability. Depth to a seasonal high water table is at a depth of 1.5 to 2.5 feet from November to April.

USE AND VEGETATION: When drained, it is used for row crops, small grain, hay, pasture, bulbs, strawberries, and cane fruit. Native vegetation is western redcedar, red alder, black cottonwood, and bigleaf maple, with an understory of Douglas spirea, vine maple, and willow.

DISTRIBUTION AND EXTENT: Southwestern Washington. Caples soils are of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Cowlitz County, Washington, 1971.

REMARKS: Diagnostic horizons and features recognized in this pedon are: ochric epipedon and a cambic horizon from 9 to 39 inches.

National Cooperative Soil Survey
U.S.A.

24-hour Design Storms for the
Cowlitz County Urbanized Area

2-year 2.54”
5-year 3.10”
10-year 3.60”
25-year 4.37”
50-year 5.17”
100-year 6.17”

A-7 CN OR RCN SELECTION

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:	used for all pervious for present condition & channel slope for Pre and Post	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.		Lots 1-3 (ammended soil)			
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):					
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				

Separate curve number shall be selected for pervious & impervious portions of the site or basin

(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.

APPENDIX B
MINT VALLEY
BASIN AREA MAPS

B-1 PRESENT CONDITIONS BASIN MAP

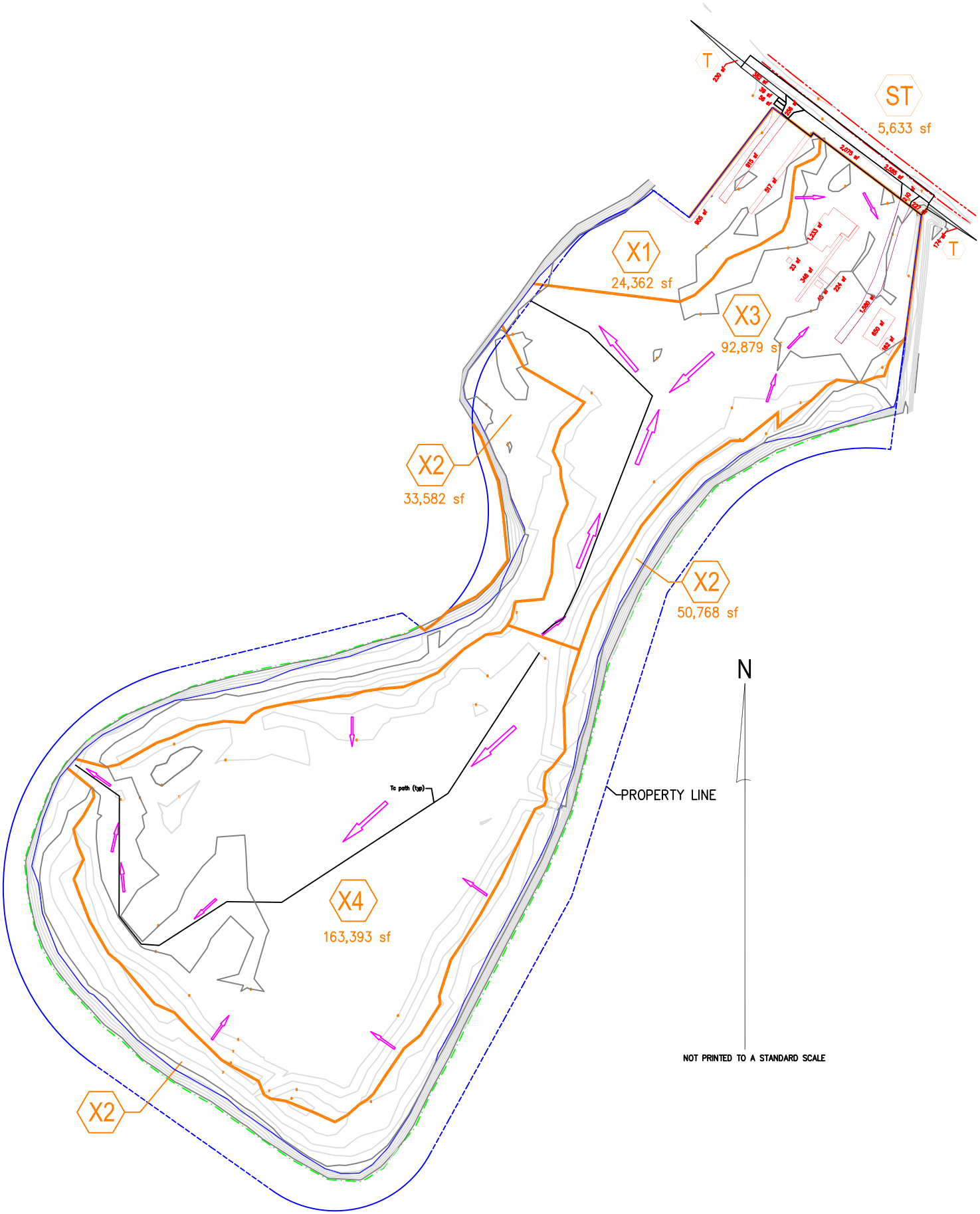
B-2 POST-DEVELOPMENT BASIN MAP

B-3 POST-DEVELOPMENT SUBBASIN AREAS MAP (WQ & STORM SYSTEM)

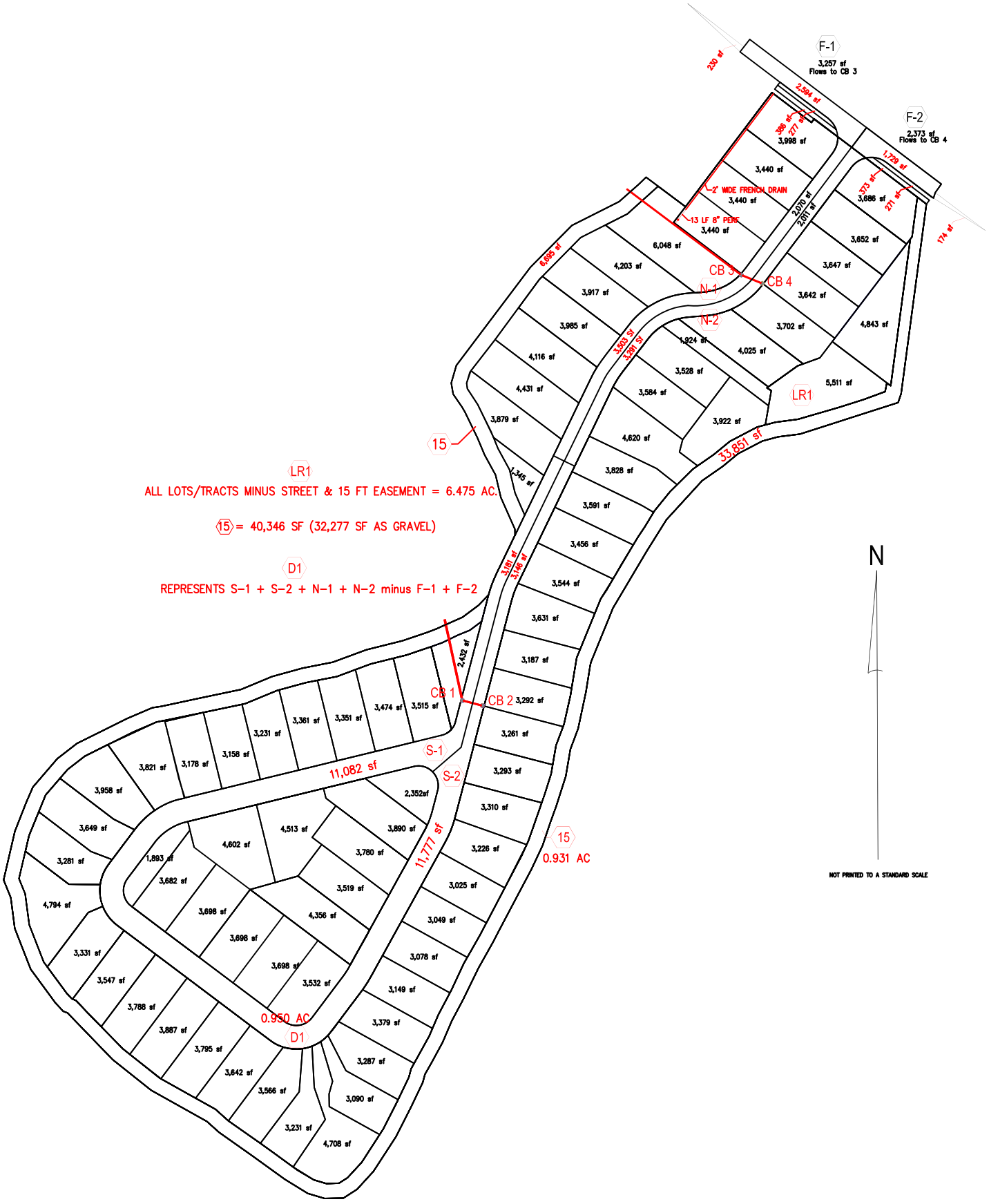
POST MAP FOR AREAS WITH INFILTRATION

POST MAP WITH GRADING ELEVATIONS

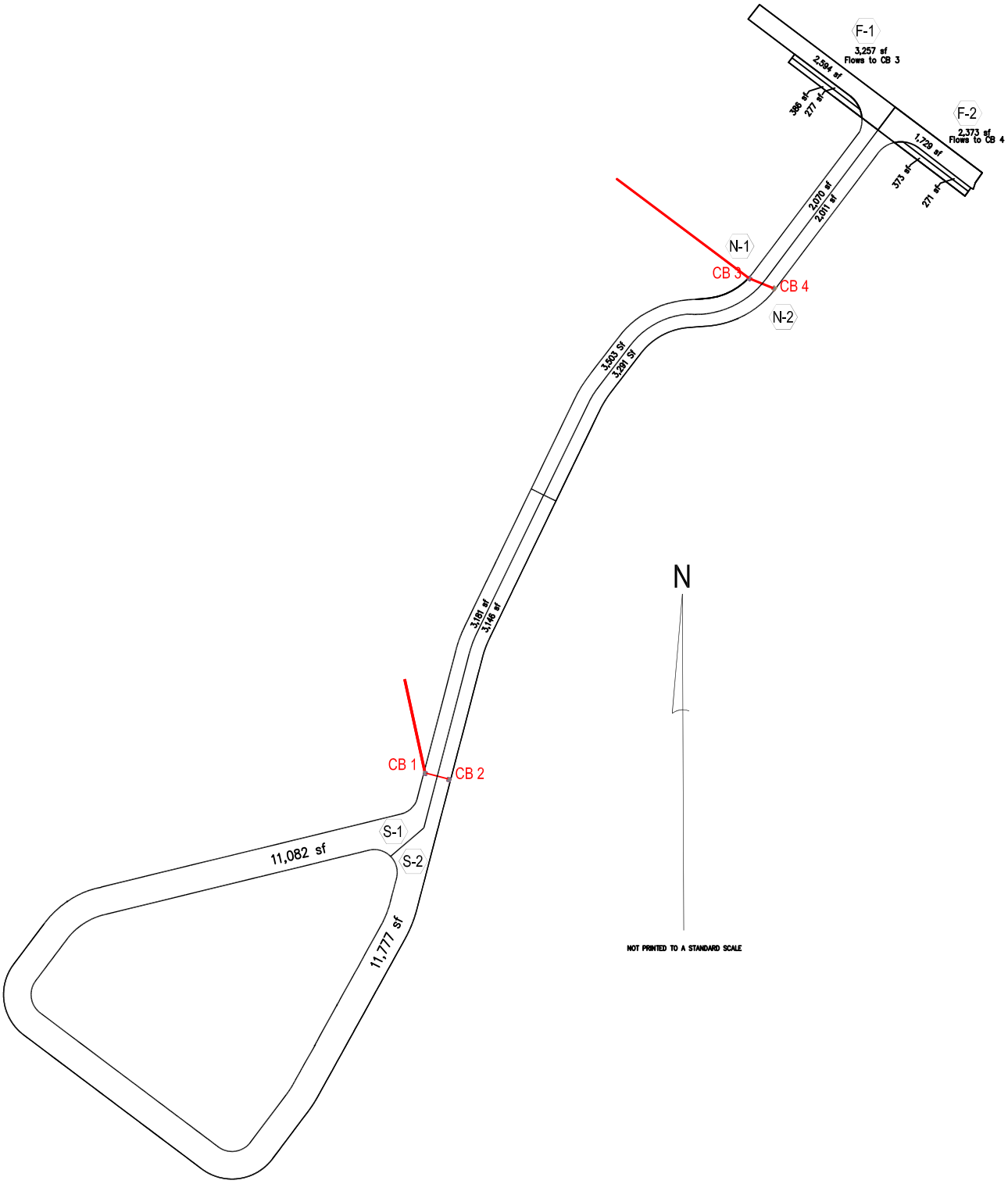
POST GRAVEL AREA MAP FOR MODELING INFILTRATION



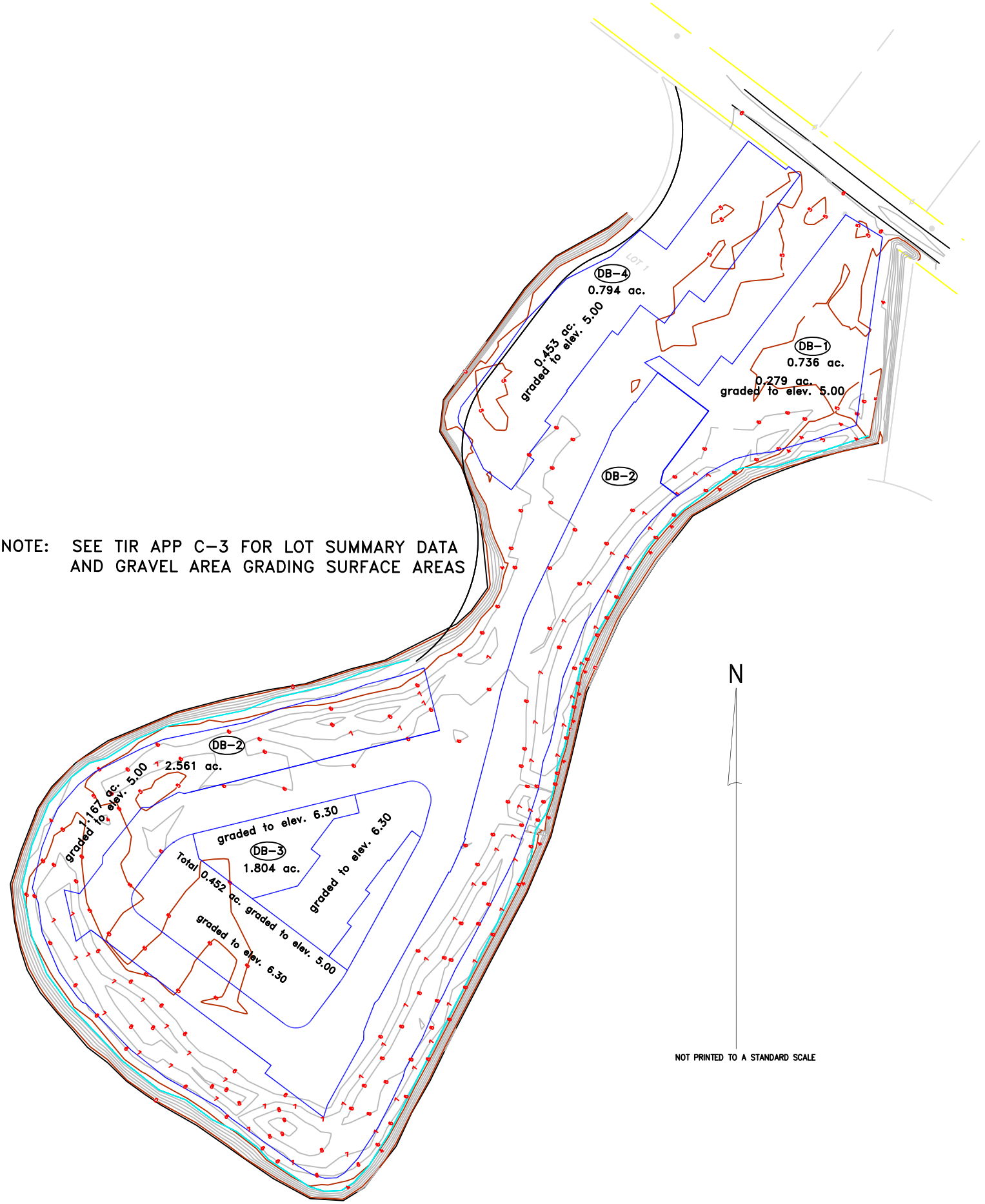
PRE-DEVELOPMENT BASIN MAP



POST-DEVELOPMENT MAP

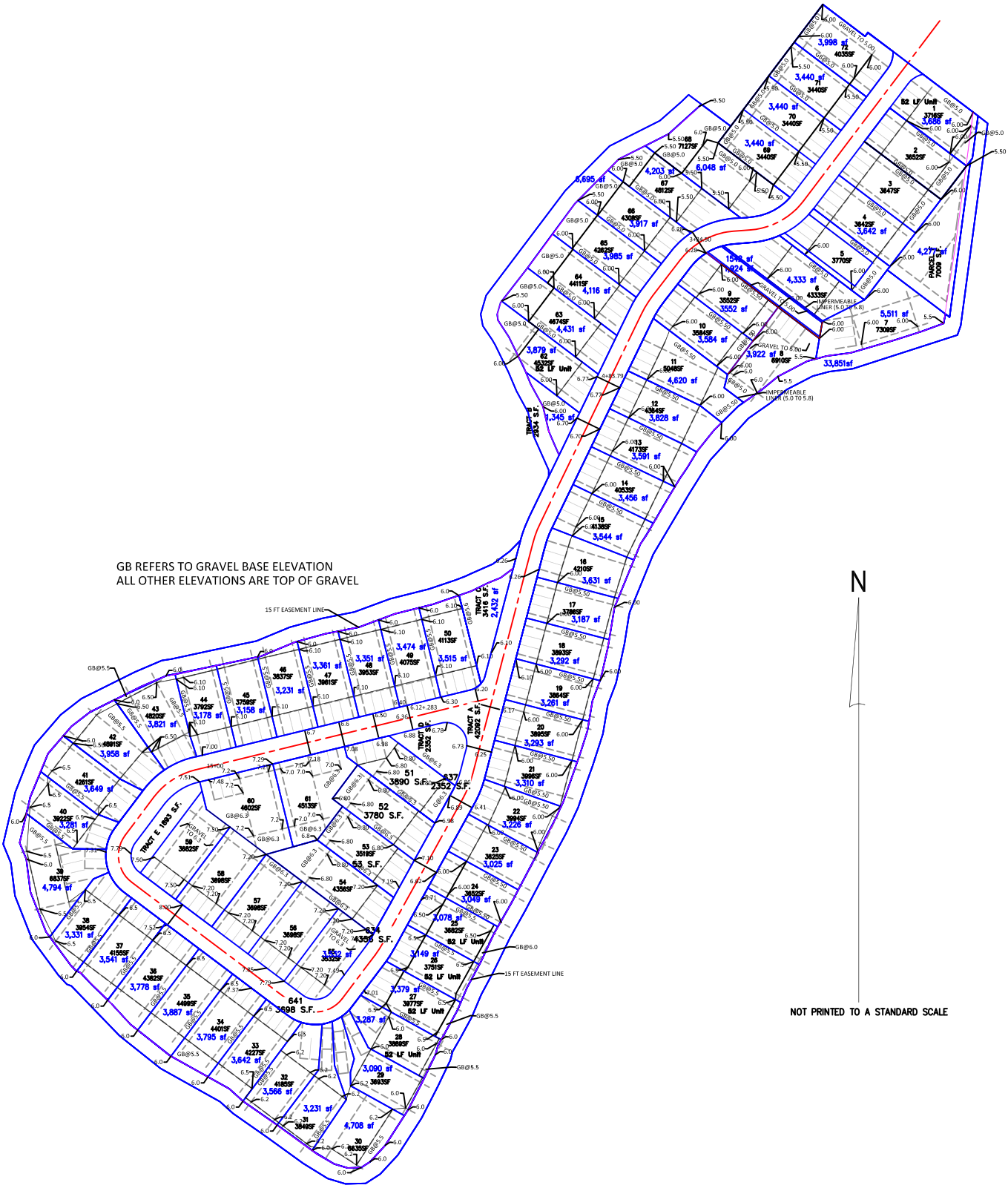


POST-DEVELOPMENT MAP
WQ TREATMENT SUBBASINS

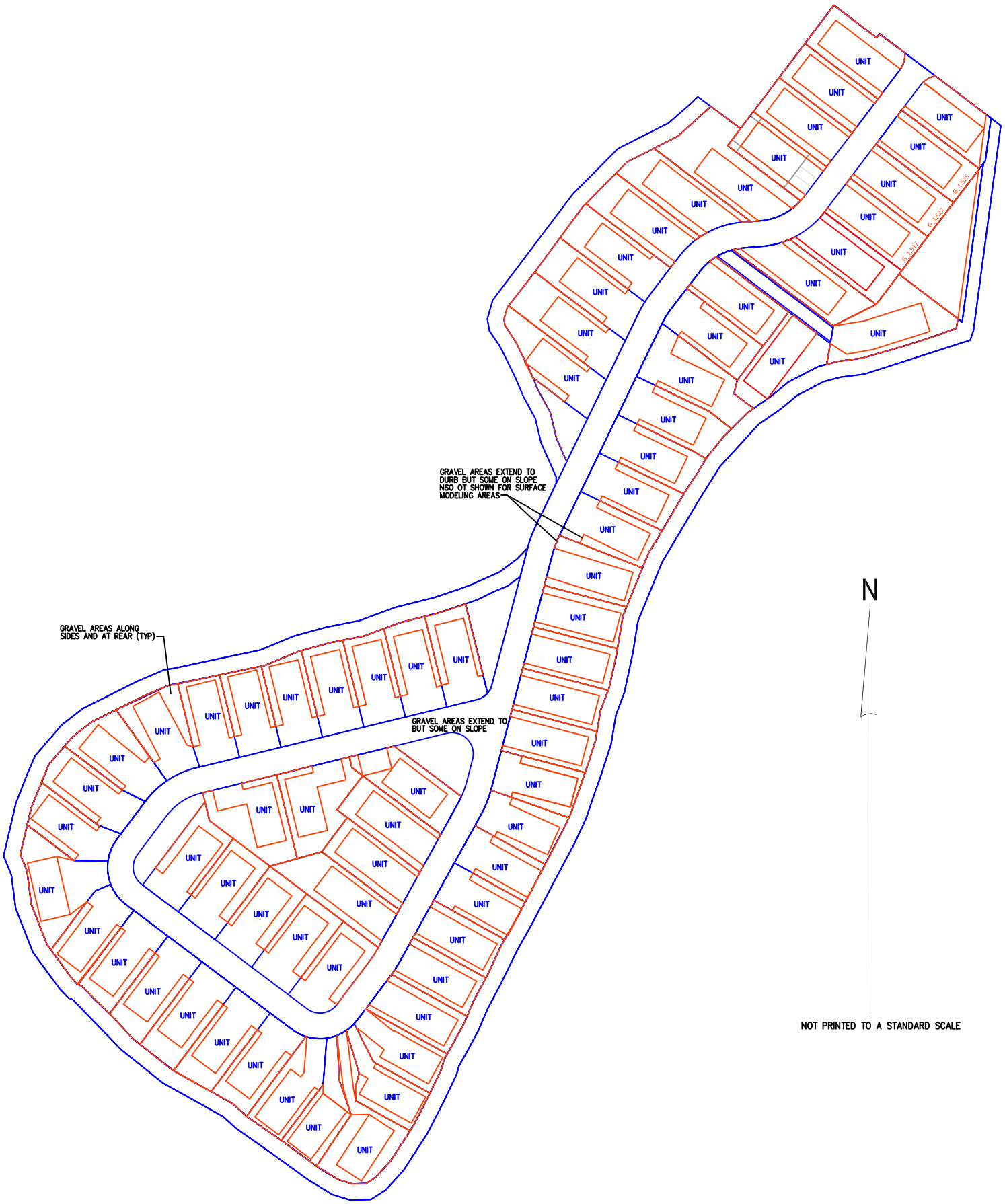


NOTE: SEE TIR APP C-3 FOR LOT SUMMARY DATA AND GRAVEL AREA GRADING SURFACE AREAS

INFILTRATION BASIN AREAS



GRADING FOR NFILTRATION BASIN AREAS



GRAVEL AREAS

APPENDIX C HYDROLOGY/HYDRAULICS

MINT VALLEY – OAK STREET

C-1 SOIL INFORMATION AND SURFACE INFILTRATION

C-2 POST-DEVELOPMENT BASIN AREA SUMMARY

C-3 BASIN AREA GROUPS AND PERCENT GRAVEL

C-4 INFILTRATION BASIN EVENT SUMMARY DATA

C-5 GUTTER FLOW ANALYSIS FOR SPREAD CHECK

- **100-yr HydroCAD for Storm System Analysis**

C-6 WATER QUALITY FLOW RATES

- **MGSFlood Report**

C-7 COMPARE PRE/POST RUNOFF VOLUMES

- **MGSFlood Report**

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-1 APPROACH FOR SURFACE INFILTRATION

METHOD FOR POST-DEVELOPMENT RUNOFF

1. The lots are all graded away from the street curb.
2. The lots will be covered with a 6 inch to 12 inch layer of gravel along the sides of the units and at the ends toward the 15 ft easement. The soil at the proposed cut grade in many cases will be mostly cut soil with a suitable infiltration rate. On lots requiring fill, cut soil* from another portion of the site may be mixed with sand as necessary to provide the required infiltration capacity. Fill soils generally require some time for pore spaces to re-develop to for the previous infiltration capacity capability.

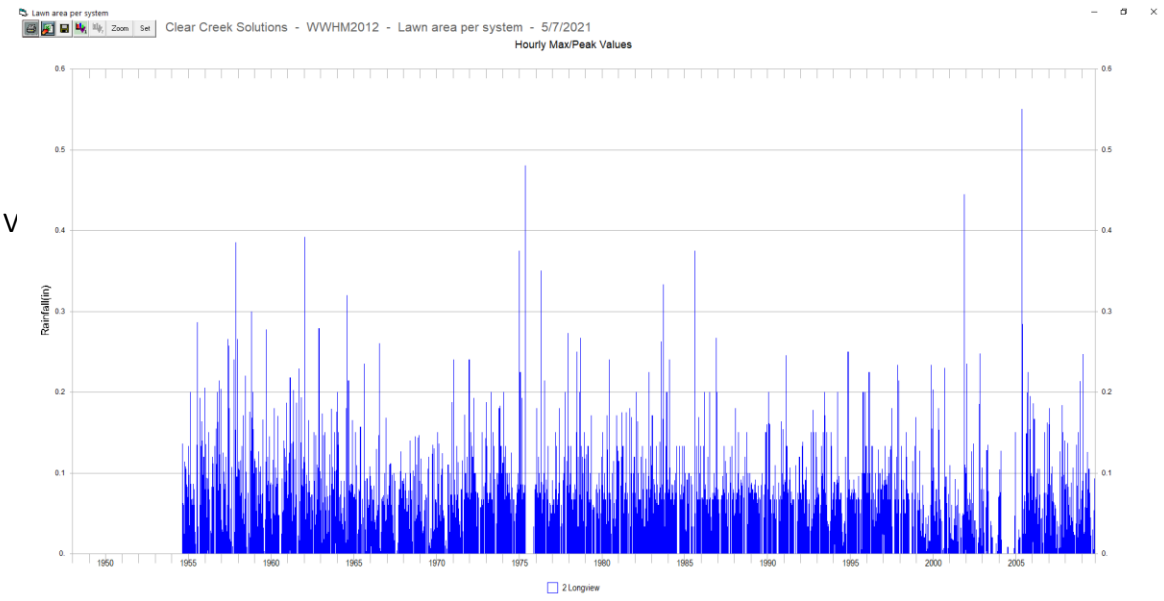
   *Infiltration testing resulted in three test pits with rates of about 6 in/hr and one (represented northerly portion) at 22 in/hr.

3. The rainfall that falls directly on the gravel surface will easily move to the soil surface below and infiltrate. Modeling (continuous) as an infiltrating surface indicated that all rainfall would be infiltrated even if the surface rate were only 0.23 in/hr. We are designing based on a 2.5 in/hr rate.
   - ❖ Find the largest rainfall depth of 0.55 inches in one hour (WWHM2012).

V

1

2



This analysis demonstrates that all direct rainfall would easily dissipate below the gravel surface portion of each lot.

However, each lot will have a driveway, roof, and walk that is impervious. Runoff from these impervious areas flow onto and/or into the rock surface (splash blocks for roofs) and mixes with the direct rainfall onto the gravel surface. The combined runoff flow and volume then starts to dissipate or pond on the level graded soil below the gravel and fully infiltrates.

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-2 POST-DEVELOPMENT BASIN AREA SUMMARY

Lot #	Lot Area (sf)	Drive (sf)	Gravel (sf)	Roof (sf)	Impervious Total (sf)	Impervious Total (ac)	Percent Gravel
1	3,455	559	1,440	1,456	3,455	0.0793	42%
2	3,652	559	1,525	1,568	3,652	0.0838	42%
3	3,647	557	1,522	1,568	3,647	0.0837	42%
4	3,642	557	1,517	1,568	3,642	0.0836	42%
5	4,025	896	1,561	1,568	4,025	0.0924	39%
6	4,333	924	1,841	1,568	4,333	0.0995	42%
Drive	1,924	1,542	382	0	1,924	0.0442	20%
Parcel F	4,277	460	2,359	1458	4,277	0.0982	55%
7	5,511	1,279	2,664	1,568	5,511	0.1265	48%
8	3,922	586	1,768	1,568	3,922	0.0900	45%
9	3,552	600	1,384	1,568	3,552	0.0815	39%
10	3,584	818	1,198	1,568	3,584	0.0823	33%
11	4,620	1047	2,005	1,568	4,620	0.1061	43%
12	3,832	798	1,466	1,568	3,832	0.0880	38%
13	3,591	783	1,240	1,568	3,591	0.0824	35%
14	3,456	799	1,089	1,568	3,456	0.0793	32%
15	3,544	901	1,075	1,568	3,544	0.0814	30%
16	3,613	566	1,479	1,568	3,613	0.0829	41%
17	3,187	560	1,059	1,568	3,187	0.0732	33%
18	3,292	560	1,164	1,568	3,292	0.0756	35%
19	3,261	560	1,133	1,568	3,261	0.0749	35%
20	3,293	560	1,165	1,568	3,293	0.0756	35%
21	3,310	783	959	1,568	3,310	0.0760	29%
22	3,226	770	1,000	1,456	3,226	0.0741	31%
23	3,025	789	668	1,568	3,025	0.0694	22%
24	3,049	795	686	1,568	3,049	0.0700	22%
25	3,078	558	1,064	1,456	3,078	0.0707	35%
26	3,149	560	1,133	1,456	3,149	0.0723	36%
27	3,379	621	1,190	1,568	3,379	0.0776	35%
28	3,287	670	1,161	1,456	3,287	0.0755	35%
29	3,090	620	902	1,568	3,090	0.0709	29%
30	4,708	753	2,387	1,568	4,708	0.1081	51%
31	3,231	908	755	1,568	3,231	0.0742	23%
32	3,566	831	1,167	1,568	3,566	0.0819	33%
33	3,642	813	1,261	1,568	3,642	0.0836	35%
34	3,795	800	1,427	1,568	3,795	0.0871	38%
35	3,887	794	1,525	1,568	3,887	0.0892	39%
36	3,778	804	1,406	1,568	3,778	0.0867	37%
37	3,541	808	1,165	1,568	3,541	0.0813	33%
38	3,331	876	887	1,568	3,331	0.0765	27%
39	4,794	1604	1,622	1,568	4,794	0.1101	34%
40	3,281	778	935	1,568	3,281	0.0753	28%
41	3,649	942	1,139	1,568	3,649	0.0838	31%
42	3,958	876	1,514	1,568	3,958	0.0909	38%
43	3,821	770	1,483	1,568	3,821	0.0877	39%
44	3,178	766	844	1,568	3,178	0.0730	27%
45	3,158	801	789	1,568	3,158	0.0725	25%
46	3,231	796	867	1,568	3,231	0.0742	27%
47	3,361	806	987	1,568	3,361	0.0772	29%
48	3,351	801	982	1,568	3,351	0.0769	29%

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-2 POST-DEVELOPMENT BASIN AREA SUMMARY

49	3,474	804	1102	1,568	3,474	0.0798	32%
50	3,515	843	1104	1,568	3,515	0.0807	31%
Tract C	2,432	1173	1,259		2,432	0.0558	52%
Tract D	2,352	1080	1,272		2,352	0.0540	54%
51	3,890	566	1,756	1,568	3,890	0.0893	45%
52	3,780	614	1,598	1,568	3,780	0.0868	42%
53	3,519	611	1,340	1,568	3,519	0.0808	38%
54	4,356	617	2,171	1,568	4,356	0.1000	50%
55	3,532	761	1,203	1,568	3,532	0.0811	34%
56	3,698	860	1,270	1,568	3,698	0.0849	34%
57	3,698	860	1,270	1,568	3,698	0.0849	34%
58	3,698	860	1,270	1,568	3,698	0.0849	34%
59	3,682	838	1,276	1,568	3,682	0.0845	35%
Tact E	1,893	1467	426		1,893	0.0435	23%
60	4,602	568	2,466	1,568	4,602	0.1056	54%
61	4,513	560	2,385	1,568	4,513	0.1036	53%
Tract B	1,345	1,345	0		1,345	0.0309	0%
62	3,879	913	1,510	1,456	3,879	0.0890	39%
63	4,431	920	1,943	1,568	4,431	0.1017	44%
64	4,226	1025	1,633	1,568	4,226	0.0970	39%
65	3,985	802	1,615	1,568	3,985	0.0915	41%
66	3,917	582	1767	1,568	3,917	0.0899	45%
67	4,203	810	1,825	1,568	4,203	0.0965	43%
68	6,048	864	3,616	1,568	6,048	0.1388	60%
69	3,440	560	1,312	1,568	3,440	0.0790	38%
70	3,440	560	1,312	1,568	3,440	0.0790	38%
71	3,440	560	1,312	1,568	3,440	0.0790	38%
72	3,998	560	1,870	1,568	3,998	0.0918	47%
	282,053	61,547	106,824	113,682	282,053	6.4750	
	6.4750	1.4129	2.4523	2.6098	6.4750		

Lot #	Lot Area (sf)	Drive (sf)	Gravel (sf)	Roof (sf)	Impervious Total (sf)	Impervious Total (ac)	Percent Gravel

Site (street), Channel Bank, and Street Frontage Runoff

Subcat ID	Street CN98 (sf)	Sidewalk CN98 (sf)	Gravel (12 ft) CN98 (sf)	Landscape CN85 (sf)	Channel Bank CN85 (sf)	Subcat Totals (sf)
F-1	2,594	386		277		3,257
F-2	1,729	373		271		2,373
Taper (direct)	404					404
S-1	14,263					14,263
S-2	14,923					14,923
N-1	5,572					5,572
N-2	5,302					5,302
15			32,277	8,069		40,346
	44,787	759	32,277	8,617	0	86,440
	1.028	0.017	0.741	0.198	0	
				Total	1.984	

Note: The following area (channel bank -CS) is the same for both pre and poat and is not included in modeling

CS					34,202	34,202

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-2 POST-DEVELOPMENT BASIN AREA SUMMARY

Runoff to CB System

Subcat N-1 CB-3	Street (sf)	Sidewalk (sf)	Pervious (sf)	Totals
O-1	2,594	386	277	
N-1 (from N)	2,070			
N-1 (from S)	3,502			
	8,166	386	277	8,829
	0.1875 ac	0.0089 ac	0.0064 ac	0.2027 ac

Subcat N-2 CB-4	Street (sf)	Sidewalk (sf)	Pervious (sf)	Totals
O-2	1,729	373	271	
N-2 (from N)	2,011			
N-2 (from S)	3,291			
	7,031	373	271	7,675
	0.1614 ac	0.0086 ac	0.0062 ac	0.1762 ac

Subcat S-1 CB-1	Street (sf)	Sidewalk (sf)	Pervious (sf)	Totals
S-1 (from S)	11,082			
S-1 (from N)	3,181			
	14,263	0	0	14,263
	0.3274 ac	0	0	0.3274 ac

Subcat S-2 CB-2	Street (sf)	Sidewalk (sf)	Pervious (sf)	Totals
S-2 (from S)	11,777			
S-2 (from N)	3,146			
	14,923	0	0	14,923
	0.3426 ac	0	0	0.3426 ac

Totals	1.0189 ac	0.0174 ac	0.0126 ac	1.0489 ac

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-3 BASIN AREA GROUPS AND PERCENT GRAVEL

These groupings are based on lots where the bottom of the gravel is the same and ponding runoff water can spread from lot to lot. Essentially eaach of these grouping areas is a separate infiltration basin area.

Some lots are highlighted in yellow indicating a lower percentage of gravel or base area for infiltration. However, due to the ability to flow through thr gravel fill horizontally, the percentage of gravel overall is a larger percentage. These tabultions were prepared to develop the input values for the HydroCAD analysis for each of these groupings (infiltration systems).

INFILTRATION BASIN LOTS 1-6+

Lot #	Lot Area (sf)	Drive * (sf)	Gravel (sf)	Roof (sf)	Impervious Total (sf)	Impervious Total (ac)	Top Gravel (elev)	Bottom Gravel (elev)	Spill (elev.)	Percent Gravel
1	3,455	559	1,440	1,456	3,455	0.0793	6.00	5.00	5.50	42%
2	3,652	559	1,525	1,568	3,652	0.0838	6.00	5.00	6.00	42%
3	3,647	557	1,522	1,568	3,647	0.0837	6.00	5.00	6.00	42%
4	3,642	557	1,517	1,568	3,642	0.0836	6.00	5.00	6.00	42%
5	4,025	896	1,561	1,568	4,025	0.0924	6.00	5.00	6.00	39%
6	4,333	924	1,841	1,568	4,333	0.0995	6.00	5.00	6.00	42%
Drive	1,924	1,542	382	0	1,924	0.0442	6.00	5.00	6.00	20%
Parcel F	4,277	460	2,359	1458	4,277	0.0982	6.00	5.00	5.50	55%
	28,955	6,054	12,147	10,754	28,955	0.6647				40.4%
	0.6647	0.1390	0.2789	0.2469	0.6647					

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-3 BASIN AREA GROUPS AND PERCENT GRAVEL

INFILTRATION BASIN LOTS 9-50+

	Lot #	Lot Area (sf)	Drive * (sf)	Gravel (sf)	Roof (sf)	Impervious Total (sf)	Impervious Total (ac)	Top Gravel (elev)	Bottom Gravel (elev)	Spill (elev.)	Percent Gravel
1	9	3,552	600	1,384	1,568	3,552	0.0815	6.00	5.50	6.00	39%
2	10	3,584	818	1,198	1,568	3,584	0.0823	6.00	5.50	6.00	33%
3	11	4,620	1047	2,005	1,568	4,620	0.1061	6.00	5.50	5.50	43%
4	12	3,832	798	1,466	1,568	3,832	0.0880	6.00	5.50	6.00	38%
5	13	3,591	783	1,240	1,568	3,591	0.0824	6.00	5.50	6.00	35%
6	14	3,456	799	1,089	1,568	3,456	0.0793	6.00	5.50	6.00	32%
7	15	3,544	901	1,075	1,568	3,544	0.0814	6.00	5.50	6.00	30%
8	16	3,613	566	1,479	1,568	3,613	0.0829	6.00	5.50	6.00	41%
9	17	3,187	560	1,059	1,568	3,187	0.0732	6.00	5.50	6.00	33%
10	18	3,292	560	1,164	1,568	3,292	0.0756	6.00	5.50	6.00	35%
11	19	3,261	560	1,133	1,568	3,261	0.0749	6.00	5.50	6.00	35%
12	20	3,293	560	1,165	1,568	3,293	0.0756	6.00	5.50	6.00	35%
13	21	3,310	783	959	1,568	3,310	0.0760	6.00	5.50	6.00	29%
14	22	3,226	770	1,000	1,456	3,226	0.0741	6.00	5.50	6.00	31%
15	23	3,025	789	668	1,568	3,025	0.0694	6.00	5.50	6.00	22%
16	24	3,049	795	686	1,568	3,049	0.0700	6.00	5.50	6.00	22%
17	25	3,078	558	1,064	1,456	3,078	0.0707	6.50	5.50	6.00	35%
18	26	3,149	560	1,133	1,456	3,149	0.0723	6.50	5.50	6.00	36%
19	27	3,379	621	1,190	1,568	3,379	0.0776	6.50	5.50	6.00	35%
20	28	3,287	670	1,161	1,456	3,287	0.0755	6.00	5.50	6.00	35%
21	29	3,090	620	902	1,568	3,090	0.0709	6.00	5.50	6.00	29%
22	30	4,708	753	2,387	1,568	4,708	0.1081	6.20	5.50	6.00	51%
23	31	3,231	908	755	1,568	3,231	0.0742	6.20	5.50	6.00	23%
24	32	3,566	831	1,167	1,568	3,566	0.0819	6.20	5.50	6.00	33%
25	33	3,642	813	1,261	1,568	3,642	0.0836	6.50	5.50	6.00	35%
26	34	3,795	800	1,427	1,568	3,795	0.0871	6.50	5.50	6.00	38%
27	35	3,887	794	1,525	1,568	3,887	0.0892	6.50	5.50	6.00	39%
28	36	3,778	804	1,406	1,568	3,778	0.0867	6.50	5.50	6.00	37%
29	37	3,541	808	1,165	1,568	3,541	0.0813	6.50	5.50	6.00	33%
30	38	3,331	876	887	1,568	3,331	0.0765	6.50	5.50	6.00	27%
31	39	4,794	1604	1,622	1,568	4,794	0.1101	6.50	5.50	6.00	34%
32	40	3,281	778	935	1,568	3,281	0.0753	6.50	5.50	6.00	28%
33	41	3,649	942	1,139	1,568	3,649	0.0838	6.50	5.50	6.00	31%
34	42	3,958	876	1,514	1,568	3,958	0.0909	6.50	5.50	6.00	38%
35	43	3,821	770	1,483	1,568	3,821	0.0877	6.50	5.50	6.00	39%
36	44	3,178	766	844	1,568	3,178	0.0730	6.50	5.50	6.00	27%
37	45	3,158	801	789	1,568	3,158	0.0725	6.10	5.50	6.00	25%
38	46	3,231	796	867	1,568	3,231	0.0742	6.10	5.50	6.00	27%
39	47	3,361	806	987	1,568	3,361	0.0772	6.10	5.50	6.00	29%
40	48	3,351	801	982	1,568	3,351	0.0769	6.10	5.50	6.00	29%
41	49	3,474	804	1102	1,568	3,474	0.0798	6.10	5.50	6.00	32%
42	50	3,515	843	1104	1,568	3,515	0.0807	6.10	5.50	6.00	31%
43	Tract C	2,432	1173	1,259		2,432	0.0558	6.17	5.50	6.00	52%
		150,100	33,865	50,827	65,408	150,100					33.5%
		3.4458	0.7774	1.1668	1.5016	3.4458					

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-3 BASIN AREA GROUPS AND PERCENT GRAVEL

INFILTRATION BASIN LOTS 51-61+

Lot #	Lot Area (sf)	Drive * (sf)	Gravel (sf)	Roof (sf)	Impervious Total (sf)	Impervious Total (ac)	Top Gravel (elev)	Bottom Gravel (elev)	Spill (elev.)	Percent Gravel
Tract D	2,352	1080	1,272		2,352	0.0540	6.95	6.30	6.73	54%
51	3,890	566	1,756	1,568	3,890	0.0893	6.80	6.30	6.80	45%
52	3,780	614	1,598	1,568	3,780	0.0868	6.80	6.30	6.80	42%
53	3,519	611	1,340	1,568	3,519	0.0808	6.80	6.30	6.80	38%
54	4,356	617	2,171	1,568	4,356	0.1000	6.80	6.30	6.80	50%
55	3,532	761	1,203	1,568	3,532	0.0811	7.20	6.30	7.20	34%
56	3,698	860	1,270	1,568	3,698	0.0849	7.20	6.30	7.20	34%
57	3,698	860	1,270	1,568	3,698	0.0849	7.20	6.30	7.20	34%
58	3,698	860	1,270	1,568	3,698	0.0849	7.20	6.30	7.20	34%
59	3,682	838	1,276	1,568	3,682	0.0845	7.50	6.30	7.50	35%
Tact E	1,893	1467	426		1,893	0.0435	7.83	6.30	7.50	23%
60	4,602	568	2,466	1,568	4,602	0.1056	7.20	6.30	6.80	54%
61	4,513	560	2,385	1,568	4,513	0.1036	7.20	6.30	6.80	53%
	47,213	10,262	19,703	17,248	47,213	1.0839				44.2%
	1.0839	0.2356	0.4523	0.3960	1.0839					

INFILTRATION BASIN LOTS 62-72

Lot #	Lot Area (sf)	Drive * (sf)	Gravel (sf)	Roof (sf)	Impervious Total (sf)	Impervious Total (ac)	Top Gravel (elev)	Bottom Gravel (elev)	Spill (elev.)	Percent Gravel
Tract B	1,345	1,345	0		1,345	0.0309				0%
62	3,879	913	1,510	1,456	3,879	0.0890	6.00	5.00	5.50	39%
63	4,431	920	1,943	1,568	4,431	0.1017	6.00	5.00	5.50	44%
64	4,226	1025	1,633	1,568	4,226	0.0970	6.00	5.00	5.50	39%
65	3,985	802	1,615	1,568	3,985	0.0915	6.00	5.00	5.50	41%
66	3,917	582	1767	1,568	3,917	0.0899	6.00	5.00	5.50	45%
67	4,203	810	1,825	1,568	4,203	0.0965	6.00	5.00	5.50	43%
68	6,048	864	3,616	1,568	6,048	0.1388	6.00	5.00	5.50	60%
69	3,440	560	1,312	1,568	3,440	0.0790	5.50	5.00	5.50	38%
70	3,440	560	1,312	1,568	3,440	0.0790	5.50	5.00	5.50	38%
71	3,440	560	1,312	1,568	3,440	0.0790	5.50	5.00	5.50	38%
72	3,998	560	1,870	1,568	3,998	0.0918	6.00	5.00	6.00	47%
	46,352	9,501	19,715	17,136	46,352	1.0641				42.9%
	1.0641	0.2181	0.4526	0.3934	1.0641					

APPENDIX C HYDROLGY/HYDRAULICS
MINT VALLEY
C-4 INFILTRATION BASIN EVENT SUMMARY DATA

NOTE: The event summaries are listed for the four (grouped infiltration systems). Some individual lot systems are listed as well. These are the ones with low percentage gravel areas relative to lot size and illustrate the difference in ponded depth if the water could not move horizontally from lot to lot.

INFILTRATION BASIN LOTS 1-6+

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation* (feet)	Storage (cu ft)	Runoff Vol. (ac-ft)
2-yr - county	0.3895	0.3893	0.3893	0	5.01	24	0.128
10-yr - county	0.5608	0.5604	0.5604	0	5.01	34	0.186
25-yr-county	0.6845	0.6840	0.6840	0	5.01	41	0.229
100-yr-county	0.9723	0.7030	0.7030	0	5.09	389	0.329

*gravel base at 5.0 and overflow at elev. 5.5

Note: Assumed 35% void space in gravel

Drive by Lot 6

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation* (feet)	Storage (cu ft)	Runoff Vol. (ac-ft)
2-yr - county	0.0262	0.0221	0.0221	0	5.04	6	0.009
10-yr - county	0.0377	0.0221	0.0221	0	5.17	26	0.012
25-yr-county	0.0460	0.0221	0.0221	0	5.28	43	0.015
100-yr-county	0.0654	0.0221	0.0221	0	5.61	93	0.022

*gravel base at 5.0 and overflow at elev. 6.0

Note: Assumed 40% void space in gravel

APPENDIX C HYDROLGY/HYDRAULICS
MINT VALLEY
C-4 INFILTRATION BASIN EVENT SUMMARY DATA

INFILTRATION BASIN LOTS 9-50+

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation* (feet)	Storage (cu ft)	Runoff Vol. (ac-ft)
2-yr - county	2.0194	2.0181	2.0181	0	5.51	122	0.663
10-yr - county	2.9071	2.9052	2.9052	0	5.51	176	0.967
25-yr-county	3.5482	2.9414	2.9414	0	5.55	817	1.187
100-yr-county	5.0403	2.9424	2.9424	0	5.69	3,417	1.703

*gravel base at 5.50 and overflow at elev. 6.0

Note: Assumed 35% void space in gravel

LOT 23

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation* (feet)	Storage (cu ft)	Runoff Vol. (ac-ft)
2-yr - county	0.0409	0.0387	0.0387	0	5.52	4	0.013
10-yr - county	0.0689	0.0387	0.0387	0	5.62	32	0.019
25-yr-county	0.0719	0.0387	0.0387	0	5.71	57	0.024
100-yr-county	0.1021	0.0387	0.0387	0	5.98	128	0.034

*gravel base at 5.50 and overflow at elev. 6.0

Note: Assumed 40% void space in gravel

LOT 31

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation* (feet)	Storage (cu ft)	Runoff Vol. (ac-ft)
2-yr - county	0.0437	0.0436	0.0436	0	5.51	3	0.014
10-yr - county	0.0628	0.0437	0.0437	0	5.60	29	0.021
25-yr-county	0.0767	0.0437	0.0437	0	5.68	55	0.026
100-yr-county	0.1090	0.0437	0.0437	0	5.92	128	0.037

*gravel base at 5.50 and overflow at elev. 6.0

Note: Assumed 40% void apace in gravel

LOT 45

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation* (feet)	Storage (cu ft)	Runoff Vol. (ac-ft)
2-yr - county	0.0425	0.0424	0.0424	0	5.51	3	0.014
10-yr - county	0.0612	0.0457	0.0457	0	5.57	22	0.020
25-yr-county	0.0747	0.0457	0.0457	0	5.65	46	0.025
100-yr-county	0.1060	0.0457	0.0457	0	5.87	115	0.036

*gravel base at 5.50 and overflow at elev. 6.0

Note: Assumed 40% void space in gravel

APPENDIX C HYDROLGY/HYDRAULICS
MINT VALLEY
C-4 INFILTRATION BASIN EVENT SUMMARY DATA

INFILTRATION BASIN LOTS 51-61+

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation* (feet)	Storage (cu ft)	Runoff Vol. (ac-ft)
2-yr - county	0.6352	0.6348	0.6348	0	6.31	38	0.008
10-yr - county	0.9144	0.9138	0.9138	0	6.31	55	0.012
25-yr-county	1.1161	1.1153	1.1153	0	6.31	67	0.015
100-yr-county	1.5854	1.4020	1.4020	0	6.39	645	0.021

*gravel base at 6.3 and overflow at elev. 7.5

Note: Assumed 35% void space in gravel

Tract E

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation* (feet)	Storage (cu ft)	Runoff Vol. (ac-ft)
2-yr - county	0.0255	0.0254	0.0254	0	6.31	2	0.008
10-yr - county	0.0367	0.0361	0.0361	0	6.31	3	0.012
25-yr-county	0.0447	0.0361	0.0361	0	6.35	12	0.015
100-yr-county	0.0636	0.0361	0.0361	0	6.48	46	0.021

*gravel base at 6.3 and overflow at elev. 7.5

Note: Assumed 40% void space in gravel

INFILTRATION BASIN LOTS 62-72

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation* (feet)	Storage (cu ft)	Runoff Vol. (ac-ft)
2-yr - county	0.6236	0.6232	0.6232	0	5.01	38	0.205
10-yr - county	0.8977	0.8972	0.8972	0	5.01	54	0.298
25-yr-county	1.0957	1.0950	1.0950	0	5.01	66	0.367
100-yr-county	1.5565	1.1409	1.1409	0	5.09	595	0.526

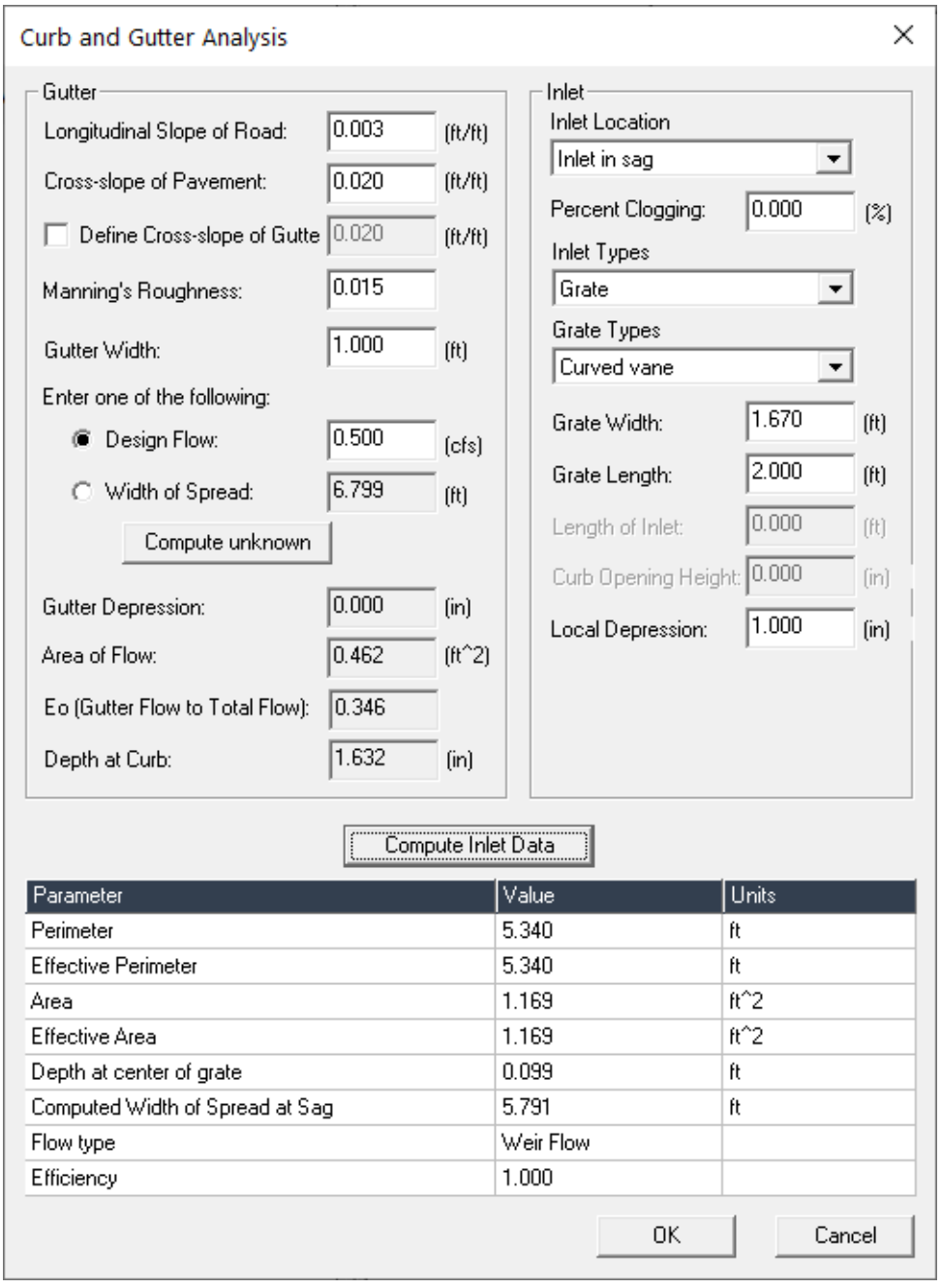
*gravel base at 5.0 and overflow at elev. 5.5

Note: Assumed 35% void space in gravel

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-5 GUTTER FLOW ANALYSIS REPORTS

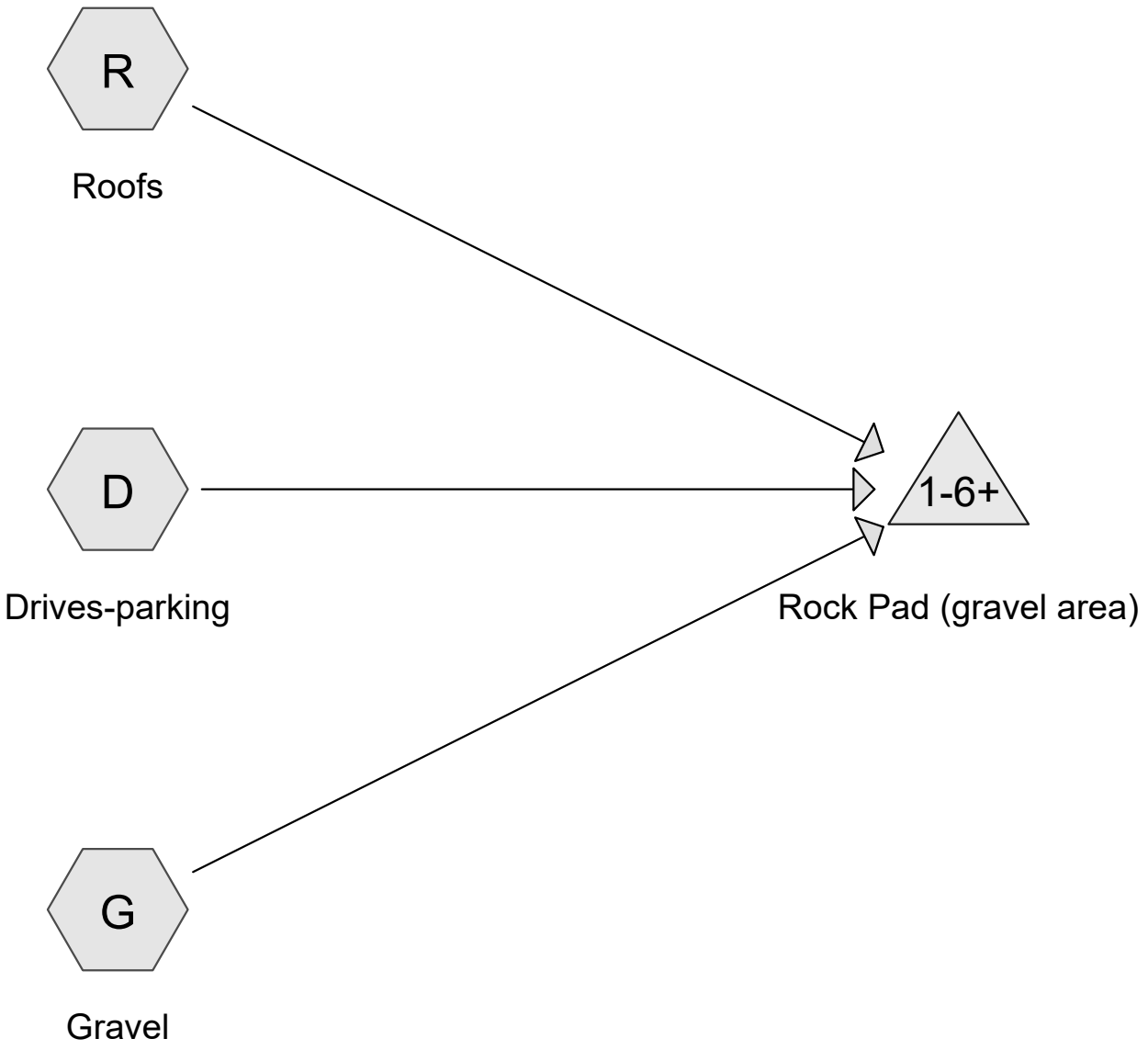
FHWA - Hydraulic Toolbox program

Runoff to CB 2 – vertical curb analysis



Notes: For vertical curb

1) Q_{100} = 0.50 cfs for total flow from both sides of the inlet.
2) Width of spread – not correct because this would only relate to 0.50 cfs which is total flow from both sides.
3) Actual spread is 5.791 ft at grate. BUT, see below for rolled curb.
4) The flow to the other side at CB-1 is almost the same – so 5.79 spread on that side of street also = 24-11.58 = 12.42 ft open pavement travel width.



Subcat Reach Pond Link

Routing Diagram for Final - Lots 1-6+ (2.5 iph) Gravel Pad
Prepared by GME Drainage Consultant, Printed 11/27/2024
HydroCAD® 10.20-2h s/n 08107 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment D: Drives-parking

Runoff = 0.2033 cfs @ 7.89 hrs, Volume= 0.069 af, Depth= 5.93"
Routed to Pond 1-6+ : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	6,054	98	Drive
	6,054	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Subcatchment G: Gravel

Runoff = 0.4079 cfs @ 7.89 hrs, Volume= 0.138 af, Depth= 5.93"
Routed to Pond 1-6+ : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	12,147	98	direct rain on gravel area
	12,147	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Subcatchment R: Roofs

Runoff = 0.3611 cfs @ 7.89 hrs, Volume= 0.122 af, Depth= 5.93"
Routed to Pond 1-6+ : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	10,754	98	Drive
	10,754	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Pond 1-6+: Rock Pad (gravel area)

Inflow Area = 0.665 ac,100.00% Impervious, Inflow Depth = 5.93" for 100-yr-county event
Inflow = 0.9723 cfs @ 7.89 hrs, Volume= 0.329 af
Outflow = 0.7030 cfs @ 7.75 hrs, Volume= 0.329 af, Atten= 28%, Lag= 0.0 min
Discarded = 0.7030 cfs @ 7.75 hrs, Volume= 0.329 af
Primary = 0.0000 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 5.09' @ 8.12 hrs Surf.Area= 12,147 sf Storage= 389 cf

Plug-Flow detention time= 1.8 min calculated for 0.328 af (100% of inflow)
Center-of-Mass det. time= 1.8 min (653.8 - 652.0)

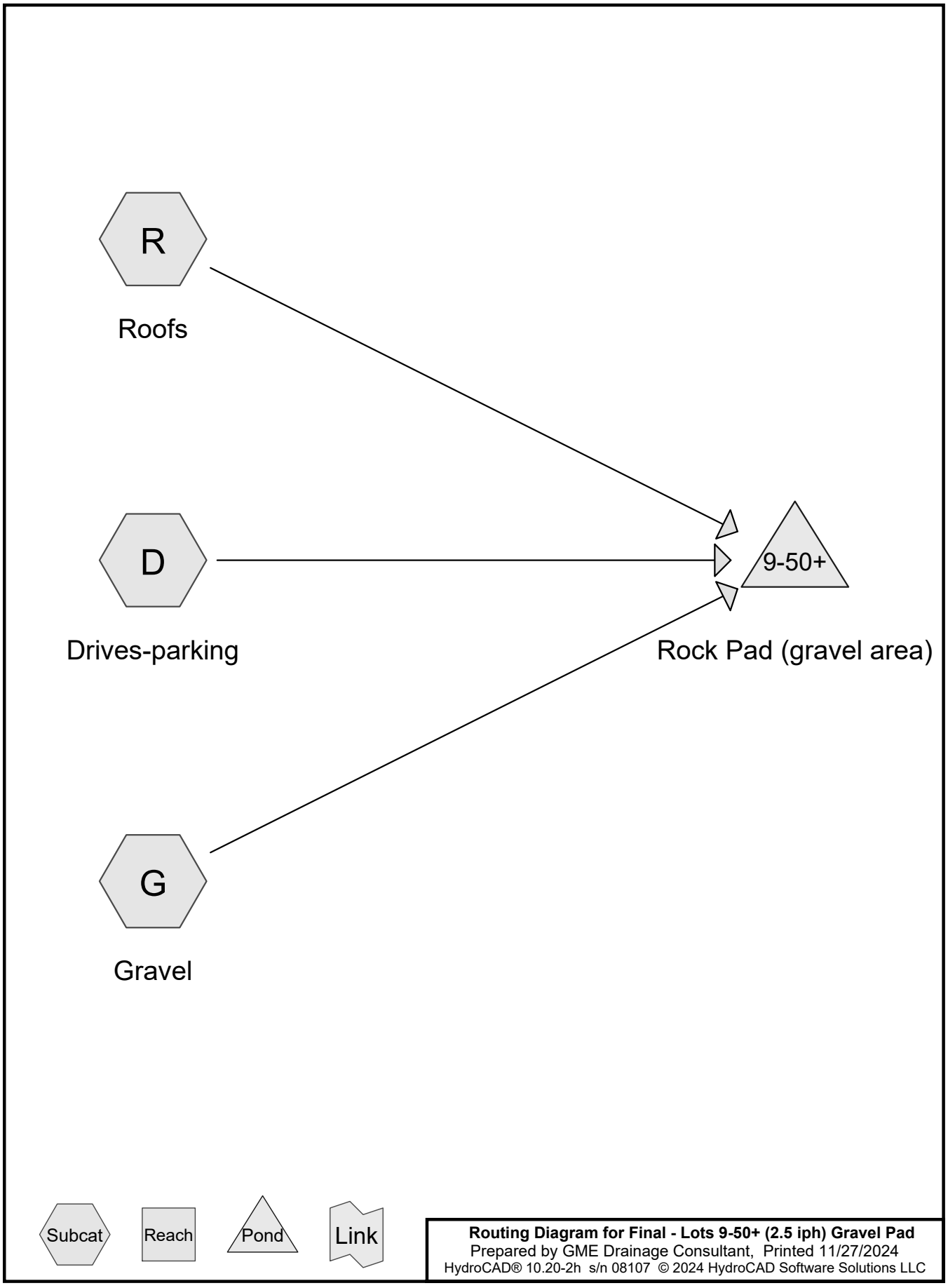
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	2,126 cf	**Custom Stage Data (Conic)**Listed below (Recalc) 6,074 cf Overall x 35.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.00	12,147	0	0	12,147
5.50	12,147	6,074	6,074	12,342

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**2.500 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'
#2	Primary	6.00'	**4.0' long + 1.0 '/' SideZ x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.7030 cfs @ 7.75 hrs HW=5.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.7030 cfs)

Primary OutFlow Max=0.0000 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.0000 cfs)


R
Roofs
D
Drives-parking
G
Gravel
9-50+
Rock Pad (gravel area)
Subcat
Reach
Pond
Link
Routing Diagram for Final - Lots 9-50+ (2.5 iph) Gravel Pad
Prepared by GME Drainage Consultant, Printed 11/27/2024
HydroCAD® 10.20-2h s/n 08107 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment D: Drives-parking

Runoff = 0.4556 cfs @ 7.90 hrs, Volume= 0.150 af, Depth= 2.31"
Routed to Pond 9-50+ : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-yr - county Rainfall=2.54"

	Area (sf)	CN	Description
*	33,865	98	Drive
	33,865	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Subcatchment G: Gravel

Runoff = 0.6838 cfs @ 7.90 hrs, Volume= 0.225 af, Depth= 2.31"
Routed to Pond 9-50+ : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-yr - county Rainfall=2.54"

	Area (sf)	CN	Description
*	50,827	98	direct rain on gravel area
	50,827	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Subcatchment R: Roofs

Runoff = 0.8800 cfs @ 7.90 hrs, Volume= 0.289 af, Depth= 2.31"
Routed to Pond 9-50+ : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-yr - county Rainfall=2.54"

	Area (sf)	CN	Description
*	65,408	98	Drive
	65,408	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Pond 9-50+: Rock Pad (gravel area)

Inflow Area = 3.446 ac,100.00% Impervious, Inflow Depth = 2.31" for 2-yr - county event
Inflow = 2.0194 cfs @ 7.90 hrs, Volume= 0.663 af
Outflow = 2.0181 cfs @ 7.92 hrs, Volume= 0.663 af, Atten= 0%, Lag= 1.0 min
Discarded = 2.0181 cfs @ 7.92 hrs, Volume= 0.663 af
Primary = 0.0000 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 5.51' @ 7.92 hrs Surf.Area= 50,827 sf Storage= 122 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.0 min (674.3 - 673.3)

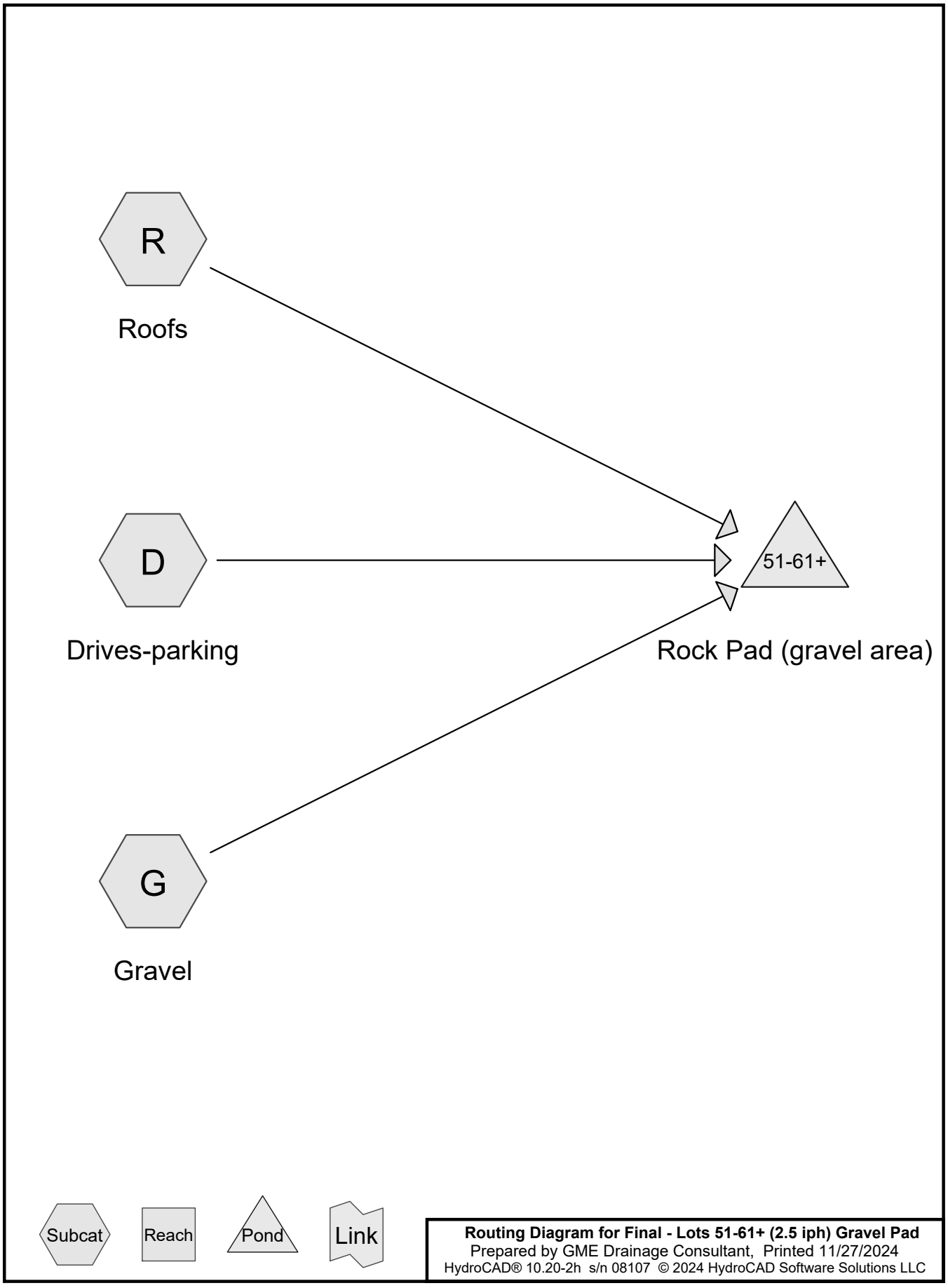
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	8,895 cf	**Custom Stage Data (Conic)**Listed below (Recalc) 25,414 cf Overall x 35.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.50	50,827	0	0	50,827
6.00	50,827	25,414	25,414	51,227

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**2.500 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'
#2	Primary	6.00'	**4.0' long + 1.0 '/' SideZ x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=2.0152 cfs @ 7.92 hrs HW=5.51' (Free Discharge)
1=Exfiltration (Exfiltration Controls 2.0152 cfs)

Primary OutFlow Max=0.0000 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.0000 cfs)



Routing Diagram for Final - Lots 51-61+ (2.5 iph) Gravel Pad
Prepared by GME Drainage Consultant, Printed 11/27/2024
HydroCAD® 10.20-2h s/n 08107 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment D: Drives-parking

Runoff = 0.0824 cfs @ 7.91 hrs, Volume= 0.027 af, Depth= 1.36"
Routed to Pond 51-61+ : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.58"

	Area (sf)	CN	Description
*	10,262	98	Drive
	10,262	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Subcatchment G: Gravel

Runoff = 0.1582 cfs @ 7.91 hrs, Volume= 0.051 af, Depth= 1.36"
Routed to Pond 51-61+ : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.58"

	Area (sf)	CN	Description
*	19,703	98	direct rain on gravel area
	19,703	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Subcatchment R: Roofs

Runoff = 0.1385 cfs @ 7.91 hrs, Volume= 0.045 af, Depth= 1.36"
Routed to Pond 51-61+ : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.58"

	Area (sf)	CN	Description
*	17,248	98	Drive
	17,248	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Pond 51-61+: Rock Pad (gravel area)

Inflow Area = 1.084 ac,100.00% Impervious, Inflow Depth = 1.36" for WQ event
Inflow = 0.3791 cfs @ 7.91 hrs, Volume= 0.123 af
Outflow = 0.3789 cfs @ 7.92 hrs, Volume= 0.123 af, Atten= 0%, Lag= 1.0 min
Discarded = 0.3789 cfs @ 7.92 hrs, Volume= 0.123 af
Primary = 0.0000 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 6.30' @ 7.92 hrs Surf.Area= 19,703 sf Storage= 23 cf

Plug-Flow detention time= 1.0 min calculated for 0.123 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (692.1 - 691.1)

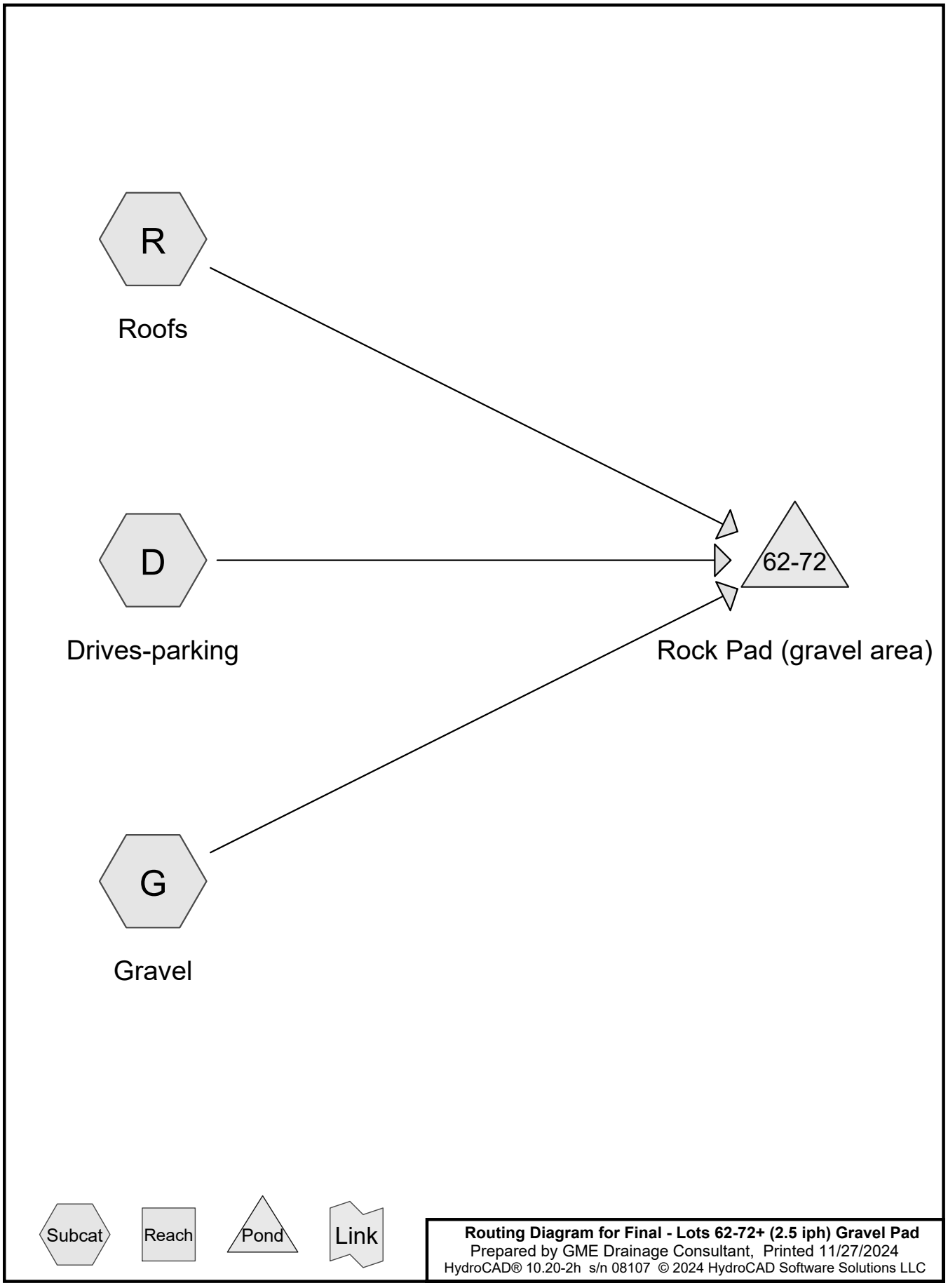
Volume	Invert	Avail.Storage	Storage Description
#1	6.30'	3,448 cf	**Custom Stage Data (Conic)**Listed below (Recalc) 9,852 cf Overall x 35.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
6.30	19,703	0	0	19,703
6.80	19,703	9,852	9,852	19,952

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.30'	**2.500 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'
#2	Primary	6.80'	**4.0' long + 1.0 '/' SideZ x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.3783 cfs @ 7.92 hrs HW=6.30' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.3783 cfs)

Primary OutFlow Max=0.0000 cfs @ 0.00 hrs HW=6.30' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.0000 cfs)


R
Roofs
D
Drives-parking
G
Gravel
62-72
Rock Pad (gravel area)
Subcat
Reach
Pond
Link
Routing Diagram for Final - Lots 62-72+ (2.5 iph) Gravel Pad
Prepared by GME Drainage Consultant, Printed 11/27/2024
HydroCAD® 10.20-2h s/n 08107 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment D: Drives-parking

Runoff = 0.1278 cfs @ 7.90 hrs, Volume= 0.042 af, Depth= 2.31"
Routed to Pond 62-72 : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-yr - county Rainfall=2.54"

	Area (sf)	CN	Description
*	9,501	98	Drive
	9,501	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Subcatchment G: Gravel

Runoff = 0.2652 cfs @ 7.90 hrs, Volume= 0.087 af, Depth= 2.31"
Routed to Pond 62-72 : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-yr - county Rainfall=2.54"

	Area (sf)	CN	Description
*	19,715	98	direct rain on gravel area
	19,715	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Subcatchment R: Roofs

Runoff = 0.2305 cfs @ 7.90 hrs, Volume= 0.076 af, Depth= 2.31"
Routed to Pond 62-72 : Rock Pad (gravel area)

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-yr - county Rainfall=2.54"

	Area (sf)	CN	Description
*	17,136	98	Drive
	17,136	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, assume**

Summary for Pond 62-72: Rock Pad (gravel area)

Inflow Area = 1.064 ac,100.00% Impervious, Inflow Depth = 2.31" for 2-yr - county event
Inflow = 0.6236 cfs @ 7.90 hrs, Volume= 0.205 af
Outflow = 0.6232 cfs @ 7.92 hrs, Volume= 0.205 af, Atten= 0%, Lag= 1.0 min
Discarded = 0.6232 cfs @ 7.92 hrs, Volume= 0.205 af
Primary = 0.0000 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 5.01' @ 7.92 hrs Surf.Area= 19,715 sf Storage= 38 cf

Plug-Flow detention time= 1.0 min calculated for 0.205 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (674.3 - 673.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	3,450 cf	**Custom Stage Data (Conic)**Listed below (Recalc) 9,858 cf Overall x 35.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.00	19,715	0	0	19,715
5.50	19,715	9,858	9,858	19,964

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**2.500 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'
#2	Primary	6.80'	**4.0' long + 1.0 '/' SideZ x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.6223 cfs @ 7.92 hrs HW=5.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.6223 cfs)

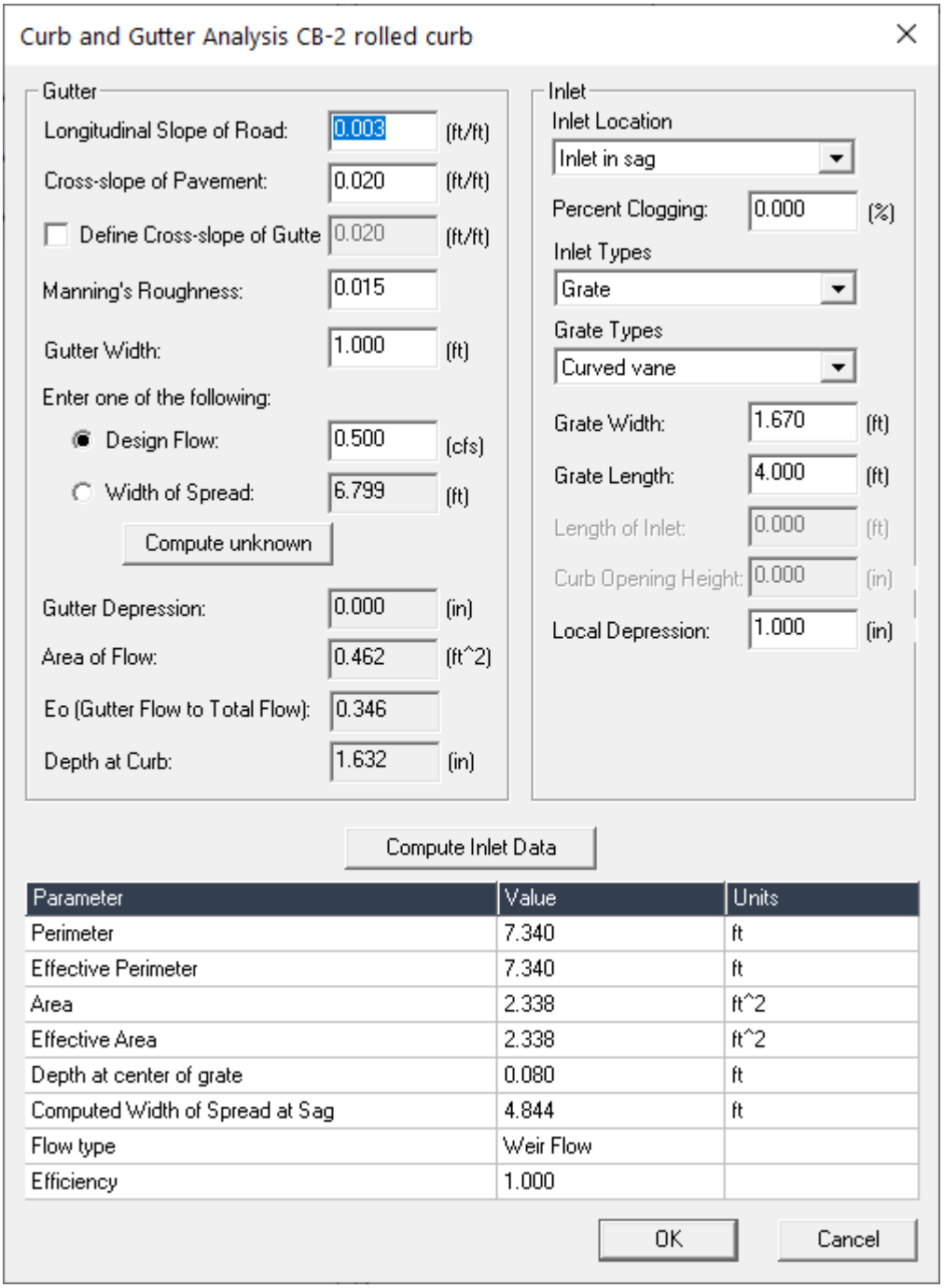
Primary OutFlow Max=0.0000 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.0000 cfs)

Notes: For rolled curb

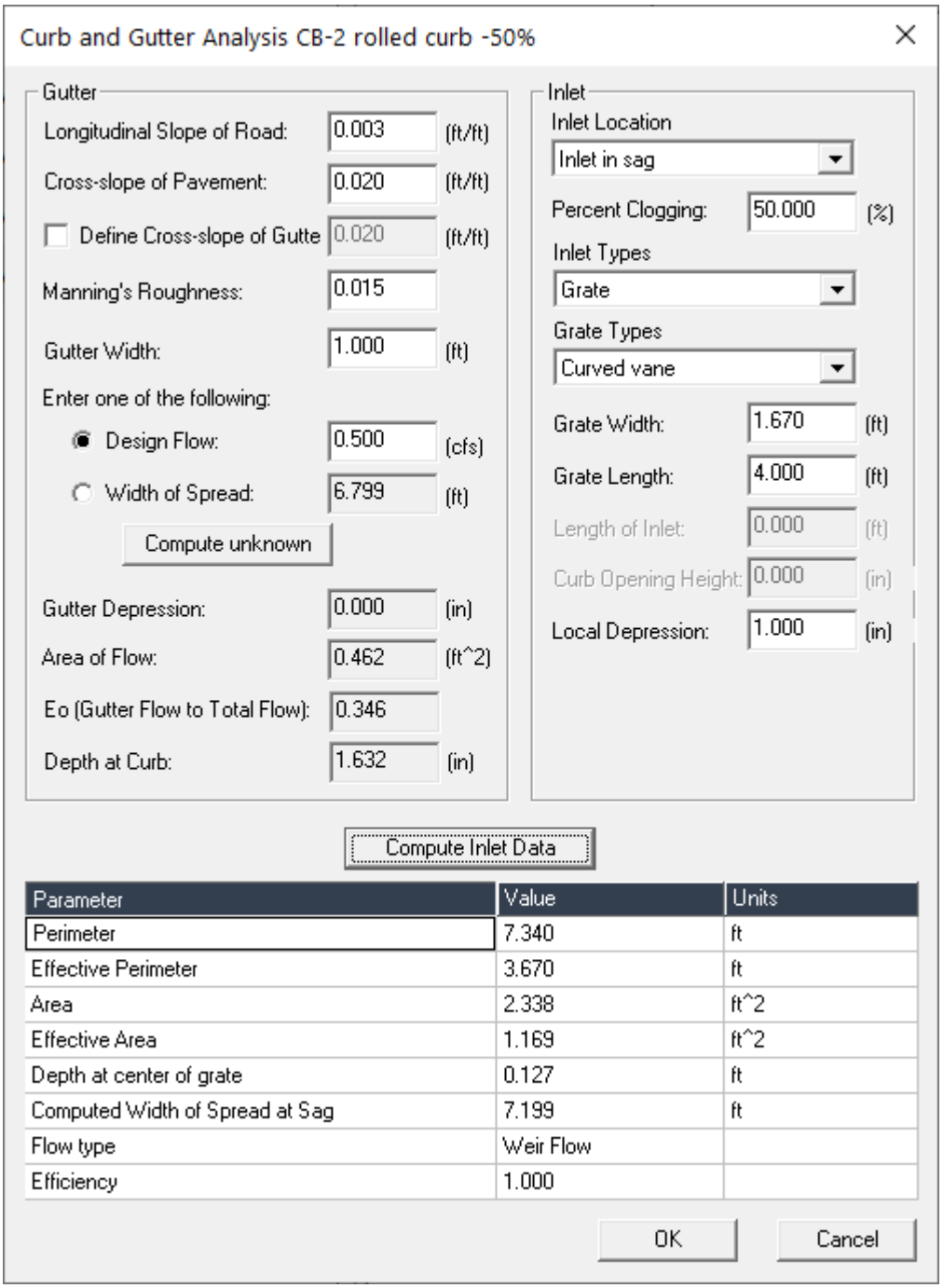
1) The grate now has inflow from all sides – therefore, double the length to have the program determine the correct perimeter and effective perimeter of 7.34 instead of 5.34.

Find that spread at grate changes from 5.79 to 4.844 ft.

Runoff to CB 2 – rolled curb analysis



Now determine 50% clogged result.



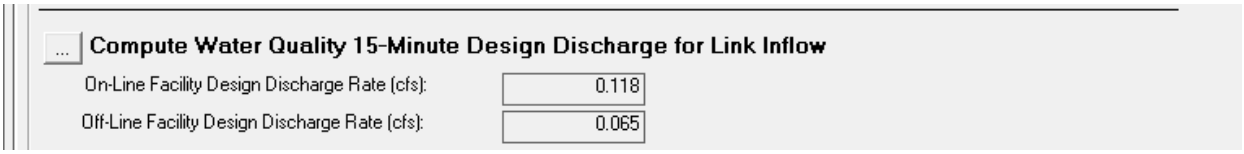
Find result = 7.2 ft

The flow to the other side at CB-1 is almost the same – so 7.2 spread on that side also = 24-14.4 = 9.6 ft open pavement travel width. This is more than adequate.

The analysis for CB 3 and CB 4 was not evaluated since the flows are nearly half as much as for C 2 and C 1.

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-6 WQ DESIGN RATE – REQ'D FILTERS

South WQ System (CB 1)

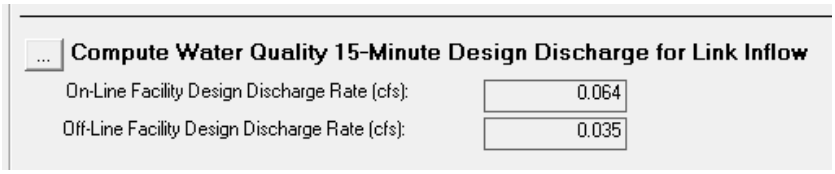


Requires 1- (18" + 12") stack height (0.076 cfs capacity) - PerkFilter

Alternate*: 2-27" Phosphosorb Cartridges (0.084 cfs WQ capacity) - Contech

***requires lower invert**

North WQ System (CB 4)



Requires 1- 18" Cartridge (0.045 cfs capacity) - Perkfilter

Alternate*: 1-27" Phosphosorb Cartridge (0.042 WQ cfs capacity) - Contech

***requires lower invert**

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.58
Program License Number: 201610013
Project Simulation Performed on: 04/01/2024 1:49 PM
Report Generation Date: 04/02/2024 11:39 AM

Input File Name: WQ Flows-update-Longview.fld
Project Name: Mint Vally
Analysis Title: Runoff to Low Point Systems
Comments: Determine WQ flow

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-6 WQ DESIGN RATE – REQ'D FILTERS

Precipitation Station Data Selected

Full Period of Record Available used for Routing

Climatic Region Number: 15
Precipitation Station : 454769 Longview 10/01/1954-10/01/2009
Evaporation Station : 456803 Puyallup
At Site 25-Year, 24-Hour Precipitation (inches): 4.21
Gage 25-Year, 24-Hour Precipitation (inches) : 4.21
Precipitation Scale Factor : 1.000

Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	0.670	0.380
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	0.670	0.380

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : South Filter ----------

	-------Area (Acres) --------
ROADS/FLAT	0.670
Subbasin Total	0.670

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : North Filter ----------

	-------Area (Acres) --------
C, Lawn, Flat	0.013
ROADS/FLAT	0.367
Subbasin Total	0.380

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 1

Link Name: Result for S Filter
Link Type: Copy
Downstream Link: None

********** LINK DATA **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 1

Link Name: Result for N filter
Link Type: Copy
Downstream Link: None

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 1

********** Link: Result for S Filter ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.300
5-Year	0.412
10-Year	0.457
25-Year	0.638
50-Year	0.932
100-Year	**
200-Year	**
500-Year	**

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 1

********** Link: Result for N filter ********** Link Outflow 1 Frequency Stats

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-6 WQ DESIGN RATE – REQ'D FILTERS

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.166
5-Year	0.228
10-Year	0.255
25-Year	0.353
50-Year	0.521
100-Year	**
200-Year	**
500-Year	**

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: South Filter	0.000
Link: Result for S Filter	0.000
Total:	0.000

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: North Filter	0.400
Link: Result for N filter	0.000
Total:	0.400

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 55)
Predeveloped: 0.000 ac-ft/year, Post Developed: 0.007 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 1

********** Link: Result for S Filter **********

2-Year Discharge Rate : 0.300 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.12 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.06 cfs (0.065 on WQ Data program direct calc.)

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-6 WQ DESIGN RATE – REQ'D FILTERS

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 108.10
Inflow Volume Including PPT-Evap (ac-ft): 108.10
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 108.10
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

----------SCENARIO: POSTDEVELOPED

Number of Links: 1

********** Link: Result for N filter **********

2-Year Discharge Rate : 0.166 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.06 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.04 cfs (0.038 on WQ Data program direct calc.)

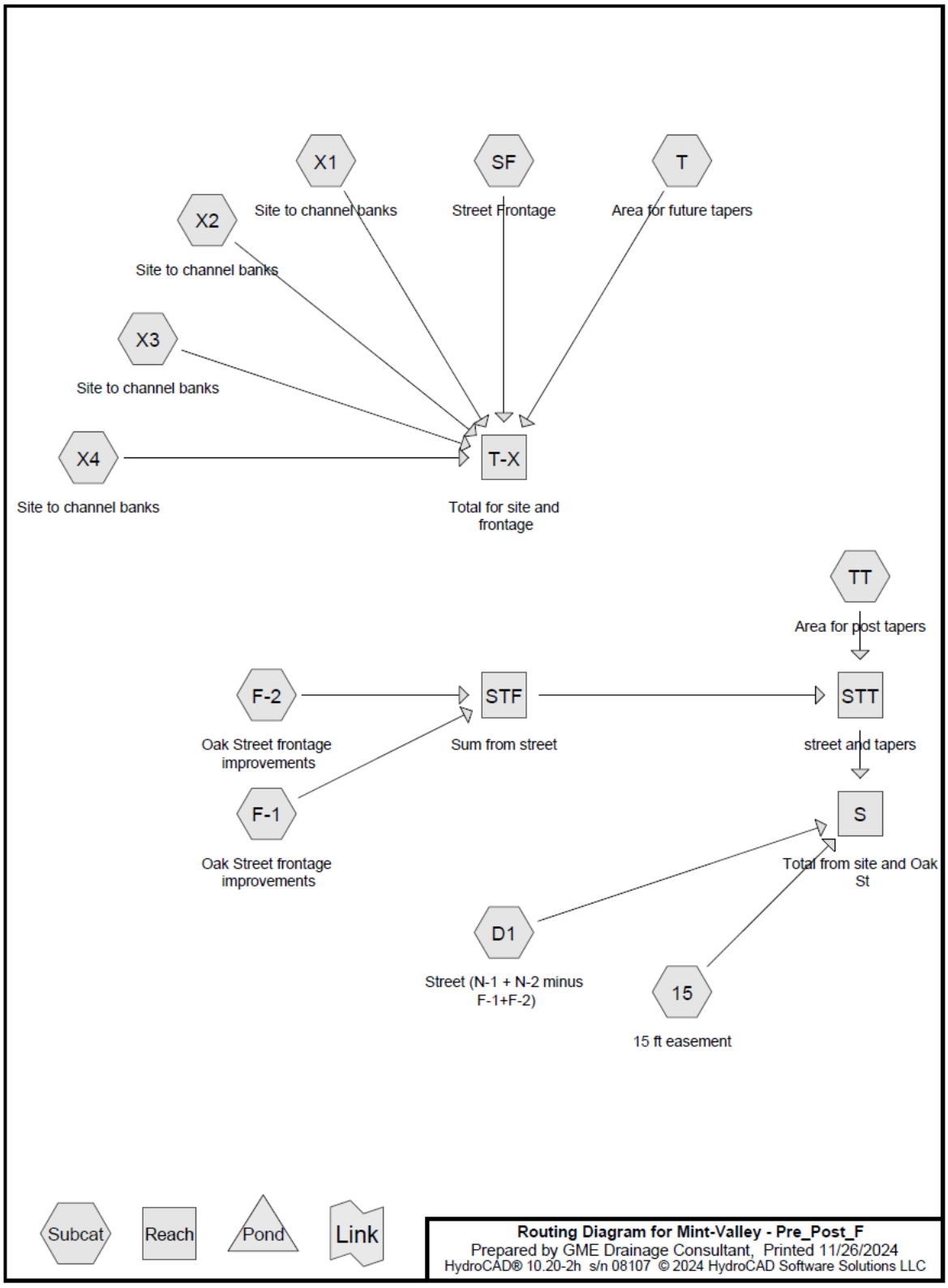
Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 60.43
Inflow Volume Including PPT-Evap (ac-ft): 60.43
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 60.43
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

*************Compliance Point Results ***************

This section removed – not a compliance point analysis – for WQ results only

page 6 was a blank page so deleted

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-7 COMPARE PRE/POST RUNOFF VOLUMES



Summary for Subcatchment 15: 15 ft easement

Runoff = 1.08 cfs @ 8.01 hrs, Volume= 0.438 af, Depth= 5.64"
Routed to Reach S : Total from site and Oak St

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (ac)	CN	Description
*	0.747	98	gravel
*	0.184	85	lawn
	0.931	95	Weighted Average
	0.184	85	19.76% Pervious Area
	0.747	98	80.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, assume**

Summary for Subcatchment D1: Street (N-1 + N-2 minus F-1+F-2)

Runoff = 1.26 cfs @ 8.00 hrs, Volume= 0.478 af, Depth= 5.93"
Routed to Reach S : Total from site and Oak St

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (ac)	CN	Description
*	0.966	98	Street
	0.966	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					**Direct Entry, assume**

Summary for Subcatchment F-1: Oak Street frontage improvements

Runoff = 0.07 cfs @ 8.00 hrs, Volume= 0.026 af, Depth= 5.76"
Routed to Reach STF : Sum from street

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	1,729	98	Street improvements (area to half street0
*	373	98	New sidewalk
*	271	85	Landscaping
	2,373	97	Weighted Average
	271	85	11.42% Pervious Area
	2,102	98	88.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					**Direct Entry, assume**

Summary for Subcatchment F-2: Oak Street frontage improvements

Runoff = 0.10 cfs @ 8.00 hrs, Volume= 0.036 af, Depth= 5.81"
Routed to Reach STF : Sum from street

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	2,594	98	Street improvements (area to half street0
*	386	98	New sidewalk
*	277	85	Landscaping
	3,257	97	Weighted Average
	277	85	8.50% Pervious Area
	2,980	98	91.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					**Direct Entry, assume**

Summary for Subcatchment SF: Street Frontage

Runoff = 0.10 cfs @ 8.16 hrs, Volume= 0.063 af, Depth= 5.58"
Routed to Reach T-X : Total for site and frontage

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	4,504	98	Impervious
*	1,432	85	Pervious
	5,936	95	Weighted Average
	1,432	85	24.12% Pervious Area
	4,504	98	75.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
63.7	300	0.0050	0.08		**Sheet Flow, Account for travrl time to discharge** Grass: Dense n= 0.240 P2= 2.82"

Summary for Subcatchment T: Area for future tapers

Runoff = 0.01 cfs @ 7.99 hrs, Volume= 0.003 af, Depth= 4.46"
Routed to Reach T-X : Total for site and frontage

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	230	85	Pervious
*	174	85	Pervious
	404	85	Weighted Average
	404	85	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, assume**

Summary for Subcatchment TT: Area for post tapers

Runoff = 0.01 cfs @ 7.98 hrs, Volume= 0.005 af, Depth= 5.93"
Routed to Reach STT : street and tapers

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	230	98	Impervious
*	174	98	Impervious
	404	98	Weighted Average
	404	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, assume**

Summary for Subcatchment X1: Site to channel banks

Runoff = 0.43 cfs @ 8.07 hrs, Volume= 0.215 af, Depth= 4.60"
Routed to Reach T-X : Total for site and frontage

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	22,025	85	Field
*	905	98	Impervious
*	915	98	Impervious
*	517	98	Impervious
	24,362	86	Weighted Average
	22,025	85	90.41% Pervious Area
	2,337	98	9.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.5	113	0.0025	0.05		**Sheet Flow, VERY FLAT** Grass: Dense n= 0.240 P2= 2.82"

Summary for Subcatchment X2: Site to channel banks

Runoff = 2.24 cfs @ 7.91 hrs, Volume= 0.720 af, Depth= 4.46"
Routed to Reach T-X : Total for site and frontage

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	50,768	85	Field
*	33,582	85	Field
	84,350	85	Weighted Average
	84,350	85	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	40	0.1000	0.17		**Sheet Flow, VERY FLAT** Grass: Dense n= 0.240 P2= 2.82"

Summary for Subcatchment X3: Site to channel banks

Runoff = 1.00 cfs @ 8.41 hrs, Volume= 0.805 af, Depth= 4.53"
Routed to Reach T-X : Total for site and frontage

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	88,614	85	Field
*	1,233	98	impervious
*	23	98	impervious
*	348	98	impervious
*	45	98	impervious
*	224	98	impervious
*	1,580	98	impervious
*	650	98	impervious
*	162	98	impervious
	92,879	86	Weighted Average
	88,614	85	95.41% Pervious Area
	4,265	98	4.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
84.1	300	0.0025	0.06		**Sheet Flow, VERY FLAT** Grass: Dense n= 0.240 P2= 2.82"
23.8	143		0.10		**Direct Entry, Continue flat**
107.9	443	Total			

Summary for Subcatchment X4: Site to channel banks

Runoff = 1.41 cfs @ 8.97 hrs, Volume= 1.395 af, Depth= 4.46"
Routed to Reach T-X : Total for site and frontage

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-yr-county Rainfall=6.17"

	Area (sf)	CN	Description
*	163,393	85	Field
	163,393	85	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
84.1	300	0.0025	0.06		**Sheet Flow, VERY FLAT** Grass: Dense n= 0.240 P2= 2.82"
77.7	466		0.10		**Direct Entry, Continue flat**
161.8	766	Total			

Summary for Reach S: Total from site and Oak St

Inflow Area = 2.036 ac, 90.34% Impervious, Inflow Depth = 5.79" for 100-yr-county event
Inflow = 2.51 cfs @ 8.00 hrs, Volume= 0.982 af
Outflow = 2.51 cfs @ 8.00 hrs, Volume= 0.982 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node PC

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach STF: Sum from street

Inflow Area = 0.129 ac, 90.27% Impervious, Inflow Depth = 5.79" for 100-yr-county event
Inflow = 0.16 cfs @ 8.00 hrs, Volume= 0.062 af
Outflow = 0.16 cfs @ 8.00 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min
Routed to Reach STT : street and tapers

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach STT: street and tapers

Inflow Area = 0.139 ac, 90.92% Impervious, Inflow Depth = 5.80" for 100-yr-county event
Inflow = 0.18 cfs @ 7.99 hrs, Volume= 0.067 af
Outflow = 0.18 cfs @ 7.99 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S : Total from site and Oak St

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach T-X: Total for site and frontage

Inflow Area = 8.524 ac, 2.99% Impervious, Inflow Depth = 4.51" for 100-yr-county event
Inflow = 4.84 cfs @ 7.99 hrs, Volume= 3.202 af
Outflow = 4.84 cfs @ 7.99 hrs, Volume= 3.202 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node EC

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

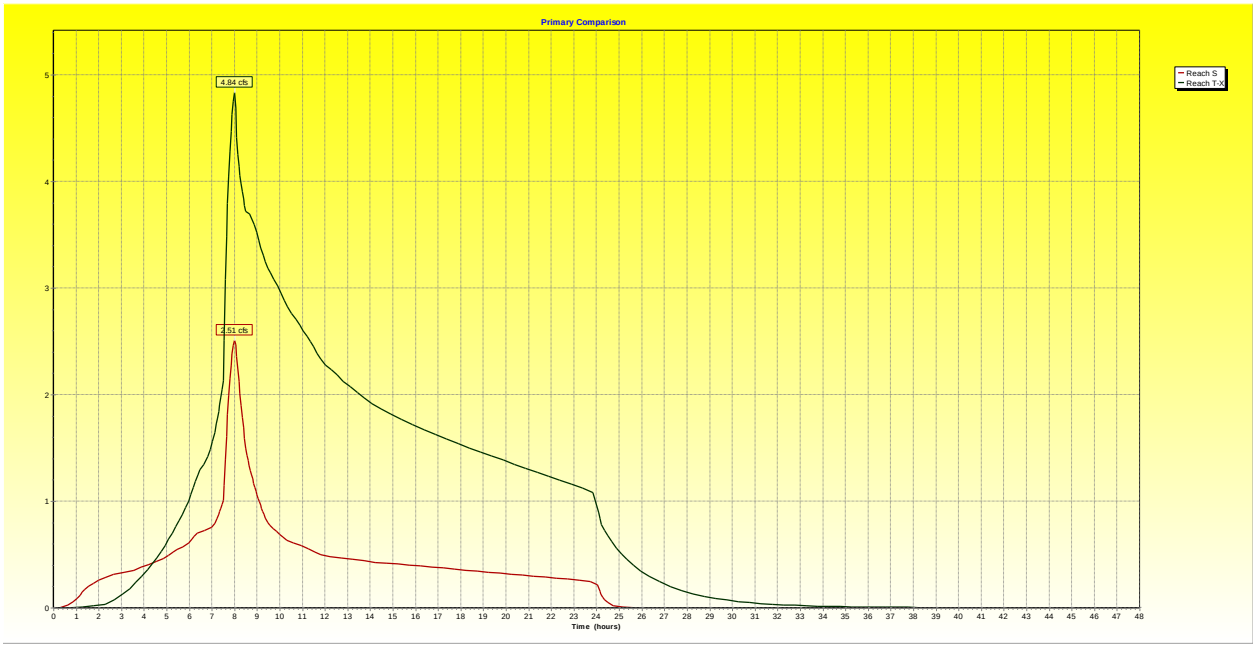
APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-7 COMPARE PRE/POST RUNOFF VOLUMES

Events for Reach T-X: Total for site and frontage

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-yr - county	1.11	1.11	**0.000**	**0**
10-yr - B to B county	3.57	3.57	0.000	0
10-yr - county	2.11	2.11	0.000	0
25-yr-county	2.90	2.90	0.000	0
100-yr-county	**4.84**	**4.84**	0.000	0
WQ	0.36	0.36	0.000	0

Events for Reach S: Total from site and Oak St

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-yr - county	0.97	0.97	**0.000**	**0**
10-yr - B to B county	1.49	1.49	0.000	0
10-yr - county	1.42	1.42	0.000	0
25-yr-county	1.75	1.75	0.000	0
100-yr-county	**2.51**	**2.51**	0.000	0
WQ	0.57	0.57	0.000	0



APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-7 COMPARE PRE/POST RUNOFF VOLUMES
RUNOFF VOLUME SUMMARIES

SUBCAT ID	25-yr Peak Rate (cfs)	25-yr Runoff Volume (ac-ft)	100-yr Peak Rate (cfs)	100-yr Runoff Volume (ac-ft)
T-X (Pre)	2.90	2.011	4.84	3.202
S (Post)	1.75	0.679	2.51	0.982
		66.2% reduction		69.3% reduction

Compare with Continuous Modeling Analysis

MGSFlood Analysis Results

----------SCENARIO: PREDEVELOPED

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 798.72
Inflow Volume Including PPT-Evap (ac-ft): 798.72
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 798.72
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

********** Link: Discharge PO **********

Note: This analysis routes the roof areas, drives areas, and gravel areas into the infiltration systems* on each lot.

*** The amount of runoff infiltrated for the 55-yr span is estimated to be from drives, roofs, and gravel = 1,045 ac-ft.**

----------SCENARIO: POSTDEVELOPED

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 288.31
Inflow Volume Including PPT-Evap (ac-ft): 288.31
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 288.31
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

About 63.9% volume reduction

APPENDIX C HYDROLOGY/HYDRAULICS
MINT VALLEY
C-7 COMPARE PRE/POST RUNOFF VOLUMES

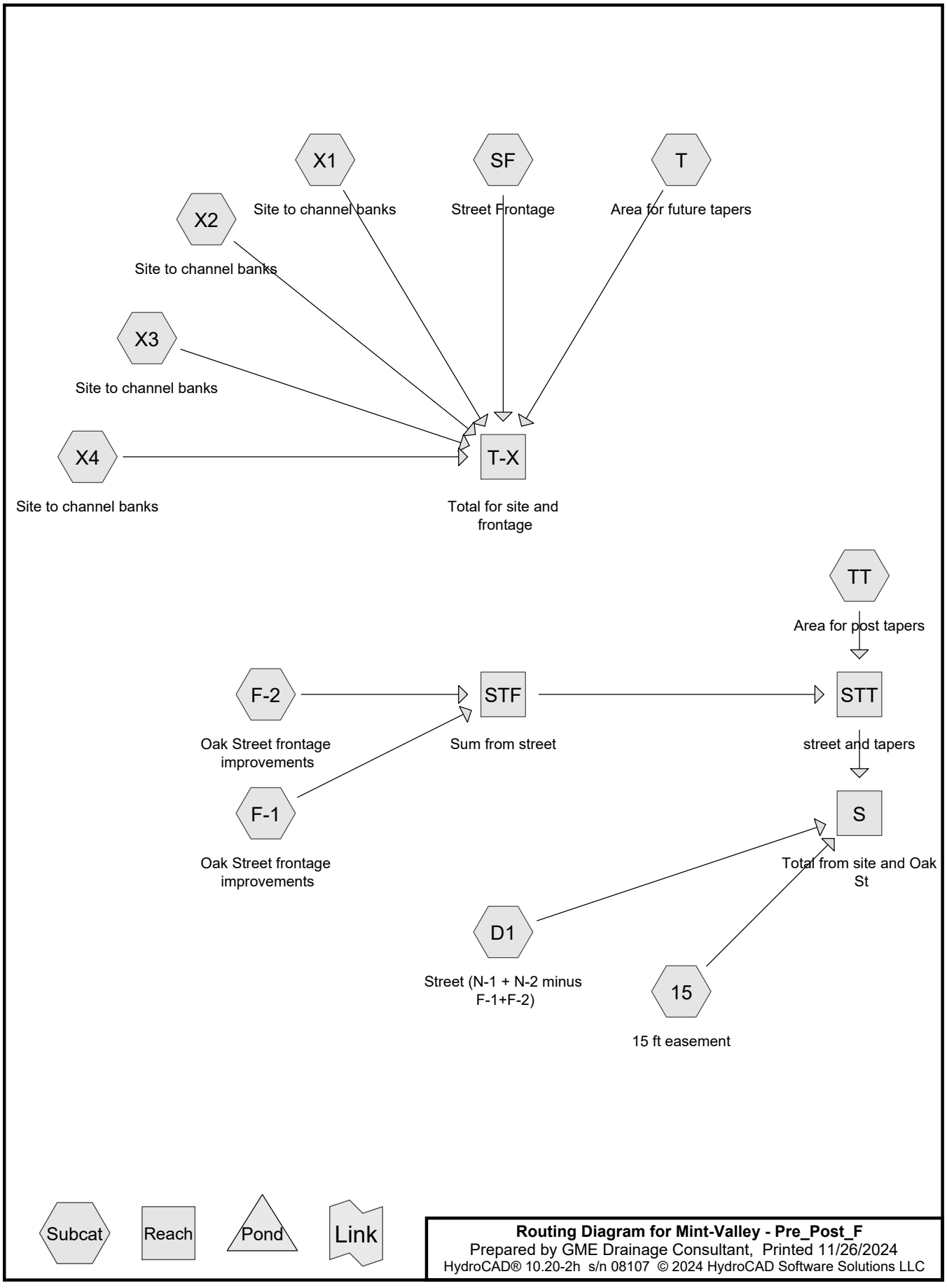
*************Compliance Point Results ***************

Scenario Predeveloped Compliance Link: Discharge X1 thru X4
Scenario Postdeveloped Compliance Link: Discharge PO

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.148	2-Year	0.803
5-Year	2.341	5-Year	1.110
10-Year	2.615	10-Year	1.247
25-Year	4.239	25-Year	1.704
50-Year	7.773	50-Year	2.497
100-Year	**	100-Year	**
200-Year	**	200-Year	**
500-Year	**	500-Year	**

** Record too Short to Compute Peak Discharge for These Recurrence Intervals


X1
Site to channel banks
SF
Street Frontage
T
Area for future tapers
X2
Site to channel banks
X3
Site to channel banks
X4
Site to channel banks
T-X
Total for site and frontage
TT
Area for post tapers
F-2
Oak Street frontage improvements
STF
Sum from street
STT
street and tapers
F-1
Oak Street frontage improvements
S
Total from site and Oak St
D1
Street (N-1 + N-2 minus F-1+F-2)
15
15 ft easement
Subcat
Reach
Pond
Link
Routing Diagram for Mint-Valley - Pre_Post_F
Prepared by GME Drainage Consultant, Printed 11/26/2024
HydroCAD® 10.20-2h s/n 08107 © 2024 HydroCAD Software Solutions LLC

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.58
Program License Number: 201610013
Project Simulation Performed on: 11/21/2024 12:48 PM
Report Generation Date: 11/21/2024 12:48 PM

Input File Name: Mint Valley Pre-Post -Compare.fld
Project Name: Mint Valley-Oak St.
Analysis Title: Assume infiltration at lots and parcels
Comments: Runoff from 15 ft easement and channel bank and streets - include frontage

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Precipitation Station Data Selected

Full Period of Record Available used for Routing

Climatic Region Number: 15
Precipitation Station : 454769 Longview 10/01/1954-10/01/2009
Evaporation Station : 456803 Puyallup
At Site 25-Year, 24-Hour Precipitation (inches): 4.21
Gage 25-Year, 24-Hour Precipitation (inches) : 4.21
Precipitation Scale Factor : 1.000

Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **WATERSHED DEFINITION** **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	8.525	1.984
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	8.525	1.984

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : X1 to X4 ----------

-------Area (Acres) --------
C, Lawn, Flat 8.270
ROADS/FLAT 0.255

Subbasin Total 8.525

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : PO ----------
-------Area (Acres) --------
A/B, Lawn, Flat 0.198
ROADS/FLAT 1.786

Subbasin Total 1.984

********** LINK DATA **********

----------SCENARIO: PREDEVELOPED
Number of Links: 1

Link Name: Discharge X1 thru X4
Link Type: Copy
Downstream Link: None

********** LINK DATA **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 1

Link Name: Discharge PO
Link Type: Copy
Downstream Link: None

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 1

********** Link: Discharge X1 thru X4 ********** Link Outflow 1
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)
Tr (yrs) Flood Peak (cfs)
==========

2-Year	1.148
5-Year	2.341
10-Year	2.615
25-Year	4.239
50-Year	7.773
100-Year	**
200-Year	**
500-Year	**

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 1

********** Link: Discharge PO ********** Link Outflow 1
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.803
5-Year	1.110
10-Year	1.247
25-Year	1.704
50-Year	2.497
100-Year	**
200-Year	**
500-Year	**

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

*************Groundwater Recharge Summary ***************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin: X1 to X4		262.208
Link:	Discharge X1 thru X4	0.000
Total:		262.208

Total Post Developed Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin: PO		24.497
Link:	Discharge PO	0.000
Total:		24.497

Total Predevelopment Recharge is Greater than Post Developed
Average Recharge Per Year, (Number of Years= 55)

Predeveloped: 4.767 ac-ft/year, Post Developed: 0.445 ac-ft/year

*************Water Quality Facility Data ***************

----------SCENARIO: PREDEVELOPED

Number of Links: 1

********** Link: Discharge X1 thru X4 **********

2-Year Discharge Rate : 1.148 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.28 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.16 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 798.72
Inflow Volume Including PPT-Evap (ac-ft): 798.72
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 798.72
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

----------SCENARIO: POSTDEVELOPED

Number of Links: 1

********** Link: Discharge PO **********

2-Year Discharge Rate : 0.803 cfs

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.31 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.17 cfs

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 288.31
Inflow Volume Including PPT-Evap (ac-ft): 288.31
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 288.31
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Link: Discharge X1 thru X4

Scenario Postdeveloped Compliance Link: Discharge PO

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.148	2-Year	0.803
5-Year	2.341	5-Year	1.110
10-Year	2.615	10-Year	1.247
25-Year	4.239	25-Year	1.704
50-Year	7.773	50-Year	2.497
100-Year	**	100-Year	**
200-Year	**	200-Year	**
500-Year	**	500-Year	**

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

****** Flow Duration Performance ******

Excursion at Predeveloped 50%Q2 (Must be Less Than or Equal to 0%):	-48.4%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than or Equal to 0%):	-48.4%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-50.0%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

****** LID Duration Performance ******

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	-62.7%	PASS
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	-44.0%	PASS

MEETS ALL LID DURATION DESIGN CRITERIA: PASS

APPENDIX D

Geotech Report

MINT VALLEY – OAK STREET

D-1 Geotech Report – Infiltration Testing

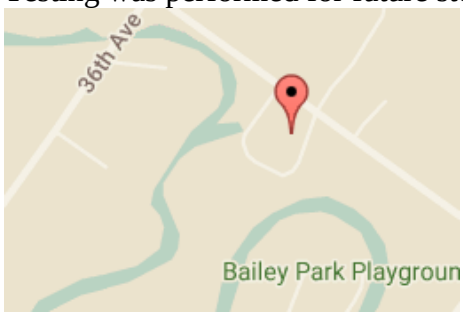
James Kessi PE
Kessi Engineering and Consulting
360-991-9300
james.kessi@gmail.com

22 October 2024

Re: Infiltration testing for 3503 Oak Street, Longview, WA

Dear Mr. Kessi,

Field Investigation:
Rapid Soil Solutions (RSS) has performed a total of four (4) infiltration tests at the above-mentioned site. Figure 1 shows the project site location. RSS found fine-grained Alluvial Deposits, Qal, such as silt. Testing was performed for future storm water design.



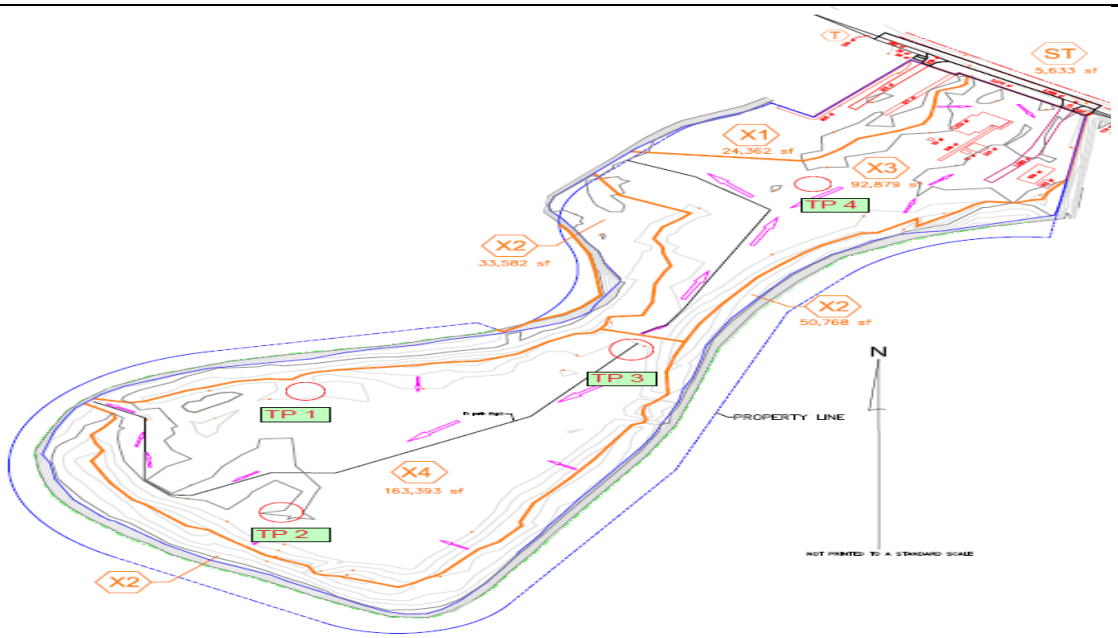
Infiltration Testing and ground water depth
Infiltration testing was performed as per the City of Longview Storm Water Manual 2016. Testing took place in four hand auger borings. The test was run a total of three times. A summary of the results with the testing depths is shown below. Ground water is found around 56in measured near TP #4.

Location	Depth (ft)	Rate (in/hr.)
TP # 1	2	5.875
TP #2	2	6
TP #3	1.5	5
TP #4	1.5	22

The analysis, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of explorations. Any questions regarding this report please contact me at the below number or email.
Sincerely,

Mia Mahedy, PE GE.

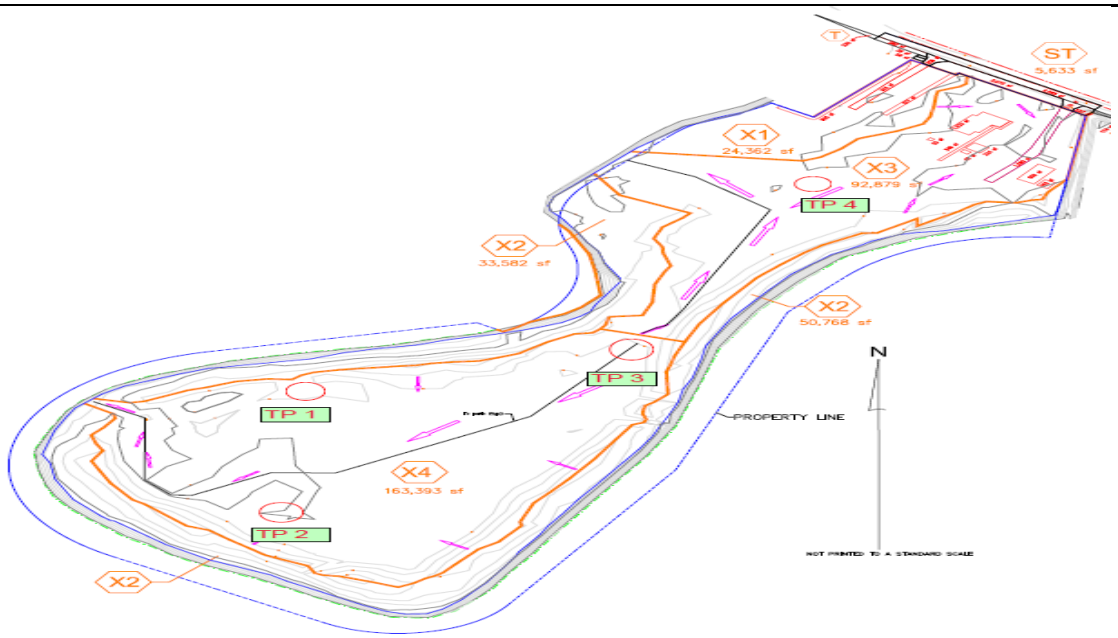
Rapid Soil Solutions Infiltration Test Results



Preliminary Information			
Location:	3503 Oak St, Longview, WA.	**Performed By: (Supervised by Mia Mahedy, PE, GE)**	Rick Sands
Date & Time:	10-18-24	**Instrument Used:**	3 inch hand auger
Weather:	55, showers	**Depth:**	2 ft

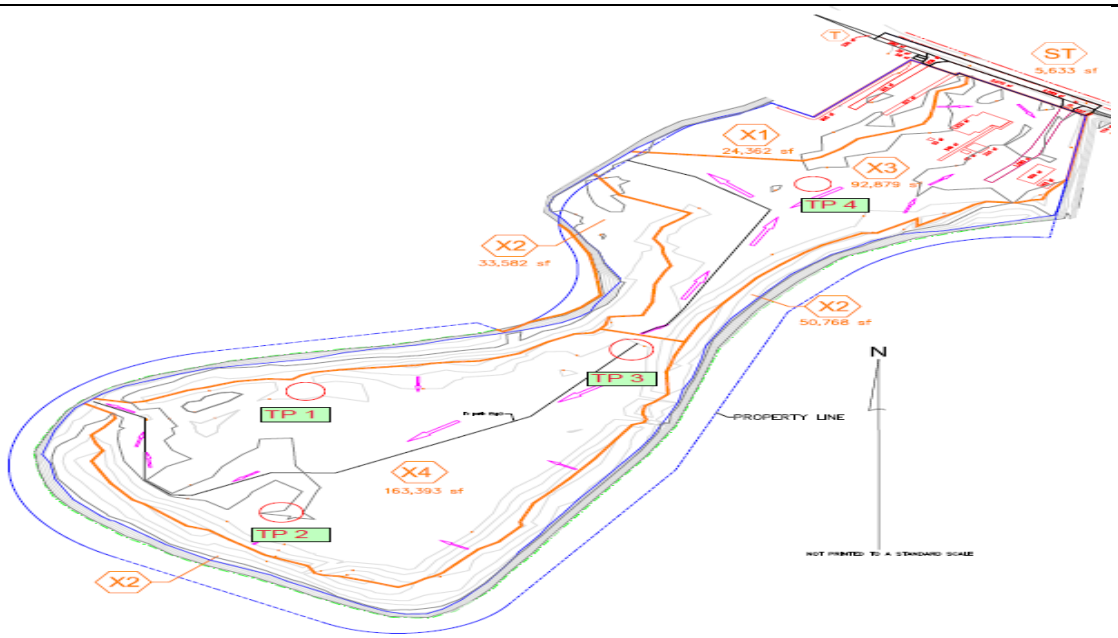
TP 1			
6 inches	Topsoil		
6 inches-2ft	Dry to damp, tan, grey, light orange, clayey silt, medium stiffness		
Time	**Measurement (inches)**	**Level Refilled To (inches)**	**Rate (inches/hour)**
10:15	13 5/8		
10:35	9.5		
10:55	8 3/8		
11:15	7 7/8	13.75	
11:35	9 5/8		
11:55	8 5/8		
12:15	6 5/8	13 1/8	
12:35	9 7/8		
12:55	7 7/8		
1:15	7		
Site Infiltration Rate (inches/hour)			**5.875 in/hr.**

Rapid Soil Solutions Infiltration Test Results



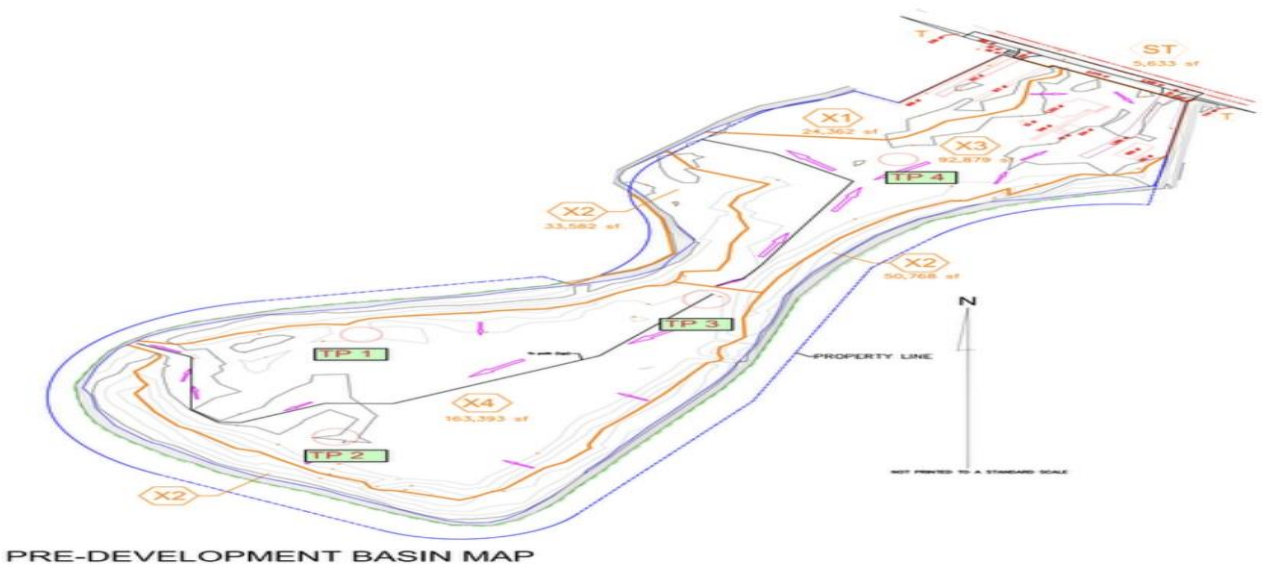
Preliminary Information			
Location:	3503 Oak St, Longview, WA.	**Performed By: (Supervised by Mia Mahedy, PE, GE)**	Rick Sands
Date & Time:	10-18-24	**Instrument Used:**	3 inch hand auger
Weather:	55, showers	**Depth:**	2 ft
TP 2			
6 inches	Topsoil		
6 inches-2ft	Dry to damp, tan, grey, light orange, clayey silt, medium stiffness		
Time	**Measurement (inches)**	**Level Refilled To (inches)**	**Rate (inches/hour)**
10:15	13.25		
10:35	10		
10:55	8.25		
11:15	7	14.25	
11:35	10		
11:55	8.75		
12:15	7 5/8	13	
12:35	9 3/8		
12:55	7.75		
1:15	7		
Site Infiltration Rate (inches/hour)			**6 in/hr.**

Rapid Soil Solutions Infiltration Test Results



Preliminary Information			
Location:	3503 Oak St, Longview, WA.	**Performed By: (Supervised by Mia Mahedy, PE, GE)**	Rick Sands
Date & Time:	10-16-24	**Instrument Used:**	3-inch hand auger
Weather:	62, cloudy	**Depth:**	1.5 ft
TP 3			
12 inches	Topsoil		
12 inches-1.5ft	Dry to damp, tan, grey, light orange, clayey silt, medium stiffness		
Time	**Measurement (inches)**	**Level Refilled To (inches)**	**Rate (inches/hour)**
12:45	13.75		
1:05	8 5/8		
1:25	7.75		
1:45	6.25	15 3/8	
2:05	12.5		
2:25	10.75		
2:45	8 7/8	15 1/8	
3:05	11 7/8		
3:25	11.25		
3:45	10 1/8		
Site Infiltration Rate (inches/hour)			**5 in/hr.**

Rapid Soil Solutions Infiltration Test Results



PRE-DEVELOPMENT BASIN MAP

Preliminary Information			
Location:	3503 Oak St, Longview, WA.	**Performed By: (Supervised by Mia Mahedy, PE, GE)**	Rick Sands
Date & Time:	10-16-24	**Instrument Used:**	3 inch hand auger
Weather:	62, cloudy	**Depth:**	2 ft
TP 4			
6 inches	Topsoil		
6 inches-2ft	Dry to damp, tan, grey, light orange, clayey silt, medium stiffness		
Time	**Measurement (inches)**	**Level Refilled To (inches)**	**Rate (inches/hour)**
12:45	12 3/8		
1:05	1.25		
1:25	0	14.25	
1:45	1.75		
2:05	0	13.25	
2:25	3 7/8		
2:45	0		
Site Infiltration Rate (inches/hour)			**22 in/hr.**

---------- Forwarded message ---------
From: **Mia Mahedy** <mia@rapidsoilsolutions.com>
Date: Fri, Oct 25, 2024 at 10:36 AM
Subject: Re: Oak St Mint Valley Longview Infiltration & Soils Report and invoice 10-22-2024
To: James Kessi <james.kessi@gmail.com>

James, we went back this morning. Water is at 56in. Also it may come up as to 48in the soils were rusty starting at 4ft.

Mint Valley

BINDING SITE PLAN - TYPE B

LOCATED IN THE CITY OF LONGVIEW, WASHINGTON

MHP - MANUFACTURED HOME PARK

CIVIL ENGINEER & APPLICANT:
KESSI ENGINEERING & CONSULTING
JAMES KESSI,PE
6400 NE HWY 99 #G169
VANCOUVER, WA 98665
(360) 991-9300
james.kessi@gmail.com

SURVEYOR:
HAMPSTUR CORP.
PHIL GUSTIN, PLS
1813 BAKER WAY
KELSO, WA 98626
(360) 423-8166
pgust@hampstur.com

OWNER
COLUMBIA VIEW GROUP LLC
6400 NE HIGHWAY 99 STE G169
VANCOUVER, WA 98665
999north@gmail.com
360-448-5633

SITE ADDRESS :
3503 & 3505 OAK STREET
LONGVIEW, WA 98632

SITE LOCATION:
LOCATED ON THE SOUTH SIDE OF OAK STREET APPROXIMATELY 800' NORTHWEST OF THE INTERSECTION WITH 34TH AVENUE LOCATED IN THE NE 1/4 OF SECTION 30, T8N, R2W, W.M. LONGVIEW, WA

PARCEL NUMBERS:
05319: 50,947 SF, 1.16 ACRES
053180300: 401,308 SF, 9.22 ACRES
THIS EX. PARCEL 05139 TO BE BLA'D INTO PARCEL F.
THE EX. 3503 HOUSE TO BE REPLACED, REMOVED OR RELOCATED ONTO THIS BLA PARCEL F (#05319).
TOTAL EXISTING AREA = 452,255 SF = 10.38 ACRES

BLOCK 14
LOT 12
LOT 13
LOT 14
LOT 15
LOT 16
OAK STREET
3503 OAK HOUSE TO REMOVE
LOT 16 BLOCK 15
PARCEL F
CITY OF SEATTLE
CITY OF SEATTLE
EDGE OF WATER
EDGE OF WATER
EDGE OF WATER

GRADING AND EROSION CONTROL NOTES:

1. ALL CONSTRUCTION, MATERIALS, WORKMANSHIP AND METHODS OF CONSTRUCTION SHALL CONFORM TO COWLITZ COUNTY ENGINEERING SERVICES GENERAL REQUIREMENTS AND DETAILS. EROSION CONTROL SHALL BE AS PER THE STANDARD DETAILS CONTAINED THEREIN.

2. ALL EROSION CONTROL METHODS SHALL CONFORM WITH COWLITZ COUNTY STANDARD NOTES AND DETAILS PER DETAILS SHEET.

3. THE CONTRACTOR SHALL MAINTAIN AN ON-SITE WRITTEN DAILY LOG OF EROSION CONTROL MAINTENANCE.

4. ALL EROSION CONTROL AND STORMWATER WORK SHALL CONFORM TO THE APPROVED SWPPP FOR THE SITE.

5. ALL EXPOSED AND UNWORKED SOILS SHALL BE STABILIZED BY THE APPROPRIATE BEST MANAGEMENT PRACTICES (BMPS). SEE EROSION PREVENTION & SEDIMENT CONTROL PLAN'

6. DURING CONSTRUCTION, ALL PROPOSED STORM SYSTEMS SHALL REMAIN OFF-LINE UNTIL THE SITE IS COMPLETELY STABILIZED AND SIDEWALK, PAVING AND OTHER SITE WORK IS COMPLETE AND ACCEPTED.

7. A WHEEL WASH WILL BE REQUIRED IF THE EROSION PROJECT ENGINEER OR CONTROL INSPECTOR DETERMINES IT TO BE NECESSARY TO PROTECT PUBLIC AND ADJACENT PROPERTIES FROM SEDIMENT, MUD AND DEBRIS BEING TRANSPORTED ONTO A ROAD SURFACE.

8. ALL AREAS TO BE GRADED SHALL BE CLEARED OF ALL VEGETATION DURING THE STRIPPING OF THE ORGANIC TOP SOIL LAYER.

9. ALL UNSUITABLE GROUND SUCH AS SOFT ORGANIC CLAY AND SILTS MUST BE REMOVED TO REDUCE EMBANKMENT SETTLEMENT.

10. ANY TREES THAT WILL BE REMOVED SHOULD BE INDIVIDUALLY REMOVED, TAKING CARE TO REMOVE ALL ROOTS. ROOT CAVITIES SHALL BE INDIVIDUALLY BACKFILLED AND COMPACTED PRIOR TO COMMENCEMENT OF FILLING OPERATIONS.

11. STRIPPED SURFACE SOIL SHALL BE STOCKPILED IN DESIGNATED AREAS.

12. FOR COMPACTION OF EARTH EMBANKMENTS, REFER TO THE GEOTECHNICAL REPORT BY PROJECT GEOTECHNICAL ENGINEER.

13. CUT AND FILL SLOPES SHALL NOT BE GREATER THAN 1 UNIT VERTICAL IN 2 UNITS HORIZONTAL (50%). EXCEPT AS PERMITTED BY THE CONSTRUCTION INSPECTOR, NO ROCK OR SIMILAR IRREDUCIBLE MATERIAL WITH A MAXIMUM DIMENSION GREATER THAN 12 INCHES SHALL BE BURIED OR PLACED IN FILLS.

14. BACKFILL FOR UTILITY TRENCHES SHALL BE SELECT NATIVE MATERIAL OR IMPORTED GRANULAR MATERIAL OR CDF WHERE REQUIRED AND AS APPROVED BY THE CONSTRUCTION INSPECTOR. BACKFILL MATERIAL SHALL BE COMPACTED TO 95% MAXIMUM DENSITY.

15. CONTRACTOR TO VERIFY WHICH ON-SITE TREES ARE TO BE REMOVED AND WHICH TREES ARE TO REMAIN WITH DEVELOPER PRIOR TO ANY TREE REMOVAL.

16. ALL LOTS TYPICAL SFR DOWNSPOUT SYSTEM PER DETAILS SHALL BE INSTALLED WITH HOME PRIOR TO OCCUPANCY.

17. CONTRACTOR TO HAVE DESIGNATED TEMPORARY SOILS STRIPPINGS STOCK PILE LOCATIONS ON THE PLAN. SUGGESTED AREAS SHOWN ARE FOR PLANNING PURPOSES, AND CONTRACTOR MAY USE ADDITIONAL AREAS IF NEEDED, PROVIDED THE LOCATIONS ARE PROPERLY STABILIZED AND DO NOT ALLOW SOIL TO LEAVE THE SITE.

18. CONTRACTOR TO VERIFY EXISTING SEPTIC LOCATION PRIOR TO GRADING AND DECOMMISSIONING .

19. SEPTIC SYSTEM TO BE ABANDONED AND DOCUMENTATION FROM CONTRACTOR TO BE PROVIDED TO HEALTH DISTRICT IMMEDIATELY AFTER.

20. EXISTING WELL HOUSE TO BE REMOVED, A COUNTY DEMOLITION PERMIT IS REQUIRED BEFORE REMOVAL.

21. CONTRACTOR TO FLAG AND VERIFY WITH OWNER WHICH TREES ARE TO REMAIN OR BE REMOVED PRIOR TO BEGINNING SITE WORK.

22.CONTRACTOR TO PROTECT ALL OPEN CUT AREAS THAT WILL BE UNWORKED WITH HYDRO-SEED, STRAW, WOOD FIBER MULCH, COMPOST OR EQUIVALENT.

23. ANY STATED CUT AND FILL QUANTITIES ARE APPROXIMATE ONLY. THE CONTRACTOR IS ADVISED TO DETERMINE HIS OWN TAKEOFF & QUANTITIES FOR BIDDING. ACTUAL EARTHWORK EASEMENTS FOR AGRICULTURAL QUANTITIES MAY VARY DEPENDING ON CONTRACTOR'S METHOD OF COMPACTION SHRINKAGE, STRIPPING DEPTHS, & ACCURACY OF THE EARTHWORK TAKEOFF. WHEN SIGNING THE PROJECT CONSTRUCTION CONTRACT, THE CONTRACTOR AGREES THAT HIS COST FOR CONSTRUCTION OF THE GRADING IMPROVEMENTS AND DISPOSAL OF EXCESS MATERIAL (IF NECESSARY), IS INCLUDED & THERE WILL BE NO ADDITIONAL CHARGE FOR THIS ITEM. STRUCTURAL MATERIAL ON THIS SITE IS INTENDED TO APPROXIMATELY BALANCE. GRADING DESIGN IS BASED ON SURVEY INFORMATION AND FINISH DESIGNED ROUGH GRADING ELEVATIONS. ALL EXISTING INCLUSIONS OF NON-STRUCTURAL OR ORGANIC SOILS AND STRIPPINGS SHALL BE OVER-EXCAVATED AS NECESSARY TO COMPETENT MATERIAL.

LEGEND

FF130	FINISH FLOOR ELEVATION
	FINISHED GRAD FLOW ARROW
	SURFACE FLOW DIRECTION
	SILT FENCE
	INLET PROTECTION
	PROPOSED DRAINAGE BASIN

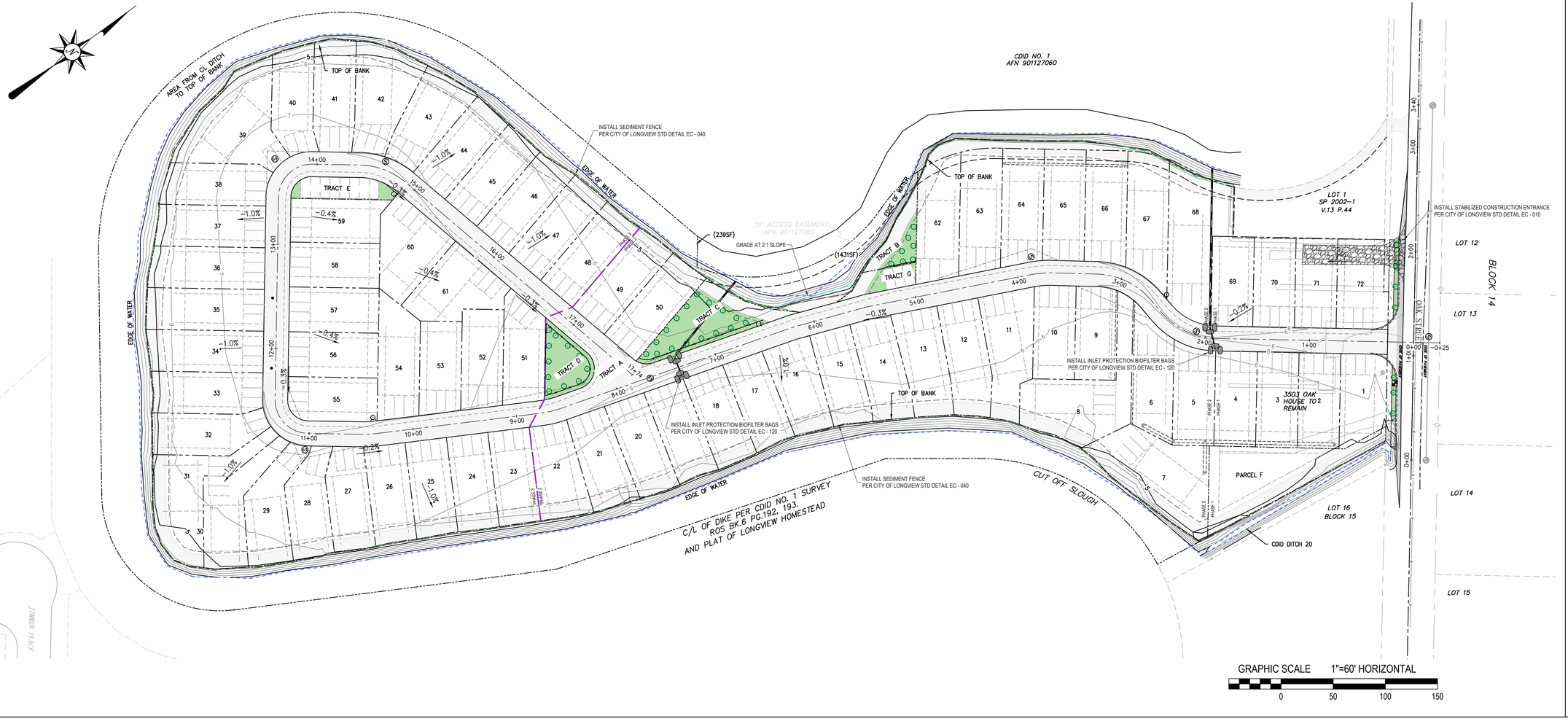
APPROXIMATE EARTHWORK QUANTITIES

CUT 6" STRIPPING OVER SITE: 7315 CY

CUT : 3445 CY
FILL : 10695 CY

CONTRACTOR TO VERIFY THESE AMOUNTS
GRADING AND CUT FILL VOLUMES ARE FROM EXISTING GRADE(EG) TO FINISH GRADE(FG). FINISH GRADE INCLUDES TOP OF SOIL AND TOP OF HARD SURFACES (ASPHALT ROAD, CURBS, SIDEWALKS, AND ANY SLAB ON GRADE FOUNDATIONS)

THE MIN. UNIT FF (FINISHED FLOOR) IS ELEVATION 6.7'.



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DRAWN BY: T.F.
DESIGNED BY: J.K.
CHECKED BY: J.K.

REGISTERED PROFESSIONAL ENGINEER
STATE OF WASHINGTON
R. KESSI
34035
May 13, 2025

PROJECT #155
DATE: 5/13/2025

MINT VALLEY
GRADING AND EROSION CONTROL PLAN

MV 2

GRAPHIC SCALE 1"=50' HORIZONTAL

0 50 100 150

LEGEND - PROPOSED

- PROPOSED RIGHT OF WAY
- PROPOSED BOUNDARY
- PROPOSED BUILDING SETBACK
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY CLEANOUT
- PROPOSED SANITARY MANHOLE
- PROPOSED SANITARY LATERAL
- PROPOSED STORM DRAIN
- PROPOSED STORM MANHOLE
- PROPOSED STORM DRAIN INLET
- PROPOSED WATER LINE
- PROPOSED WATER METER
- PROPOSED FIRE HYDRANT

SANITARY SEWER SERVICE:
CITY OF LONGVIEW

WATER SERVICE:
CITY OF LONGVIEW

ELECTRICAL SERVICE:
COWLITZ PUD

WELLS OR SEPTICS:
NONE KNOWN

WATER - MIN. 8" PRIVATE WATER MAIN
WITH HYDRANTS EVERY 500' MIN.

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STATE OF WASHINGTON R. KESSI 34935 REGISTERED PROFESSIONAL ENGINEER
May 13, 2025

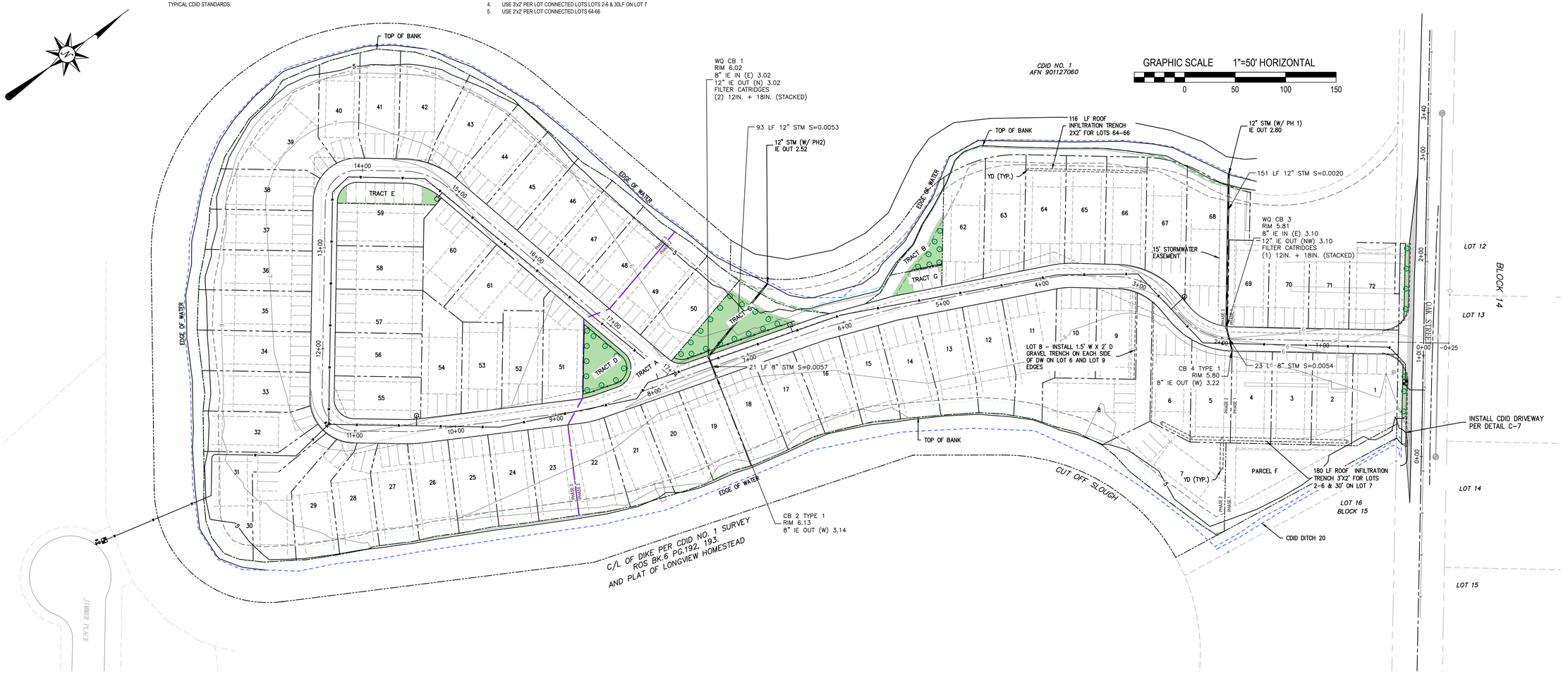
PROJECT #155
DATE: 5/13/2025

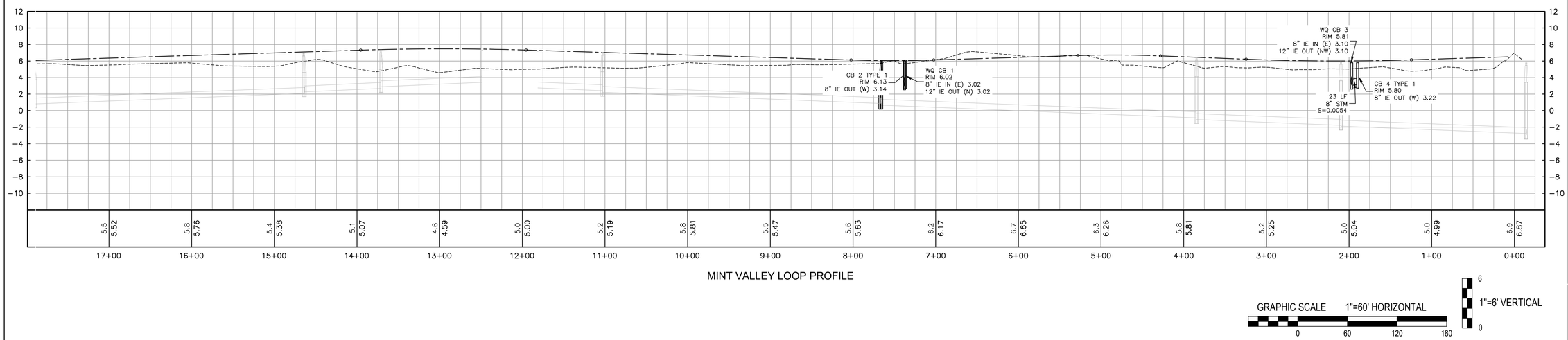
MINT VALLEY
COMPOSITE UTILITY PLAN

MV 3

CDID 12' WIDE MAINTENANCE ROAD NOTE:
THE ROAD TO BE A MINIMUM 6" CRUSHED AGGREGATE WITH LAYER OF GEOTEXTILE BENEATH. ALL SUBBASE SOIL, ADDED STRUCTURAL AGGREGATE AND CONCRETE RUBBLE TO BE STRUCTURALLY COMPACTED AND ALL ORGANIC MATERIALS REMOVED PRIOR TO TOP LIFT INSTALLATION. BANK TO BE STABILIZED WITH CONCRETE RUBBLE AS PER TYPICAL CDID STANDARDS.

ROOF DRAIN INFILTATION NOTE FOR LOTS 2-7 AND 64-66:
1. INSTALL ROOF INFILTRATION TRENCH 2'X2' WITH 6" PER PIPE FOR LOTS AS SHOWN
2. YD- YARD DRAINS AT 6" TO BE PROVIDED AT EACH END AND AT ANGLE POINTS AS TYPICAL
3. EACH PAIR OF THESE LOTS TO CONNECT SHARED MIN 4" ROOF DRAIN PIPE FROM HOUSE TO THE TRENCH
4. USE 3'x2' PER LOT CONNECTED LOTS LOTS 2-6 & 30LF ON LOT 7
5. USE 2'x2' PER LOT CONNECTED LOTS 64-66





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R. KESSI JAMES NEER 34035 REGISTERED PROFESSIONAL ENGINEER STATE OF WASHINGTON
May 13, 2025

PROJECT #155
DATE: 5/13/2025

MINT VALLEY
STORMWATER PLAN AND STREET PROFILE

MV 4

OAK ST PROFILE

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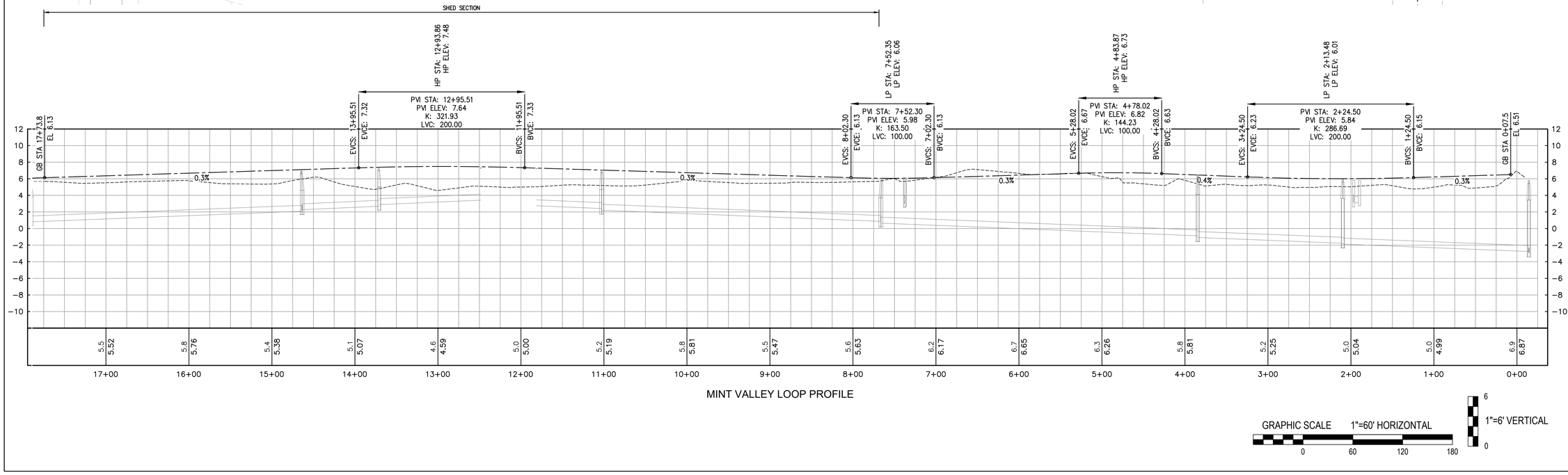
STATE OF WASHINGTON JAMES K. KESSI 34935 REGISTERED PROFESSIONAL ENGINEER

May 13, 2025

PROJECT #155
DATE: 5/13/2025

MINT VALLEY
OAK STREET PLAN & PROFILE

MV 6



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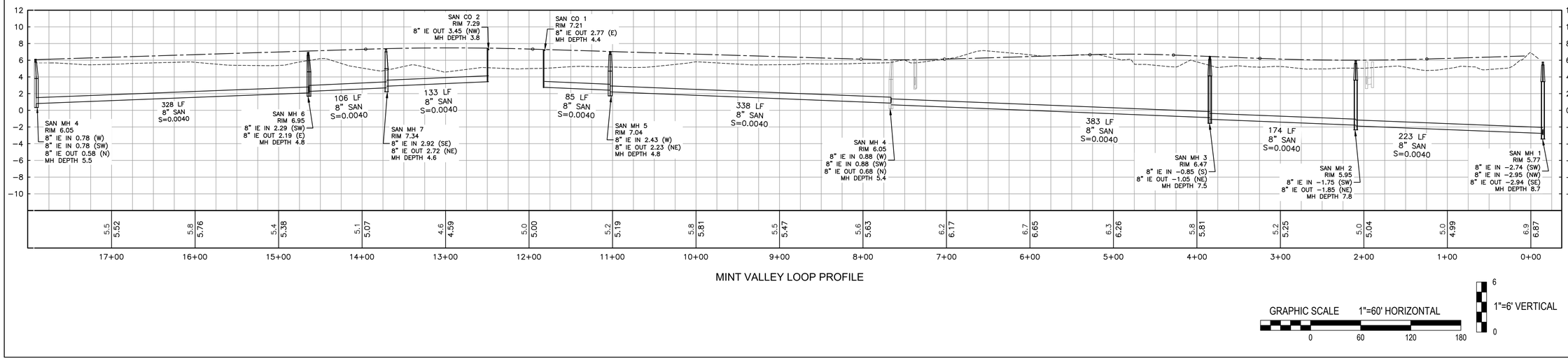
DESIGNED BY: J.K.
CHECKED BY: J.K.

PROJECT #155
DATE: 5/13/2025

MINT VALLEY
MINT VALLEY LOOP - PVT PLAN & PROFILE

MV 7



MINT VALLEY LOOP PROFILE

GRAPHIC SCALE 1"=60' HORIZONTAL
0 60 120 180

1"=6' VERTICAL
6
0

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STATE OF WASHINGTON R. JASON KESSI 34935 REGISTERED PROFESSIONAL ENGINEER
May 13, 2025

PROJECT #155
DATE: 5/13/2025

MINT VALLEY
SANITARY & WATER PLAN

MV 9

PROJECT PHASING

THIS PROJECT WILL BE CONSTRUCTED IN EITHER ONE SINGLE PHASE, TWO PHASES OR UP TO THREE PHASES.
PHASE 1 – THE FIRST 150' OF PRIVATE STREET WITH A TEMPORARY HAMMERHEAD TURNAROUND AT THE END ON ADJACENT FUTURE LOTS 5 & 68.
PHASE 2 – THE NEXT SECTION OF PRIVATE STREET FROM PH 1 UP TO TRACT D INCLUDING A HAMMERHEAD TURNAROUND AT TRACT D.
PHASE 3 – ALL REMAINING LOTS AROUND THE LOOP. EACH PHASE WILL BE DESIGNED TO MEET REQUIRED STANDARDS FOR THAT PHASE. ALTERNATIVELY, THE PHASES 1+2 OR PHASES 1+2+3 MAY BE CONSTRUCTED CONCURRENTLY.

GRAPHIC SCALE 1"=50' HORIZONTAL
0 50 100 150

NOTES

ALL SIGNAGE AND STRIPING SHALL BE IN ACORDANCE WITH MUTCD AND CITY OF LONGVIEW

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R. KESSI — STATE OF WASHINGTON — 34835 — REGISTERED PROFESSIONAL ENGINEER
May 13, 2025

PROJECT #155
DATE: 5/13/2025

MINT VALLEY
SIGNAGE AND STRIPING PLAN

MV 11

GENERAL NOTES FOR EROSION AND SEDIMENT CONTROL - PAGE 1

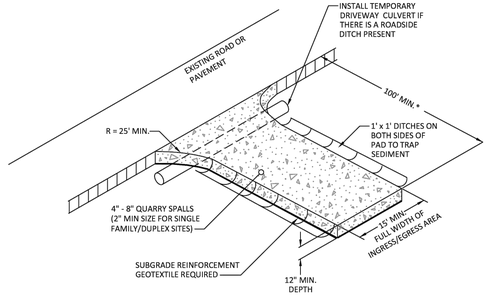
1. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE SITED, DESIGNED, CONSTRUCTED, AND MAINTAINED IN ACCORDANCE WITH THE MOST RECENT CITY OF LONGVIEW STANDARD PLANS AND SPECIFICATIONS, AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON STATE.
2. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN PLACE AND IN WORKING CONDITION PRIOR TO ANY LAND DISTURBING ACTIVITY, INCLUDING BUT NOT LIMITED TO CLEARING, GRADING, FILLING, EXCAVATION, OR ANY CHANGE IN THE EXISTING SOIL COVER (BOTH VEGETATIVE AND NON-VEGETATIVE). EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AND APPROVED BY THE CITY PRIOR TO COMMENCEMENT OF WORK. ADDITIONAL MEASURES MAY BE REQUIRED IF THE APPROVED MEASURES ARE INSUFFICIENT AS CONSTRUCTION PROGRESSES AND/OR SEASONAL CONDITIONS DICTATE.
3. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REGULARLY INSPECTED AND MAINTAINED TO ENSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION THROUGHOUT THE DURATION OF THE PROJECT. INSPECTIONS SHALL OCCUR DAILY ON ACTIVE SITES, ONCE PER WEEK ON INACTIVE SITES, AND WITHIN 24 HOURS FOLLOWING A 0.5 INCH RAIN EVENT. THE CONTRACTOR SHALL MAINTAIN A LOG OF EROSION AND SEDIMENT CONTROL MEASURE INSPECTIONS AND MAINTENANCE. THE CONTRACTOR SHALL PROVIDE A 24 HOUR CONTACT NUMBER FOR EMERGENCY MAINTENANCE AND REPAIR OF SITE MEASURES.
4. PRIOR TO ANY LAND DISTURBING ACTIVITIES, CLEARING AND WORK AREA LIMITS SHALL BE CLEARLY DELINEATED AND MARKED. ALL SENSITIVE AND CRITICAL AREAS (WETLANDS, STEEP SLOPES, WATERWAYS, TREES TO BE PRESERVED, ETC.) AND THEIR BUFFERS SHALL BE CLEARLY DELINEATED AND MARKED, AND PROTECTED WITH APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES.
5. PRIOR TO ANY LAND DISTURBING ACTIVITIES, STORM DRAIN INLETS WITHIN OR DOWNSLOPE OF THE PROJECT AREA SHALL BE PROTECTED. INLET PROTECTION SHALL BE CLEANED OR REPLACED AS NEEDED TO MAINTAIN DRAIN AND ENSURE CONTINUED PERFORMANCE. ALL INLET PROJECTION SHALL BE REMOVED PROMPTLY FOLLOWING COMPLETION OF THE PROJECT.
6. PRIOR TO ANY LAND DISTURBING ACTIVITIES, CONSTRUCTION ACCESS SHALL BE ESTABLISHED PER STANDARD PLAN EC-010 ALONG WITH OTHER EROSION AND SEDIMENT CONTROL MEASURES NECESSARY TO MINIMIZE TRACKING OF SEDIMENT ONTO PUBLIC STREETS AND ROADWAYS.
7. TO THE MAXIMUM EXTEND PRACTICABLE, MINIMIZE THE DISTURBANCE OF NATURAL VEGETATION, SOILS, AND SLOPES.
8. ALL RECENTLY UNWORKED DISTURBED AND EXPOSED SOILS SHALL BE STABILIZED BY THE APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES.
9. STOCKPILES SHALL BE STABILIZED BY IMPLEMENTING APPROPRIATE EROSION AND PERIMETER SEDIMENT CONTROL MEASURES, AND SHALL BE LOCATED AWAY FROM STORM DRAIN INLETS, DRAINAGE DITCHES, AND WATERWAYS.
10. SEDIMENT OR DEBRIS SHALL NOT BE ALLOWED TO ENTER NEWLY INSTALLED OR EXISTING STORMWATER INLETS, CATCH BASINS, PIPES, DRAINAGE DITCHES, OR PERMANENT STORMWATER MANAGEMENT FACILITIES THAT ARE ON-SITE OR ADJACENT TO THE PROJECT. IF THIS OCCURS, THE CONTRACTOR SHALL REMOVE ALL ACCUMULATED SEDIMENT AND MAKE APPROPRIATE REPAIRS.

The City of Longview Washington	EROSION CONTROL GENERAL NOTES - PAGE 1 OF 2	
	STANDARD PLAN: **EC - 000**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

GENERAL NOTES FOR EROSION AND SEDIMENT CONTROL - PAGE 2

11. ANY SOIL, SEDIMENT, OR DEBRIS TRANSPORTED ONTO ROADWAYS, SIDEWALKS, OR ANY PUBLIC RIGHT-OF-WAY SHALL BE REMOVED IMMEDIATELY BY SHOVELING AND/OR SWEEPING. WASHING SHALL NOT BE UTILIZED UNLESS SPECIFICALLY APPROVED IN WRITING BY THE CITY.
12. STRAW MULCH USED FOR TEMPORARY EROSION CONTROL SHALL BE CERTIFIED AS WEED FREE UNLESS APPROVED BY THE CITY IN WRITING. SEED MIX USED IN THE PUBLIC RIGHT-OF-WAY SHALL ALSO BE PRE-APPROVED BY THE CITY IN WRITING PRIOR TO USE.
13. DEWATERING PLANS NEED TO BE SUBMITTED TO THE CITY FOR REVIEW AND APPROVAL A MINIMUM OF ONE WEEK PRIOR TO PLANNED USE. DEWATERING DISCHARGE SHALL HAVE AN APPROVED POINT OF DISCHARGE OR MEANS OF PROPER DISPOSAL.
14. DURING DRY WEATHER CONSTRUCTION PERIODS, THE CONTRACTOR SHALL IMPLEMENT DUST CONTROL MEASURES WHICH SHALL BE MAINTAINED UNTIL ALL DISTURBED AREAS ARE STABILIZED.
15. DISTURBED AREAS THAT WILL NOT BE BROUGHT TO FINAL GRADE OR GIVEN A PERMANENT COVER TREATMENT WITHIN 30 DAYS OF THE EXPOSURE SHALL HAVE AN APPROVED TEMPORARY SEEDING MIXTURE APPLIED AT A MINIMUM OF 180 LBS/ACRE OR APPLY MULCH PLACED TO STABILIZED AND REDUCE EROSION.
16. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER SITE STABILIZATION IS ACHIEVED OR AFTER MEASURES ARE NO LONGER NEEDED.
17. CONSTRUCTION SHALL NOT BE CONSIDERED COMPLETE AND ACCEPTABLE UNTIL ALL DISTURBED AREAS HAVE BEEN PERMANENTLY STABILIZED. FOLLOWING STABILIZATION AND PRIOR TO COMPLETION AND/OR OCCUPANCY, THE PERMANENT STORMWATER DRAINAGE SYSTEM SHALL BE CLEANED WITH A VACTOR SYSTEM (WITH NO DISCHARGE TO THE MUNICIPAL SYSTEM) OR OTHER METHOD AS APPROVED BY THE CITY.

The City of Longview Washington	EROSION CONTROL GENERAL NOTES - PAGE 2 OF 2	
	STANDARD PLAN: **EC - 001**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

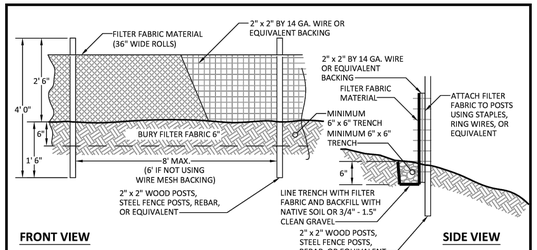


NOTES:

1. INSTALL WOVEN GEOTEXTILE FABRIC TO PREVENT SUB-SOIL PUMPING.
2. THE CITY INSPECTOR MAY REQUIRE THE ENTRANCE TO BE PAVED TO THE EDGE OF THE RIGHT-OF-WAY PRIOR TO THE INSTALLATION OF THE CONSTRUCTION ENTRANCE TO AVOID DAMAGE TO THE EXISTING ROADWAY.
3. TOP DRESS THE PAD WITH CLEAN 3" ROCK WHEN THE CONSTRUCTION ENTRANCE BECOMES CLOGGED WITH SEDIMENT.
4. ANY SEDIMENT TRACKED FROM THE SITE ONTO THE STREET SHALL BE CLEANED IMMEDIATELY. PRESSURE WASHING NOT ALLOWED. SWEEPING IS THE PREFERRED METHOD.
5. REFER TO BMP C105 IN VOLUME II OF THE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON FOR MORE INFORMATION.

* 50' MINIMUM PAD LENGTH FOR SITES WITH LESS THAN 1 ACRE OF LAND DISTURBANCE. A 20' MINIMUM PAD LENGTH AND 8" MINIMUM PAD DEPTH MAY BE ACCEPTABLE AS APPROVED FOR SINGLE FAMILY & DUPLEX RESIDENCES.

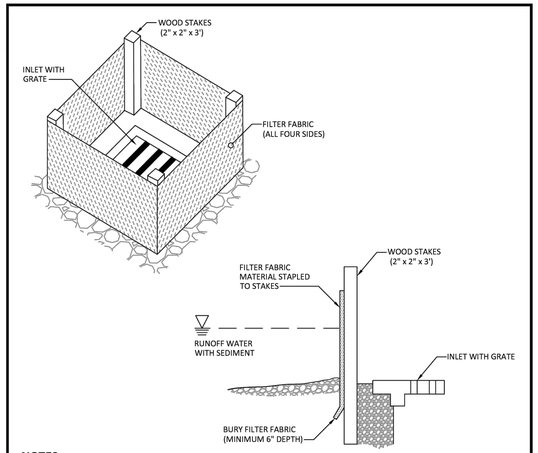
The City of Longview Washington	STABILIZED CONSTRUCTION ENTRANCE	
	STANDARD PLAN: **EC - 010**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



NOTES:

1. SEDIMENT FENCE SHALL BE INSTALLED TO FOLLOW CONTOURS WHERE FEASIBLE.
2. FENCE POSTS SHALL BE SPACED A MAXIMUM OF 8 FEET APART (6 FEET IF NOT USING WIRE SUPPORT BACKING) AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 18 INCHES.
3. PREPARE A 6" x 6" TRENCH ON THE UPHILL SIDE OF THE POSTS FOR STAPLED FENCING AND ON THE DOWNHILL SIDE OF THE POSTS FOR FENCING WITH STITCHED LOOP.
4. LINE TRENCH WITH FILTER FABRIC AND BACKFILL WITH NATIVE SOIL OR 3/4" TO 1.5" CLEAN GRAVEL AND COMPACT SO THAT THE FILTER FABRIC LIES 6" VERTICALLY BELOW FINISHED GRADE.
5. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A 2" x 2" BY 14 GA WIRE SUPPORT BACKING (OR EQUIVALENT) SHALL BE USED. WHEN EXTRA-STRENGTH FILTER FABRIC AND CLOSER POST SPACING ARE USED, THE WIRE BACKING MAY BE ELIMINATED.
6. FASTEN FILTER FABRIC AND BACKING SECURELY TO THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 1 INCH LONG, RING WIRES OR EQUIVALENT. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
7. WHEN JOINTS ARE NECESSARY, FILTER FABRIC SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6-INCH OVERLAP, AND BOTH ENDS SECURELY FASTENED TO THE POST.
8. SEDIMENT FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. SEDIMENT DEPOSITS MUST BE REMOVED WHEN THEY REACH APPROXIMATELY ONE-HALF THE HEIGHT OF THE FENCE. DAMAGED FENCE SHALL BE REMOVED AND REPLACED PROMPTLY
9. SEDIMENT FENCES SHALL ONLY BE REMOVED WHEN THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
10. REFER TO BMP C233 IN VOLUME II OF THE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON FOR MORE INFORMATION

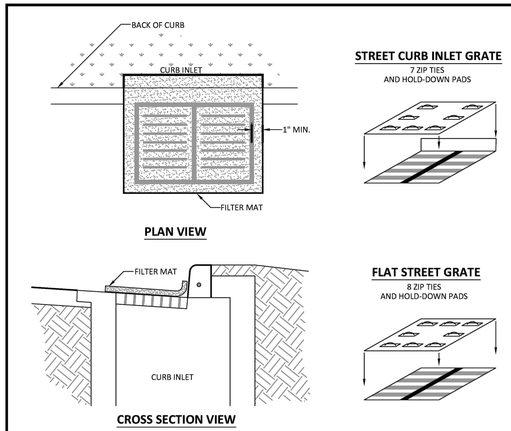
The City of Longview Washington	SEDIMENT FENCE	
	STANDARD PLAN: **EC - 040**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



NOTES:

1. FOR USE ON DROP INLETS LOCATED IN UNSTABILIZED AREAS.
2. ATTACH FILTER FABRIC TO WOOD STAKES LOCATED AT FOUR CORNERS SURROUNDING INLET.
3. BURY FILTER FABRIC TO MINIMUM 6 INCH DEPTH.
4. INSPECT ONCE PER WEEK AND WITHIN 24 HOURS FOLLOWING A 0.5 INCH RAIN EVENT.
5. REMOVE SEDIMENT FROM BEHIND BARRIERS, AS NEEDED AND AFTER EACH SIGNIFICANT RAIN EVENT.
6. REPAIR OR REPLACE MATERIALS AS NEEDED TO ENSURE PROPER FUNCTION.

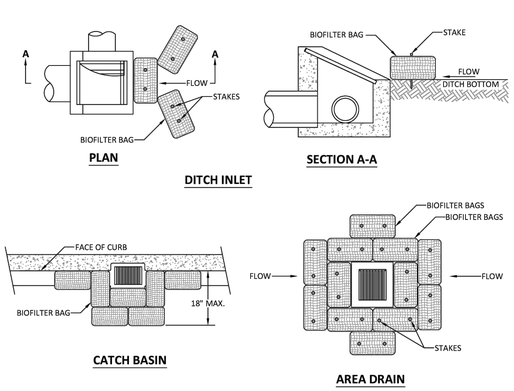
The City of Longview Washington	FILTER FABRIC INLET BARRIER	
	STANDARD PLAN: **EC - 090**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



NOTES:

1. FOR USE ON DROP INLETS AND CURB INLETS IN PAVED AREAS.
2. POSITION FILTER MAT ON INLET GRATE WITH MINIMUM 1 INCH OVERLAP ON EACH SIDE.
3. ATTACH WITH CABLE TIES. USE A MINIMUM OF 7 TIES FOR CURB INLET GRATES AND 8 FOR FLAT INLET GRATE.
4. INSPECT ONCE PER WEEK AND WITHIN 24 HOURS FOLLOWING A 0.5 INCH RAIN EVENT.
5. REMOVE DEBRIS AND SEDIMENT BUILDUP FROM BEHIND AND TOP OF MAT.
6. REPLACE WITH NEW FILTER MAT AS NEEDED TO ENSURE PROPER FUNCTION.

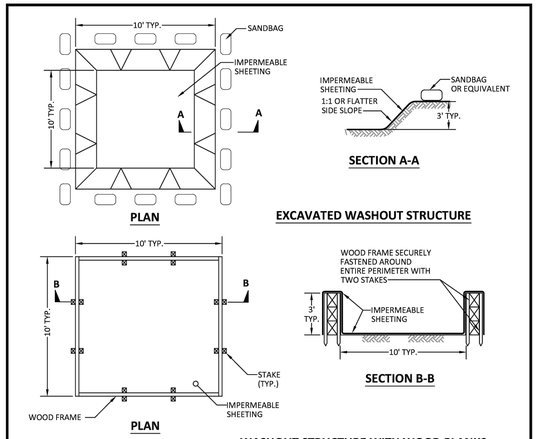
The City of Longview Washington	INLET PROTECTION FILTER MAT	
	STANDARD PLAN: **EC - 095**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



NOTES:

1. FOR USE ON DROP INLETS IN BOTH UNSTABILIZED AND PAVED AREAS.
2. NOT ALLOWED IN THE PUBLIC RIGHT OF WAY OR IN AREAS WITH MOVING TRAFFIC.
3. OVERLAP ALL BAG JOINTS 6 INCHES.
4. USE 2 STAKES PER BAG. BAGS ON PAVEMENT SHALL BE SECURED BY ALTERNATE MEANS TO PREVENT MOVEMENT DURING RAIN EVENTS.
5. INSPECT ONCE PER WEEK AND WITHIN 24 HOURS FOLLOWING A 0.5 INCH RAIN EVENT.
6. REMOVE DEBRIS AND SEDIMENT BUILDUP FROM BEHIND BAGS.
7. REPLACE WITH NEW BAGS AS NEEDED TO ENSURE PROPER FUNCTION.

The City of Longview Washington	INLET PROTECTION BIOFILTER BAGS	
	STANDARD PLAN: **EC - 120**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



NOTES:

1. LOCATE CONCRETE WASHOUT STRUCTURE A MINIMUM OF 50 FEET AWAY FROM STORM DRAIN INLETS, STORMWATER CONVEYANCES, DITCHES AND WATERCOURSES AND WETLANDS.
2. PROVIDE A SIGN IDENTIFYING THE CONCRETE WASHOUT IN CLOSE PROXIMITY TO THE FACILITY.
3. USE PLASTIC OR OTHER IMPERMEABLE SHEETING FOR EASE OF MAINTENANCE. REPLACE SHEETING IF DAMAGED.
4. EMPTY OR REPLACE A STRUCTURE THAT IS 75% FULL AND DISPOSE OF MATERIAL APPROPRIATELY.
5. REFER TO BMP C154 IN VOLUME II OF THE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON FOR MORE INFORMATION.

The City of Longview Washington	CONCRETE WASHOUT	
	STANDARD PLAN: **EC - 200**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

KESSI ENGINEERING
PLANNING CIVIL ENGINEERING CONSULTING PROJECT MANAGEMENT
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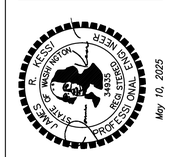
(360)991-9300 Email:info@kessiconsulting.com
www.kessiconsulting.com
KESSI ENGINEERING & CONSULTING

REVISIONS
1 2 3 4 5

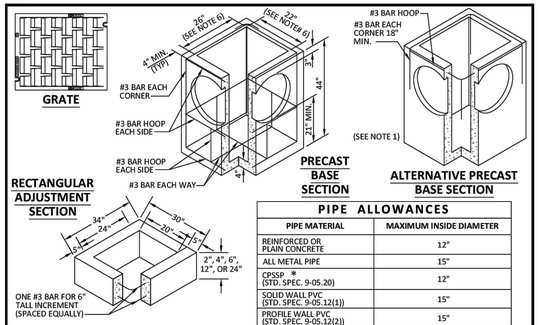
DRAWN BY: T.F.
DESIGNED BY: J.K.
CHECKED BY: J.K.



PROJECT #155
DATE: 5/10/2025

MINT VALLEY
GRADING AND EROSION CONTROL DETAILS

MV D1



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

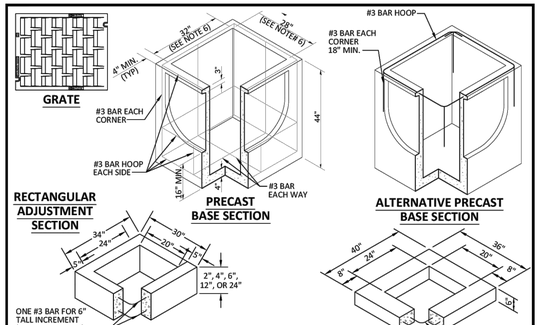
* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES:

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

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

CATCH BASIN TYPE 1



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

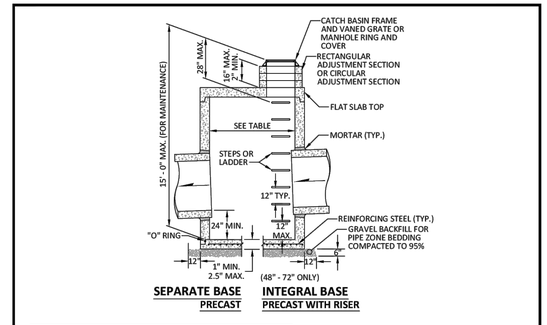
* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES:

1. AS ACCEPTABLE ALTERNATIVES TO THE REBAR SHOWN IN THE **PRECAST BASE SECTION**, FIBERS (PLACED ACCORDING TO THE STANDARD SPECIFICATIONS), OR WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT SHALL BE USED WITH THE MINIMUM REQUIRED REBAR SHOWN IN THE **ALTERNATIVE PRECAST BASE SECTION**. WIRE MESH SHALL NOT BE PLACED IN THE KNOCKOUTS.
2. THE KNOCKOUT DIAMETER SHALL NOT BE GREATER THAN 20". KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM TO 2.5" MAXIMUM. PROVIDE A 1.5" MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH **STANDARD SPECIFICATION 9-04.3.**
3. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE LOWEST PIPE INVERT SHALL BE 5'.
4. THE FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE DOWN, OR INTEGRALLY CAST INTO THE ADJUSTMENT SECTION WITH FLANGE UP.
5. THE PRECAST BASE SECTION MAY HAVE A ROUNDED FLOOR, AND THE WALLS MAY BE SLOPED AT A RATE OF 1:24 OR STEEPER.
6. THE OPENING SHALL BE MEASURED AT THE TOP OF THE PRECAST BASE SECTION.
7. ALL PICKUP HOLES SHALL BE GROUTED FULL AFTER THE BASIN HAS BEEN PLACED.
8. POURED IN PLACE CATCH BASINS MAY BE APPROVED. (SUBMIT SHOP DRAWING)
9. USE COMBINATION INLET WHERE CURBS ARE PRESENT UNLESS OTHERWISE APPROVED.

The City of Longview Washington	STANDARD PLAN: SD - 020	CITY ENGINEER APPROVAL: Samuel B. Barham
	DATE: JUNE 2024	DRAWN BY: Camryn LaChaine

CATCH BASIN TYPE 1L



CATCH BASIN DIMENSIONS				
CATCH BASIN DIAMETER	MIN. WALL THICKNESS	MIN. BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS
48"	4"	6"	36"	8"
54"	4.5"	8"	42"	8"
60"	5"	8"	48"	8"
72"	6"	8"	60"	12"
84"	8"	12"	72"	12"
96"	8"	12"	84"	12"
120"	10"	12"	96"	12"
144"	12"	12"	108"	12"

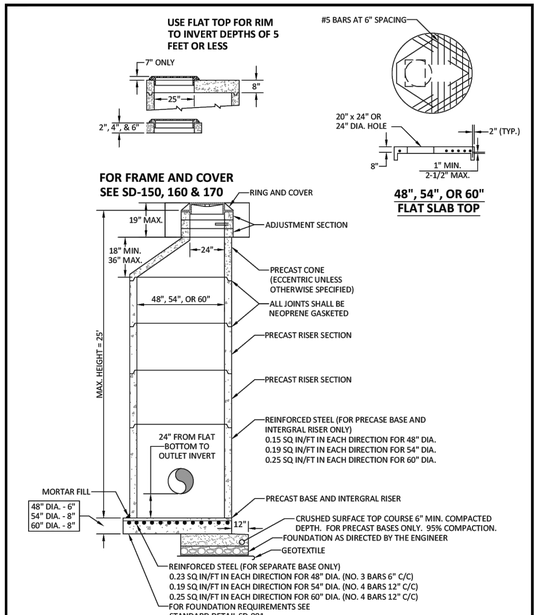
PIPE ALLOWANCES					
CATCH BASIN DIAMETER	PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER				
	CONCRETE	ALL METAL	① CPSSP	②③ SOLID WALL PVC	②③ PROFILE WALL PVC
48"	24"	30"	24"	30"	30"
54"	30"	36"	30"	36"	36"
60"	36"	42"	36"	42"	42"
72"	42"	54"	42"	48"	48"
84"	54"	60"	54"	48"	48"
96"	60"	72"	60"	48"	48"
120"	66"	84"	60"	48"	48"
144"	78"	96"	60"	48"	48"

NOTES:

1. NO STEPS ARE REQUIRED WHEN HEIGHT IS 4' OR LESS.
2. THE BOTTOM OF THE PRECAST CATCH BASIN MAY BE SLOPED TO FACILITATE CLEANING.
3. THE RECTANGULAR FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE UP OR DOWN. THE FRAME MAY BE CAST INTO THE ADJUSTMENT SECTION.
4. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM TO 2.5" MAXIMUM. PROVIDE A 1.5" MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH STANDARD SPECIFICATION 9-04.3.
5. ALL RISERS OR ADJUSTMENT SECTIONS SHALL BE THE SAME INSIDE DIMENSION AS THE BASE.

The City of Longview Washington	STANDARD PLAN: SD - 040	CITY ENGINEER APPROVAL: Samuel B. Barham
	DATE: JUNE 2024	DRAWN BY: Camryn LaChaine

CATCH BASIN TYPE 2

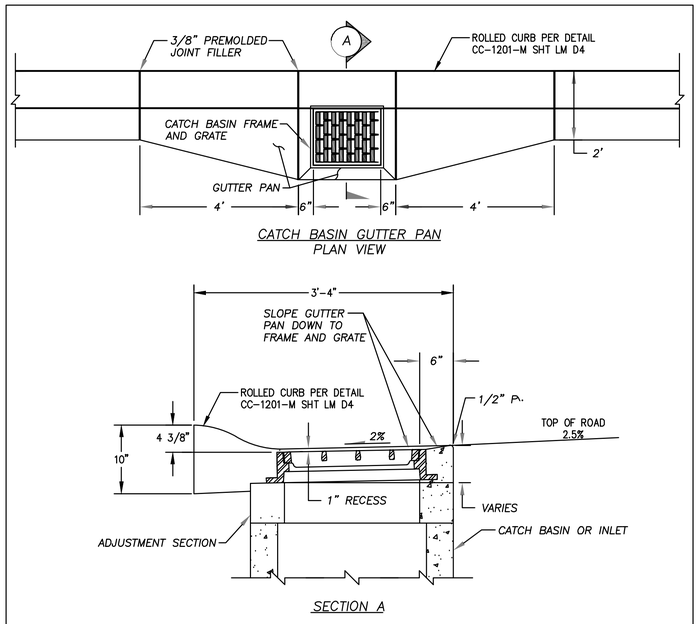


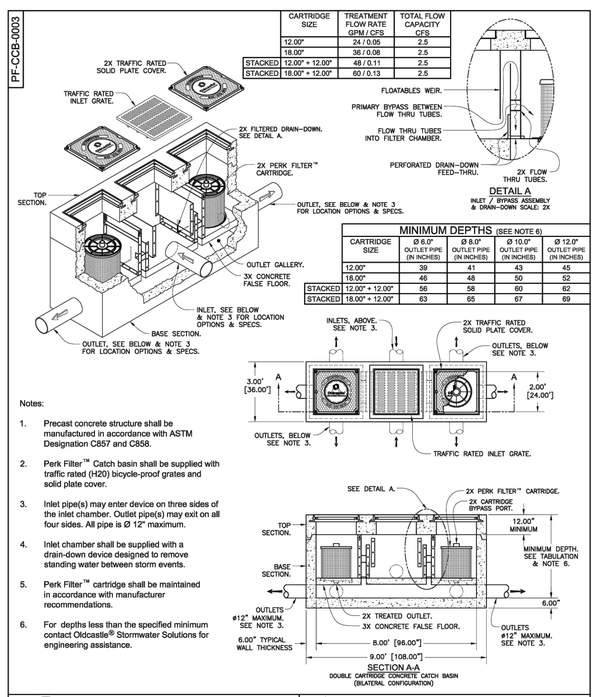
SECTION VIEW

SEE NEXT PAGE (SD-131) FOR MANHOLE DIMENSION TABLE AND GENERAL NOTES

The City of Longview Washington	STANDARD PLAN: SD - 130	CITY ENGINEER APPROVAL: Samuel B. Barham
	DATE: JUNE 2024	DRAWN BY: Camryn LaChaine

STORM DRAIN MANHOLE





Notes:

1. Precast concrete structure shall be manufactured in accordance with ASTM Designation C857 and C858.
2. Perk Filter™ Catch basin shall be supplied with traffic rated (H20) bicycle-proof grates and solid plate cover.
3. Inlet pipe(s) may enter device on three sides of the inlet chamber. Outlet pipe(s) may exit on all four sides. All pipe is Ø 12" maximum.
4. Inlet chamber shall be supplied with a drain-down device designed to remove standing water between storm events.
5. Perk Filter™ cartridge shall be maintained in accordance with manufacturer recommendations.
6. For depths less than the specified minimum contact Oldcastle® Stormwater Solutions for engineering assistance.

Perk Filter™
Concrete Catch Basin
Double Cartridge
(Bilateral Configuration)

Media Filtration

Oldcastle® Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

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DRAWING NO.	REV.	ECO	DATE	SHEET
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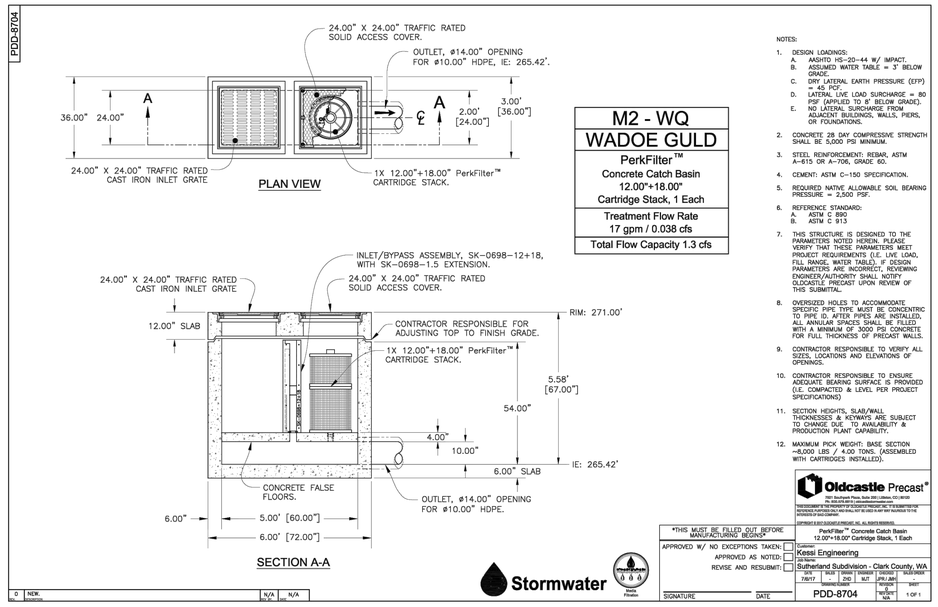

M2 - WQ
WADOE GULD
PerkFilter™ Concrete Catch Basin 12.00"+18.00" Cartridge Stack, 1 Each
Treatment Flow Rate 17 gpm / 0.038 cfs
Total Flow Capacity 1.3 cfs

NOTES:

1. DESIGN LOADINGS:
   A. AASHTO HS-20-44 W/ IMPACT.
   B. ASSUMED WATER TABLE = 3' BELOW GRADE.
   C. DRY LATERAL EARTH PRESSURE (EFP) = 45 PCF.
   D. LATERAL LIVE LOAD SURCHARGE = 80 PSF (APPLIED TO 8' BELOW GRADE).
   E. NO LATERAL SURCHARGE FROM ADJACENT BUILDINGS, WALLS, PIERS, OR FOUNDATIONS.
2. CONCRETE 28 DAY COMPRESSIVE STRENGTH SHALL BE 5,000 PSI MINIMUM.
3. STEEL REINFORCEMENT: REBAR, ASTM A-615 OR A-706, GRADE 60.
4. CEMENT: ASTM C-150 SPECIFICATION.
5. REQUIRED NATIVE ALLOWABLE SOIL BEARING PRESSURE = 2,500 PSF.
6. REFERENCE STANDARD:
   A. ASTM C 890
   B. ASTM C 913
7. THIS STRUCTURE IS DESIGNED TO THE PARAMETERS NOTED HEREON. PLEASE VERIFY THAT THESE PARAMETERS MEET PROJECT REQUIREMENTS (I.E. LIVE LOAD, FILL RANGE, WATER TABLE). IF DESIGN PARAMETERS ARE INCORRECT, REVIEWING ENGINEER/AUTHORITY SHALL NOTIFY OLDCASTLE PRECAST UPON REVIEW OF THIS SUBMITTAL.
8. OVERSIZED HOLES TO ACCOMMODATE SPECIFIC PIPE TYPE MUST BE CONCENTRIC TO PIPE ID. AFTER PIPES ARE INSTALLED, ALL ANNULAR SPACES SHALL BE FILLED WITH A MINIMUM OF 3000 PSI CONCRETE FOR FULL THICKNESS OF PRECAST WALLS.
9. CONTRACTOR RESPONSIBLE TO VERIFY ALL SIZES, LOCATIONS AND ELEVATIONS OF OPENINGS.
10. CONTRACTOR RESPONSIBLE TO ENSURE ADEQUATE BEARING SURFACE IS PROVIDED (I.E. COMPACTED & LEVEL PER PROJECT SPECIFICATIONS)
11. SECTION HEIGHTS, SLAB/WALL THICKNESSES & KEYWAYS ARE SUBJECT TO CHANGE DUE TO AVAILABILITY & PRODUCTION PLANT CAPABILITY.
12. MAXIMUM PICK WEIGHT: BASE SECTION =8,000 LBS / 4.00 TONS. (ASSEMBLED WITH CARTRIDGES INSTALLED).

Oldcastle Precast®
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120
Ph: 800.579.8819 | oldcastleprecast.com
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THIS MUST BE FILLED OUT BEFORE MANUFACTURING BEGINS	PerkFilter™ Concrete Catch Basin 12.00"+18.00" Cartridge Stack, 1 Each
APPROVED W/ NO EXCEPTIONS TAKEN: ☐	Customer: Kessi Engineering
APPROVED AS NOTED: ☐	Job Number: Sutherland Subdivision - Clark County, WA
REVISE AND RESUBMIT: ☐	
SIGNATURE / DATE	DRAWING NO. PDD-8704

DATE	SCALE	DRAWN	CHECKED	DESIGN	SALES ORDER
7/5/17	-	ZHD	MJT	JPR / APH	-
REVISION				REVISION	SHEET
N/A				N/A	1 OF 1

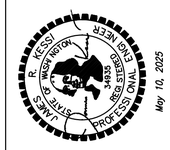
Stormwater

Media Filtration

KESSI ENGINEERING
CONSULTING
PLANNING PROJECT MANAGEMENT
CIVIL ENGINEERING
6400 NE HWY 99 #G-169 VANCOUVER, WA 98665
(360)991-9300 Email:info@kessiconsulting.com
www.kessiconsulting.com
KESSI ENGINEERING & CONSULTING

REVISIONS

	1	2	3	4	5
DRAWN BY:	T.F.				
DESIGNED BY:	J.K.				
CHECKED BY:	J.K.				



May 10, 2025

PROJECT #155

DATE: 5/10/2025

MINT VALLEY
STORM DETAILS

MV D3

SANITARY SEWER CONSTRUCTION NOTES

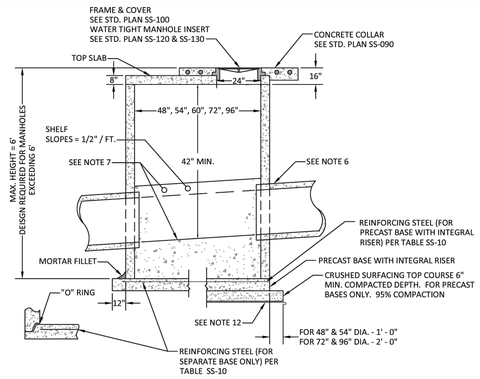
1. ALL PUBLIC SANITARY SEWER SYSTEMS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION AND THE CITY OF LONGVIEW STANDARD PLANS AND SPECIFICATIONS.
2. ALL PUBLIC SANITARY SEWER SYSTEM CONSTRUCTION IS SUBJECT TO INSPECTION AND APPROVAL BY THE CITY DEPARTMENT OF PUBLIC WORKS AND UTILITY OPERATIONS. THE CONTRACTOR SHALL NOTIFY THE CITY A MINIMUM OF TWO FULL WORKING DAYS PRIOR TO THE START OF ANY CONSTRUCTION.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO THE START OF CONSTRUCTION/EXCAVATION AND SHALL NOTIFY THE ENGINEER OF ANY POTENTIAL CONFLICTS. THE CONTRACTOR IS REQUIRED TO CONTACT THE NORTHWEST UTILITY NOTIFICATION CENTER A MINIMUM OF TWO FULL BUSINESS DAYS PRIOR TO THE START OF CONSTRUCTION AND/OR ANY EXCAVATION AT 811 OR WWW.CALLBEFOREYOUDIG.ORG.
4. TRACER WIRE SHALL BE INSTALLED WITH ALL NON-CONDUCTIVE PIPES IN ONE CONTINUOUS STRAND. TRACER WIRE SHALL BE MINIMUM #12 AWG SOFT DRAWN COPPER WIRE. UTILITY LOCATE TEST OF TRACER WIRE IS REQUIRED. THE INSULATION COLOR SHALL BE GREEN AND ITS MATERIAL SHALL BE A MINIMUM 30 MIL COMPOSED OF HIGH DENSITY POLYETHYLENE (HDPE) OR HIGH MOLECULAR WEIGHT POLYETHYLENE (HMWPE). SECURE THE WIRE ON THE PIPE WITH TAPE EVERY 8-10 FEET AS NEEDED TO KEEP THE WIRE STRAIGHT AND ON TOP OF THE PIPE. INSTALL A GREEN WARNING TAPE 12-18 INCHES ABOVE THE PIPE IN THE SAME ORIENTATION TO THE INSTALLED PIPE. SEE SS-260 FOR LOCATOR BOX DETAIL AND REQUIREMENTS.
5. THE EXISTING SANITARY SEWER SYSTEM SHALL STAY ISOLATED FROM THE NEW SYSTEM VIA MECHANICAL PLUG UNTIL THE NEW SYSTEM IS CLEANED, TESTED, VIDEO INSPECTED AND APPROVED FOR USE.
6. SANITARY SEWER PIPE SHALL BE CLEANED BY USE OF HIGH PRESSURE NOZZLE AND VACUUM TRUCK PRIOR TO VIDEO INSPECTION OF TESTING. VIDEO INSPECTION SHALL BE PERFORMED IN AN OPERATIONAL AND SEQUENTIAL ORDER AS APPROVED BY THE CITY ENGINEER PER WSDOT SPECIFICATION 7-17.3(2)H. ALL VIDEO WORK SHALL BE COMPLETED WITH NO PIECEMEAL OR SKIPPING AROUND THE SYSTEM. VIDEO RECORDINGS SHALL BE SUBMITTED BY ELECTRONIC MEDIA APPROVED AND ACCEPTED BY THE CITY. THERE SHALL BE NO DEBRIS IN THE LINES OR FURTHER CLEANING WILL BE REQUIRED PRIOR TO ACCEPTANCE.
7. ALL SANITARY SEWER PIPE SHALL BE TESTED FOR DEFLECTION. SANITARY SEWER CONSTRUCTED OF FLEXIBLE PIPE (E.G. THERMOPLASTIC PIPE) SHALL BE TESTED IN ACCORDANCE WITH 7-17.3(2)G OF THE STANDARD SPECIFICATIONS.
8. BELLIES SHALL NOT EXCEED 0.03 FEET ACCORDING TO WSDOT STANDARDS.
9. ALL SANITARY SEWER PIPE WHICH CROSSES WATER PIPE SHALL BE IN ACCORDANCE WITH STANDARD PLANS W-290, W-295, OR W-300 AS APPLICABLE TO THE SITUATION AND APPROVED BY THE ENGINEER.

The City of Longview Washington	SANITARY SEWER GENERAL NOTES	
	STANDARD PLAN: **SS - 000**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

NOTES:

1. PRECAST MAHOLES SHALL MEET THE REQUIREMENTS OF ASTM C478. JOINTS SHALL BE NEOPRENE OR RUBBER GASKETED CONFORMING TO ASTM C443. LIFT HOLES SHALL BE GROUTED FROM THE OUTSIDE AND INSIDE OF THE MANHOLE.
2. MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M-199 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE STANDARD SPECIFICATIONS.
3. STEPS IN MANHOLE SHALL HAVE 6" MINIMUM CLEARANCE. SEE STANDARD PLAN SS-140 "MISCELLANEOUS MANHOLE DETAILS."
4. KOR-N-SEAL ASSEMBLIES, SAND COLLAR, OR APPROVED EQUAL REQUIRED FOR ALL CONNECTIONS.
5. ALL BASE REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STENGTH OF 60,000 PSI & BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MINIMUM CLEARANCE.
6. FOR DETAILS SHWOING GRADE RINGS, LADDER, STEPS, HANDHOLDS, & TOP SLABS, SEE STANDARD PLAN SS-140 "MISCELLANEOUS MANHOLE DETAILS."
7. GROUT FOR KOR-N-SEAL BOOTS OR SAND COLLAR FLUSH TO MANHOLE.
8. WATER TIGHT MANHOLE INSERT REQUIRED, SEE STANDARD PLAN SS-130.
9. ALL JOINTS TO BE GROUTED INSIDE MANHOLE.
10. ALL PIPES TO BE TRIMMED TO A MAXIMUM 1" PENETRATION INTO MANHOLE.
11. FOUNDATION MATERIAL TO BE PLACED AS REQUIRED AND DIRECTED BY THE ENGINEER.
12. MANHOLE CASTINGS TO BE WSDOT INSPECTED AND APPROVED.
13. NO STEPS ALLOWED IN MANHOLES.
14. GEOTEXTILE SHALL MEET THE REQUIREMENTS OF SECTION 09-33 & AS NOTED IN THE CITY SPECIAL PROVISIONS HEREIN.
15. GROUTING SHALL BE SUFFICIENT TO PREVENT LEAKS BETWEEN THE PRECAST COMPONENTS OF THE COMPLETED STRUCTURE & SHALL BE PERFORMED INSIDE, BETWEEN, & OUTSIDE OF ALL RISERS, JOINTS, & PIPE PENETRATIONS.

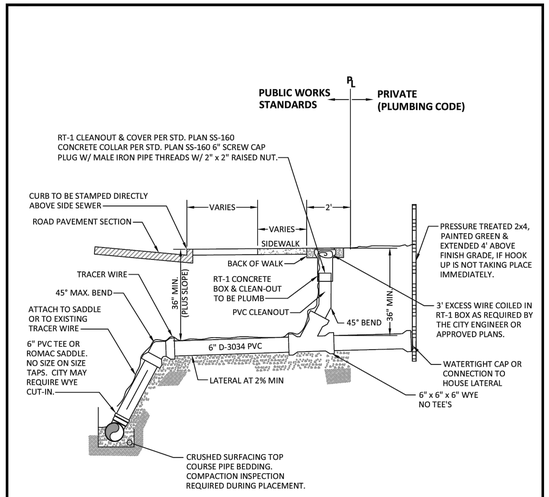
The City of Longview Washington	SANITARY SEWER MANHOLE (PAGE 2 OF 2)	
	STANDARD PLAN: **SS - 020**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



NOTES:

1. MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M-199 (ASTM C478) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE STANDARD SPECIFICATIONS.
2. ALL REINFORCED CAST IN PLACE CONCRETE SHALL BE CLASS 4000. NON-REINFORCED CONCRETE IN CHANNEL AND SHELF SHALL BE CLASS 3000. ALL PRECAST CONCRETE SHALL BE CLASS 4000.
3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS WITH A WALL THICKNESS OF 2" MIN.
4. ALL BASE REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 60,000 PSI AND BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MIN. CLEARANCE.
5. NPC SEALS OR APPROVED EQUAL AT ALL JOINTS.
6. KOR-N-SEAL BOOTS, SAND COLLAR, OR APPROVED EQUAL REQUIRED FOR ALL CONNECTIONS.
7. CHANNEL CONSTRUCTED FOR SANITARY SEWER MANHOLES ONLY.
8. FOR END OF LINE MANHOLE LOCATE FRAME AND LID OVER OUTFALL LINE. FOR INLINE MANHOLES LOCATE FRAME AND LID OVER UPSTREAM LINE.
9. MANHOLE FRAME TO BE CENTERED OVER FLOW.
10. GROUT KOR-N-SEAL BOOTS FLUSH TO MANHOLE.
11. FOUNDATION MATERIAL TO BE PLACED AS REQUIRED AND AS DIRECTED BY ENGINEER.
12. GEOTEXTILE SHALL MEET THE REQUIREMENTS OF SECTION 09-33 & AS NOTED IN THE CITY SPECIAL PROVISIONS HEREIN.
13. GROUTING SHALL BE SUFFICIENT TO PREVENT LEAKS BETWEEN THE PRECAST COMPONENTS OF THE COMPLETED STRUCTURE AND SHALL BE PERFORMED INSIDE, BETWEEN, AND OUTSIDE OF ALL RISERS, JOINTS, AND PIPE PENETRATIONS.
14. POURED IN PLACE BASINS NEED CITY APPROVAL.

The City of Longview Washington	FLAT TOP SANITARY SEWER MANHOLE	
	STANDARD PLAN: **SS - 030**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

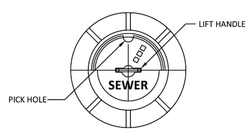


NOTES:

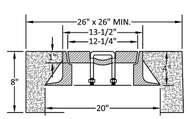
1. INSERT TEE MAY BE INSTALLED IN CERTAIN SITUATIONS AS APPROVED BY CITY ENGINEER AND UTILITY OPERATIONS.
2. LATERALS SHALL BE INSTALLED A MINIMUM OF FIVE FEET FROM THE NEAREST MANHOLE. NO LATERAL CONNECTION SHALL BE MADE TO MANHOLES UNLESS APPROVED BY THE ENGINEER.
3. INVERT MEASURE DOWN TO BE POSTED ON 2x4 POST.

The City of Longview Washington	6" SANITARY SEWER SERVICE LATERAL	
	STANDARD PLAN: **SS - 150**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

CLEAN OUT FOR 8" LINES OR LARGER



"SEWER" TO BE EMBOSSED ON LID

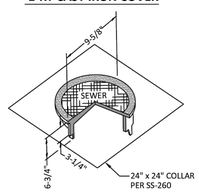


CONCRETE COLLAR

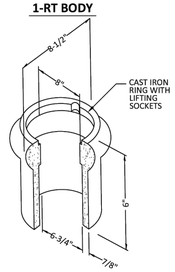
NOTES:

1. A CONCRETE COLLAR OR APPROVED EQUAL SHALL BE INSTALLED AROUND THE CAST IRON CLEAN OUT BOX.
2. COLLAR SHALL BE EDGED WITH 3/8" FELT IF INSTALLED IN A CONCRETE AREA. CONCRETE SHALL BE CLASS 4000.
3. 3' EXCESS TRACER WIRE COILED IN BOX AS REQUIRED BY THE CITY ENGINEER OR APPROVED PLANS.
4. OLYMPIC FOUNDRY, INC. 11" x 4" FLANGE DOWN FRAME AND COVER PART NO.MH5 (OR APPROVED EQUAL).

CLEAN OUT FOR 6" LINES 1-RT CAST IRON COVER



1-RT BODY

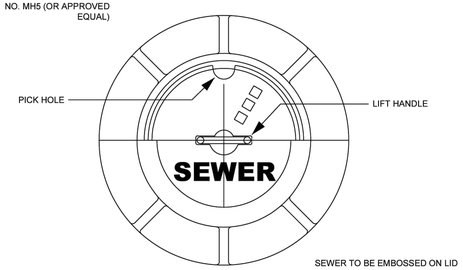


NOTES:

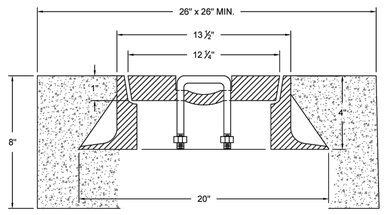
1. COVER TO BE MARKED "SEWER" FOR CLEAN OUT.
2. FOR 6" SEWER LATERAL ONLY.
3. 3' EXCESS TRACER WIRE COILED IN BOX AS REQUIRED BY THE CITY ENGINEER OR APPROVED PLANS.
4. BROOKS RT-1 PRECAST CONCRETE BODY AND CAST IRON LID (OR APPROVED EQUAL).

The City of Longview Washington	SEWER CLEAN-OUT BODY & COVER	
	STANDARD PLAN: **SS - 160**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

OLYMPIC FOUNDRY, INC. 11" x 4" FLANGE DOWN FRAME AND COVER PART NO. MH5 (OR APPROVED EQUAL)

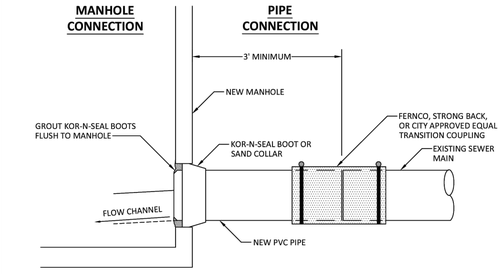


SEWER TO BE EMBOSSED ON LID



CONCRETE COLLAR
A CONCRETE COLLAR SHALL BE INSTALLED AROUND THE CAST IRON CLEAN OUT BOX.
COLLAR SHALL BE 26" x 26"L x 8"D.
COLLAR SHALL BE EDGED WITH ⅜" FELT IF INSTALLED IN A CONCRETE AREA.
CONCRETE SHALL BE CLASS 4000.
3' EXCESS TRACER WIRE COILED IN BOX AS REQUIRED BY THE CITY ENGINEER OR APPROVED PLANS.

The City of Longview Washington	CLEAN OUT FOR 8" LINES	
	STANDARD PLAN: **SS - 170**	CITY ENGINEER APPROVAL: Longview: **C.B.**
	DATE: **MARCH 2018**	



NOTES:

1. THE METHOD OF CONNECTING NEW PVC MAIN SEWER PIPE TO EXISTING MAIN SEWER PIPE SHOWN ON THIS DETAIL APPLIES TO ALL SUCH CONNECTIONS REQUIRED FOR MAIN SEWER, SIDE SEWER, AND MANHOLE REPLACEMENT WORK.
2. PIPE ENDS SHALL BE CUT TRUE AND FLUSH AND SHALL BUTT TOGETHER EVENLY AND TIGHT.
3. IF THE EXISTING PIPE IS ALSO PVC, THE EXISTING PIPE CAN BE BEVELED, THE NEW STUB SLID INTO THE MANHOLE SPIGOT FIRST THEN SLID BACK ONTO THE EXISTING PIPE.
4. CRUSHED SURFACING TOP COURSE SHALL BE PLACED AND COMPACTED AROUND CONNECTION TO ASSURE PIPE STAYS TRUE AND NO SETTLEMENT OCCURS.
5. THIS APPLICATION MAY BE USED FOR GRAVITY SYSTEMS FOR REPAIRS OR NEW INSTALLATIONS.
6. NOT FOR PRESSURE SYSTEMS.
7. SPLICE OR EXTEND EXISTING TRACE WIRE AS REQUIRED.

The City of Longview Washington	CONNECTION BETWEEN MANHOLE OR SEWER MAIN	
	STANDARD PLAN: **SS - 210**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

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REVISIONS

1	2	3	4	5

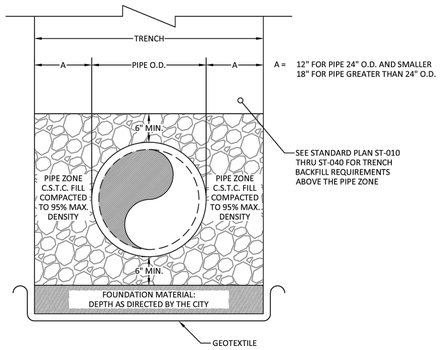
DRAWN BY: T.F.
DESIGNED BY: J.K.
CHECKED BY: J.K.

R. KESSI — STATE OF WASHINGTON — 34835 — REGISTERED PROFESSIONAL ENGINEER
May 10, 2025

PROJECT #155
DATE: 5/10/2025

MINT VALLEY
CITY OF LONGVIEW
SEWER DETAILS

MV D4



NOTE:

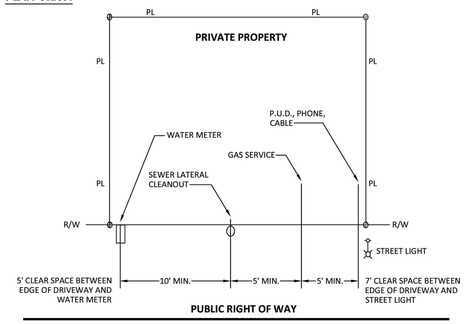
GEOTEXTILE SHALL MEET THE REQUIREMENTS OF SECTION 9-33 & AS NOTED IN THE CITY SPECIAL PROVISIONS. AS APPROVED BY THE CITY.

PIPE BEDDING

STANDARD PLAN: SS - 240	CITY ENGINEER APPROVAL: Samuel B. Barham
DATE: JUNE 2024	DRAWN BY: Camryn LaChaine

WATER METER MAY NOT BE LOCATED WITHIN DRIP LINE OF TREES, IN CONCRETE, OR IN DRIVEWAY

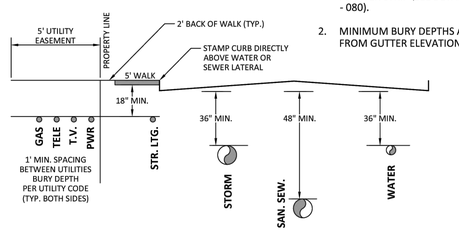
PLAN VIEW:



SECTION VIEW:

PUBLIC RIGHT OF WAY

PRIVATE PROPERTY



NOTES:

1. SIDEWALK WITH OR WITHOUT PLANTER STRIP (SEE DETAIL ST - 080).
2. MINIMUM BURY DEPTHS ARE FROM GUTTER ELEVATIONS.

TYPICAL UTILITY PLACEMENT LOCATIONS

STANDARD PLAN: SS - 300	CITY ENGINEER APPROVAL: Samuel B. Barham
DATE: JUNE 2024	DRAWN BY: Camryn LaChaine

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REVISIONS

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3	
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DRAWN BY: T.F.
DESIGNED BY: J.K.
CHECKED BY: J.K.

PROJECT #155

DATE: 5/10/2025

MINT VALLEY
CITY OF LONGVIEW
SEWER DETAILS

MV D5

WATER GENERAL NOTES

A. WATER SUPPLY

1. ALL WATER SYSTEM WORK AND MATERIALS SHALL COMPLY WITH THE LATEST EDITION OF CITY SPECIFICATIONS, AND THE LATEST EDITION OF WSDOT/APWA SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION, AND THE WASHINGTON STATE DIVISION ADMINISTRATIVE RULES CHAPTER 333, IN THAT ORDER.
2. ALL WATER AND SANITARY SEWER LATERALS TO BE POTHOLED FOR PIPE SIZE, TYPE, AND DEPTH PRIOR TO CONSTRUCTION. SHOP DRAWINGS ARE REQUIRED AND SHALL BE APPROVED PRIOR TO ANY CONNECTIONS.
3. ALL WATERLINE PIPE SHALL HAVE MINIMUM COVER OF 36 INCHES OVER TOP OF PIPE.
4. THE CONTRACTOR SHALL TAKE PRECAUTIONS TO PROTECT PIPE INTERIORS, FITTINGS, AND VALVES AGAINST CONTAMINATION. CONTRACTORS SHALL PROVIDE WRITTEN NOTIFICATION TO CUSTOMERS AND CITY 48 HOURS IN ADVANCE OF ANY PLANNED SHUT DOWN. WRITTEN NOTIFICATION TO BE APPROVED BY CITY.
5. FITTINGS AND PIPE SECTIONS THAT WILL NOT BE DISINFECTED BY CHLORINE IN LINE FOR 24 TO 30 HOURS SHALL HAVE THE INTERIORS SWABBED WITH A 50 mg/l HYPOCHLORITE SOLUTION BEFORE THEY ARE INSTALLED. SWABBING SHALL BE WITNESSED BY CITY INSPECTOR.
6. CONCRETE THRUST BLOCKS ARE TO BE CONSTRUCTED AT TEES, BENDS, FIRE HYDRANTS, BLOW-OFFS, AND WHERE INDICATED ON THE PLANS AND STANDARD DETAILS. THE MINIMUM BEARING SURFACE AGAINST UNDISTURBED SOIL IS SHOWN ON THE DETAIL SHEET. THRUST BLOCKS SHALL BE ALLOWED TO CURE 14 DAYS BEFORE PIPELINE PRESSURE TESTING UNLESS 3-DAY MIX IS USED. FITTINGS SHALL BE WRAPPED WITH A POLY PLASTIC AS A BOND BREAKER. BLOCKS SHALL BE FORMED PRIOR TO POUR.
7. THE PIPELINE SHALL BE PRESSURE TESTED IN ACCORDANCE WITH THE CITY SPECIFICATIONS. THE TEST IS TO BE WITNESSED BY THE CITY INSPECTOR.
8. THE PIPELINE IS TO BE THOROUGHLY DISINFECTED AND FLUSHED (AT 6 FPS FLUSHING VELOCITY) IN ACCORDANCE WITH THE CURRENT CITY STANDARDS. DE-CHLORINATION REQUIRED. NO DISCHARGE OF CHLORINATED WATER ALLOWED. SANITARY SEWER NOT TO BE USED FOR DISCHARGE. SUBMIT CHLORINATION AND DE-CHLORINATION PLAN ONE WEEK PRIOR TO CHLORINATION. CHLORINATION TO BE PERFORMED AFTER THE LINES ARE FLUSHED AND HAVE PASSED PRESSURE TEST.
9. PRIOR TO ENERGIZING THE WATER SYSTEM, A BACTERIOLOGICAL WATER SAMPLE SHALL BE TAKEN BY THE CITY WATER DEPARTMENT INSPECTOR, SUBMITTED TO AN ACCREDITED TESTING LAB, AND RETURNED TO THE DEPARTMENT INDICATING NO HAZARDS EXISTS.
10. THE STAGES OF SYSTEM TESTING AND INTEGRATION ARE FLUSHING, HYDROSTATIC PRESSURE TEST, CHLORINATION/DISINFECTION, DE-CHLORINATION, AND BACTERIOLOGICAL SAMPLE. CONTRACTOR'S PLAN SUBMITTAL SHALL SPECIFICALLY ADDRESS EACH ONE OF THESE ITEMS, INCLUDING SEQUENCING, WITH ENOUGH INFORMATION FOR THE CITY TO DETERMINE THE EFFICACY OF THE CONTRACTOR'S PROPOSAL.
11. NO ONE OTHER THAN CITY WATER DEPARTMENT PERSONNEL TO OPERATE VALVES. ALL VALVES TO REMAIN ACCESSIBLE.
12. ALL PIPE AND FITTINGS SHALL BE RESTRAINED JOINT. FITTINGS SHALL BE GRIP RING OR MEGALUG DUCTILE IRON ONLY. PIPE TO HAVE FIELD LOCK GASKETS. ALL PIPE SHALL HAVE SECONDARY RESTRAINT WITH THRUST BLOCKS OR APPROVED EQUAL.
13. TRACER WIRE - 12 GAUGE SOFT DRAWN COPPER (BLUE) TO BE USED.
14. UTILITY MARKER TAPE SHALL BE INSTALLED 12 TO 18 INCHES ABOVE MAIN AND SERVICE LINES.
15. AS BUILT DRAWINGS SHALL BE SUBMITTED & APPROVED PRIOR TO ACCEPTANCE.

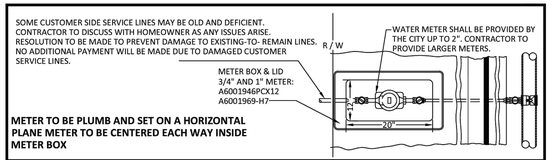
The City of Longview Washington	WATER GENERAL NOTES - PAGE 1 OF 3	
	STANDARD PLAN: **W - 000**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

WATER GENERAL NOTES (CONTINUED)

B. PRESSURE TESTING AND CHLORINATION:

1. THE CITY OF LONGVIEW OPERATIONS CREWS SHALL BE RESPONSIBLE FOR OPERATION OF ALL VALVES ON THE CITY WATER SYSTEM. THIS INCLUDES VALVES LOCATED ON CITY WATER SYSTEM WITHIN THE GEOGRAPHIC LIMITS OF A PRIVATE OR PUBLIC PROJECT AREA.
2. THE ORDER OF SYSTEM TESTING AND INTEGRATION SHALL BE: FLUSHING, HYDROSTATIC PRESSURE, CHLORINATION, DE-CHLORINATION, AND BACTERIOLOGICAL SAMPLE AND TEST. CONTRACTOR SHALL SCHEDULE EACH PHASE OF THESE PROCEDURES WITH CITY INSPECTOR WITH A MINIMUM OF 48 HOURS ADVANCE NOTICE. NEWLY CONSTRUCTED WATER LINES WHICH HAVE NOT BEEN FULLY TESTED AND ACCEPTED BY WATER DEPARTMENT SHALL BE FULLY RESTRAINED AND SHALL REMAIN ISOLATED (I.E. AIR-GAPPED) FROM CITY WATER SYSTEM, SUBJECT TO PROCEDURES BELOW.
3. CONTRACTOR IS STRONGLY ENCOURAGED TO HOLD ON-SITE PRE-TESTING MEETING WITH CITY INSPECTOR AND WATER DEPARTMENT TO ENSURE EFFICIENT OUTCOMES. IF AT ANY POINT IN THE TESTING PROCEDURES, CONDITIONS, MEANS, OR METHODS ARE OBSERVED THAT ARE LIKELY TO COMPROMISE WATER SUPPLY SAFETY, HUMAN LIFE SAFETY, OR PROPERTY SAFETY, OR WILL RESULT IN UNREASONABLE AMOUNTS OF WATER LOSS, CITY STAFF WILL SUSPEND TESTING UNTIL ISSUES ARE ADDRESSED TO CITY'S SATISFACTION.
4. FLUSHING SHALL BE PERFORMED BY CONTRACTOR WITH ASSISTANCE AS NEEDED FROM WATER DEPARTMENT. FLUSHING SHALL BE WITNESSED BY CITY INSPECTOR AND WATER DEPARTMENT PERSONNEL. MINIMUM FLUSHING VELOCITY SHALL BE SIX (6) FEET PER SECOND OR THE MAXIMUM ACHIEVABLE VELOCITY USING LOCAL SYSTEM FLOW, THROUGH A TERMINAL BLOW OFF SIZED AT ONE HALF THE DIAMETER OF THE NEW MAIN DIAMETER INSTALLED (E.G. 8 INCH NEW MAIN USES 4 INCH BLOWOFF). IF CONTRACTOR CAN SHOW JUST CAUSE FOR THE USE OF NON-STANDARD TEMPORARY BLOW OFF, CONTRACTOR SHALL FURNISH CITY ENGINEER WITH WRITTEN ALTERNATE BLOW OFF PLAN CONSISTING OF JUSTIFICATION OF ALTERNATE BLOW OFF, LOCATION OF TEMPORARY BLOW OFF ON PLANS, AND A SKETCH SUFFICIENT TO EVALUATE SAFE FUNCTION OF TEMPORARY ALTERNATE BLOW OFF. CITY ENGINEER WILL APPROVE OR DENY ALTERNATE BLOW OFF WITHIN ONE WEEK OF RECEIPT. IF NECESSARY FLUSHING FLOW REQUIRES TEMPORARY SYSTEM CONNECTION, SAID TEMPORARY CONNECTION SHALL BE IMMEDIATELY REMOVED AFTER FLUSHING SUCH THAT CONTAMINATION OF CITY WATER SYSTEM FROM CONTRACTOR-INSTALLED SYSTEM IS IMPOSSIBLE. SEE STANDARD PLAN W-170, W-703.
5. HYDROSTATIC PRESSURE TESTING SHALL BE PERFORMED WHOLLY BY CONTRACTOR. TEST SHALL BE WITNESSED BY CITY INSPECTOR. TEST PRESSURE SHALL BE THE GREATER OF ONE AND ONE HALF (1.5) TIMES NOMINAL STATIC SYSTEM PRESSURE OR 200 POUNDS PER SQUARE INCH (PSI). PRESSURE READING SHALL BE TAKEN FROM CONTRACTOR PROVIDED CERTIFIED CALIBRATED GAUGE. PRESSURE TESTING SHALL NOT BE PERMITTED AGAINST IN SERVICE WATER SYSTEM VALVES. SEE STANDARD PLAN W-702.
6. DISINFECTION SHALL BE PERFORMED WHOLLY BY CONTRACTOR. DISINFECTION SHALL BE BY CONTINUOUS FEED METHOD VIA INJECTION PORT, PER AWWA C651, OR CHLORINE-BEARING COMPOUNDS IN WATER PER WSDOT SS 7-03.3(24)F. TARGET CHLORINE DOSE IS 50MG/L (50PPM). DISINFECTION SHALL BE WITNESSED BY WATER DEPARTMENT PERSONNEL. SAID PERSONNEL SHALL SAMPLE FOR CHLORINE DOSE AT ANY POINTS IN THE TESTED SYSTEM THEY DEEM NECESSARY TO ENSURE PROPER DOSING. AT LEAST ONE SAMPLE PORT SHALL BE PROVIDED BY CONTRACTOR AT TERMINAL END OF DISINFECTED SECTION, PER STANDARD PLAN W-660. MINIMUM DISINFECTION TIME IS 24 HOURS. NO DISINFECTIONS MAY BE PERFORMED ON THE LAST CITY WORKING DAY OF ANY GIVEN WEEK.
7. DE-CHLORINATION SHALL BE PERFORMED WHOLLY BY CONTRACTOR. DE-CHLORINATION SHALL BE WITNESSED BY WATER DEPARTMENT. HYPER-CHLORINATED WATER SHALL NOT BE DISCHARGED TO SANITARY NOR STORM SEWER SYSTEMS, NOR TO THE OPEN ENVIRONMENT. DE-CHLORINATION IS THE RESPONSIBILITY OF THE CONTRACTOR. WITH CITY WATER DEPARTMENT PERMISSION, VERIFIED DE-CHLORINATED WATER MAY BE DISCHARGED TO STORM SEWER ONLY.
8. BACTERIOLOGICAL SAMPLE SHALL BE TAKEN BY WATER DEPARTMENT PERSONNEL UPON DETERMINATION THAT TESTED LINE IS AT NOMINAL WATER SUPPLY CHLORINE RESIDUAL. RESULTS OF BACTERIOLOGICAL TESTING WILL BE PROVIDED TO CONTRACTOR IMMEDIATELY UPON RECEIPT FROM THIRD PARTY ANALYTICAL LABORATORY. SATISFACTORY BACTERIOLOGICAL TEST WILL CONSTITUTE ACCEPTANCE AND INTEGRATION OF TESTED SYSTEM INTO CITY WATER SYSTEM.

The City of Longview Washington	WATER GENERAL NOTES - PAGE 2 OF 3	
	STANDARD PLAN: **W - 001**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



VALVE	3/4" METER	1" METER
A	3/4" BALL VALVE - FEMALE I.P. x METER W/ HANDLE	1" BALL VALVE - FEMALE I.P. x METER W/ HANDLE
B	1" x 3/4" ANGLE BALL VALVE STOP IP x METER	1" ANGLE BALL VALVE STOP IP x METER
C	1" BALL VALVE - F.I.P. x CTS COMPRESSION WITH LOCKING OPERATING NUT. (NO ADAPTERS ALLOWED) BALL VALVE TO BE INSTALLED AT 90° TO ANGLE STOP	

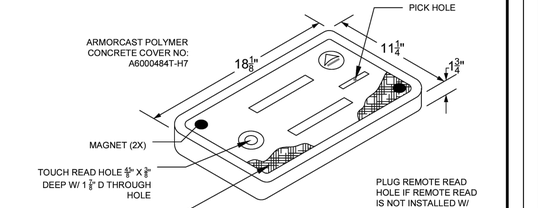
NOTE: ANGLE BALL VALVE STOPS ARE ACCEPTABLE FOR VALVE TYPE A

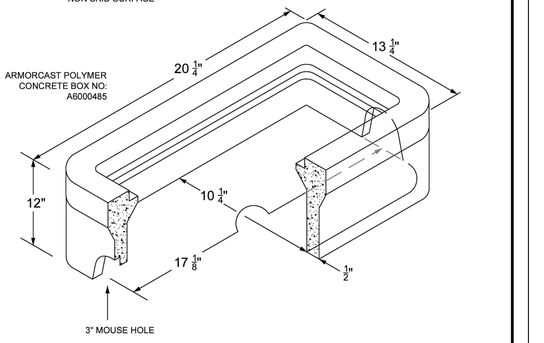
NOTES:

1. CLEARANCES:
   a. MIN. 5' FROM EDGE OF DRIVEWAY - NO METERS IN DRIVEWAY SECTION
   b. MIN. 10' FROM TREES
   c. MIN. 5' FROM OTHER UTILITIES, EXCEPT SEWER @ 10'
   d. MIN. DEPTH AT RIGHT OF WAY IS 36"
   e. MIN. DEPTH ON CUSTOMER SIDE IS 18"
2. CTS = COMPRESSION. ALL BRASS & COPPER.THE SERVICE LINE SHALL BE CONTINUOUS WITHOUT COUPLINGS BETWEEN THE CORPORATION STOP AND CURB STOP VALVE UNLESS APPROVED BY THE ENGINEER.
3. NO DIRECT TAPS ALLOWED.
4. METER LOCATION TO BE DETERMINED BY THE CITY.
5. SADDLES SHALL BE DOUBLE BAND DUCTILE IRON, BRONZE, STAINLESS STEEL, OR BAND-TYPE WITH I.P. STANDARD TAPPING.
6. BALL CORPORATION STOPS FOR USE WITH SADDLES SHALL BE OF BRONZE ALLOY WITH INLET I.P. STANDARD THREAD AND OMPRESSION OUTLET COMPATIBLE WITH CONNECTION PIPING, WITH NO ADAPTERS.
7. METER BOX IS ARMORCAST OR EQUIVALENT.
8. SERVICE PIPE SHALL BE A MINIMUM OF 1" TYPE K SOFT COPPER OR 1" POLY CTS PIPE (250PSI MIN. RATING) COMPRESSION COUPLING FOR USE IN CONNECTING PLAIN END WATER SERVICE PIPES SHALL BE APPLICABLE FOR THE TYPE OF PIPE BEING COUPLED. COMPRESSION COUPLINGS SHALL HAVE ARMORED GASKETS WHEN DIS-SIMILAR METAL PIPES ARE BEING JOINED.
9. WATER METERS SHALL NOT BE PLACED IN SIDEWALK.
10. CORPORATION STOPS AND COUPLINGS SHALL BE OF THE FOLLOWING MANUFACTURER BRANDS AND BE COMPRESSION DESIGN: MUELLER, McDONALD, FORD.
11. METER BOX LIDS SHALL BE TOUCH READ APPLICATION WITH PLUG IN KNOCK-OUT.
12. POLY PIPE REQUIRES INTERNAL STAINLESS STEEL SLEEVE FOR CONNECTION TO COMPRESSION BRASS FITTINGS.
13. UTILITY MARKER TAPE SHALL BE INSTALLED 1.0' TO 1-1/2' ABOVE SERVICE LINE.
14. ALL FITTINGS SHALL MEET SECTION 1412 SDWA.
15. MARKING TAPE SHALL BE BLUE IN COLOR.

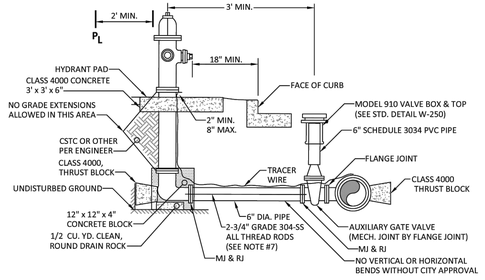
The City of Longview Washington	3/4" & 1" DOMESTIC WATER SERVICE	
	STANDARD PLAN: **W - 010**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

TRAFFIC COVER AND BOX TOUCH AND READ APPLICATION





The City of Longview Washington	TOUCH AND READ FOR 3/4" WATER METER BOX	
	STANDARD PLAN: **W - 100**	PW DIRECTOR APPROVAL: Longview: **K.H.**
	DATE: **JUNE 2020**	



NOTES:

1. TO ASSURE UNIFORMITY OF PARTS STOCKING, HYDRANTS SHALL BE AVK SERIES 27 MODERN STYLE, 5-1/4" MUELLER CENTURION, WATEROUS PACER 90, OR KENNEDY K81D GUARDIAN, WITH 16" TOP SECTION.
2. ALL HYDRANTS SHALL HAVE NATIONAL STANDARD THREAD OUTLETS, TWO 2-1/2" PORTS, AND SHALL BE EQUIPPED WITH ONE 4-1/2" PUMPER CONNECTION WHICH FACES THE MAIN ROADWAY.
3. ALL HYDRANTS SHALL STAND PLUMB WITH THE LOWEST OUTLET OF THE HYDRANT, NO LESS THAN 18" ABOVE FINISHED GRADE.
4. 10 MIL. PLASTIC SHEETING SHALL BE USED AS A BOND BREAKER BETWEEN CONCRETE BLOCKING AND PIPE FITTINGS AS WELL AS BETWEEN HYDRANT BARRELS AND HYDRANT PAD.
5. VALVE TO BE SET MINIMUM 3' FROM FACE OF HYDRANT. INCLUDE VALVE BOX IN HYDRANT PAD WHEN BOTH FALL BETWEEN WALK AND CURB.
6. ALL HYDRANTS SHALL BE BAGGED UNTIL SYSTEM IS APPROVED.
7. TO BE RODDED OR RESTRAINED JOINTS, INCLUDING THRUST BLOCKS.
8. HYDRANT MUST COMPLY TO ADA REQUIREMENTS.
9. CHAINS TO REMAIN ATTACHED TO HYDRANT.
10. THRUST BLOCKS SHALL BE CURED TO A MINIMUM OF 3500 PSI PRIOR TO TESTING, FLUSHING OR PLACING HYDRANT IN SERVICE.
11. 6" MIN. CLEARANCE FROM SIDEWALK TO ANY PORTION OF FIRE HYDRANT.
12. 3' MIN. OBSTRUCTION CLEARANCE TO ANY PORTION OF HYDRANT.
13. UTILITY MARKER TAPE SHALL BE INSTALLED 1.0' TO 1-1/2' ABOVE SERVICE LINE.
14. TRACER WIRE SHALL BE INSTALLED ALONG 6" PIPE AND SHALL BE CONNECTED TO MAIN LINE TRACER WIRE WITH DIRECT BURY LUG MANUFACTURED BY KING INNOVATIONS, COPPERHEAD, OR APPROVED EQUAL, AND DESIGNED TO NOT CUT THE METAL WIRE OR THE MAIN TRACER WIRE.
15. INSTALL 910 BOX TRACING WIRE ACCESS BOXES OR APPROVED EQUAL PER DETAIL W-280.
16. HYDRANTS SHALL BE STANDARD YELLOW IN COLOR.
17. HYDRANTS SHALL NOT BE LOCATED ANY CLOSER THAN 7' FROM DRIVEWAY OR ALLEY APPROACH, UNLESS APPROVED BY CITY ENGINEER.

The City of Longview Washington	HYDRANTS	
	STANDARD PLAN: **W - 150**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

TABLE 1: THRUST LOADS (T)
RESULTANT THRUST AT FITTINGS AT 200 PSI WATER PRESSURE

PIPE DIAM.	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND	DEAD END OR TEE
3"	3,484	1,886	962	482	2,464
4"	5,118	2,770	1,412	710	3,620
6"	10,576	5,724	2,918	1,466	7,478
8"	18,194	9,846	5,020	2,522	12,866
10"	27,370	14,812	7,552	3,794	19,354
12"	38,706	20,948	10,680	5,366	27,370
14"	52,002	28,144	14,348	7,208	36,770
16"	67,256	36,398	18,556	9,322	47,558
18"	84,470	45,716	23,306	11,710	59,730
20"	103,644	56,092	28,596	14,366	73,328
24"	147,868	80,026	40,796	20,498	104,558
30"	227,476	123,108	62,760	31,532	160,850
36"	325,862	176,354	89,904	45,170	230,418
42"	439,900	238,072	121,368	60,978	311,056
48"	573,274	310,254	158,166	79,466	405,366
54"	735,998	398,320	203,062	102,022	520,428
60"	843,212	456,344	232,642	116,884	596,242
64"	958,008	518,470	264,314	132,796	677,414

TABLE 2: SOIL BEARING CAPACITY (B)

SOIL BEARING LOAD TO BE DETERMINED PER SOILS REPORT OR INFORMATION BELOW	
SOIL TYPE	SOIL BEARING CAPACITY (B) IN PSF
MUCK, PEAT, ETC.	0
SOFT CLAY	1,000
SAND	2,000
SAND AND GRAVEL	3,000
SAND AND GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

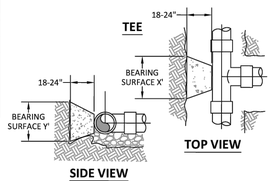
EXAMPLE CALCULATION:

DESIGN TEST PRESSURE = 225 PSI
PIPE SIZE = 12"
FITTING TYPE = TEE
SOIL TYPE = SAND
FROM TABLE 1, T = 27,370
FROM TABLE 2, B = 2,000

$$A = \frac{27,370}{2,000} * \frac{225}{200} = 15.40 \text{ SF (4' BY 4')}$$

THRUST BLOCK NOTES:

1. THRUST BLOCK SHALL BE ADEQUATE TO WITHSTAND FULL TEST PRESSURE.
2. POUR THRUST BLOCK AGAINST UNDISTURBED EARTH.
3. FITTINGS SHALL BE ISOLATED FROM CONCRETE THRUST BLOCK WITH 10 MIL PLASTIC SHEETING.
4. ALL THRUST BLOCKS TO BE CLASS 4000 CONCRETE.
5. THRUST BLOCKS SHALL BE ALLOWED TO CURE 14 DAYS BEFORE PIPELINE PRESSURE TEST, UNLESS 3-DAY MIX IS USED.
6. CONCRETE BLOCK AREA MUST BE ADJUSTED FOR PIPE SIZE, FITTING PRESSURES, AND SOIL CONDITIONS AS NEEDED.
7. NO CONCRETE HAND MIXING ALLOWED, UNLESS APPROVED BY THE ENGINEER. HAND MIXING BATCH SHALL NOT EXCEED 1/2 CY AND SHALL BE PER WSDOT STD. SPECIFICATION SECTION 6-02.3(4)B.



TO DETERMINE THE BEARING AREA OF THE THRUST BLOCK IN SQUARE FEET (SQ. FT.) USE THE FOLLOWING PROCEDURE:

A. DETERMINE THRUST (T) FOR TYPE AND SIZE OF FITTING FROM TABLE 1.
B. DETERMINE TEST DESIGN PRESSURE FROM STANDARD SPECIFICATION OR SPECIAL PROVISIONS.
C. DETERMINE SOIL BEARING CAPACITY (B) OF SOIL FROM TABLE 2.
D. DETERMINE REQUIRED BEARING AREA (A) IN SQ. FT. AS FOLLOWS:

THRUST BLOCK:

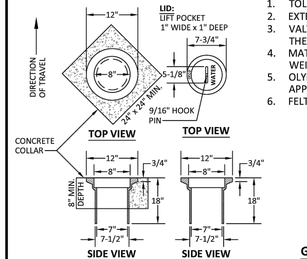
$$A = \frac{T}{B} * \frac{\text{DESIGN TEST PRESSURE}}{\text{TABLE PRESSURE}}$$

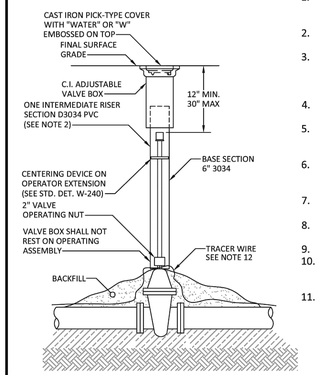
BEARING AREA:

$$A = (X')\,(Y')$$

The City of Longview Washington	THRUST BLOCK CALCULATIONS	
	STANDARD PLAN: **W - 220**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

VALVE BOX





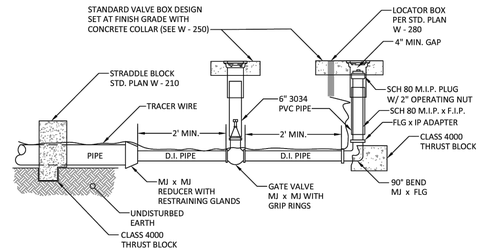
VALVE BOX NOTES:

1. TOLERANCE = 1/8".
2. EXTENSIONS SHALL BE 3034 PVC PIPE (THICK WALL).
3. VALVE BOXES SHALL MEET SECTION 9-30.3(4) OF THE STD. SPECS.
4. MATERIAL: CAST IRON ASTM A-48, CL 30; APPROX. WEIGHT: VALVE BOX - 42 LBS; COVER - 14 LBS.
5. OLYMPIC FOUNDARY PART NO. VB910 OR APPROVED EQUAL.
6. FELT EDGE (SEE DETAIL BELOW).

GENERAL NOTES:

1. THE ADJUSTABLE VALVE BOX SHALL BE CAST IRON. THE INTERMEDIATE RISER SECTION D3034 PVC.
2. ADJUSTABLE VALVE BOXES SHALL BE SUPPLIED WITHOUT BOTTOM FLANGES.
3. THE ADJUSTABLE VALVE BOX, INTERMEDIATE RISER SECTION, AND BASE SECTION SHALL BE INSTALLED PLUMB AND CENTERED OVER THE OPERATING NUT ON THE VALVE.
4. VALVE BOX TYPE SHALL BE A 910 OR APPROVED EQUAL.
5. PLASTIC VALVE STACK SHALL EXTEND FROM TOP OF VALVE BONNET TO MIDDLE OF CAST IRON VALVE BOX.
6. A CONCRETE COLLAR SHALL BE INSTALLED AROUND THE CAST IRON VALVE BOX PER DETAIL.
7. COLLAR SHALL BE MINIMUM 24" x 24"L x 8"D PER DETAIL.
8. COLLAR SHALL BE EDGED WITH 3/8" FELT IF INSTALLED IN A CONCRETE AREA.
9. LOCATE WIRE PER STANDARD PLAN W-280.
10. STAMP CONCRETE COLLARS WITH CITY PROVIDED TOOLS AND PER INSTRUCTIONS OF INSPECTOR. SEE DETAIL.
11. MAX REQUIRE TO BRING WIRE TO SURFACE PER LOCATOR BOX STD PLAN W-280.

The City of Longview Washington	VALVE BOX DETAIL	
	STANDARD PLAN: **W - 250**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



BLOW OFF PIPE SIZE SHALL OBTAIN 6FPS FLOW

The City of Longview Washington	BLOWOFF ASSEMBLY	
	STANDARD PLAN: **W - 170**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

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REVISIONS

	1	2	3	4	5
DRAWN BY:	T.F.				
DESIGNED BY:	J.K.				
CHECKED BY:	J.K.				

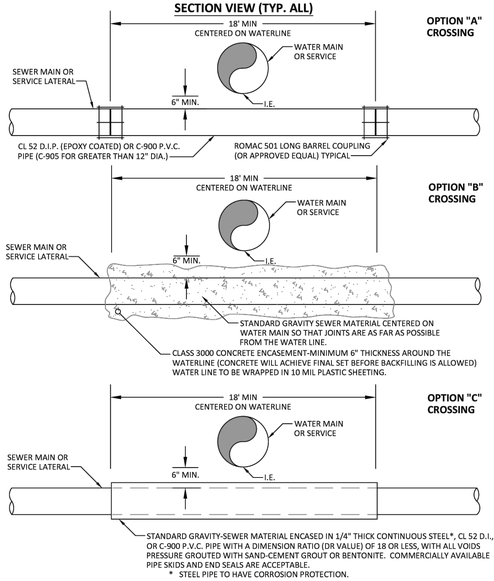
REGISTERED PROFESSIONAL ENGINEER — STATE OF WASHINGTON — R. KESSI — 34955
May 10, 2025

PROJECT #155
DATE: 5/10/2025

MINT VALLEY
CITY OF LONGVIEW
WATER DETAILS

MV D6

SECTION VIEW (TYP. ALL)



SECTION VIEW (TYP. ALL)

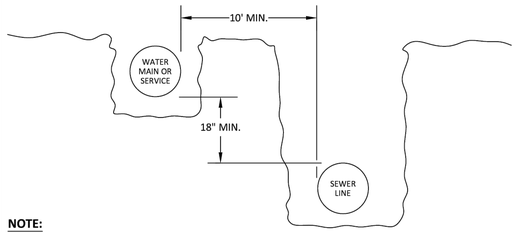
USE THIS STANDARD PLAN WHEN SANITARY SEWER LINE IS BELOW WATER LINE & THERE IS LESS THAN 18" BETWEEN I.E. OF WATER AND CROWN OF SEWER LINE. CROSSING TYPE TO BE SPECIFIED ON CONSTRUCTION PLAN OR AS DIRECTED BY THE ENGINEER.

WATER-SEWER X-ING SEWER UNDER WATER, LESS THAN 18" SEPARATION

WATER-SEWER CROSSING - WATER OVER SEWER

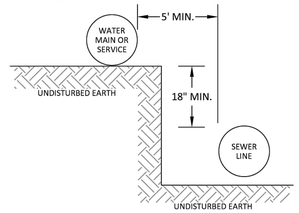
STANDARD PLAN:	CITY ENGINEER APPROVAL:
W - 290	Samuel B. Barham
DATE: JUNE 2024	DRAWN BY: Camryn LaChaine

NOTE:
NORMAL PARALLEL CONDITION: A MINIMUM HORIZONTAL SEPARATION OF 10 FEET BETWEEN ANY SANITARY SEWER AND WATER LINES, AND A MINIMUM VERTICAL SEPARATION OF 18" BETWEEN THE BOTTOM OF THE WATER LINE AND THE CROWN OF THE SEWER, SHALL BE MAINTAINED. THE DISTANCE SHALL BE MEASURED EDGE TO EDGE. LINES MUST BE LAID IN SEPARATE TRENCHES.



NOTE:
UNUSUAL PARALLEL CONDITIONS: WHEN SPECIAL CONDITIONS PREVENT THE SEPARATIONS DESCRIBED ABOVE, A SEWER MAY BE INSTALLED CLOSER THAN 10 FEET HORIZONTALLY OR 18" VERTICALLY TO A WATER LINE, PROVIDED:

1) LESS THAN 18" OF VERTICAL SEPARATION REQUIRES CL 52 D.I. OR C-900 P.V.C. FOR SEWER PIPE MATERIAL (C-905 FOR GREATER THAN 12" DIAMETER). THE ENGINEER MAY APPROVE LESS THAN 10 FEET OF HORIZONTAL SEPARATION PROVIDED SEPARATE TRENCHES CAN BE MAINTAINED.
2) IF SEWER AND WATER LINES **MUST** BE LOCATED IN THE SAME TRENCH, BOTH SEWER LINES AND WATER LINES SHALL INCLUDE A CASING PIPE OF PRESSURE RATED PIPE MATERIAL DESIGNED TO WITHSTAND A MINIMUM STATIC PRESSURE OF 150 P.S.I.. COMMERCIAL PIPE SKIDS AND AN APPROVED END CLOSURE IS REQUIRED AS NEEDED. A MINIMUM OF 5 FEET HORIZONTAL AND 18" OF VERTICAL CLEARANCE IS REQUIRED. (SEE ILLUSTRATION BELOW)



WATER-SEWER SEPARATION REQUIREMENTS FOR PARALLEL CONDITIONS

WATER-SEWER IN PARALLEL

STANDARD PLAN:	CITY ENGINEER APPROVAL:
W - 300	Samuel B. Barham
DATE: JUNE 2024	DRAWN BY: Camryn LaChaine

WATER NOTES:

7-09 WATER MAINS
Section 7-09.2; Materials
Paragraph 1 is replaced with the following:

Materials shall meet the following sections:

Pipe	9-30.1
Ductile Iron Pipe (Restrained Joint)	9-30.1(1)
Fittings	9-30.2
Ductile Iron Pipe	9-30.2(1)
Restrained Joints	9-30.2(6)
Bolted Sleeve-Type Couplings for Plain End Pipe	9-30.2(7)
Valves	9-30.3
Gate Valves (3 inches to 10 inches)	9-30.3(1)
Butterfly Valves (12 inches and greater)	9-30.3(3)
Valve Boxes	9-30.3(4)
Valve Marker Posts	9-30.3(5)
Valve Stem Extension	9-30.3(6)
Combination Air Release Valves	9-30.3(7)
Tapping Sleeve and Valve Assembly	9-30.3(8)
Hydrants (All bolts and nuts to be stainless steel with Anti-seize Compound)	9-30.5
Service Connections (2 inches and Smaller)	9-30.6

All Ductile Iron Pipe, fittings and appurtenances shall have restrained joints by the use of Mega-Lugs, Romac Grip Rings, Field-Lock gaskets, or approved equal.

Bolts and nuts for flanged pipe and fittings shall conform in size and length with ANSI/AWWA C115/A21.15. All bolts and nuts shall be made from COR-TEN steel in accordance with ANSI/AWWA C111/A21.11.

All fittings to have thrust blocks as indicated in City Standard Plans.

Note: The City reserves the right for any or all salvage rights to any existing materials removed including but not limited to fire hydrants, crosses, tees, gate valves or pipe.

It shall be determined by the City as to what materials will be salvaged.

Any material requested for salvage will be delivered by the contractor to the City's operation center as directed by the City.

All costs associated with delivery or removal and disposal shall be borne by the contractor.

7-09.3 Construction Requirements
Section 7-09.3(5); Grade and Alignment
This section is supplemented with the following:

A minimum horizontal separation of 10 feet between sanitary sewers and any existing potable water lines, and a minimum vertical separation of 18 inches between the bottom of the water line and the crown of the sewer, shall be maintained. The distance shall be measured edge to edge. Sewer line should be lower than water line and installed in separate trenches.

WATER SPECIFICATIONS (1 OF 5)

STANDARD PLAN:	CITY ENGINEER APPROVAL:
W - 700	Longview: C.B.
DATE: JAN 2017	

Section 7-09.3(9); Bedding the Pipe
Sentence 1 is replaced with the following:

Bedding material shall be select granular material free from wood waste, organic material, and other extraneous or objectionable materials and shall be CSTC.

Trace Wire
Trace wire shall be installed on all water mains and smaller service lines with a lay length of more than 6 feet. The wire shall be attached to the lines at 15 foot intervals and shall be brought to the surface at all junctions and termini using methods approved by the Engineer. Trace wire material for water lines shall be 12 Gauge, soft drawn, insulated, and shall be blue in color.

Splices shall be made with a kit containing a "T" shaped open cell centering device and a plastic bag of urethane and hardener which is mixed at the time of installation or heat shrinkable insulating tubing. Heat shrinking insulating tubing shall consist of a mastic lined heavy wall polyolefin cable sleeve. The resin used with the "T" shaped open cell centering device shall be a quick curing flexible compound with an approximate set-up time of 4 minutes at 72° F.
A continuity test shall be performed on tracer wire with inspector present prior to paving roadway.

7-09.3(19) Connections
Section 7-09.3(19) A; Connections to Existing Mains
Paragraphs 1, 4, 5, and 6 are replaced with the following:

Connections to the existing water main shall not be made without first making the necessary arrangements with the City Water/Sewer Department in advance. Work shall not be started until the existing main has been potholed to determine the materials, equipment, and labor necessary to properly complete the work. All the materials, equipment, and labor necessary to properly complete the work shall be assembled on the site before work is started. Torque tighten all non-test bolts.

Once work is started on a connection, it shall proceed continuously without interruption, and as rapidly as possible until completed. No shutoff of mains will be permitted overnight, over weekends, on Mondays or Fridays, or on holidays. The Water/Sewer Superintendent must be notified a minimum of 48 hours prior to any shutoff and must give approval prior to the shutoff taking place.

If the connection to the existing system involves turning off the water, the Contractor shall be responsible for notifying the residents affected by the shutoff a minimum of 48 hours prior to the shutoff. The Water/Sewer Superintendent will advise which property owners are to be notified.

Connections must be performed between 8:00 a.m. and 4:00 p.m. Tuesday through Thursday unless other arrangements have been made with the Water/Sewer Superintendent. Any overtime cost by city staff will be incurred by the contractor.

All waterlines and services shall be abandoned at the main and provide a one foot separation from the watermain. Flushing may be required to be performed at night (per City direction) during non-peak flows.

Section 7-09.3(21); Concrete Thrust Blocking
This section is supplemented with the following:

All forms for concrete and deformed rebar thrust blocking must be approved by the City Engineer prior to pouring the concrete.

WATER SPECIFICATIONS (2 OF 5)

STANDARD PLAN:	CITY ENGINEER APPROVAL:
W - 701	Longview: C.B.
DATE: JAN 2017	

Once work is started on a connection, it shall proceed continuously without interruption, and as rapidly as possible until completed. No shutoff of mains will be permitted overnight, over weekends, on Mondays or Fridays, or on holidays. The Water/Sewer Superintendent must be notified a minimum of 48 hours prior to any shutoff and must give approval prior to the shutoff taking place.

If the connection to the existing system involves turning off the water, the Contractor shall be responsible for notifying the residents affected by the shutoff a minimum of 48 hours prior to the shutoff. The Water/Sewer Superintendent will advise which property owners are to be notified.

Connections must be performed between 8:00 a.m. and 4:00 p.m. Tuesday through Thursdays unless other arrangements have been made with the Water/Sewer Superintendent. Any overtime cost by city staff will be incurred by the contractor.

All waterlines and services shall be abandoned at the main and provide a one foot separation from the watermain. Flushing may be required to be performed at night (per City direction) during non-peak flows.

Section 7-09.3(21); Concrete Thrust Blocking
This section is supplemented with the following:

All forms for concrete and deformed rebar thrust blocking must be approved by the City Engineer prior to pouring the concrete.

Section 7-09 .3(23); Hydrostatic Pressure Test
Paragraphs 1, 4, and 5 are replaced with the following:

All water mains and appurtenances shall be tested in sections of convenient length under a hydrostatic pressure equal to 1.5 times that under which they will operate or 200 psi whichever is greater. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished and operated by the Contractor. The Engineering Department must be notified a minimum of 48 hours prior to testing and must be present when tests are performed.

The mains shall be filled with water and allowed to stand under pressure a sufficient length of time to allow the escape of air and allow the lining of the pipe to absorb water. The Contractor shall be responsible for providing the water necessary to fill the pipelines for testing purposes.

The test shall be accomplished by pumping the main up to the required pressure, stopping the pump for 2 hours, and then pumping the main up to the test pressure again. During the test, the section being tested shall be observed to detect any visible leakage. A clean container shall be used for holding water for pumping up pressure on the main being tested. This makeup water shall be sterilized by the addition of chlorine to a concentration of 50 mg/l. In accordance with AWWA Standards.

WATER SPECIFICATIONS (3 OF 5)

STANDARD PLAN:	CITY ENGINEER APPROVAL:
W - 702	Longview: C.B.
DATE: MARCH 2018	

Disinfection of Water Mains
Section 7-09.3(24)A; Flushing
Paragraph 1 is replaced with the following:

Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. Tap shall be provided large enough to develop a velocity of at least 6 fps in the main. Hydrants are not to be used for pipe flushing; only approved blow off assemblies are to be used. Connecting to city mains or flushing may be required at night depending on system conditions as determined by the engineer.

Contractor to provide sampling station point per City standards.

Section 7-09.3(24)D; Dry Calcium Hypochlorite
This section is deleted in it's entirety.

7-12 VALVES FOR WATER MAINS
Construction Requirements
Section 7-12.3(1); Installation of Valve Marker Post
This section is replaced with the following:

Where required, a valve marker post shall be furnished and installed with each valve. Valve marker posts shall be placed at the edge of the right-of-way opposite the valve and be set with a minimum of 48" of the post exposed above grade. The post shall have a blue reflective "water valve" decal placed within 3" of the top of the post. The post shall be carsonite. The post shall face on coming traffic at 4 feet away from the valve.

A concrete collar shall be poured around valve boxes that are to grade. A two headed arrow stamp will be used to stamp the concrete collar to show direction of flow for the water main.

All operators for Butterfly Valves shall be on centerline of street side of the main.

The contractor shall not operate any city valve. The city must be contacted to turn all city valves for all phases of construction.

7-14 HYDRANTS
Construction Requirements
Section 7-14.3(6); Hydrant Extensions
This section is supplemented with the following:

Hydrant extensions will not be allowed for newly constructed hydrants. The large port on the hydrant shall face the road.

7-15 SERVICE CONNECTIONS
Section 7-15.3; Construction Requirements
Paragraph 1 is replaced with the following:

All service connections to water mains shall be made using saddles as specified and be of the size and type suitable for use with the pipe being installed. Service pipelines shall be installed perpendicular to the main, unless otherwise shown in the plans.

WATER SPECIFICATIONS (4 OF 5)

STANDARD PLAN:	CITY ENGINEER APPROVAL:
W - 703	Longview: C.B.
DATE: MARCH 2018	

Water meter service shall not conflict with electric/gas services, required 4' horizontal and 12" vertical separation from other utilities for Longview (5' horz. and 18" vert. for Kelso). (10' horizontal and 18" vertical from sanitary sewer)

PERMISSABLE HYDRANT METER LOCATION NOTE (construction water)

Contractor shall apply for hydrant permit thru the City Water Department if construction water is needed.
No meters installed without fee's being paid in full.
City to determine location for all hydrant meters.

WATER NOTES ADDITIONAL

1. Connection to the Water System shall be inspected by Public Works Department. 48 Hours (2 working days) notice for inspection.
2. All water system flushing, including fire lines, shall be scheduled through the Public Works Department who will in turn schedule the water department to be present to record water used and to operate city valves.
3. Utility permits must be applied and paid for prior to any connections being made to either the water or sewer system.
4. All backflow devices must be tested and certified by a stated certified tester prior to the water services being activated for use.
5. Only City Water Department personnel shall operate city valves.
6. Shut downs of the water system for connections will be done between Tuesday and Thursday from 8 AM and 4 PM. Max time the water may be off is 4 hours without prior approval.
7. Submittals and shop drawings must be approved before the shut down is scheduled. Contractor is required to notify the customers affected 2 working days in advance in writting with city approved letter.
8. Meters larger than 1" will be supplied by the contractor.
   a. Must be delivered to the Water Department shop for accuracy testing at least one week prior to installation date.
   b. Must be installed by the contractor.
   c. Must have approved submittal

All backfill shall be $\frac{5}{8}$" minus (CSTC).

Foundation material & Geo grid shall be installed as directed by the City of Longview & to the depth as directed.

All pavement patches shall be 2" plus existing in depth or as directed by the City of Longview.

All pavement shall be full depth sawcut & replaced per the limits as marked by the City of Longview after construction.

WATER SPECIFICATIONS (5 OF 5)

STANDARD PLAN:	CITY ENGINEER APPROVAL:
W - 704	Longview: C.B.
DATE: MARCH 2018	

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(360)991-9300 Email:info@kessiconsulting.com
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KESSI ENGINEERING & CONSULTING

REVISIONS 1 2 3 4 5

DRAWN BY: T.F.
DESIGNED BY: J.K.
CHECKED BY: J.K.

May 10, 2025

PROJECT #155
DATE: 5/10/2025

MINT VALLEY
CITY OF LONGVIEW
WATER DETAILS

MV D7

STREET CONSTRUCTION NOTES

1. ALL PUBLIC STREETS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION AND THE CITY OF LONGVIEW STANDARD PLANS AND SPECIFICATIONS.
2. A PERMIT MUST BE OBTAINED FROM THE PUBLIC WORKS DEPARTMENT PRIOR TO CONSTRUCTION IN THE CITY RIGHT OF WAY (R/W). THE ENGINEERS OFFICE MUST BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION.
3. MATERIAL IN SOFT SPOTS WITHIN THE ROADWAY SHALL BE REMOVE TO THE DEPTH REQUIRED TO PROVIDE A FIRM FOUNDATION AND SHALL BE THOROUGHLY COMPACTED TO A RELATIVE DENSITY OF 95% OF OPTIMUM. THE MAXIMUM ALLOWABLE ROCK SIZE IS 4 INCHES. WORK SHALL BE CONSISTENT WITH THE STANDARD SPECIFICATIONS SECTION 2-06. GEOTEXTILE MAY BE UTILIZED TO ACHIEVE STABILITY.
4. NEW CURBS SHALL BE MARKED WITH "S" FOR SEWER, "W" FOR WATER, AND "D" FOR STORM SEWER DRAIN WHEREVER A WATER, SEWER, OR STORM CROSSES UNDER THE CURB.
5. ALL PUBLIC STREET CONSTRUCTION IS SUBJECT TO INSPECTION AND APPROVAL BY THE CITY DEPARTMENT OF PUBLIC WORKS. THE CONTRACTOR SHALL NOTIFY THE CITY A MINIMUM OF TWO FULL WORKING DAYS PRIOR TO THE START OF ANY CONSTRUCTION.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO THE START OF CONSTRUCTION/EXCAVATION AND SHALL NOTIFY THE ENGINEER OF ANY POTENTIAL CONFLICTS. THE CONTRACTOR IS REQUIRED TO CONTACT THE NORTHWEST UTILITY NOTIFICATION CENTER A MINIMUM OF TWO FULL BUSINESS DAYS PRIOR TO THE START OF CONSTRUCTION AND/OR ANY EXCAVATION AT 811 OR WWW.CALLBEFOREYOUDIG.ORG.
7. AS-BUILT DRAWINGS SHALL BE SUBMITTED AND APPROVED PRIOR TO PROJECT ACCEPTANCE.
8. ANY CONTRACTOR CAUSED DAMAGE TO CITY STREETS, ALLEYS, SIDEWALKS, OR CITY INFRASTRUCTURE SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE CITY AT THE SOLE EXPENSE OF THE CONTRACTOR.
9. ALL CONCRETE STREET AND/OR ALLEY PANELS THAT ARE SAWN OR OTHERWISE IMPACTED BY THE CONTRACTOR'S WORK SHALL BE FULL PANEL REPLACEMENT (TO NEAREST CONTROL JOINT).
10. PRIOR TO THE START OF WORK, IF THE CONTRACTOR DETERMINES THE CONSTRUCTION ACTIVITY WILL DAMAGE ADJACENT (UN-CUT) CONCRETE PANELS, THE CONTRACTOR SHALL CONTACT THE CITY ENGINEER FOR A DETERMINATION ON THE EXTENT OF PANEL REPLACEMENT OR REPAIR.
11. DOUBLE SAW CUT: ALL CONCRETE PAVEMENT SHALL BE DOUBLE CUT AND SHALL BE FULL DEPTH SAWCUT AND REPLACED TO THE LIMITS AS MARKED BY THE CITY STAFF.
12. CURING COMPOUND PER SECTION 5-05.3(13). CLEAR CONCRETE SEALER TO BE PLACED WITHIN 2 HOURS AFTER FINISHING IN COMPLETE.
13. CLUSTER STYLE MAIL BOXES ARE PROHIBITED ON COLLECTOR AND ARTERIAL STREETS.
14. PRE-CONSTRUCTION MEETING (PRECON): A PRECON SHALL BE HELD FOR ALL WORK IN THE CITY'S RIGHT-OF-WAY. PRIOR TO SCHEDULING PRECON, A R/W PERMIT SHALL BE OBTAINED AND LOCATES ARE TO BE PAINTED ON GROUND.

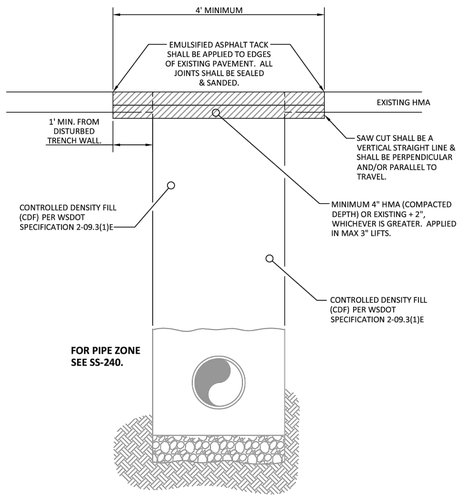
The City of Longview Washington	STREET GENERAL NOTES	
	STANDARD PLAN: **ST - 000**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**

Street Construction Notes cont.

10. Prior to the start of work, if the contractor determines the construction activity will damage adjacent (un-cut) concrete panels, the contractor shall contact the City Engineer for a determination on the extent of panel replacement or repair.
11. DOUBLE SAW CUT - All concrete pavement shall be double cut and shall be full depth sawcut and replaced to the limits as marked by the city staff.
12. Curing compound per section 5-05.3(13)

    Clear concrete sealer to be placed within 2 hours after finishing in complete.
13. Cluster style mail boxes are prohibited on collector and arterial streets.
14. PRE-CONSTRUCTION MEETING (Precon) - A precon shall be held for all work in the City's Right-of-Way. Prior to scheduling precon, a R/W permit shall be obtained and locates are to be painted on ground.

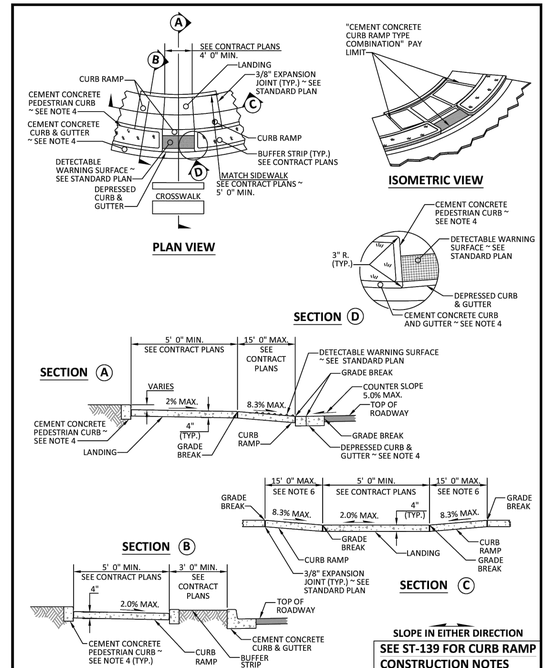
The City of Longview Washington	STREET GENERAL NOTES	
	STANDARD PLAN: **ST - 001**	CITY ENGINEER APPROVAL: Longview: **K.H.**
	DATE: **SEPT 2019**	



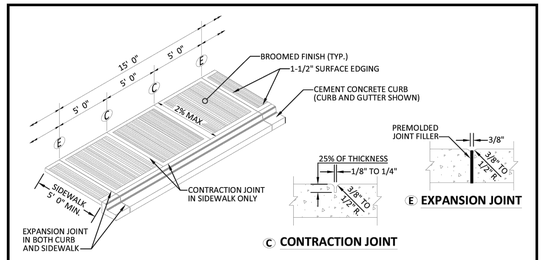
NOTES:

1. ALL MATERIALS EXCEPT HMA AND BEDDING MATERIAL SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY AS DETERMINED BY ASTM D1557.
2. TRENCH SHALL BE PLATED OR CAPPED WITH COLD MIX UNTIL PAVED.
3. PLATE TO BE PINNED & COLD MIXED, OR SECURED BY METHOD APPROVED BY ENGINEER.

The City of Longview Washington	ASPHALT RESIDENTIAL TRENCH RESTORATION	
	STANDARD PLAN: **ST - 020**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



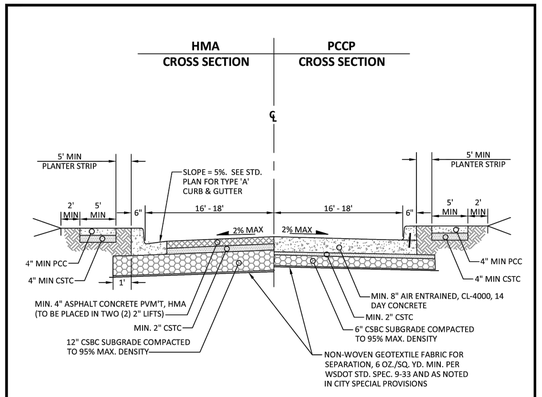
The City of Longview Washington	COMBINATION CURB RAMP	
	STANDARD PLAN: **ST - 132**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



NOTES:

1. CONCRETE MIX (COMMERCIAL MIX) AIR ENTRAINED 3000 PSI, OR STRONGER.
2. CURING COMPOUND PER SECTION 5-05.3(13)A CLEAR CONCRETE SEALER TO BE PLACED WITHIN (2) TWO HOURS AFTER FINISHING IS COMPLETE.
3. EXPANSION JOINTS AT CURB MUST ALIGN WITH EXPANSION JOINTS IN SIDEWALK.
4. EXPANSION JOINT ON REPLACED 4 FT. SIDEWALKS SHALL BE PLACED ON 16 FT. INTERVALS.
5. EXPANSION JOINTS SHALL BE PLACED AT POINTS OF TANGENCY ON STREETS, ALLEYS & DRIVEWAY RETURNS AND WHERE NEW CONCRETE IS POURED AGAINST EXISTING CONCRETE. ALL JOINTS SHALL BE CLEAN AND IN THE GUTTER SECTIONS SHALL BE EDGED. ALL COSTS SHALL BE INCIDENTAL TO THE COST OF THE CONTRACT.
6. AS A GENERAL RULE RESIDENTIAL SIDEWALKS SHALL BE PLACED 2 FT. FROM THE PROPERTY LINE AND COMMERCIAL SIDEWALKS SHALL BE PLACED ON THE PROPERTY LINE.
7. SIDEWALKS SHALL SLOPE 2% MAX TOWARD STREET.
8. BASE SHALL BE A MINIMUM OF 4" COMPACTED CSTC.
9. WHEN TRANSITIONING AROUND FIXED OBJECTS IN THE SIDEWALK (FIRE HYDRANTS, MAIL BOXES, ETC.) MAINTAIN A STANDARD SIDEWALK WIDTH BY WIDENING THE SIDEWALK BEHIND THE FIXED OBJECT. IF THE STANDARD WIDTH CAN'T BE MAINTAINED, THE SIDEWALK MAY BE NARROWED TO 4-FOOT WIDTH, FOR SHORT DISTANCES. ALL SIDEWALK WIDTH DEVIATIONS SHALL BE APPROVED BY THE CITY ENGINEER.
10. MATCH EXISTING PATTERN, COLOR, AND TEXTURE OF REPLACED CONCRETE TO THE MAXIMUM EXTENT PRACTICABLE WITH SURROUNDING SIDEWALK WHERE DESIGNATED BY THE CITY.
11. STAMP STREET NAMES AT ALL INTERSECTION CORNER LANDINGS.
12. JOINT MATERIAL TO BE ASPHALT IMPREGNATED.
13. FULL PANEL REPLACEMENT REQUIRED FOR ALL DAMAGED OR VANDALIZED CONCRETE. NO GRAFFITI DAMAGE OR REPAIRS WILL BE ACCEPTED.
14. 2" DEEP CONTRACTION JOINTS ARE ALLOWED.
15. SEE DETAIL ST-160 FOR SIDEWALK THRU DRIVEWAY AREA.
16. SIDEWALK THICKNESS SHALL BE 4" EXCEPT:
    - THROUGH RESIDENTIAL DRIVEWAYS - 6"
    - OCEAN BEACH HWY SIDEWALK - 6"
    - THROUGH COMMERCIAL DRIVEWAYS - 8"
    - THROUGH ALLEY APPROACHES - 8"

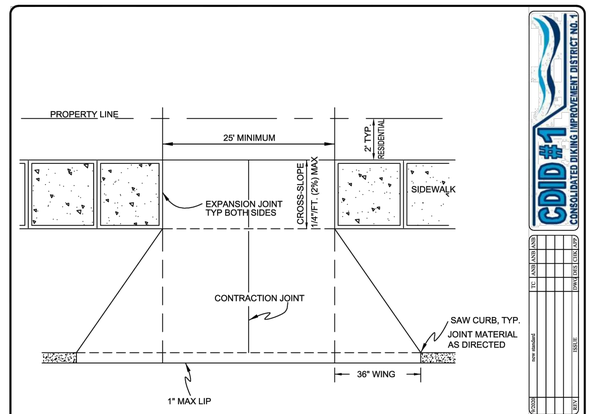
The City of Longview Washington	SIDEWALKS	
	STANDARD PLAN: **ST - 150**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



NOTES:

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

The City of Longview Washington	LOCAL ACCESS STREET SECTION	
	STANDARD PLAN: **ST - 080**	CITY ENGINEER APPROVAL: **Samuel B. Barham**
	DATE: **JUNE 2024**	DRAWN BY: **Camryn LaChaine**



NOTES:

1) CDID1 DRIVEWAYS SHALL BE A MINIMUM OF 10" IN THICKNESS. CONCRETE SHALL BE AIR ENTRAINED CLASS 4000. ASPHALT IMPREGNATED JOINT MATERIAL SHALL BE PLACED AS SHOWN ON THIS PLAN.
2) CRUSHED SURFACING BASE COURSE SHALL BE PLACED & COMPACTED TO A DEPTH OF 8" MINIMUM.
3) WHERE APPROACH LENGTH EXCEEDS 15', PLACE ADDITIONAL TRANSVERSE CONTRACTION JOINT WHERE DIRECTED.
4) A 1" MAXIMUM LIP SHALL BE PROVIDED AT THE GUTTER LINE OF THE APPROACH.
5) CURB (FOR CONCRETE STREETS) OR CURB & GUTTER (FOR ASPHALT STREETS) SHALL BE POURED MONOLITHICALLY WITH DRIVEWAY.
6) FURTHER REQUIREMENTS FOR FORMS, FORM SETTING, PLACING, FINISHING, AND CURING SHALL BE AS OUTLINED IN WSDOT STANDARD SPEC 5-05.3.
7) CROSS SLOPE ON SIDEWALK SHALL NOT EXCEED 2%.
8) REFER TO CITY OF LONGVIEW STANDARD PLAN ST-160 FOR ADDITIONAL REQUIREMENTS.

CDID #1 CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 1

MAINTENENCE ACCESS DRIVEWAY
STANDARD INSTALLATION DETAIL

DATE: SEPT 2020
DESIGN: ANB
DRAWN: TC

DRAWING NO.
C-7
1 of 1

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KESSI ENGINEERING & CONSULTING

REVISIONS

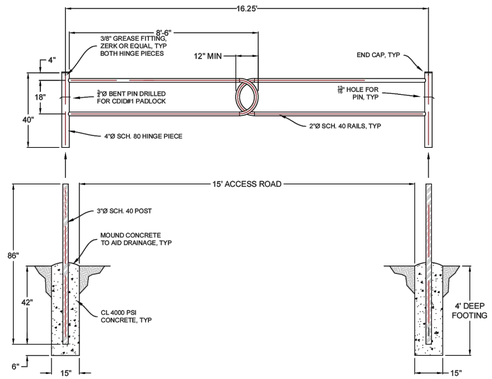
	1	2	3	4	5
DRAWN BY:	T.F.				
DESIGNED BY:	J.K.				
CHECKED BY:	J.K.				

STATE OF WASHINGTON JAMES R. KESSI 24955 REGISTERED PROFESSIONAL ENGINEER
May 10, 2025

PROJECT #155
DATE: 5/10/2025

MINT VALLEY
STREET SECTION ADA RAMPS AND CONSTRUCTION NOTES

MV D8



NOTES:

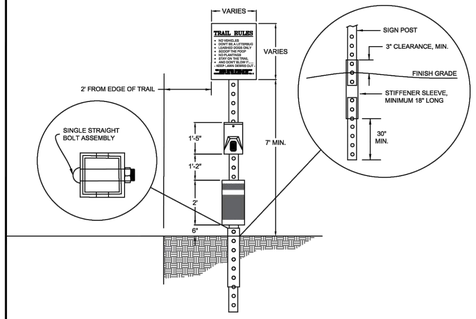
1. ALL WELDED CONNECTIONS SHALL BE ¾" CONTINUOUS FILLET WELDS, GROUND SMOOTH.
2. ALL SHARP OR ROUGH EDGES SHALL BE GROUND SMOOTH. GRIND CORNERS TO ¼" ± RADIUS
3. GATE AND POSTS SHALL BE CLEANED OF ALL RUST AND CONTAMINANTS AND PAINTED WITH NEW CAT YELLOW OR APPROVED EQUIVALENT.
4. ALL END CAPS SHALL BE ¼" A36 GRADE B MS.
5. LOCATE THE TWO CHICANE GATES SUCH THAT, WHEN CLOSED ACROSS ACCESS ROAD AND PARALLEL TO EACH OTHER, THERE IS 6-FT OF SEPARATION BETWEEN THEM. OR AS DIRECTED BY ENGINEER FOR SPECIAL CIRCUMSTANCES.
5. PROVIDE AND INSTALL UNISTRUT SIGN SUPPORT SYSTEM FOR TRAIL SIGNS AT EACH ACCESS POINT PER CDID1 STANDARD DETAIL C-9.
6. CONTRACTOR SHALL PROVIDE SPECIFIC LOCK BODY (ONE FOR EACH PIN) TO CDID #1. LOCKS SHALL BE SMALL FORMAT IC (SFIC) WITH HASP LENGTH OF 1 3/4" TO 2 3/4". CDID #1 WILL INSTALL CORES.

CDID #1 CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 1

CHICANE ACCESS GATE
STANDARD INSTALLATION DETAIL

DATE: SEPT 2020
DESIGN: ANB
DRAWN: ANB

DRAWING NO.
C-2
1 of 1



NOTES:

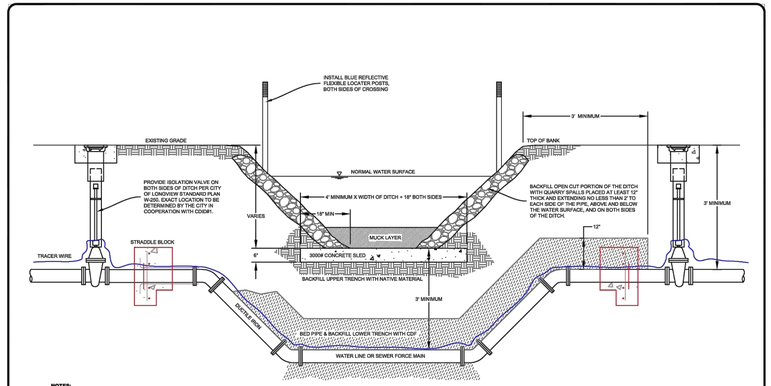
1. SIGN SUPPORT SYSTEM SHALL BE TELESCOPING SQUARE TUBING BY UNISTRUT (TELESPAR) OR APPROVED EQUAL.
2. POSTS SHALL BE 2-INCH PERFORATED SQUARE TUBING ROLLED FROM 12 GAUGE (0.105") STRIP STEEL, ASTM A446 GRADE A.
3. RECEIVERS SHALL BE 2-1/4" OR THE CONSECUTIVE SIZE SOLID SQUARE TUBING, ROLLED FROM 12 GAUGE (0.105") STRIP STEEL, ASTM A446 GRADE A.
4. POSTS SHALL BE STRAIGHT WITH A SMOOTH UNIFORM FINISH AND SHALL TELESCOPE FREELY WITH MINIMAL PLAY. ALL HOLES AND CUT OFF ENDS SHALL BE FREE OF BURRS.
5. ALL MEMBERS SHALL BE ZINC GALVANIZED FINISH PER ASTM A525 COATING DESIGNATION G90.
6. UNLESS NOTED OTHERWISE, CONTRACTOR OR DEVELOPER SHALL PROVIDE AND INSTALL SIGN SUPPORT SYSTEM, RECEIVER AND POST. CDID#1 WILL PROVIDE AND INSTALL THE SIGN.
7. IF REQUIRED, SIGNS SHALL BE ENGINEER GRADE INSTALLED ON A MINIMUM 0.080 GAUGE SIGN BLANK. SIGN DIMENSIONS, TEXT SIZE AND CONTENT SHALL BE AS DETERMINED BY CDID#1.
8. PHYSICAL LOCATION OF SIGN POSTS SHALL BE VERIFIED WITH CDID#1 FOR OPTIMAL VISIBILITY.
9. GARBAGE CAN SHALL BE FOR OUTDOOR USE, 11.5 GALLON, POWDER COATED GALVANIZED STEEL, GREEN IN COLOR, 12" DIA. X 24" TALL, POST MOUNTED WITH MANUAL LIFT LID AND BAG CLAMPS, UPGORILO OR APPROVED EQUAL.
10. BAG DISPENSER SHALL BE FOR OUTDOOR USE, RUSTPROOF ALUMINUM, GREEN IN COLOR, LOCKING WITH TWO KEYS, POLE MOUNTED, 2-PRONG WITH 5" SPACING, MUTT MITT OR APPROVED EQUAL.

CDID #1 CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 1

PET WASTE STATION
STANDARD INSTALLATION DETAIL

DATE: JUNE 2024
DESIGN: ANB
DRAWN: ANB

DRAWING NO.
C-15
1 of 1



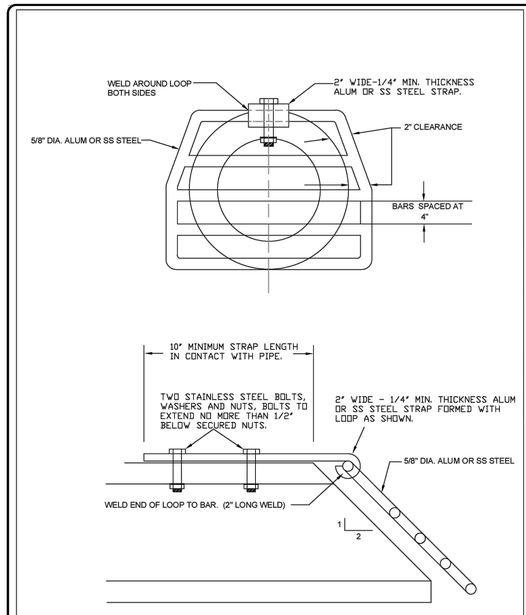
NOTES:

1. ALL PIPE, FITTINGS, VALVES, MECHANICAL JOINT RESTRAINTS AND BEDDING SHALL MEET CITY OF LONGVIEW STANDARD DETAILS AND SPECIFICATIONS.
2. SIZE OF THRUST BLOCKS, AND TYPE AND SIZE OF THRUST BLOCKS SHALL MEET CITY OF LONGVIEW STANDARDS.
3. CONCRETE SLED SHALL BE A 3-DAY MIX WITH 3,000 PSI MINIMUM STRENGTH.
4. CONCRETE SLED MAY BE OMITTED IF 60" OR MORE OF COVER IS PROVIDED OVER THE TOP OF PIPE IN UNPAVED AREAS.
5. USE OF A STEEL CASING REQUIRES 14 GAUGE CONDS. STEEL CASING SHALL BE TWICE THE DIAMETER OF THE CARRIER PIPE AND THE ANNULAR SPACE MUST BE GROUT FILLED. STEEL CASING MUST EXTEND AT LEAST 5-FT BEYOND TOP OF DITCH BANK ON BOTH SIDES OF THE CROSSING.

1 of 1

UTILITY CROSSING
STANDARD INSTALLATION DETAIL

CDID #1 CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 1



NOTES:

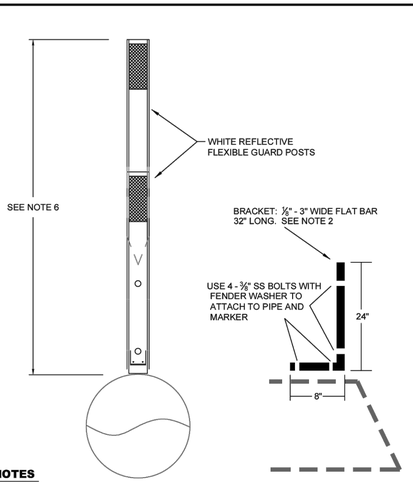
1. FOR CULVERTS 8" AND LARGER
2. PIPE BEVELED 2:1
3. WHEN CORRUGATED THERMOPLASTIC PIPE IS USED, SECURING BOLTS SHALL BE ALIGNED TO PASS THROUGH THE OUTER CORRUGATION RIDGES.
4. SEE DETAIL SD-3: LOCATOR POST MOUNTING HOLES TO MATCH.

CDID #1 CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 1

CULVERT SAFETY GRATE
STANDARD INSTALLATION DETAIL

DATE: JULY 2020
DESIGN: ANB
DRAWN: TC

DRAWING NO.
SD-2
1 of 1



NOTES

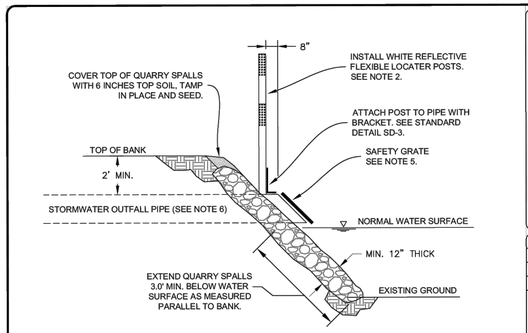
1) MARKER POSTS SHALL BE LOCATED ON TOP OF THE PIPE UNLESS DIRECTED OTHERWISE.
2) STEEL BRACKET SHALL BE CLEANED AND PAINTED. BEND AT 8". INSTALLATION OF BRACKET SHALL NOT INTERFERE WITH SAFETY GRATE BUT MAY USE GRATE MOUNTING HOLES IF APPLICABLE.
3) MARKER POSTS SHALL BE WHITE IN COLOR.
4) MARKER POSTS TO BE USED AS DIRECTED BY CDID1 OR AS SHOWN ON PLANS.
5) MARKER POSTS ARE REQUIRED ON ALL OUTFALL PIPES PROTRUDING INTO DITCHES & DRAINAGE WAYS OWNED OR MAINTAINED BY CDID1.
6) INSTALLATION: TOP OF POST SHALL BE 78" ABOVE GRADE AT POINT OF INSTALLATION. THIS MAY BE ACHIEVED BY BOLTING TWO MARKERS TOGETHER. NUTS, BOLTS AND WASHERS TO BE STAINLESS STEEL.
7) DRILL MOUNTING HOLES TO MATCH SD-2 CULVERT SAFETY GRATE MOUNTING HOLES AND MOUNT TOGETHER IN ONE BOLT UP.

CDID #1 CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 1

LOCATOR POST
STANDARD INSTALLATION DETAIL

DATE: JULY 2020
DESIGN: ANB
DRAWN: TC

DRAWING NO.
SD-3
1 of 1



NOTES:

1.) QUARRY SPALLS PER WSDOT SPEC 9-13.1(5), PLACED AT LEAST 12" THICK. QUARRY SPALLS SHALL EXTEND NO LESS THAN:
- 1-FT ABOVE TOP OF PIPE
- 2-FT TO EACH SIDE OF PIPE
- 3-FT BELOW NORMAL WATER SURFACE

2.) WHITE REFLECTIVE FLEXIBLE FIBERGLASS LOCATOR POST OR APPROVED EQUAL SHALL BE INSTALLED ON TOP OF THE PIPE AND SHALL EXTEND AT LEAST 6 1/2-FT ABOVE GROUND. INSTALL POST WITH BRACKET PER CDID1 STANDARD DETAIL SD-3.

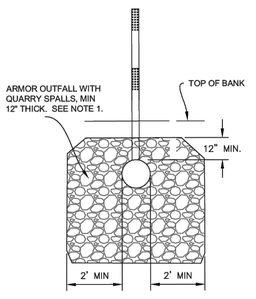
3.) SEED ALL DISTURBED AREAS WITH EROSION CONTROL SEED MIXTURE PER CDID1 STANDARD DETAIL EC-1 UPON PROJECT COMPLETION.

4.) THIS STANDARD PLAN NOT INTENDED TO PROVIDE FOR FISH PASSAGE REQUIREMENTS.

5.) BEVEL PIPE AND INSTALL CULVERT SAFETY GRATE FOR PIPES 8" AND LARGER PER CDID1 STANDARD DETAIL SD-2.

6.) SUBMIT PIPE SIZE AND TYPE TO DISTRICT ENGINEER FOR APPROVAL. MINIMUM COVER SHALL BE 2'.

7) CDID1 ASSUMES NO OWNERSHIP OF CULVERTS, OUTFALLS OR OTHER STORMWATER CONVEYANCES. THE PERMITTEE IS SOLELY RESPONSIBLE FOR THE MAINTENANCE, REPAIR, REPLACEMENT AND/OR POSSIBLE RELOCATION OF ALL CONSTRUCTED IMPROVEMENTS.



QUARRY SPALL PLACEMENT DETAIL

CDID #1 CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 1

STORMWATER OUTFALL PIPE
STANDARD INSTALLATION DETAIL

DATE: JULY 2020
DESIGN: ANB
DRAWN: TC

DRAWING NO.
SD-1
1 of 1

KESSI ENGINEERING
PLANNING CONSULTING
CIVIL ENGINEERING PROJECT MANAGEMENT
6400 NE HWY 99 #G-169 VANCOUVER, WA 98665
(360)991-9300 Email:info@kessiconsulting.com
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REVISIONS

DRAWN BY:	1
T.F.	2
DESIGNED BY:	3
J.K.	4
CHECKED BY:	5
J.K.	

R. KESSI WASHINGTON 14935 REGISTERED PROFESSIONAL ENGINEER STATE OF
May 10, 2025

PROJECT #155
DATE: 5/10/2025

MINT VALLEY
CDID#1 DETAILS

MV D9

BASIS OF BEARING
GEODETIC (TRUE)
BASED ON GPS DATA
TAKEN NEAR THE SW CORNER OF Lot 2
of SP 2002-1

DATUM: NAVD '88

LEGEND

- CORNER FOUND AND TIED
- CALCULATED POSITION
- ( ) RECORD DATA
- SANITARY SEWER MANHOLE
- WATER METER
- UTILITY POLE (WITHIN I.O')
- TREE
- EXISTING FENCE LINE

50 0 50 100

Scale: 1 inch = 50 feet

BLOCK 14
LOT 12
LOT 13
LOT 14
LOT 15
LOT 16
LOT 17
LOT 18
BLOCK 15
OAK STREET
34TH AVE
50'
EDGE OF PAVEMENT
GM STREET
MH 3+40
SSMH RIM: 7.08
8" SE-NW: -2.52
MH 0+00 LAT 8
SSMH RIM: 6.23
8" SE-NW: -3.47
PROJECT TBM
NAD 83 (2011)
N: 5,258,672.788
E: 1,059,873.208
EL: 10.000 (NAVD 88)
SET
LOT 1
SP 2002-1
V13 P44
LOT 1
SP 2002-1
V13 P44
1.9 ACS
LOT 2
8.9 ACS
17.19'
GRAVEL
GRAVEL
GAZEBO
SHED
BUILDING
BUILDING
BUILDING
BUILDING
BUILDING
BUILDING
BUILDING
SHED
SHED
CMU
CMU
EOR
EOR
EOR

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Taylor Island Estates PUD Subdivision Staff Report

Staff Report Date:	May 28, 2025
Property Owner:	TJ & Andrew Frey
Applicant:	Hinton Development
Project Summary:	Proposal for a Planned Unit Development (PUD) Subdivision to divide approximately 12.83 acres total, into 54 single-family detached lots in on phase.
Project Location:	The 12.83 acres site is located at what is currently 5431 Mt Solo Road, parcel number 107710100. The site is currently developed with a single-family residence to be removed and is bordered on three sides by CDID #1 drainage ditch.
Current Zoning:	R-1 Low Density Residential
Comprehensive Plan:	Low Density Residential
Existing Land Use:	Single family with outbuilding
Surrounding Land Use:	Single family residential, Recreational Park, Educational Service
Staff Recommendation:	Approval of the Taylor Island Estates Planned Unit Development (PUD) Subdivision, with conditions.

1. PROJECT DESCRIPTION

The applicant, Hinton Development Corporation, is proposing the Taylor Island Estates Planned Unit Development (PUD), a 54-lot single-family residential subdivision on an approximately 12.83-acre site located at 5431 Mt. Solo Road in Longview, WA (Parcel No. 107710100). The project is located in the R-1 (Single-Family Residential) 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 proposed gross density is approximately 4.21 dwelling units per acre, which is below the maximum 6 units per acre allowed in the R-1 zone under PUD provisions. Access to the subdivision will be from Mt. Solo Road via a single entrance to a network of internal public roads. All internal roads will be constructed with 50 feet of right-of-way and 30 feet of paved width, including detached 5-foot sidewalks and planter strips. As part of the proposed development, the applicant has requested a variance from LMC 12.50.050, which requires two points of access for residential developments containing 30 or more dwelling units. The development includes public water and sewer service provided by the City of Longview, and stormwater will be managed through on-site detention pond and treatment facilities discharging to CDID Ditch #15 in compliance with LMC 17.80.

The subdivision is designed to preserve open space and provide recreational amenities in accordance with PUD requirements. Approximately 41% of the site (229,065 square feet) is dedicated to open space, with 103,223 square feet allocated for active recreation through a loop trail system. Adequate parking will be provided for each home in the development as each home will be constructed with a minimum two car garages.

The site is mostly flat with gentle slope downward from the north and east to the southwest and bordered on three sides by CDID ditch. Vegetation onsite is dominated by pasture grass and it was recently seeded for hay production. The site currently has a single-family dwelling with outbuildings that will be removed as part of the project.

2. CRITICAL AREAS

No mapped critical areas appear to be on the site. The project site is bordered by a CDID ditch on three sides. Under LMC 17.10.070, CDID drainage ditches are exempt from critical area regulations as outlined in the critical area code.

3. SEPA AND PUBLIC NOTICE

SEPA was conducted and noticed as part of the project review. A Determination of Non-Significance (DNS) was issued on May 15th, 2025. The comment period ended on May 28th, 2025. The applicant has satisfactory addressed the comments received during the SEPA review process.

4. LMC 19.20.030 R-1 DENSITY AND DIMENSIONAL STANDARDS

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

Standard	**R-1 Requirement**	**PUD Modification Allowed?**	**Taylor Island Estates Proposal**	**Meets Standard**
Minimum Lot Size	6,000 sq. ft.	Yes (via LMC 19.66.050)	3,150 – 6,166 sq. ft.	✓ Yes (PUD)
Minimum Lot Frontage/Width	50 ft	Yes	25 ft (pie), 35 ft (rectangular)	✓ Yes (PUD)
Maximum density	6 units/acre	No	4.21 units/acre	✓ Yes
Front setback	25 ft	Yes	25 ft	✓ Yes
Interior Side Setback	5 ft	Yes	5 ft	✓ Yes
Rear Setback	15 ft	Yes	15 ft	✓ Yes
Maximum Building Height	35 ft	No	35 ft	✓ Yes (subject to future permit review)
Maximum Impervious Surface	65%	Yes	65%	✓ Yes

Staff Findings: The proposed Taylor Island Estates PUD subdivision complies with the underlying R-1 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 for pie-shaped lots and 35 feet for rectangular lots. Lot sizes range from 3,150 to 6,166 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 4.21 dwelling units per acre is below the maximum 6 units per acre allowed in the R-1 zone.

5. LMC 19.66 PLANNED UNIT DEVELOPMENT

A. 19.66.050 Discretionary Standards

The planned unit development (PUD) process provides an alternative to the traditional approach to subdividing property, allowing for variety and flexibility in plat design in exchange for open space, recreational amenities and better overall design. As part of the application the

applicant has applied for the following modifications, which are allowed under the PUD standards:

a) Minimum lot size and building site dimensions.
b) Minimum development standards for street right-of-way improvements including. the regulations related to right-of-way width, pavement width, planting strips, sidewalk construction.

Staff Findings: The R-1 residential district typically requires a minimum lot size of 6,000 square feet and a minimum lot width of 50 feet. The project proposes modifications to these standards, including a minimum lot width of 25 feet for pie-shaped lots and 35 feet for rectangular lots; and lot sizes range from 3,150 to 6,166 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, encouraging affordable housing.

Modifications to the RoW standards and road standards are also allowed under LMC 19.66.050, however, these modifications are approved by the Fire Chief (e.g Fire Marshal) and City Engineer according to the following criteria:

(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) The modification is consistent with sound engineering principles and will be safe, practical, and efficient.

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

(d) The proposed modification is consistent with the goals and policies of the Comprehensive Plan.

Per LMC 12.50.040, the required minimum right-of-way width for residential street access is 60 feet, with a minimum pavement width of 32 feet. The project proposes a 50-foot right-of-way and a 30-foot minimum pavement width. The city engineer and fire marshal have reviewed and approved the proposed deviations, finding that the project site is physically constrained by the CDID drainage ditch along three sides. The proposed reductions to street right-of-way and pavement width are consistent with sound engineering principles, provide for safe and efficient circulation, and align with both the intent of LMC 12.50 and the goals of the City's Comprehensive Plan.

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…"

Staff Findings: The applicant proposes to dedicate approximately 41% of the total 12.83-acre site (229,065 square feet) to open space. Of this, 103,223 square feet equating to 18 %of the total site is designated for active recreational use, including a looped trail system. These areas will be fully accessible to residents and designed for recreational enjoyment, thereby qualifying as usable recreation space per PUD standards. The open space trail system will be dedicated to and maintained by CDID. The proposal satisfies the intent and requirements of LMC 19.66.070 by providing ample open space that supports the livability and character of the neighborhood.

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

Staff Findings: The proposed Taylor Island Estates Planned Unit Development (PUD) 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 Taylor Island Estates Planned Unit Development (PUD) will serve the public use and interest by offering a mix of lot sizes and housing options within the R-1 zoning district, supporting efficient land use while preserving significant open space for community benefit. Public infrastructure improvements will include extension of city water and sewer services, and installation of stormwater treatment and detention facilities designed to meet applicable City standards. The project includes a single point of access from Mt. Solo Road and requests a variance from LMC 12.50.050, which requires two access points for developments exceeding 30 units. Due to site constraints created by CDID drainage ditches on three sides, the City Engineer and Fire Marshal have approved the variance on the condition that all homes are equipped with residential fire sprinkler systems to ensure adequate fire protection. According to the geotechnical report prepared by Redmond Geotechnical Services (dated June 30, 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 54-lot single-family residential development in terms of its size, shape, and relatively flat topography. The proposed density of 4.21 units per acre is well within the allowable limits for the R-1 zoning district and is consistent with the surrounding residential context. The geotechnical report prepared by Redmond Geotechnical Services confirms that the site can support residential development using standard construction methods and that there are no significant geologic hazards present, such as landslides and liquefaction. The site layout works with the existing physical constraints, including the CDID drainage ditches that border the property on three sides. Based on this information, staff finds that the site is appropriate for the proposed use and will not result in significant adverse impacts.

3. Innovative Development

Staff Findings: The proposed Taylor Island Estates 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 layout of the proposed Taylor Island Estates PUD has been designed to minimize disturbance to existing natural features on the site. The property is bordered on three sides by CDID drainage ditches, which have been preserved and incorporated into the site design.

4. Design, Appearance, Neighborhood Compatibility

Staff Findings: The development adjacent to the project site consists of existing single-family residential neighborhoods characterized by landscaped front yards, mature trees, and sidewalks, features that are proposed in the Taylor Island Estates PUD. The project incorporates similar design elements, including detached sidewalks and landscaped planter strips creating a compatibly along the perimeter.

5. Open Space and Natural Features

Staff Findings: The proposed PUD clearly identifies open space areas throughout the site (Tracts A-F), with a total of 228,065 square feet (41% of the site) designated as open space, exceeding the 20% minimum requirement. Of the total open space 103,223 square feet (18%) is set aside for active recreational use, including a loop trail. The open space protects natural features on site that comprise of CDID ditch as the trail system will provided access for the maintenance of the ditch. A portion of Tract A, which

includes the trail, will be dedicated to CDID, who will assume ownership and maintenance of the trail system. The specific area to be dedicated to CDID will be determined during the final plat process and identified on the final plat as "Tract G." Similarly, the stormwater pond will be separated from Tract A during final plat review and designated as "Tract H" on the final plat. This new "Tract H" will be dedicated to City of Longview, who will maintain that portion of the stormwater system. The remainder of Tract A not associated with the trail or stormwater pond, will remain under the ownership of the HOA, along with Tracts B, C, D, E, and F.

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 City street to serve the proposed lots. The applicant has requested a modification to the typical street standards outlined in LMC 12.50.040 and -.050 as part of their flexible PUD design. The proposed roadway will include a 30-foot driving surface, and a 5-foot detached sidewalk. Additionally, detached sidewalks will be provided along the project's frontage on Mt. Solo Road. Street lights 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.

8" Water and Sewer main extensions will be installed along the new street and connect to the existing water and sewer utilities in Mt. Solo Road.

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 Filterra Bioscape vaults for water quality treatment and an on-site detention pond designed to control flow rates to pre-development conditions for the 25-year storm event. Stormwater will be collected from the individual lots via a stormwater line along the rear of the properties and transported to the detention facility on Tract A before being discharged into the CDID ditch.

Staff Findings: The Taylor Island Estates development includes appropriate provisions to address impacts related to transportation, utilities, and drainage. The proposed streets, utilities, and public improvements for the Taylor Island Estates subdivision have been

designed in accordance with the City's current ordinances, standards, and plans; excepting for the requested modification to the interior street standards.

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.

The project includes a single point of access from Mt. Solo Road and requests a variance from LMC 12.50.050, which requires two access points for developments exceeding 30 units. Due to site constraints created by CDID drainage ditches on three sides, the City Engineer and Fire Marshal have approved the variance on the condition that all homes are equipped with residential fire sprinkler systems to ensure adequate fire protection.

B. Public Health, Safety, and Welfare

Staff Findings: All homes within the project will be equipped with fire sprinklers to mitigate for the lack of a secondary access, as approved by the City Engineer and Fire Marshal. The project proposes open space and a trail system to promote active living of residences in of the subdivision.

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…"* The project is located directly across the street from Mt. Solo Middle School, with no existing crosswalks nearby to facilitate children safely walking to school. In order to provide for safe walking routes to school, a crosswalk shall be installed across Mt. Solo Road at a location determined by the City Engineer with consultation with the Longview School District. This crosswalk shall be, at a minimum, of a RRFB design to increase safety and visibility. Alternative proposals, such as but not limited to, a bridge or tunnel, may also be allowed, provided the alternate design provides an equal or greater level of safety. Any alternate design is subject to City Engineer approval.

C. Topography and Physical Characteristics

Staff Findings: The site is mostly flat and doesn't include steep slopes, wetlands, or other mapped critical areas. The provided geotechnical report confirms the soils are suitable for residential development, with no major concerns like flooding or unstable soils. The drainage ditches maintained by CDID #1 run along three sides of the property and have been left in place, working into the overall design as part of the open space and stormwater system.

The Taylor Island Estates subdivision has been laid out to work with the site's natural features . The property is mostly flat and bordered by CDID drainage ditches on three

sides, which are being preserved in place and incorporated into the open space design, maintaining their function. The project abuts Mt Solo Road, a minor arterial road, a landscaping plan has been provided that includes street trees and planting within planter strips consistent with City standards. Fencing of proposed detention pond may be required during final plat review.

D. Compliance With Local and State Codes

Staff Findings: The Taylor Island Estates PUD complies with all applicable state, local, and regional requirements. It meets the subdivision regulations under Chapter 58.17 RCW, including SEPA review, public notice and platting procedures. The project will be conditioned to provide a safe route to school option satisfying RCW 58.17.110. The project is consistent with the R-1 zoning district and the City's Comprehensive Plan, and it doesn't fall within shoreline jurisdiction, so the Cowlitz County Shoreline Master Program does not apply. Stormwater is managed in accordance with LMC 17.80 using on-site detention. All streets, utilities, and public improvements will be built to City standards under LMC12.50. The project meets fire safety requirements through approved street design. The project will provide 41% of the site as open space, with 18% being for recreation use including a looped trail system. 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 and/or CDID via the final plat. Additional title transfers, if required, will occur at the time of final plat recording.

F. Landscaping

Staff Findings: A landscaping plan has been provided by the applicant showing the proposed location and type of vegetation proposed on the site. A 4 ½ -foot planting strip has been provided between the sidewalk and curb of the new street, and a mix of trees and bushes are proposed on the two open space tracts B, C and D. Additionally, trees are proposed along the Mt. Solo Road frontage. 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
- 20’ driveway easement and 35’ fire turnaround easements for Tracts 9 and 10

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 Taylor Island Estate PUD Subdivision is located within the R-1 Residential District, which aligns with the Low-Density Residential designation in the City’s Comprehensive Plan. The Low-Density Residential designation supports the development of Single-family development.

Based on the City of Longview’s Comprehensive Plan, the proposed Taylor Island Estates PUD is consistent with several key goals, policies, and objectives related to land use, housing, infrastructure, and open space. The project supports the Low-Density Residential land use designation by providing single-family homes at a gross density of 4.21 units per acre well below the maximum of 6 units per acre allowed in the R-1 zone. The plan includes a variety of lot sizes and uses the PUD process to promote flexibility while maintaining compatibility with surrounding 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

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

Low Density Residential

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

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

density, and location considering existing land use patters, capacity of public facilities, natural characteristic of the land and community preferences.

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

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

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

8. CONCLUSION

The proposed 54-lot Taylor Island Estates 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 Low Density 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 applicant has requested a variance to allow a single point of access due to site constraints created by CDID ditches on three sides of the site. The request has been reviewed and supported by the City Engineer and Fire Marshal, with a condition imposed to equip all homes with fire sprinkler for adequate fire protection, public safety and compliance with city standards.

The project includes pedestrian connections, a looped public street network, approximately 41% of the site dedicated to open space, and provides for safety improvements for students who walk to school. 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.

9. RECOMMENDATIONS

Approval of the Planned Unit Development (PUD) Subdivision

Staff recommends approval of the Taylor Island Estates Planned Unit Development (PUD) Subdivision, a 54-lot PUD Subdivision, based on the findings and conclusions and subject to the conditions attached to this staff report.

10. EXHIBITS

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

11. CONDITIONS OF APPROVAL

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

2. The plat shall be titled Taylor Island Estates Planned Unit Development. Approval is limited to 54 lots. the new lots shall substantially conform to the lot sizes and dimensions shown on the approved preliminary plat.

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

4. To satisfy the safe route to school requirements for RCW 58.17, at the minimum the applicant shall install a marked pedestrian crossing with Rectangular Rapid Flashing Beacons (RRFBs) across Mt. Solo Road in line with the new intersection, or other alternate design as approved by the City Engineer, in consultation with the Longview School District.

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

6. The geotechnical assessment provided from Redmond Geotechnical Services dated on June 30, 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.

7. 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, open space tracts B, C, D, E, and F. 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.

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

9. All homes within the subdivision shall be equipped with residential fire sprinkler systems as a condition of the approval for the access variance.

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

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

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

13. 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.

14. The developer shall construct all required half-street improvements along the Mt. Solo Road frontage in accordance with City of Longview Public Works standards. Improvements shall be shown in the Final Engineering Plans and approved by the City Engineer.

15. 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.

16. 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.

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

18. Stormwater treatment and detention 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.

19. All necessary stormwater tracts, maintenance and drainage easements shall be identified on the final plat, and the applicable documents to create such easements.

20. Tract A will be divided and identified as three new Tracts. Tract G will include the trail system, which will be dedicated to CDID. Tract H will include the stormwater pond and will be dedicated to the City of Longview. The remainder of Tract will remain as Tract A and will be placed in the ownership of the HOA. Tracts B, C, D, E, and F will remain under HOA ownership. The final plat shall indicate the new open space tract arrangement and shall carry an annotation regarding the ownership of each tract and responsibility for ongoing maintenance for each tract.

21. At each of the two access points to the CDID#1 gravel maintenance road, the applicant shall install a 10-inch thick concrete driveway approach (CDID#1 Standard Detail C-7), an access gate (CDID#1 Standard Detail C-2), and a pet waste station (CDID#1 Standard Detail C-15), all in accordance with CDID#1 standards. These improvements shall be shown on the Final Engineering Plans and are subject to review and approval by both the City Engineer and CDID#1.

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

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

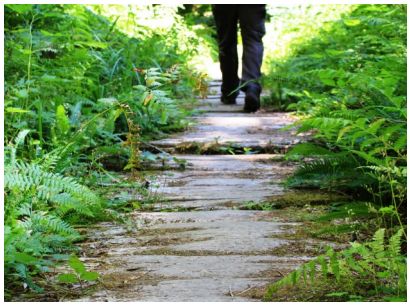
    - A fire sprinkler system shall be installed in all dwelling within this plat prior to final occupancy.

- All future development shall conform to the conclusions and recommendations contained in the geotechnical assessment performed by Redmond Geotechnical Services, dated June 30, 2024.

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

CRITICAL AREAS REPORT

January 20, 2025



Mt. Solo Rd

Longview, Washington

Prepared for

Hinton Development
Attn: Nikole Hinton
14010 NE 3rd Court #A106
Vancouver, Washington 98685
(360) 546.1220

Prepared by

Ecological Land Services

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

(360) 578-1371 • Project Number 0152.21

SIGNATURE PAGE

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

Natalie Denson
Biologist

Beau Johnson
Project Coordinator/Biologist V

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APPENDICES

Appendix A – Routine Determination Method and Plant Indicator Rating Definitions
Appendix B – Wetland Determination Data Forms
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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. The site consists of Cowlitz County Tax Parcel Number 107710100, located at 5431 Mt. Solo Road in Longview, Washington. The parcel is located within a portion of Section 23, Township 8 North, Range 3 West, of the Willamette Meridian (Figure 1). On December 12, 2024, ELS biologists conducted a comprehensive site assessment for the presence of wetlands, fish and wildlife habitat conservation areas, and priority habitats. This critical areas assessment summarizes ELS' findings according to the *Longview Municipal Code (LMC) Title 17 – Environment* (December 2024).

SITE DESCRIPTION

The approximately 12.83-acre site is a single parcel zoned as Residential District (R-1). Access to the site is gained from the southeast from Mt. Solo Road via a gravel driveway (Figure 2). The surrounding parcels are zoned as Residential District (R-1 and R-2) and Residential District Planned Unit Development (R-1 PUD) consisting primarily of single-family residential housing. Structures currently onsite consist of a single-family dwelling and an agricultural building. According to the Federal Emergency Management Agency's (FEMA) National Flood Hazard Layer (NFHL) viewer, the site is not located within a floodplain and is in an area with reduced flood risk due to levees (2024).

The topography of the site is generally flat with a gentle slope downward from the north and east to the southwest (Figure 2). Vegetation onsite is dominated by pasture grass and it was recently seeded for hay production. The perimeter of the site, aside from where it is bordered by Mt. Solo Road, is vegetated by forest cover.

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) 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 December 12, 2024, to determine the presence or absence of critical areas including streams, wetlands, and priority habitats. Standard vegetation, soil, and hydrology data were collected from five test plots to determine the presence, location, and extent of any onsite wetlands. No wetlands were observed onsite. One stream was delineated onsite (Ditch 15). The OHWM of the onsite boundary of Ditch 15 was delineated based upon scour, wrack deposits, and a change in vegetation.

Test plot and ordinary high water mark (OHWM) flagging locations were recorded using a hand-held GPS unit capable of sub-meter accuracy under ideal conditions (Figure 2).

VEGETATION

The vegetation onsite is dominated by pasture grasses with deciduous and coniferous trees along the upland boundary of Ditch 15. The majority of the site is maintained for hay production including tilling and seeding.

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.

UPLAND VEGETATION

Upland vegetation included a mix of perennial rye (*Lolium perenne*, FAC) and orchard grass (*Dactylis glomerata*, FACU).

RIPARIAN VEGETATION

Riparian vegetation along Ditch 15 included red-osier dogwood (*Cornus sericea,* FACW), Sitka willow (*Salix sitchensis*, FACW), Pacific willow (*Salix lucida*, FACW), Himalayan blackberry (*Rubus armeniacus*, FAC), and yellow flag iris (*Iris pseudacorus*, OBL).

SOILS

As referenced on the Natural Resources Conservation Service's (NRCS) Web Soil Survey website, the onsite soils are mapped as Caples silty clay loam, 0 to 3 percent slopes (17) (2024a; Figure 3). Appendix B contains Wetland Determination Data Forms with soil descriptions.

Caples silty clay loam, 0 to 3 percent slopes is characterized as being a somewhat poorly drained soil with a depth to water table of about 18 to 30 inches below ground surface (bgs). Caples silty clay loam is formed within floodplains with a parent material of alluvium (NRCS 2024a) and is rated as hydric by the NRCS (2024b).[1]

Table 1. Mapped Soils

Soil Series[1]	Unit Symbol[1]	Percent Slope[1]	Landform[1]	Drainage Class[1]	Hydric Soil[2]	Test Plots per Soil Series
Caples silty clay loam	17	0 to 3	Floodplains	Somewhat poorly drained	Yes	5

[1]NRCS 2024a [2]NRCS 2024b

UPLAND SOILS

Evaluated upland soils consisted of silt loams having dark grayish brown and grayish brown (10YR 4/2, 5/2) colors. Redoximorphic features as concentrations in the matrix having yellowish brown

[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.

and yellowish red (10YR 5/8, 5YR 5/6) colors were observed within all test pits and the hydric soil indicator of Depleted Matrix (F3) was met. However, the test plots did not meet the requirements for hydrophytic vegetation and wetland hydrology indicators and as such all were deemed upland plots.

HYDROLOGY

DITCH 15

According to the Washington Department of Natural Resources (WDNR), Ditch 15 is a Type F (fish-bearing) water (2024). It has perennial flow along the western, northern, and northeastern boundaries of the site in a south to southwesterly direction (Figure 2). Its width between OHWMs is approximately 45 to 55 feet and water depth is three to ten feet. Ditch 15 is connected to a series of offsite ditches that discharge into the Columbia River, a Type S (Shoreline of the State) water (WDNR 2024). A roadside ditch along Mt. Solo Road on the eastern boundary of the site drains into Ditch 15, along with upslope runoff and discharges from various other upstream personal drainage facilities. Ditch 15 discharges into Ditch 5 (Type F) approximately 0.32 miles southeast of the site.

PRECIPITATION

Precipitation data was gathered from the NOAA Regional Climate Centers Cowlitz County, Washington, WETS Station*: Longview* (2024), the closest WETS station to the site. During the two weeks prior to the December 12, 2024, site visit, precipitation totaled 1.14 inches with 0.09 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 2. Precipitation Table

Precipitation (inches)								
Date of Visit	2 Weeks Prior	3 Months Prior		30% Below	30% Above	DAREM[1]		
		Month	Monthly Total			Value	Weight	Total
12/12/24 0.09	1.14	2024-12-12	7.00	5.05	8.11	2	3	6
		2024-11-12	7.00	3.74	6.29	2	2	4
		2024-10-13	3.60	1.93	1.02	1	1	1
Rainfall 3 months prior was: drier than normal (sum 6-9), normal (sum 10-14), wetter (sum 15-18).[2]								11
Year to Date Mean Rainfall[2,3]: 47.30								
Year to Date Actual Rainfall[3]: 9.90								

[1]Direct Antecedent Rainfall Evaluation Methods (Sumner et al 2009), [2]Based on 2004-2024 data, [3]Includes missing precipitation data per NOAA website.

Critical Area Inventories

USFWS National Wetlands Inventory

The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping indicates PEM1A[2] R2ABH[3], PUBH[4], and PEM1/SSC[5] wetlands onsite (2024; Figure 4). ELS' observations are consistent with the NWI mapping of the R2SBH, PUBH, and PEM1/SSC wetlands as they correspond to the location of mapped Ditch 15; however, ELS' observations are generally inconsistent with the NWI mapping of the PEM1A wetland as there was no observed wetland in this location.

Cowlitz County Critical Areas

Cowlitz County Critical Areas (CCCA) mapping indicates the presence of freshwater emergent, riverine, and freshwater pond wetlands onsite (2024; Figure 5). ELS' observations are consistent with CCCA mapping as Ditch 15 was observed in the location of a portion of the riverine, freshwater pond, and freshwater emergent wetlands; however, ELS's observations are generally inconsistent with the CCCA mapping of the freshwater emergent wetland in the northwest corner of the site as no wetland was observed in this location. CCCA mapping also indicates the site is located in an area with reduced flood risk due to levees. ELS' observations are consistent with this mapping as the site is in an area that has levees along the Cowlitz and Columbia Rivers.

Washington Department of Fish and Wildlife Priority Habitats and Species

The Washington Department of Fish and Wildlife (WDFW) Priority Habitat and Species (PHS) maps indicate the presence of a freshwater emergent wetland and riverine habitat onsite and offsite. PHS mapping also indicates the presence of habitat which supports waterfowl concentrations (Figure 6). ELS' observations are consistent with PHS mapping with respect to the riverine and freshwater emergent habitats as their locations correspond to that of Ditch 15. However, ELS' observations are generally inconsistent with the onsite mapped freshwater emergent wetland as no wetlands were observed within the parcel boundaries. Additionally, ELS' observations are inconsistent with the waterfowl concentration habitat as that mapped location corresponds to a high-density housing development and associated playground area to the north of the site.

Washington Department of Natural Resources

The WDNR Forest Practices Application Mapping Tool (FPAMT) indicates the presence of a Type F stream flowing along the western, northern, and eastern boundaries of the site (Figure 7). ELS' observations are consistent with the WDNR mapping as the location corresponds to the location of Ditch 15.

[2] Palustrine, emergent, persistent, temporary flooded
[3] Riverine, lower perennial, aquatic bed, permanently flooded
[4] Palustrine, unconsolidated bottom, permanently flooded
[5] Palustrine, emergent, persistent, scrub-shrub, 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

DITCH 15

Ditch 15 has a width between OHWMs of approximately 45 to 55 feet with three to ten feet of slow-moving water in its channel. The Consolidated Diking Improvement District No. 1 (CDIC No. 1) of Cowlitz County regularly maintains Ditch 15 for drainage. *Longview Municipal Code Chapter 17.10.050* defines a stream as:

> *Those areas where surface water flows sufficiently to produce a defined channel or bed. A defined channel or bed is an area which demonstrates clear evidence of the passage of water and includes, but is not limited to, bedrock channels, gravel beds, sand and silt beds and defined channel swales. The channel or bed need not contain water year round. This definition is not meant to include irrigation ditches, canals, storm or surface water runoff devices or other entirely artificial watercourses, unless they are used to convey streams naturally occurring prior to construction. For regulatory purposes under this chapter, once streams are identified, the streams are typed according to WAC 222-16-031.*

By this definition, Ditch 15 partially meets the definition of a stream; however, it is also highly maintained by CDID No. 1, and it functions as a canal to convey stormwater and surface water runoff and is artificial, at least in part, as the bed and banks are routinely shaped and maintained by their maintenance actions. Additionally, exemptions to *Longview Municipal Code Chapter 17 – Environment* are detailed under *17.10.070(4)(e)* as the following:

> *Ongoing operation and maintenance of diking, levees or drainage systems, sub-flood control zones, which are part of a system of existing dikes, levees, ditches, drains, or other facilities that were created, developed or used primarily as part of a drainage or diking system as defined by this chapter. The area exempt from review hereunder for maintenance and operation is the land occupied by an existing system of dikes and levees. This area shall be maintained in a manner that meets the federal standards for funding assistance for dike and levee repairs; provided further, that restoration of the riparian habitat, including revegetation of native species compatible with ongoing maintenance and protection of the diking system, occurs to the extent feasible. Operation and maintenance does not include the expansion or creation of new dikes, levees, or drainage ditches and related facilities, which could contribute to degradation of existing wetlands.*

LMC further defines exemptions under *17.10.070(5)* as the following:

The removal or control of vegetation within stormwater or flood control sloughs and ditches maintained by the CDID, or the city on the effective date of the ordinance codified in this chapter, as deemed necessary by the public works director of the city and/or the CDID district engineer.

ELS agrees that Ditch 15 is a Type F ditch that partially meets the requirements of *the Longview Municipal Code* for being designated as a stream. However, it is also highly maintained by CDID No. 1 as a partially artificial canal drainage system, and as such, meets the exemption provisions of *LMC Chapter 17.10*. This maintenance prevents riparian species and habitat from establishing and therefore does not fully function as a natural stream system. In light of this condition, ELS recommends a 50-foot buffer be maintained for Ditch 15 similar to that of the buffer requirement for a Type Ns (non-fish bearing, seasonal) stream (*LVMC Table 17.10.120-2 Standard Riparian Buffer Widths* 2024) as a way of protecting the very limited functions of the ditch.

Table 3. Critical Areas Summary

Name	DNR Water Type[1]	Buffer Width (feet)
Ditch 15	Type F (fish-bearing)	Recommended 50

[1]*WDNR FPAMT 2024*

LIMITATIONS

ELS bases this report's determinations on standard scientific methodology and best professional judgment. In our opinion, local, state, and federal regulatory agencies should agree with our determinations. However, the information contained in this report should be considered preliminary and used at your own risk until it has been 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.

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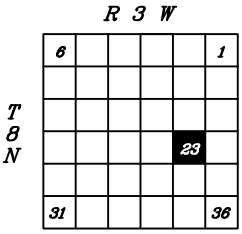
FIGURES AND PHOTOPLATES

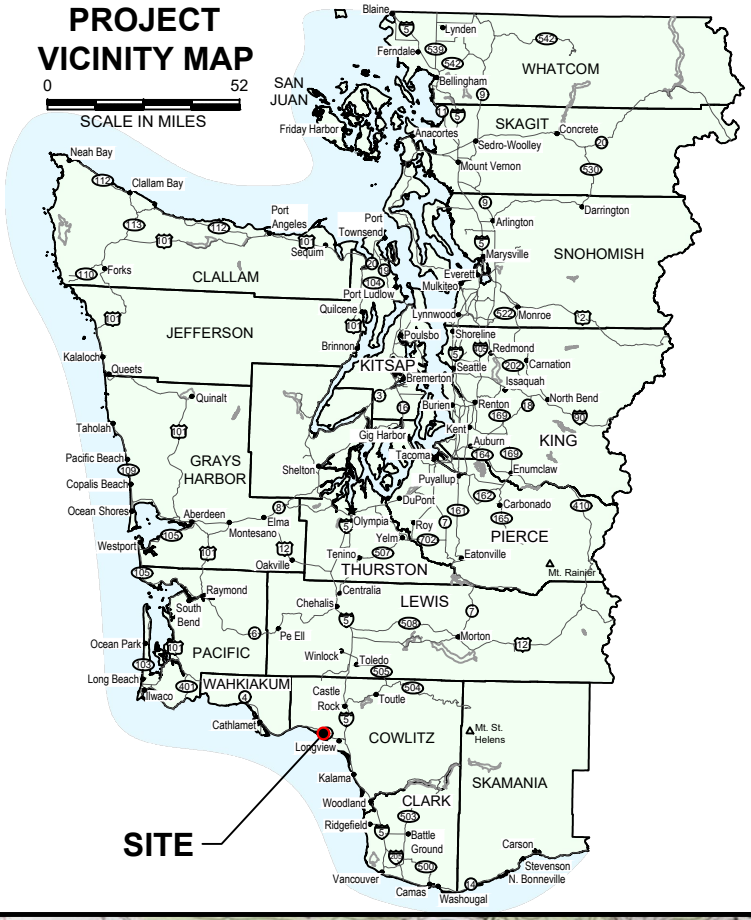
WASHINGTON

46.1661° Latitude
-123.0239° Longitude

LOCATION MAP



PROJECT VICINITY MAP



NOTE:
Quadrangle topographic map from USGS.

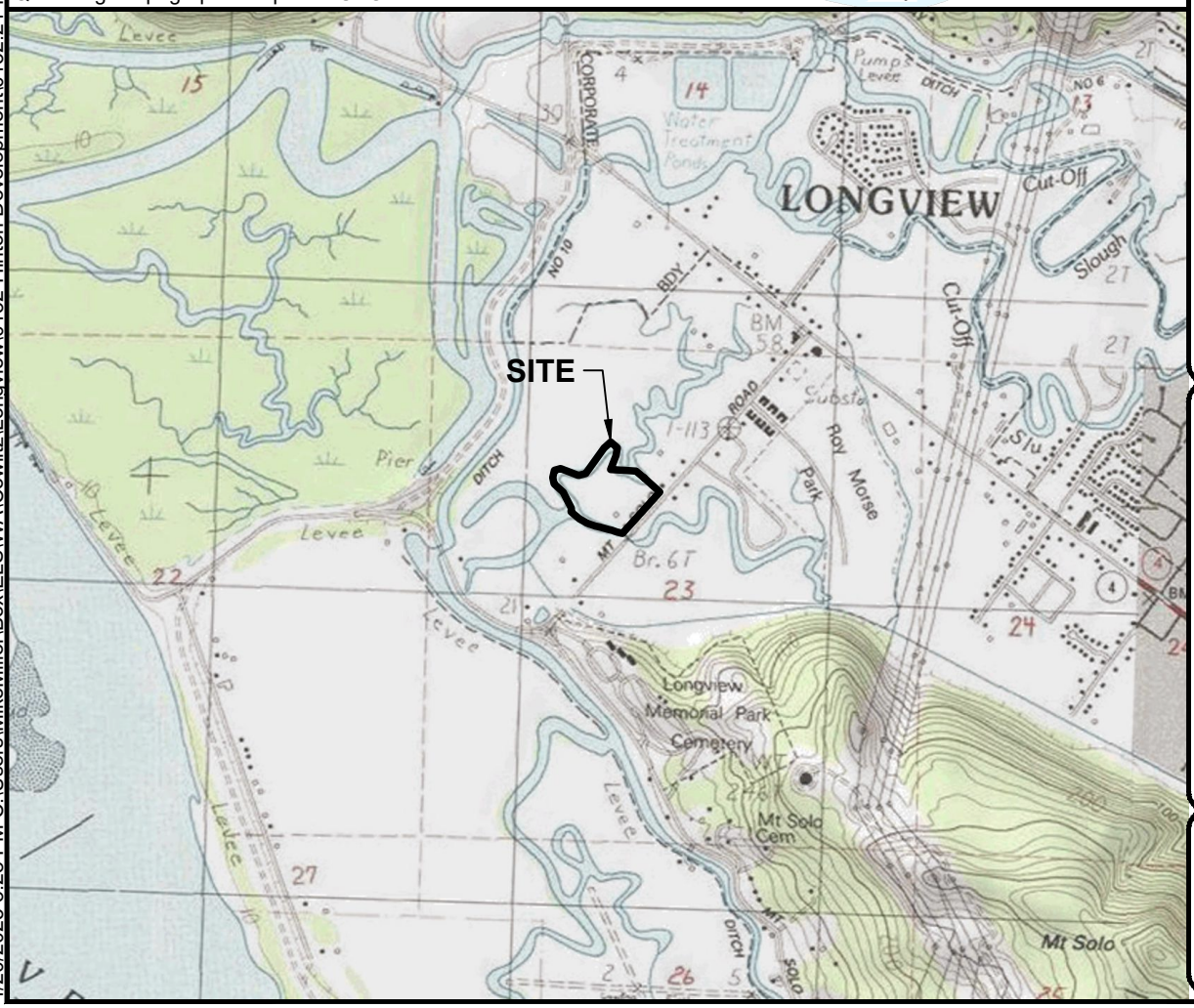


Figure 1
VICINITY MAP
Mt. Solo Rd
Hinton Development
City of Longview, Cowlitz County, WA
Section 23, Township 8N, Range 3W, W.M.

DATE: 1/20/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: BJ
CHK:
PROJECT NO: 0152.21

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

N W E S

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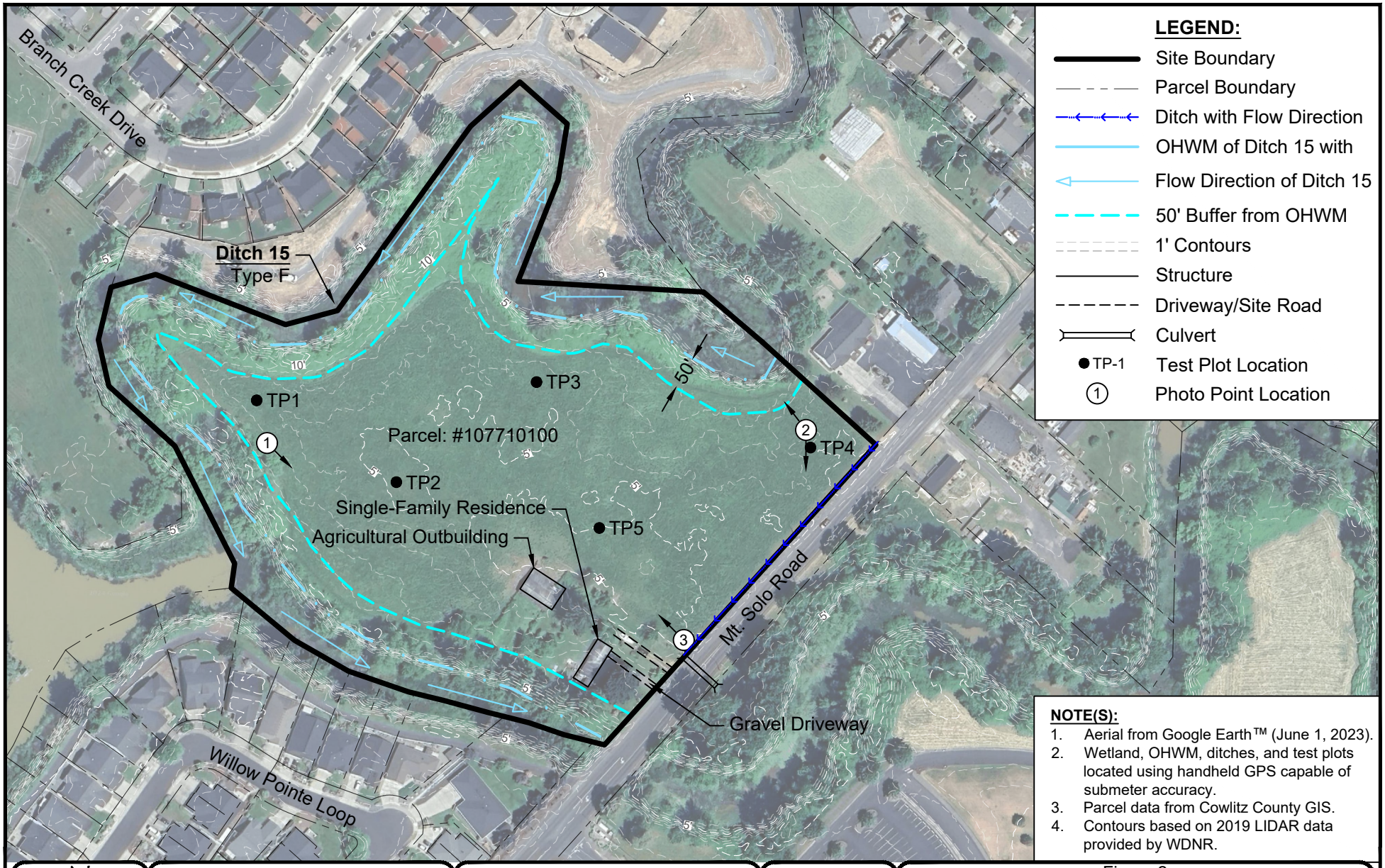

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Fax: (360) 414-9305
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DWN: MPM
REQ. BY: ND
PRJ. MGR: BJ
CHK:
PROJECT NO: 0152.21

Figure 2
EXISTING CONDITIONS
Mt. Solo Rd
Hinton Development
City of Longview, Cowlitz County, WA
Section 23, Township 8N, Range 3W, W.M.

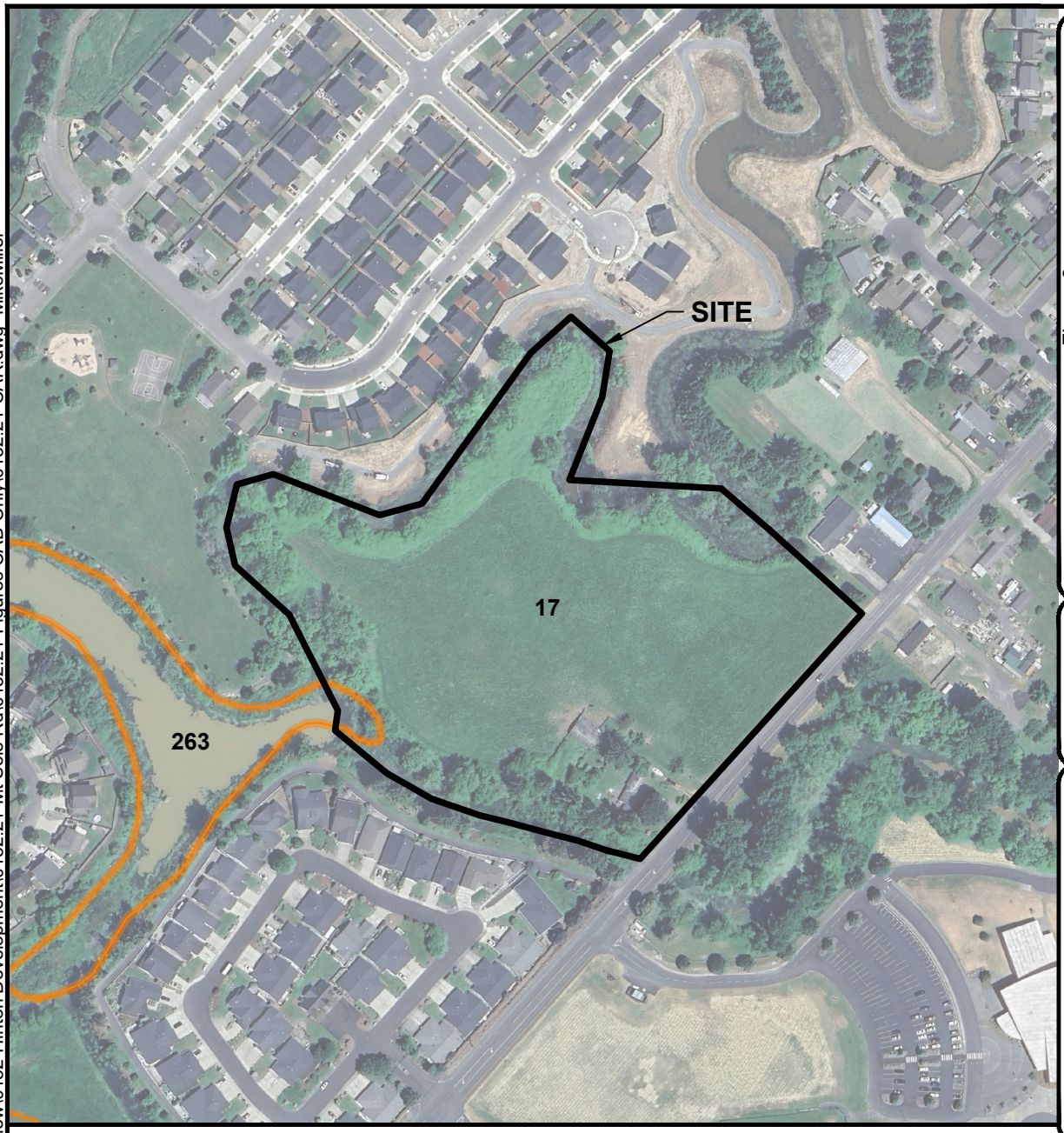

Figure 3
NRCS SOIL SURVEY
Mt. Solo Rd
Hinton Development
City of Longview, Cowlitz County, WA
Section 23, Township 8N, Range 3W, W.M.

DATE: 1/20/25
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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.**
- **263** Water.

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

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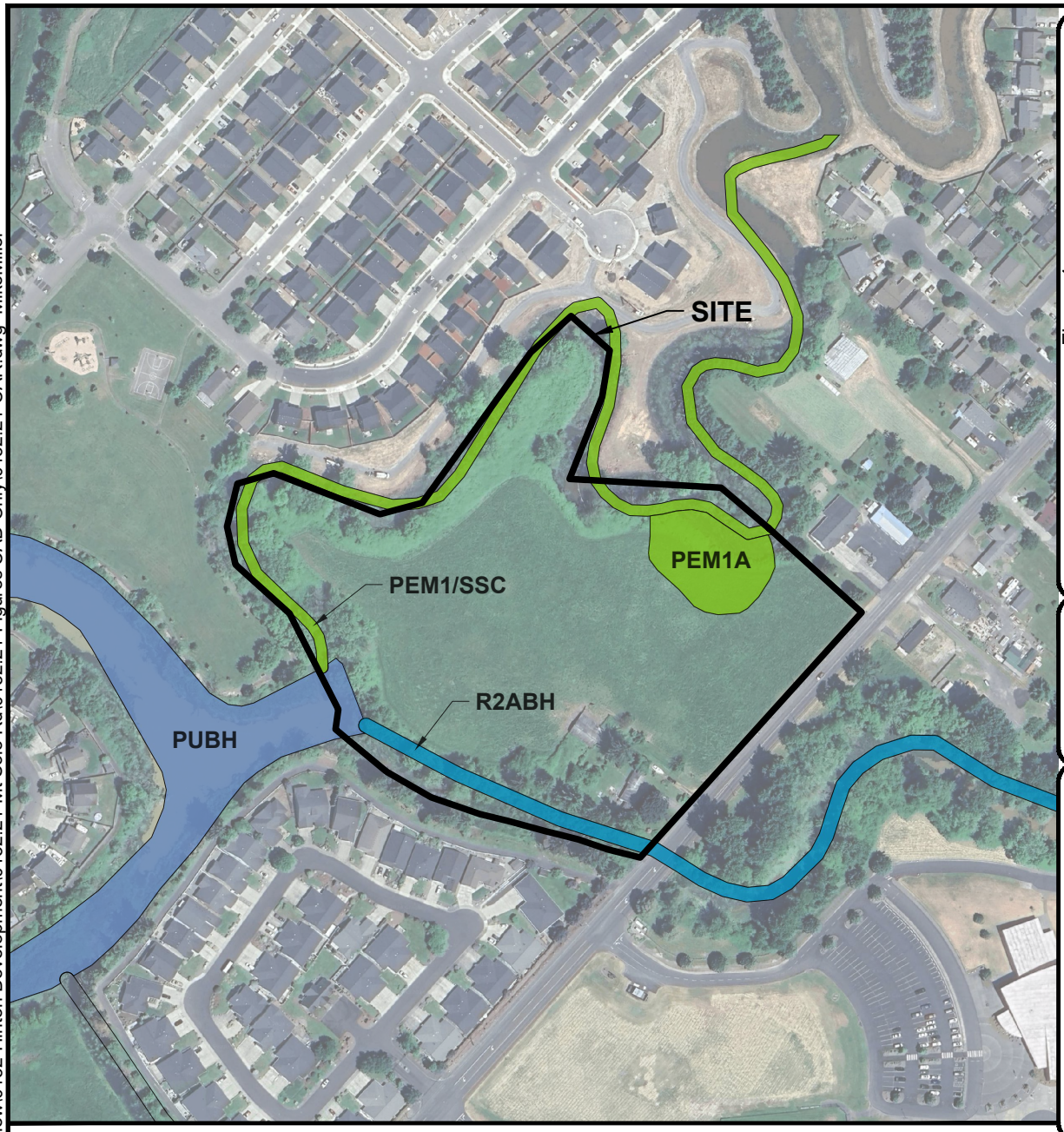

Figure 4
USFWS NATIONAL WETLANDS INVENTORY
Mt. Solo Rd
Hinton Development
City of Longview, Cowlitz County, WA
Section 23, Township 8N, Range 3W, W.M.

DATE: 1/20/25
DWN: MPM
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SCALE IN FEET

N W E S

LEGEND:

Site Boundary

Wetlands

- Freshwater Emergent Wetland
- Freshwater Pond
- Riverine

PEM1A	Palustrine, Emergent, Persistent, Temporarily flooded.
PEM1/SSC	Palustrine, Emergent, Persistent, Scrub-Shrub, Seasonally flooded.
PUBH	Palustrine, Unconsolidated Bottom, Permanently flooded.
R2ABH	Riverine, Lower Perennial, Aquatic Bed.

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*

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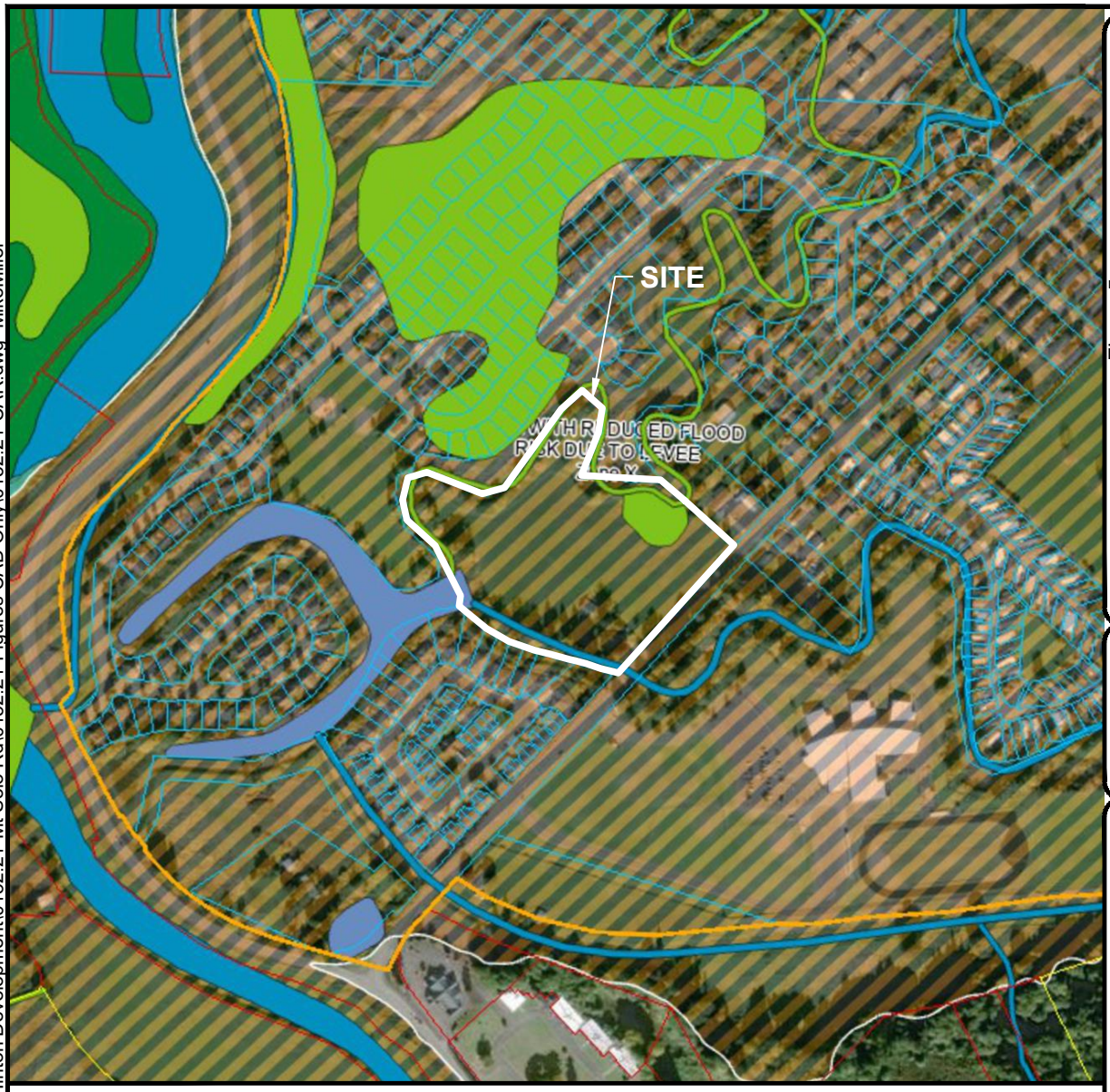

Figure 5
COWLITZ COUNTY CRITICAL AREAS
Mt. Solo Rd
Hinton Development
City of Longview, Cowlitz County, WA
Section 23, Township 8N, Range 3W, W.M.

DATE: 1/20/25
DWN: MPM
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SCALE IN FEET
0
600
1200

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S

LEGEND:

Site Boundary

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

City Limits
- City Limits

Wetlands
- Freshwater Emergent
- Freshwater Forested/Shrub
- Freshwater Pond
- Riverine

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

Flood Hazard Zones
- Area with Reduced Risk Due to Levee

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

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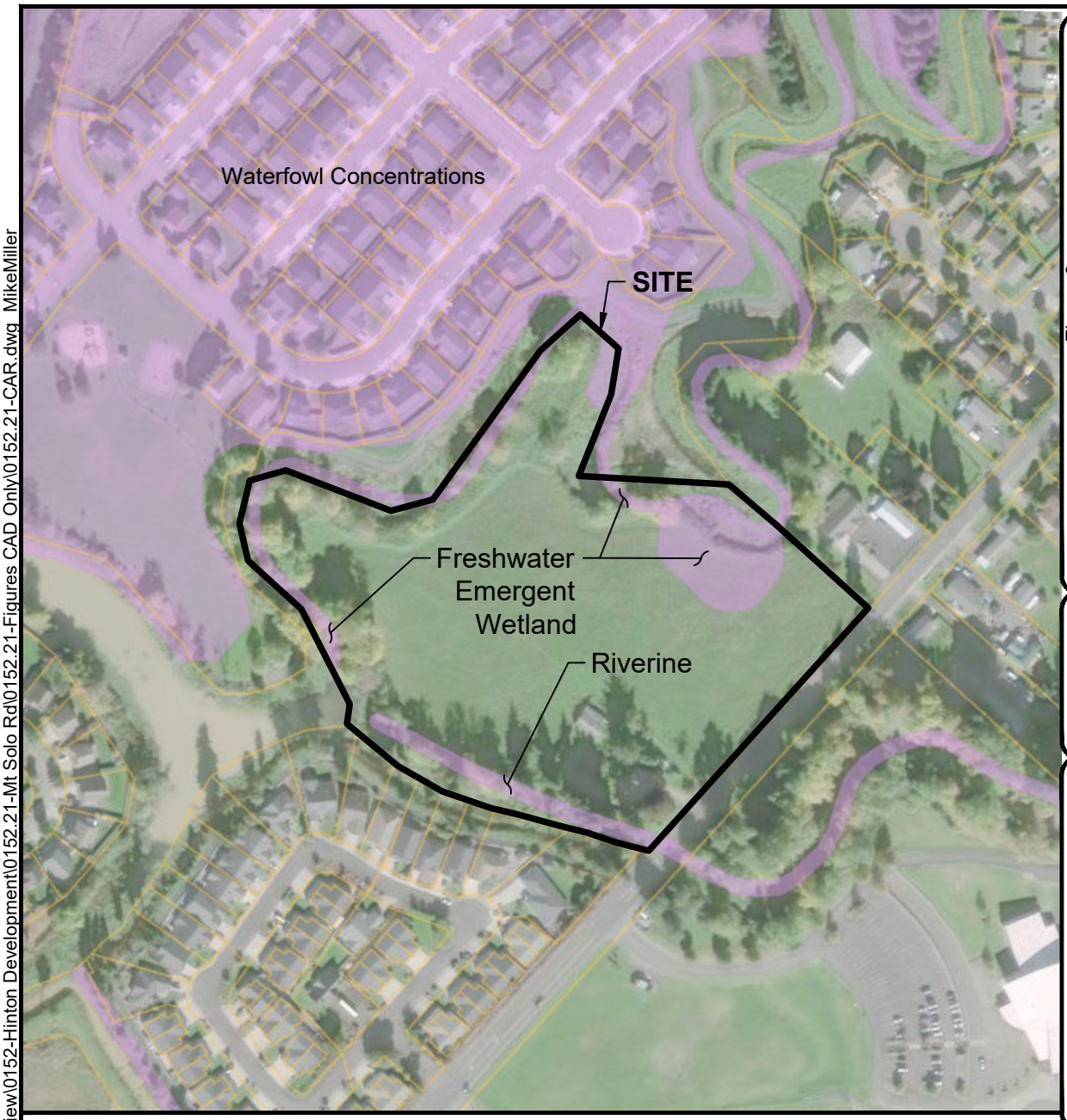

Figure 6
WDFW PRIORITY HABITATS AND SPECIES
Mt. Solo Rd
Hinton Development
City of Longview, Cowlitz County, WA
Section 23, Township 8N, Range 3W, W.M.

DATE: 1/20/25
DWN: MPM
REQ. BY: ND
PRJ. MGR: BJ
CHK:
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LEGEND:

- Site Boundary
- Parcel Boundary
- Waterfowl Concentration
- Freshwater Emergent Wetland
- Riverine

0 300 600
SCALE IN FEET

N W E S

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

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Figure 7
WDNR STREAM TYPE MAP
Mt. Solo Rd
Hinton Development
City of Longview, Cowlitz County, WA
Section 23, Township 8N, Range 3W, W.M.

DATE: 1/20/25
DWN: MPM
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0 300 600
SCALE IN FEET

N W E S

LEGEND:

Site Boundary

40-foot Contours
40 ft. Contours

Water Bodies (FP)
Open Freshwater

Water Courses (FP)
Type F

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

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Photopoint 1. Photo taken facing southeast showing the dominant open pasture of the site.

Photopoint 2a. Photo taken facing northwest.

Photopoint 2b. Photo taken facing south towards Mt. Solo Rd.

Photopoint 3. Photo taken facing northwest.

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PROJ.#: 0152.21

Photoplate 1
Hinton Development
Mt. Solo Rd
Cowlitz County, Washington

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: Mt. Solo Rd City/County: Longview/Cowlitz Sampling Date: 12-12-24
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-1
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S23, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): None Slope (%): 0-3%
Subregion (LRR): A Lat: 46.1665542 Long: -123.024956 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 within the northwestern 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. *Lolium perenne*	30%	yes	FAC
2. *Dactylis glomerata*	30%	yes	FACU
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 30 20% = 12	60%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 40%

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:The site was previously prepped and reseeded for hay production.

SOIL

Sampling Point: TP-1

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
0-6	10YR 4/2	100%		%			Silt loam	
6-16	10YR 5/2	93%	10YR 5/8	7%	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): _____
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: Mt. Solo Rd City/County: Longview/Cowlitz Sampling Date: 12-12-24
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-2
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S23, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): None Slope (%): 0-3%
Subregion (LRR): A Lat: 46.1662427 Long: -123.0241315 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 within the 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. *Lolium perenne*	30%	yes	FAC
2. *Dactylis glomerata*	30%	yes	FACU
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 30 20% = 12	60%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 40%

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:The site was previously prepped and reseeded for hay production.

SOIL

Sampling Point: TP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100%		%			Silt loam	
6-16	10YR 5/2	93%	10YR 5/8	7%	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): _____
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: Mt. Solo Rd City/County: Longview/Cowlitz Sampling Date: 12-12-24
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-3
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S23, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): Concave Slope (%): 0-3%
Subregion (LRR): A Lat: 46.1666637 Long: -123.0233377 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 within the northern 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% = ___	30%	=Total Cover	
Herb Stratum (Plot size: 5 ft radius)			
1. *Dactylis glomerata*	30%	yes	FACU
2. *Lolium perenne*	30%	yes	FAC
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 30 20% = 12	60%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 40%

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:The site was previously prepped and reseeded for hay production.

SOIL Sampling Point: TP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/2	99%	5YR 5/6	1%	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): _____
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:Test Plot 3 was collected in a depression.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mt. Solo Rd City/County: Longview/Cowlitz Sampling Date: 12-12-24
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-4
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S23, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): None Slope (%): 0-3%
Subregion (LRR): A Lat: 46.1664356 Long: -123.021738 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 4 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. *Lolium perenne*	30%	yes	FAC
2. *Dactylis glomerata*	30%	yes	FACU
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 30 20% = 12	60%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 40%

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:The site was previously prepped and reseeded for hay production.

SOIL

Sampling Point: TP-4

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
0-6	10YR 4/2	100%		%			Silt loam	
6-16	10YR 5/2	93%	10YR 5/8	7%	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): _____
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:Test Plot 4 was collected in a depression.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mt. Solo Rd City/County: Longview/Cowlitz Sampling Date: 12-12-24
Applicant/Owner: Hinton Development State: WA Sampling Point: TP-5
Investigator(s): Johnson, B. and Denson, N. Section, Township, Range: S23, T8N, R3W
Landform (hillslope, terrace, etc.): Terrace Local relief: (concave, convex, none): None Slope (%): 0-3%
Subregion (LRR): A Lat: 46.1660844 Long: -123.0229465 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 within the 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. *Lolium perenne*	25%	yes	FAC
2. *Dactylis glomerata*	25%	yes	FACU
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
9.	%		
10.	%		
11.	%		
50% = 25 20% = 10	50%	=Total Cover	
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
50% = ___ 20% = ___	%	=Total Cover	

% Bare Ground in Herb Stratum 40%

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:The site was previously prepped and reseeded for hay production.

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)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100%		%			Silt loam	
6-16	10YR 5/2	93%	10YR 5/8	7%	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): 16
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes ☐ No ☒**

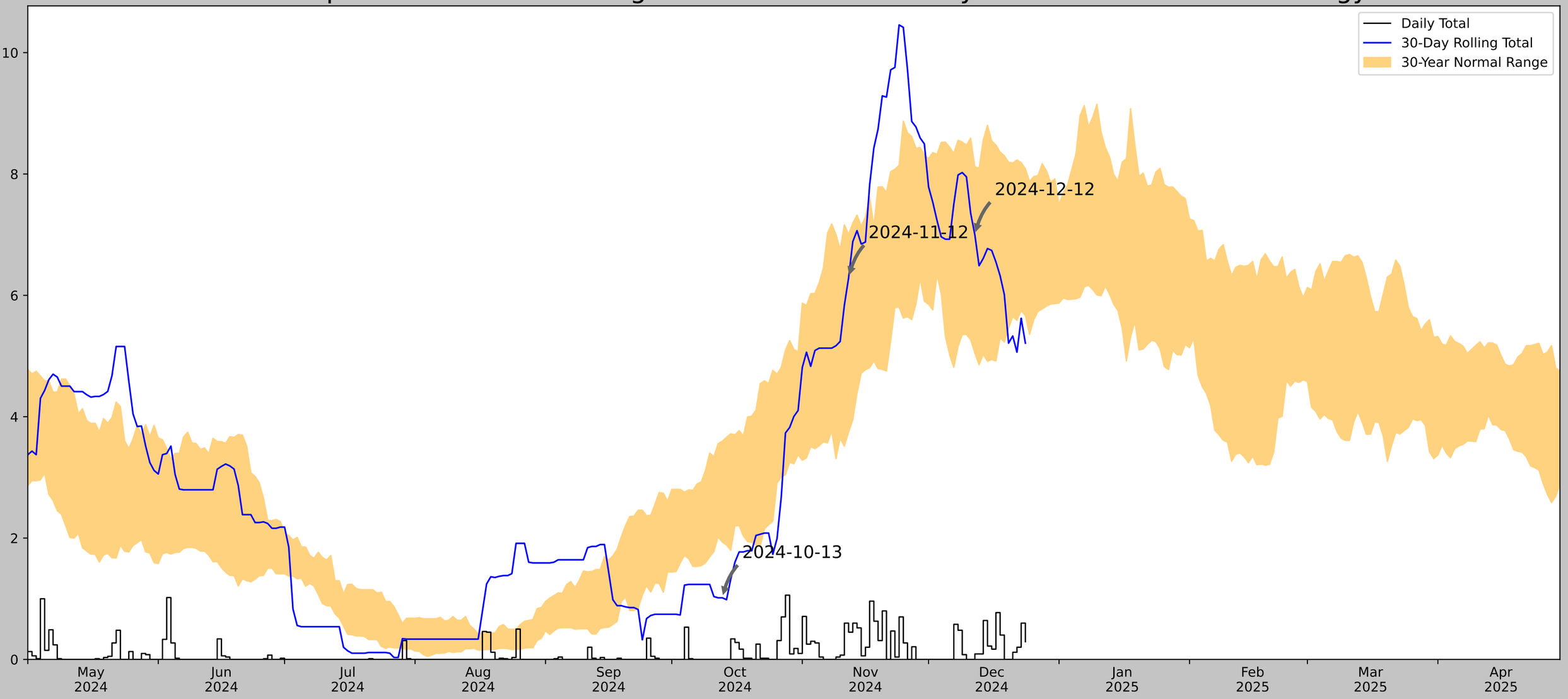
Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX C

ANTECEDENT PRECIPITATION CHART

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	46.1665542, -123.024956
Observation Date	2024-12-12
Elevation (ft)	6.277
Drought Index (PDSI)	Mild drought (2024-11)
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
2024-12-12	5.048032	8.116929	6.996063	Normal	2	3	6
2024-11-12	3.744488	7.003544	6.287402	Normal	2	2	4
2024-10-13	1.934646	3.597244	1.015748	Dry	1	1	1
Result							Normal Conditions - 11

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	3.024	4.878	1.375	10512	84
RAINIER 0.4 WSW	46.0894, -122.954	358.924	3.499	347.769	2.791	552	6
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

REDMOND GEOTECHNICAL SERVICES

Geotechnical Investigation and Consultation Services

Proposed Mt Solo Residential Development Site

Parcel #17710100

5431 Mt. Solo Road

Longview (Cowlitz County), Washington

for

Hinton Development Corp.

Project No. 1209.003.G
June 30, 2024

REDMOND GEOTECHNICAL SERVICES

August 14, 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 Mt. Solo Residential Development Site, Parcel #17710100,
5431 Mt. Solo Road, Longview (Cowlitz County), Washington

Submitted herewith is our report entitled "Geotechnical Investigation and Consultation Services, Proposed Mt. Solo Road Residential Development Site, Parcel #17710100, 5431 Mt. Solo Road, Longview (Cowlitz County), Washington". The scope of our services was outlined in our formal proposal to Ms. Nikole Hinto of Hinton Development Corp dated July 12, 2024. Written authorization of our services was provided by Ms. Nikole Hinton of Hinton Development Corp on July 15, 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
28881
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

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Figure No. 1 - Site Vicinity Map
Figure No. 2 - Site Exploration Plan
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APPENDIX A

Test Pit Logs and Laboratory Test Data

GEOTECHNICAL INVESTIGATION AND CONSULTATION SERVICES
PROPOSED MT SOLO RESIDENTIAL DEVELOPMENT SITE
PARCEL #17710100
5431 MT SOLO ROAD
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 Mt. Solo residential development project which is to be located at an existing residential and/or farm property which is sited to the west of Mt. Solo Road and north of the intersection with Willow Point Loop in Longview (Cowlitz County), Washington. The general location of the subject site, which encompasses one (1) separate tax lot and a total area of approximately 12.83 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.

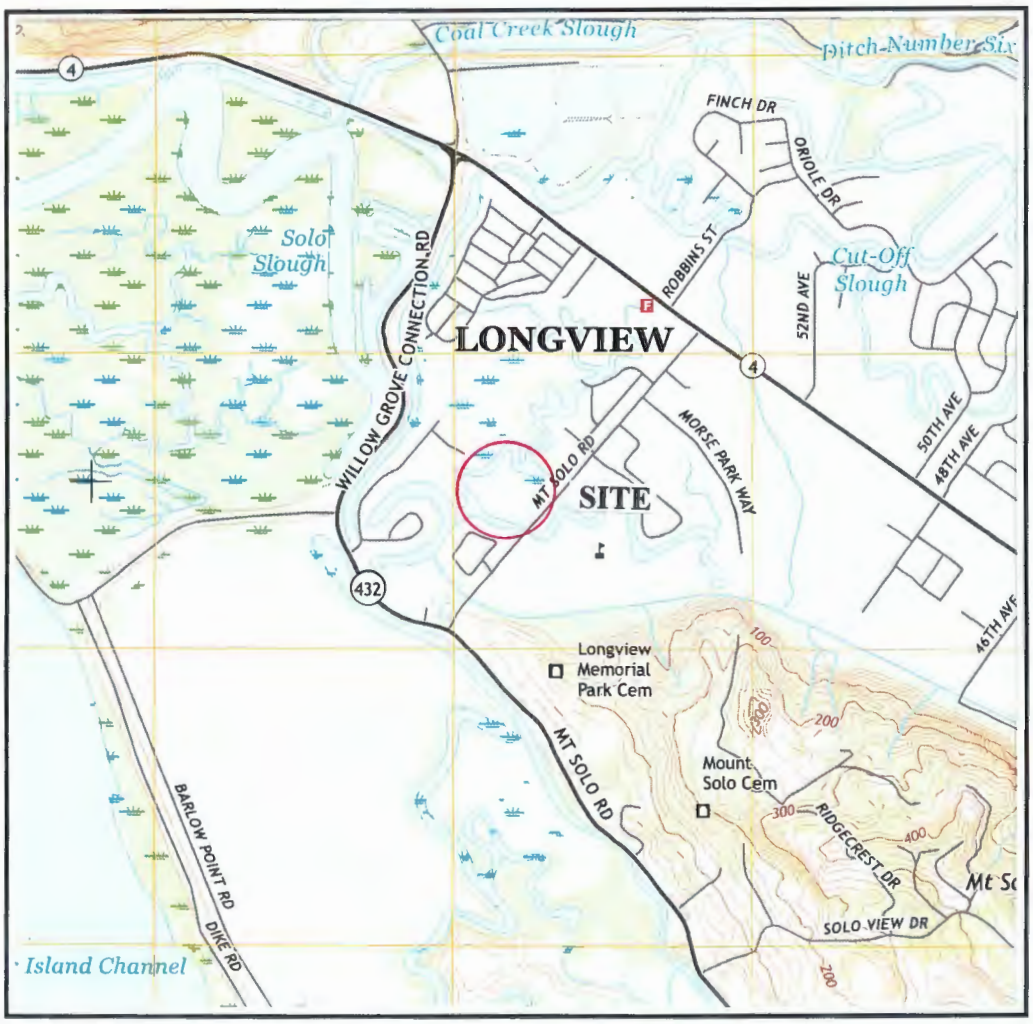
PROJECT DESCRIPTION

Based on a review of the proposed site development plan, we understand that present plans for the project will consist of the development of forty-one (41) new single-family residential home sites (lots) which will range in size from about 4,000 to 7,000 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 1,500 to 2,000 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. 1209.003.G	**MT SOLO SUBDIVISION SITE #107710100, 5431 MT SOLO ROAD**	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 ten (10) 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 Mt Solo residential development property is generally irregular in shape and encompasses a total plan area of approximately 12.83 acres. The proposed new Mt Solo residential development site is roughly bounded to the east by Mt. Solo Road and to the north, south and west by developed residential land. Additionally, the norther, southerly and westerly portions of the site are bounded by existing sloughs and/or waterways. At the time of our work, the subject proposed new Mt Solo 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 farm and/or agricultural land.

Topographically, the site is characterized as relatively flat-lying to gently sloping terrain with overall topographic relief across the site estimated at about two (2) 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 ten (10) feet beneath existing site grades on July 25, 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.

LEGEND

TH-#5 Indicates approximate location of exploratory test hole

Approximate Scale: 1" = 250'

SITE EXPLORATION PLAN

Project No. 1209.003.G	**MT SOLO SUBDIVISION SITE #107710100, 5431 MT SOLO ROAD**	Figure No. 2

Specifically, the native subsurface soils encountered across the proposed Mt Solo 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 an upper unit of medium olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey silt to a depth of about eight (8) feet beneath the existing site and/or surface grades. These upper sandy, clayey silt subgrade soils become wet to saturated at depths of about six (6) to eight (8) feet and are best characterized by relatively low to moderate strength and moderate compressibility. The upper sandy, clayey silt subgrade soils were inturn underlain by olive- to gray-brown, wet to saturated, medium stiff to medium dense, clayey, fine sandy silt to silty fine sand to the maximum depth explored of ten (10) feet beneath existing surface grades. These clayey, fine sandy silt to silty fine sand subgrade soil materials, which contain traces of organics, are best characterized by relatively low to moderate strength and low to moderate compressibility.

Groundwater

Groundwater was encountered at the time of our field work in all five (5) of the exploratory test holes (TH-#1 through TH-#5) at depths of between six (6) and eight (8) feet beneath the existing site and/or surface grades. However, due to proximity of the 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 July 25, 2024. The infiltration testing was performed in test hole TH-#1 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 posses an ultimate infiltration rate on the order of about 0.6 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 CPT analysis, which indicates that the soil behaves like clay and does not liquefy. Our analysis indicates that liquefaction of the underlying medium stiff to medium dense clayey, fine sandy silty to silty fine sand deposits located below a depth of about 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 Mt Solo 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 Mt Solo 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 Mt Solo 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 Mt Solo 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

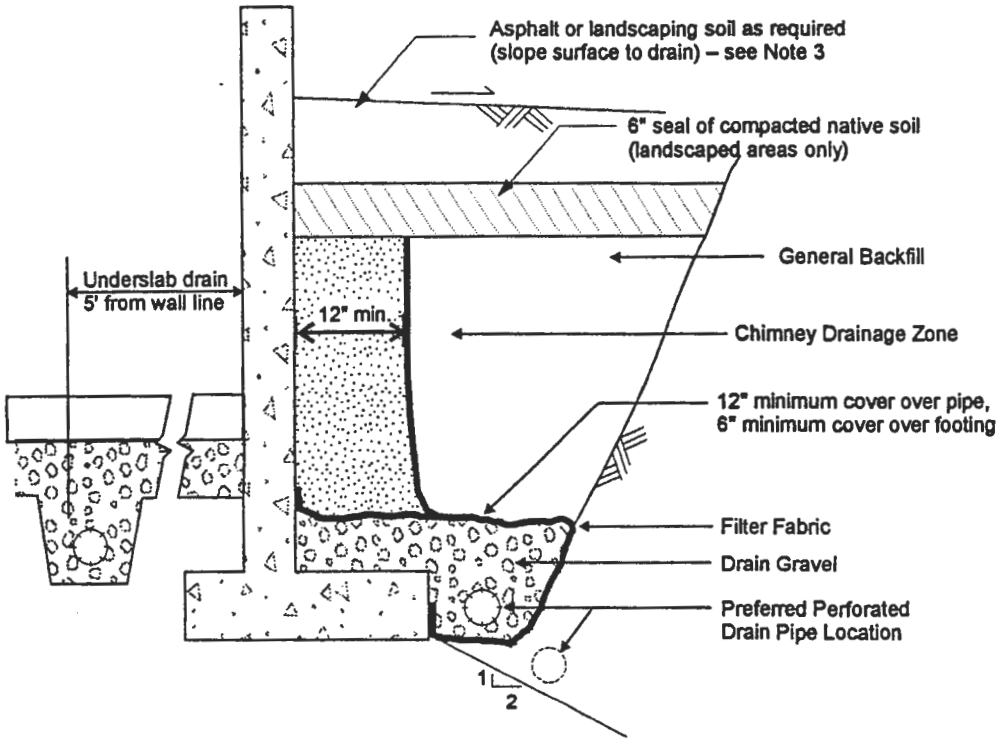
We recommend that positive measures be taken to properly finish grade the site so that drainage waters from building and/or landscaping areas as well as adjacent properties or buildings are directed away from the new apartment structures foundations. Any roof drains and/or subsurface drainage systems 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 apartment structure(s).

Groundwater was encountered at the site within all five (5) of the exploratory test holes at the time of the field work at depth of between six (6) and eight (8) feet beneath existing site grades. 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 0.3 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. 1209.003.G	MT SOLO SUBDIVISION SITE #107710100, 5431 MT SOLO ROAD	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 Mt Solo 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 Mt Solo residenntial 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.

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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 July 25, 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 about ten (10) 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 encountered in all five (5) of the exploratory test holes (TH-#1 through TH-#5) at the time of of the field work at depth of about six (6) 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.

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

MT SOLO SUBDIVISION SITE
PARCEL # 17710100, 5431 MT SOLO ROAD

PROJECT NO.	DATE	
1209.003.G	8/14/24	Figure A-4

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 7/25/24

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
						TEST PIT NO. TH-#1 ELEVATION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
	X			18.8	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5	X			22.7		Becomes wet to saturated
					ML/SM	Olive to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Depth = 10.0 feet Groundwater encountered at a depth of 7 to 8 feet at time of exploration
15						
						TEST PIT NO. TH-#2 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						Becomes wet to saturated
					ML/SM	Olive to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Depth = 10.0 feet Groundwater encountered at a depth of 6 to 7 feet at time of exploration
15						

LOG OF TEST PITS

PROJECT NO. 1209.003.G | MT SOLO SUBDIVISION SITE | FIGURE NO. A-5

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 7/25/24

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		88.8	19.1	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5	X			23.8		Becomes wet to saturated
					ML/SM	Olive- to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Depth = 10.0 feet Groundwater encountered at a deoth of 6 to 7 feet at time of exploration
15						
						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						Becomes wet to saturated
					ML/SM	Olive to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Deth = 10.0 feet Groundwater encountered at a depth og 6 to 7 feet at time of exploration
15						

LOG OF TEST PITS

PROJECT NO. 1209.003.G | MT SOLO SUBDIVISION SITE | FIGURE NO. A-6

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 7/25/24

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)
					ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						Becomes wet to saturated
					ML/SM	Olive to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Depth = 10.0 feet Groundwater encountered at a depth of 6 to 7 feet at time of exploration
15						

TEST PIT NO. ELEVATION

0
5
10
15

LOG OF TEST PITS

PROJECT NO. 1209.003.G | MT SOLO SUBDIVISION SITE | FIGURE NO. A-7

MAXIMUM DENSITY TEST RESULTS

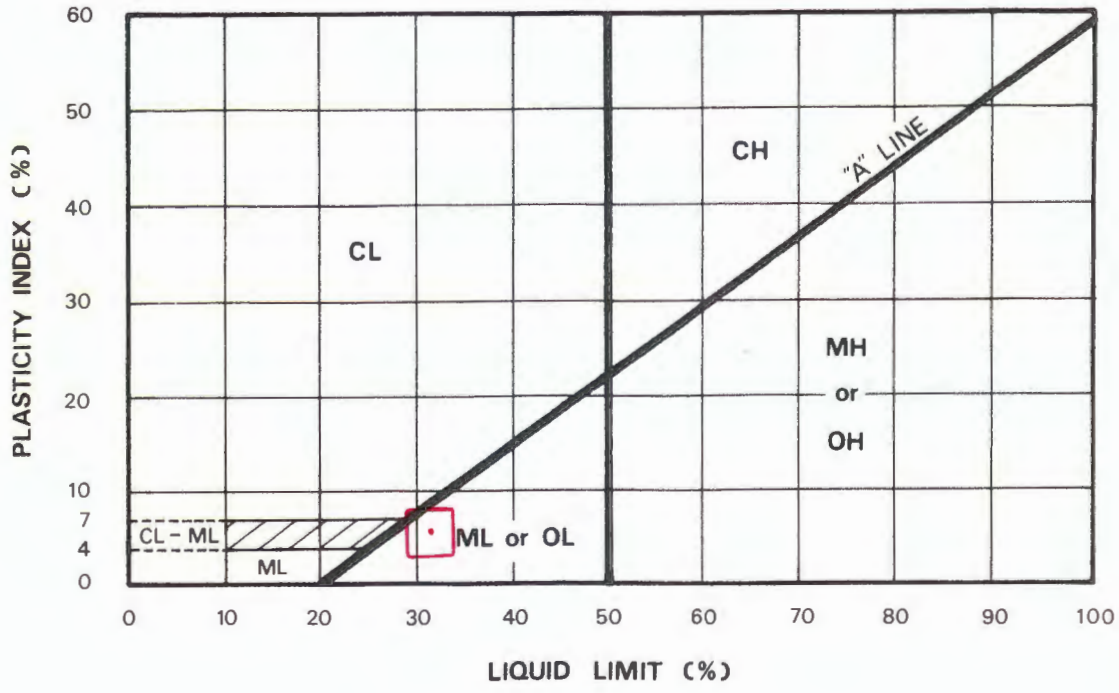
SAMPLE LOCATION	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
TH-#3 @ 2.0'	Medium to olive-brown, sandy, clayey SILT (ML)	106.0	16.0

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.: 1209.003.G | MT SOLO 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	19.1	31.6	6.3	88.0		ML

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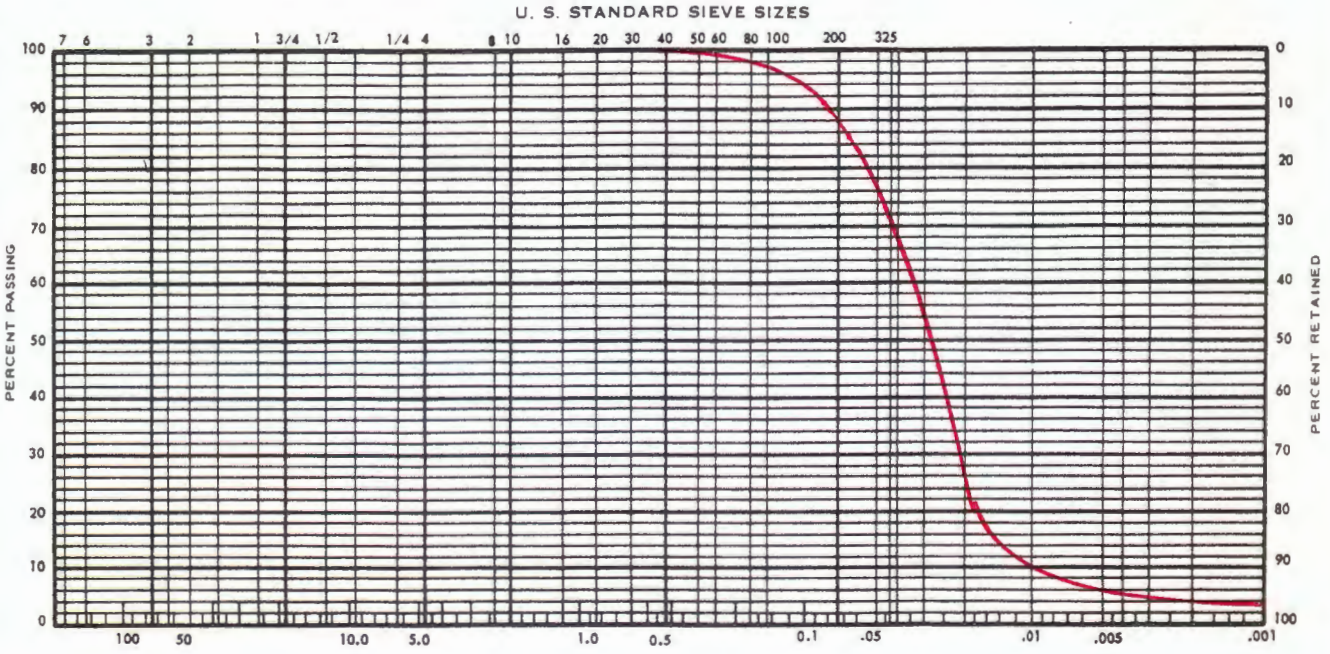
PLASTICITY CHART AND DATA

MT SOLO SUBDIVISION SITE
PARCEL # 17710100, 5431 MT SOLO TOAD

PROJECT NO.	DATE	Figure
1209.003.G	8/14/24	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

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GRADATION TEST DATA

MT SOLO SUBDIVISION SITE
PARCEL # 17710100, 5431 MT SOLO ROAD

PROJECT NO.	DATE	FIGURE
1209.003.G	8/14/24	A-10

BORING : TH-#3
DEPTH (ft) : 2.0
SPEC. GRAVITY : 2.5 (assumed)

DESCRIPTION : sandy, clayey SILT (ML)
LIQUID LIMIT : 31.6
PLASTIC LIMIT : 25.3

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	19.1	88.8	81.2	
FINAL	7.7	105.5	94.6	

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CONSOLIDATION TEST DATA

MT SOLO SUBDIVISION SITE
PARCEL # 17710100, 5431 MT SOLO ROAD

PROJECT NO.	DATE	Figure
1209.003.G	8/14/24	A-11

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#1

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	219	322	431
Expansion Dial (o.ooo1")	0	0	1
Expansion Pressure (psf)	0	0	3
Moisture Content (%)	24.6	19.4	14.1
Dry Density (pcf)	102.7	105.4	108.5
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

TAYLOR ISLAND ESTATES

PRELIM STORMWATER REPORT

Prepared for:
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01/09/2025

This project complies with Longview Municipal Code (LMC) 17.80

PRJ #:	2419
ENG #:	
DATE:	1/9/2025
JOB #:	2419

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References *10*

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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 Taylor Island Estates. 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 Talyor Island Estates project is located in northwest Longview, between 46th Avenue and 48th Avenue. The project will be constructed on parcel 107710-100 which is 12.57 acres in total. The site currently consists of short to medium grass with a single-family dwelling and outbuilding that will both be removed during construction. Mature vegetation and Ditch #15 of the Consolidated Diking Improvement District No. 1 surrounds the site to the north and west while Mount Solo Road surrounds the site to the south and east. 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 CDID Ditch #15 that surrounds the site.

The project proposes the development of 54 single family residential Lots. One entrance will be provided to the site from Mount Solo Road. 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 Contech Filterra units. The 25-year storm event will be metered via an orifice-controlled detention pond. Rear yard runoff will be collected and piped to the detention pond via yard drains. Roof runoff will also be routed to the pond via the rear yard conveyance systems.

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	**0.07 Acres**
Proposed Hard Surface	**4.22 Acres**
Proposed Lawn/Landscaping	**3.52 Acres**
Total Land-disturbing Activity	**7.81 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 CDID Ditch #15 that surrounds the site. In the developed condition, stormwater will continue to discharge to Ditch #15 after receiving water quality treatment.

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.

BMP T5.12 – Sheet Flow Dispersion

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 Filterra vaults and runoff from the roofs will be collected via rear yard conveyance systems. See the discussions under MRs #6 and #7 below for additional information.

Minimum Requirement #6. – Runoff Treatment:

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 in the form of Filterra Bioscape Vaults for all pollution-generating surfaces. A copy of the Department of Ecology's General Use Level Designation for Filterra vaults is attached in Appendix C for reference. The pollution-generating surfaces proposed with this project include front yards, driveways, sidewalks, and roadways. The Western Washington Hydrology Model (WWHM) was used to calculate water quality flows for each Filterra unit. Refer to Section F of this report for more information. Treated stormwater from the Filterra vaults will be conveyed to the detention pond and discharged to CDID Ditch #15. 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 runoff will be collected via rear yard drains and conveyed directly to the detention pond. Roof runoff and crawl space drains will connect to 4" storm laterals that plug into the yard drain structures and will therefore also be conveyed directly to the detention pond. The system mentioned above ensures that rear yard, roof, and crawl space runoff will not mix with any untreated pollution-generating runoff.

Minimum Requirement #7. – Runoff Flow Control:

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 detention pond. See Section G below for design information.

Minimum Requirement #8. – Wetlands Protection:
There are no wetlands present on the site.

Minimum Requirement #9. – Operation and Maintenance:
The Filterra Bioscape Vaults will be publicly owned and maintained and the detention pond will be privately 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 water quality 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 June 30, 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 Filterra Bioscape Vaults to provide treatment for the streets, sidewalks, driveways, planters, and front yards. Treated stormwater will be conveyed to an orifice-controlled detention pond and discharged to CDID Ditch #15. Rear yard runoff will be collected via rear yard drains and conveyed directly to the detention pond. Roof runoff and crawl space drains will connect to 4" storm laterals that plug into the rear yard drains. The following are a list of onsite stormwater management BMPs:

BMP T5.13 – Post-Construction Soil Quality and Depth

BMP D.1 – Detention Pond

Manufactured Treatment Device – Contech Filterra Bioscape Vault

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, swales, Filterra systems, and stormwater vaults. Filterra Bioscape Vaults were decided as the most feasible option.

Pollution-generating surfaces within the project include front yards, driveways, sidewalk, and roadways. Sizing of the Filterra units will be completed during final engineering.

SECTION G – Flow Control Analysis and Design

A detention pond will be used to meet the City of Longview's 25-yr flow control requirement for projects that are exempt from MR #7. The detention pond will discharge to CDID1 Ditch #15. CDID1 has provided the following water surface elevations for Ditch #15 at our proposed discharge location.

Table 2 – Ditch #15 Water Surface Elevations Provided by CDID1

Storm Event	Water Surface Elevation
24-hour, 25-year	**1.06 feet**
72-hour, 25-year	**1.99 feet**
24-hour, 100-year	**1.93 feet**
72-hour, 100-year	**5.16 feet**

Table 3 below shows the water surface elevations in the detention pond for various design storms.

Table 3 – Detention Pond Peak Water Surface Elevations

Storm Event	Elevation
Pond Bottom	**0.00 feet**
2-Year	**1.41 feet**
10-Year	**2.43 feet**
25-Year	**3.18 feet**
100-Year	**3.57 feet**
Freeboard	**4.57 feet**

Table 4 summarizes the outlet control design.

Table 4 – Wetpond Outlet Control Design

Orifice	Elevation	Size (diameter)
1	**0.00 feet**	**8.1 inch**
2	**3.17 feet**	**12 inch**

SECTION H – Wetlands Protection

There are no wetlands present on the site.

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

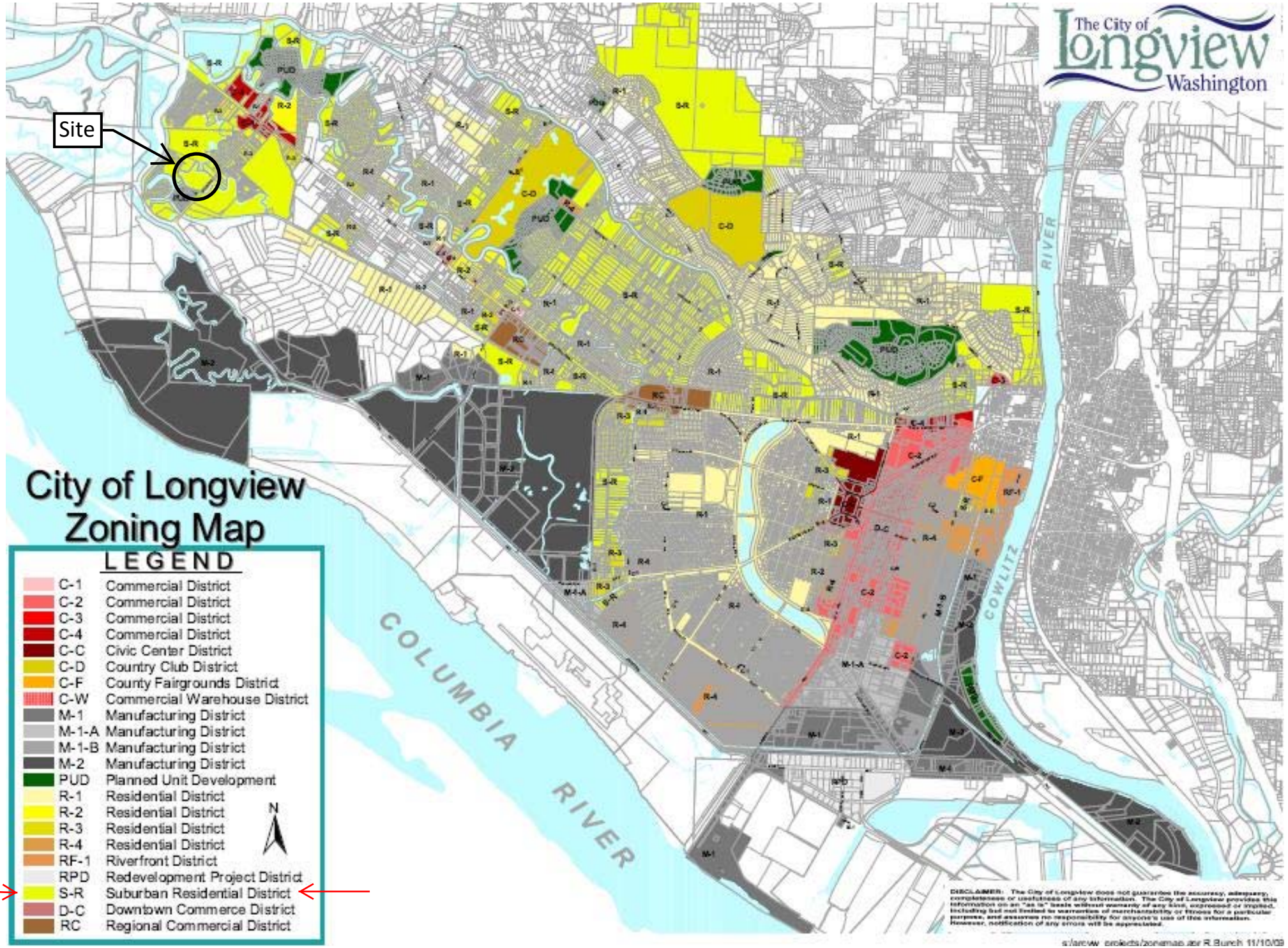
Maps Appendix A

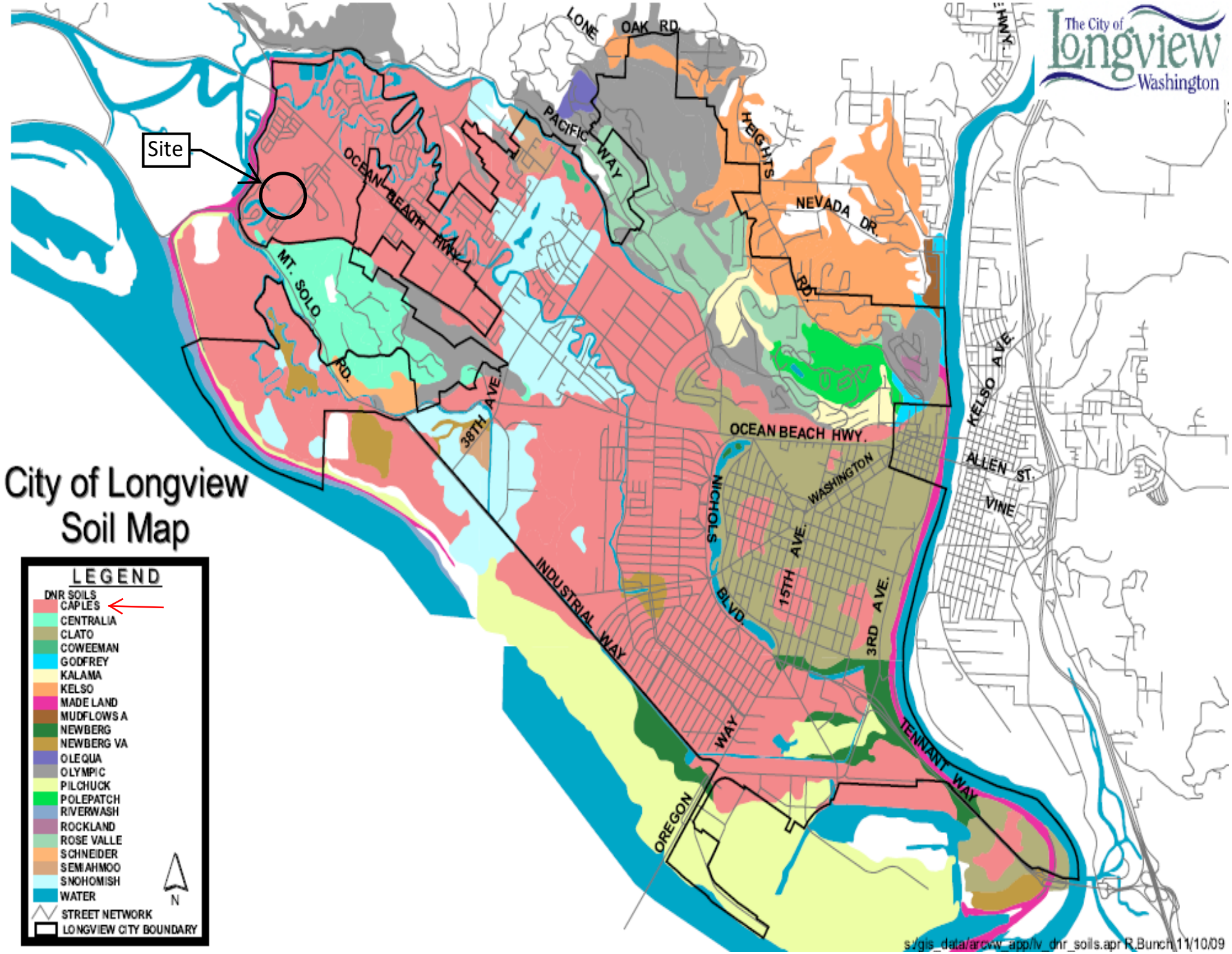
Zoning Map **A1**

Soil Types Map **A2**

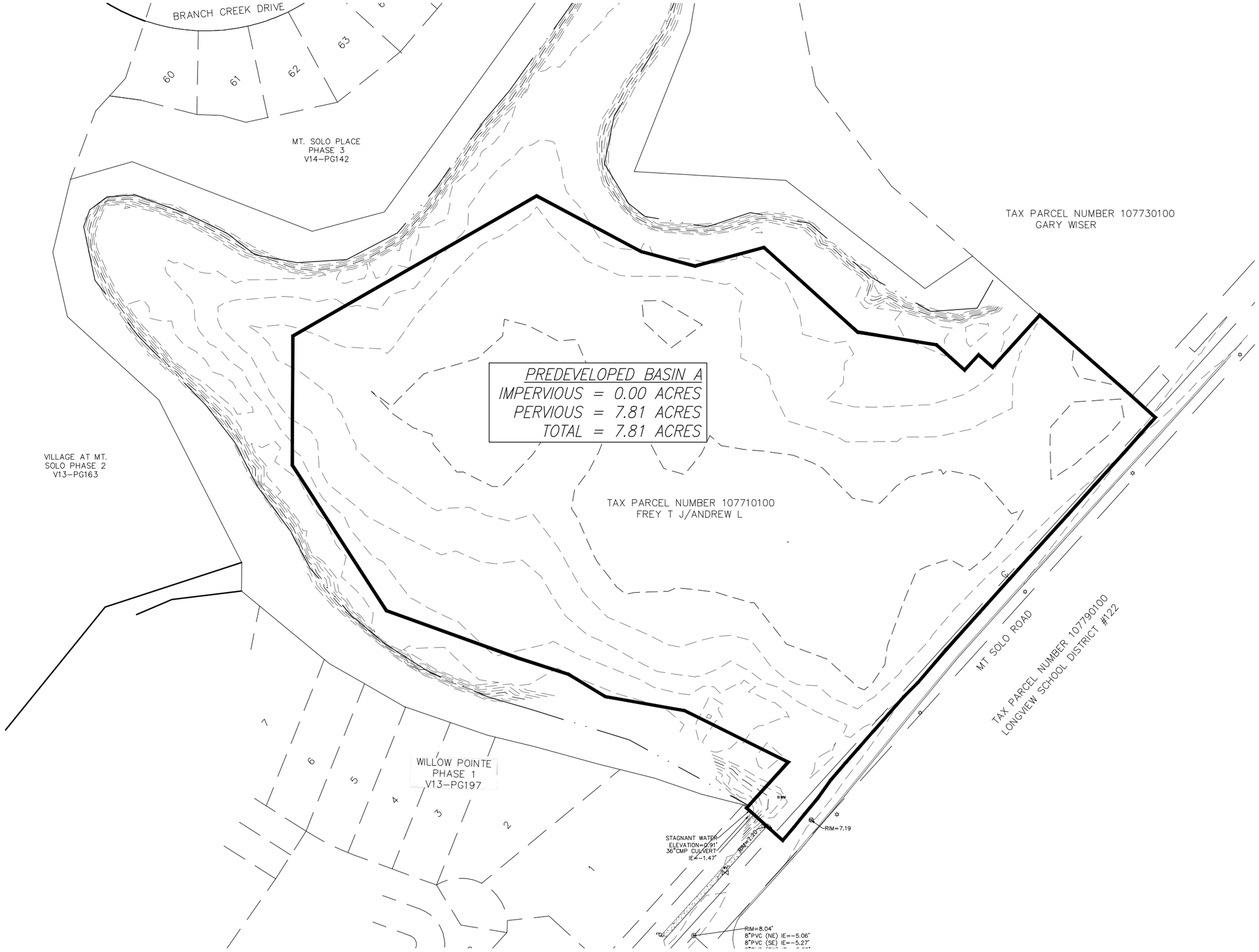
Pre-Developed Basin Map **A3**

Developed Basin Map **A4**


The City of Longview Washington
Site
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
COLUMBIA RIVER
COWLITZ RIVER
DISCLAIMER: The City of Longview does not guarantee the accuracy, adequacy, completeness or usefulness of any information. The City of Longview provides this information on an "as is" basis without warranty of any kind, expressed or implied, including but not limited to warranties of merchantability or fitness for a particular purpose, and assumes no responsibility for anyone's use of the information. However, notification of any errors will be appreciated.


The City of Longview Washington
Site
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
LONE OAK RD.
PACIFIC WAY
HEIGHTS
NEVADA DR.
RD.
OCEAN BEACH HWY.
MT. SOLO RD.
38TH AVE.
KELSO AVE.
ALLEN ST.
VINE
WASHINGTON
NICHOLS BLVD.
15TH AVE.
3RD AVE.
INDUSTRIAL WAY
OREGON WAY
TENNANT WAY
s:/gis_data/arcvw_app/lv_dnr_soils.apr R.Bunch 11/10/09

© SGA ENGINEERING, PLLC – DATE PLOTTED: Nov. 04, 2024 – 2:16 PM SGA DRAWING FILE: W:\DWG\2419– TAYLOR ISLAND ESTATES SUBDIVISION\STORMWATER\PRE–DEVELOPED



N

SGA ENGINEERING & DESIGN

TAYLOR ISLAND ESTATES
PRE–DEVELOPED BASIN MAP
CITY OF LONGVIEW, WA

SCALE: 1" = 100'
DATE: 11/4/2024
PROJECT: 2419

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BRANCH CREEK DRIVE

MT. SOLO PLACE
PHASE 3
V14–PG142

TAX PARCEL NUMBER 107730100
GARY WISER

VILLAGE AT MT.
SOLO PHASE 2
V13–PG163

TRACT 'A'

TRACT 'B'

TRACT 'C'

TRACT 'D'

BASIN 1A
IMPERVIOUS = 3.95 ACRES
PERVIOUS = 3.24 ACRES
TOTAL = 7.19 ACRES

BASIN 1B
IMPERVIOUS = 0.34 ACRES
PERVIOUS = 0.28 ACRES
TOTAL = 0.62 ACRES

MT SOLO ROAD

TAX PARCEL NUMBER 107790100
LONGVIEW SCHOOL DISTRICT #122

WILLOW POINTE
PHASE 1
V13–PG197

STAGNANT WATER
ELEVATION=0.91'
36"CMP CULVERT
IE=-1.47'

RIM=7.19

RIM=8.04'
8"PVC (NE) IE=-5.06'
8"PVC (SE) IE=-5.27'

N

SGA ENGINEERING & DESIGN

TAYLOR ISLAND ESTATES
DEVELOPED BASIN MAP
CITY OF LONGVIEW, WA

SCALE: 1" = 100'
DATE: 11/4/2024
PROJECT: 2419

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):					
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				

Separate curve number shall be selected for pervious & impervious portions of the site or basin

(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**	

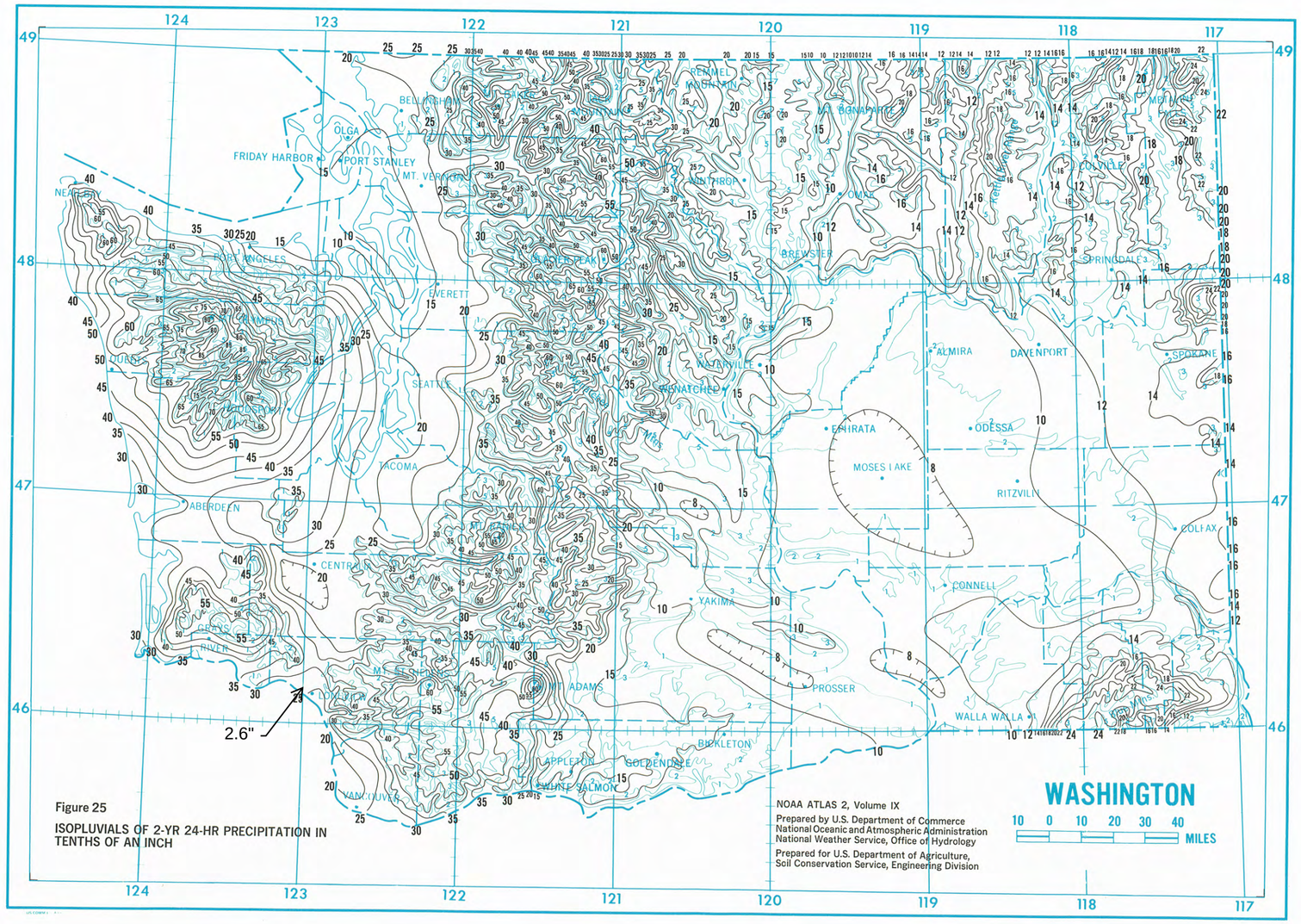

Figure 25

ISOPLUVIALS OF 2-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

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

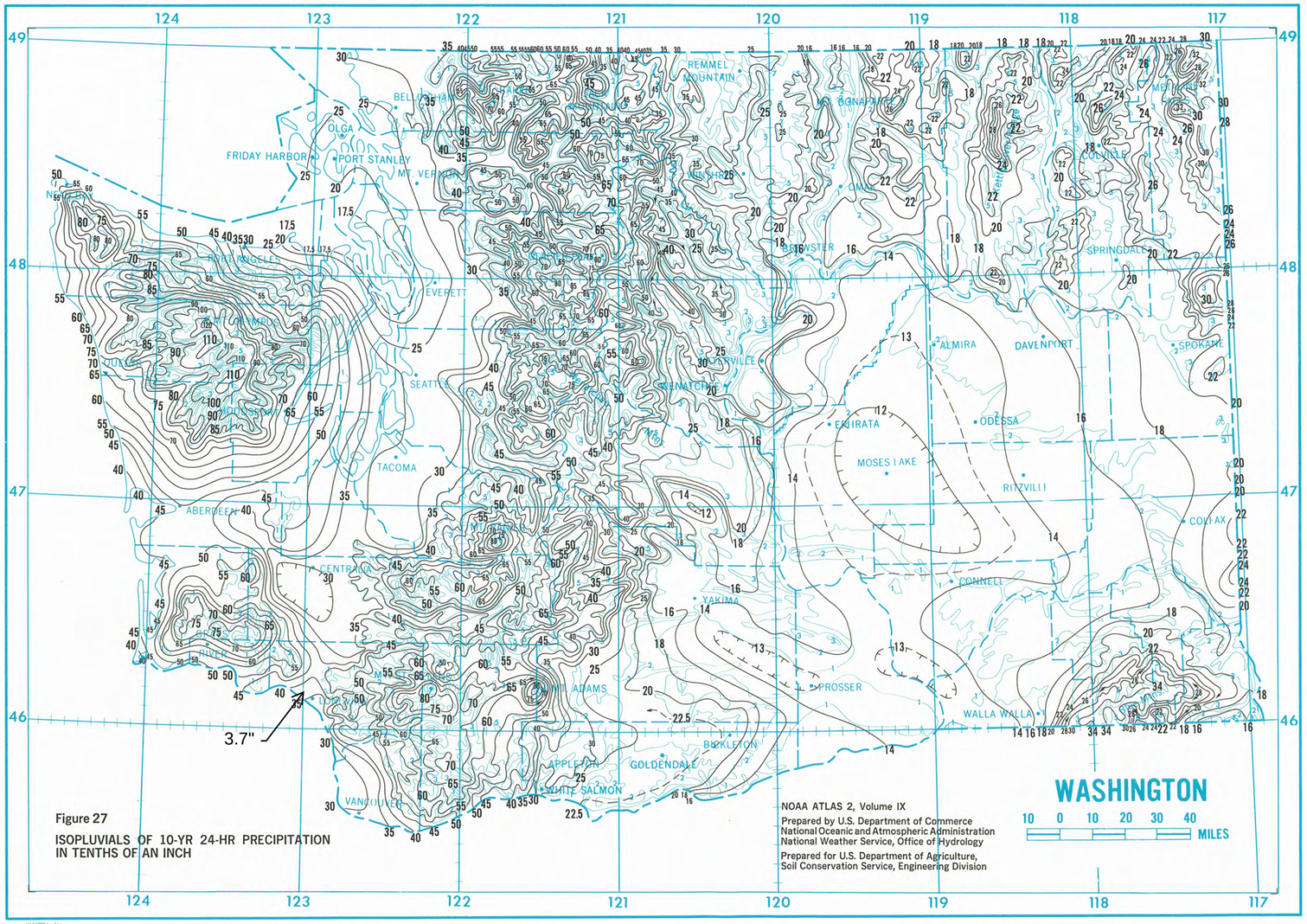

Figure 27

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

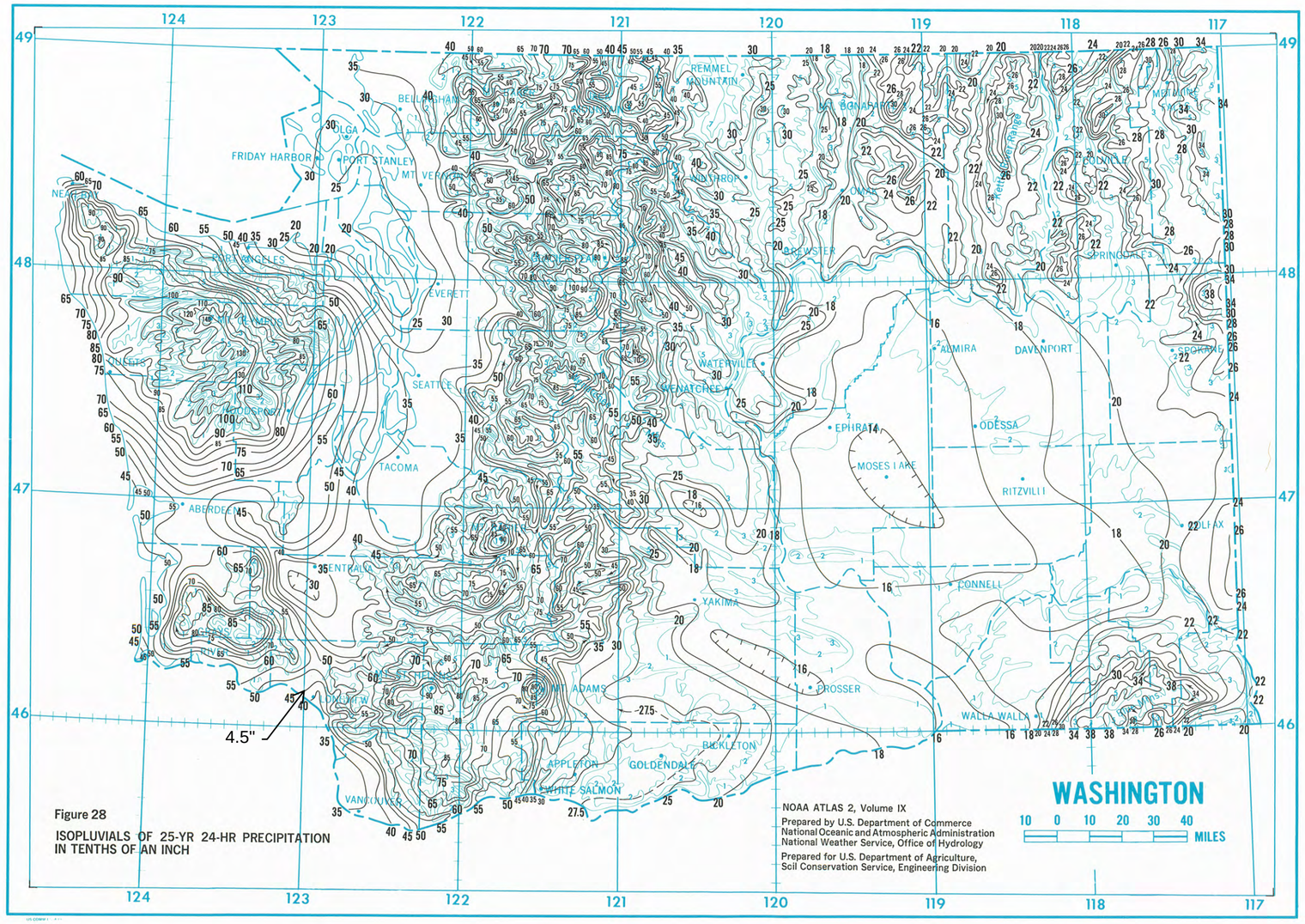

Figure 28

ISOPLUVIALS OF 25-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

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

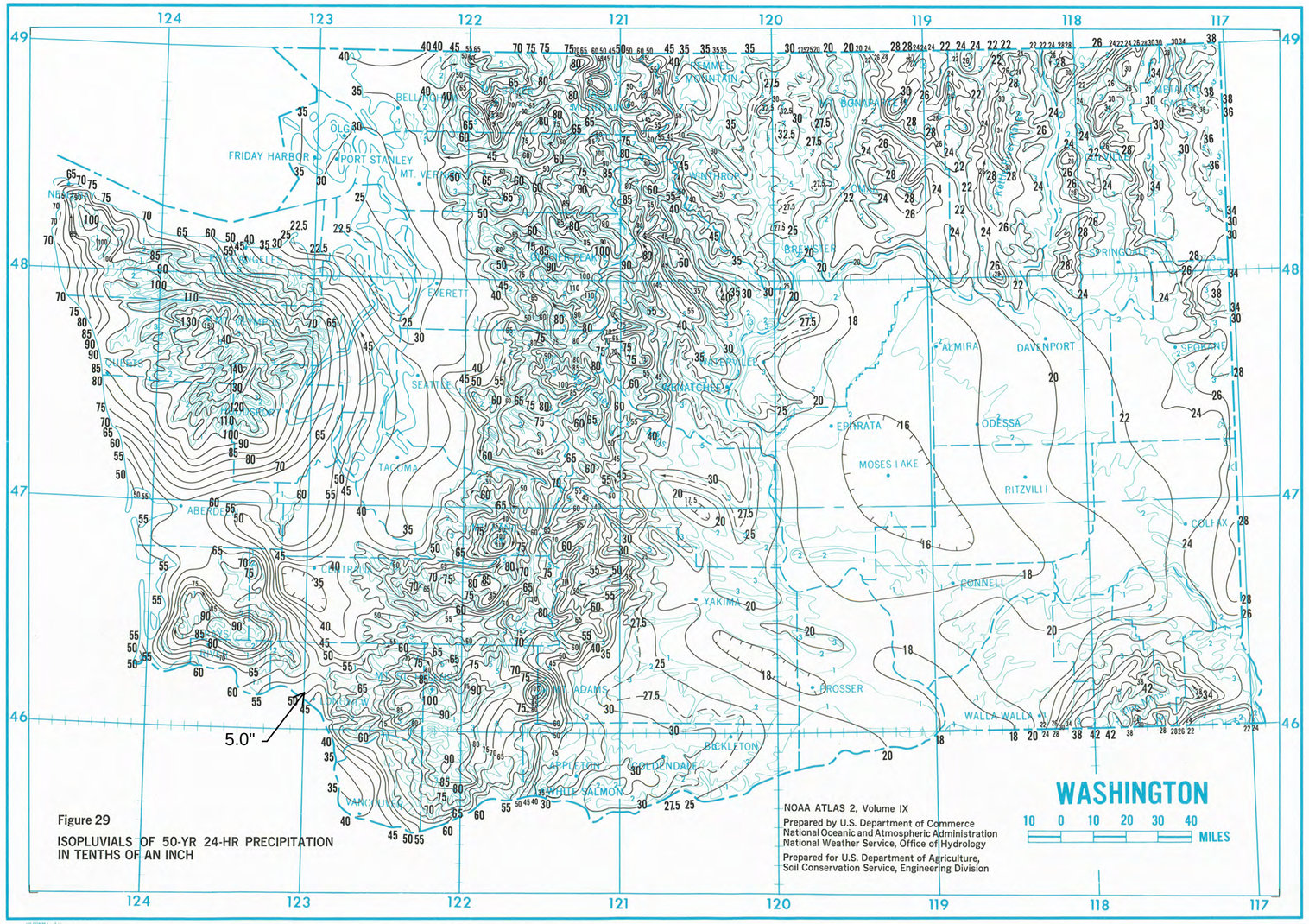

Figure 29

ISOPLUVIALS OF 50-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

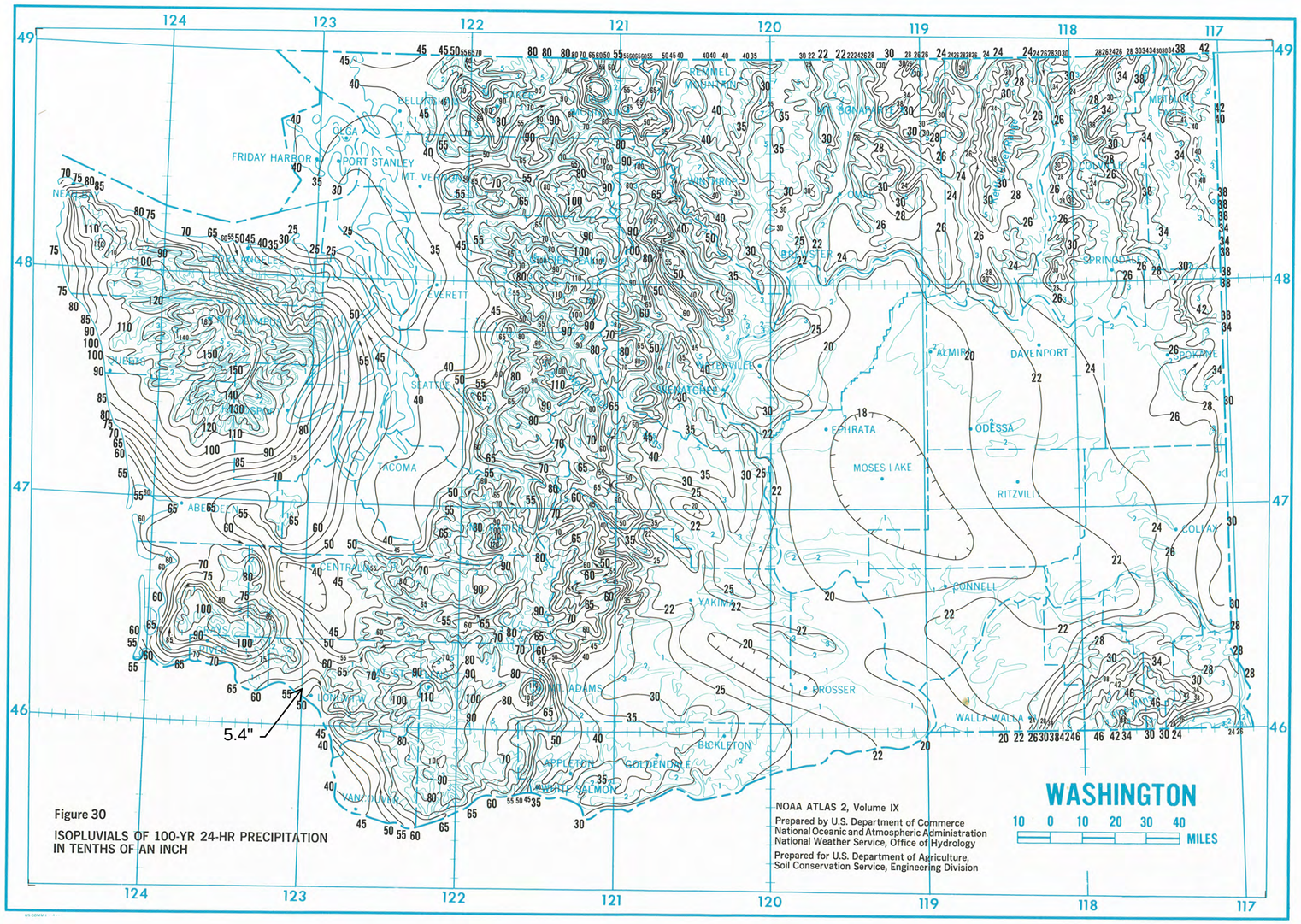

Figure 30

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

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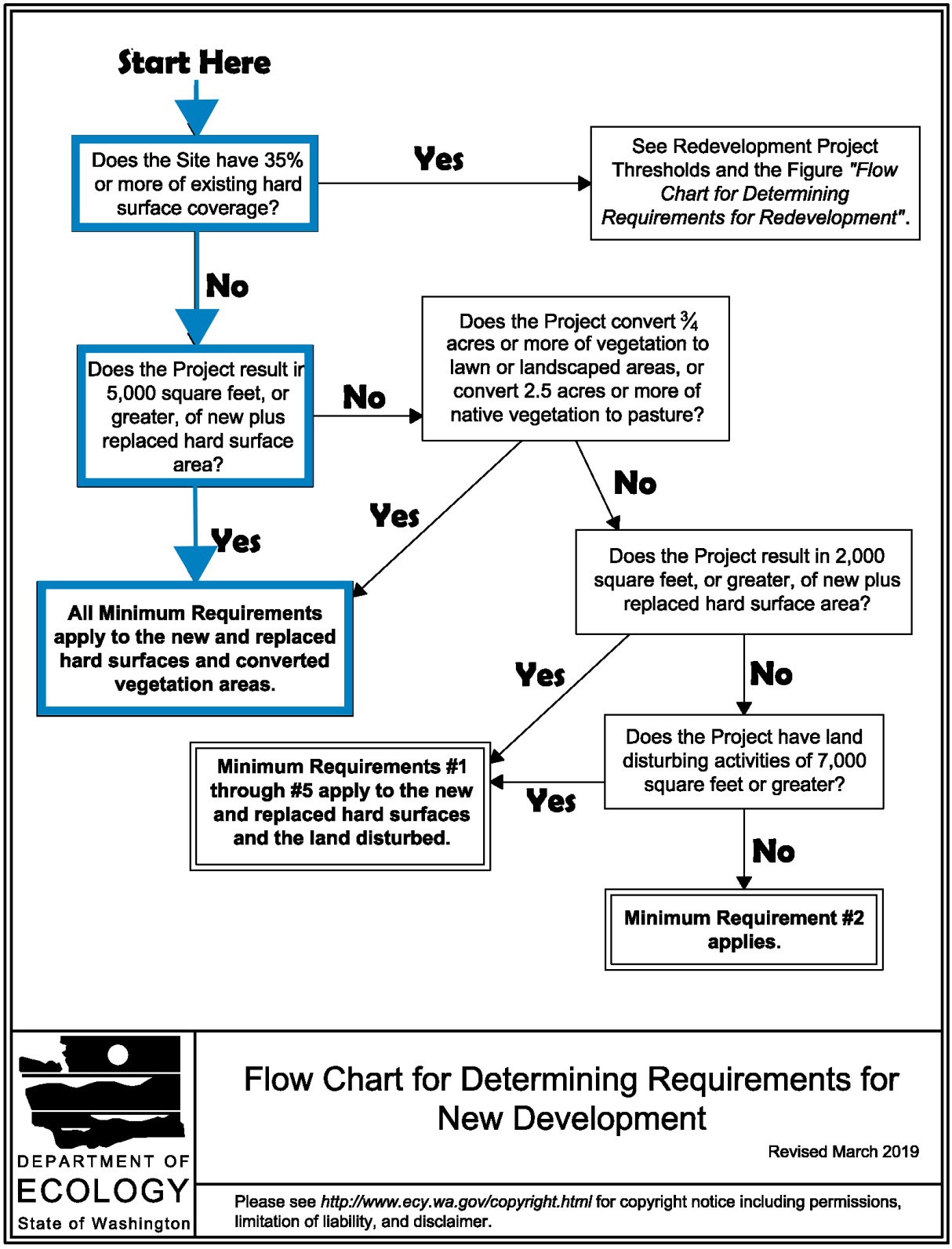
Long-Term Source Control Best Management Practices & Hydraulic Calculations Appendix C

2019 SWMMWW Figure I-3.1 **C1**
Department of Ecology Filterra GULD **C2**
HydroCAD Report for Detention Pond – Predeveloped **C3**
HydroCAD Report for Detention Pond – Developed **C4**

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



WASHINGTON STATE DEPARTMENT OF ECOLOGY

September 2019

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS), ENHANCED, PHOSPHORUS & OIL TREATMENT

For

CONTECH Engineered Solutions Filterra®

Ecology's Decision:

Based on Contech's submissions, including the Final Technical Evaluation Reports, dated August 2019, March 2014, December 2009, and additional information provided to Ecology dated October 9, 2009, Ecology hereby issues the following use level designations:

1. A General Use Level Designation for Basic, Enhanced, Phosphorus, and Oil Treatment for the Filterra® system constructed with a minimum media thickness of 21 inches (1.75 feet), at the following water quality design hydraulic loading rates:

Treatment	Infiltration Rate (in/hr) for use in Sizing
Basic	175
Phosphorus	100
Oil	50
Enhanced	175

2. The Filterra is not appropriate for oil spill-control purposes.
3. Ecology approves Filterra systems for treatment at the hydraulic loading rates listed above, to achieve the maximum water quality design flow rate. Calculate the water quality design flow rates using the following procedures:

- Western Washington: for treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three flow rate based methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

4. This General Use Level Designation has no expiration date, but Ecology may revoke or amend the designation, and is subject to the conditions specified below.

Ecology's Conditions of Use:

Filterra systems shall comply with these conditions shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the Filterra systems in accordance with applicable Contech Filterra manuals and this Ecology Decision.
2. The minimum size filter surface-area for use in Washington is determined by using the design water quality flow rate (as determined in this Ecology Decision, Item 3, above) and the Infiltration Rate from the table above (use the lowest applicable Infiltration Rate depending on the level of treatment required). Calculate the required area by dividing the water quality design flow rate (cu-ft/sec) by the Infiltration Rate (converted to ft/sec) to obtain required surface area (sq-ft) of the Filterra unit.
3. Each site plan must undergo Contech Filterra review before Ecology can approve the unit for site installation. This will ensure that design parameters including site grading and slope are appropriate for use of a Filterra unit.
4. Filterra media shall conform to the specifications submitted to and approved by Ecology and shall be sourced from Contech Engineered Solutions, LLC with no substitutions.
5. Maintenance includes removing trash, degraded mulch, and accumulated debris from the filter surface and replacing the mulch layer. Use inspections to determine the site-specific maintenance schedules and requirements. Follow maintenance procedures given in the most recent version of the Filterra Operation and Maintenance Manual.
6. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured treatment device.
    - Contech designs Filterra systems for a target maintenance interval of 6 months in the Pacific Northwest. Maintenance includes removing and replacing the mulch layer above the media along with accumulated sediment, trash, and captured organic materials therein, evaluating plant health, and pruning the plant if deemed necessary.
    - Conduct maintenance following manufacturer's guidelines.
7. Filterra systems come in standard sizes.
8. Install the Filterra in such a manner that flows exceeding the maximum Filterra operating rate are conveyed around the Filterra mulch and media and will not resuspend captured sediment.
9. Discharges from the Filterra units shall not cause or contribute to water quality standards violations in receiving waters.

Approved Alternate Configurations

Filterra Internal Bypass - Pipe (FTIB-P)

1. The Filterra® Internal Bypass – Pipe allows for piped-in flow from area drains, grated inlets, trench drains, and/or roof drains. Design capture flows and peak flows enter the structure through an internal slotted pipe. Filterra® inverted the slotted pipe to allow design flows to drop through to a series of splash plates that then disperse the design flows over the top surface of the Filterra® planter area. Higher flows continue to bypass the slotted pipe and convey out the structure.
2. To select a FTIB-P unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra Internal Bypass – Curb (FTIB-C)

1. The Filterra® Internal Bypass –Curb model (FTIB-C) incorporates a curb inlet, biofiltration treatment chamber, and internal high flow bypass in one single structure. Filterra® designed the FTIB-C model for use in a "Sag" or "Sump" condition and will accept flows from both directions along a gutter line. An internal flume tray weir component directs treatment flows entering the unit through the curb inlet to the biofiltration treatment chamber. Flows in excess of the water quality treatment flow rise above the flume tray weir and discharge through a standpipe orifice; providing bypass of untreated peak flows. Americast manufactures the FTIB-C model in a variety of sizes and configurations and you may use the unit on a continuous grade when a single structure providing both treatment and high flow bypass is preferred. The FTIB-C model can also incorporate a separate junction box chamber to allow larger diameter discharge pipe connections to the structure.
2. To select a FTIB-C unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra® Shallow

1. The Filterra Shallow provides additional flexibility for design engineers and designers in situations where various elevation constraints prevent application of a standard Filterra configuration. Engineers can design this system up to six inches shallower than any of the previous Filterra unit configurations noted above.
2. Ecology requires that the Filterra Shallow provide a media contact time equivalent to that of the standard unit. This means that with a smaller depth of media, the surface area must increase.
3. To select a Filterra Shallow System unit, the designer must first identify the size of the standard unit using the modeling guidance described above.
4. Once the size of the standard Filterra unit is established using the sizing technique described above, use information from the following table to select the appropriate size Filterra Shallow System unit.

Shallow Unit Basic, Enhanced, and Oil Treatment Sizing

Standard Depth	Equivalent Shallow Depth
4x4	4x6 or 6x4
4x6 or 6x4	6x6
4x8 or 8x4	6x8 or 8x6
6x6	6x10 or 10x6
6x8 or 8x6	6x12 or 12x6
6x10 or 10x6	13x7

Notes:
1. Shallow Depth Boxes are less than the standard depth of 3.5 feet but no less than 3.0 feet deep (TC to INV).

Applicant: Contech Engineered Solutions, LLC.

Applicant's Address: 11815 NE Glenn Widing Drive
Portland, OR 97220

Application Documents:

- State of Washington Department of Ecology Application for Conditional Use Designation, Americast (September 2006)
- Quality Assurance Project Plan Filterra® Bioretention Filtration System Performance Monitoring, Americast (April 2008)
- Quality Assurance Project Plan Addendum Filterra® Bioretention Filtration System Performance Monitoring, Americast (June 2008)
- Draft Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (August 2009)
- Final Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (December 2009)
- Technical Evaluation Report Appendices Filterra® Bioretention Filtration System Performance Monitoring, Americast, (August 2009)
- Memorandum to Department of Ecology Dated October 9, 2009 from Americast, Inc. and Herrera Environmental Consultants
- Quality Assurance Project Plan Filterra® Bioretention System Phosphorus treatment and Supplemental Basic and Enhanced Treatment Performance Monitoring, Americast (November 2011)
- Filterra® letter August 24, 2012 regarding sizing for the Filterra® Shallow System.
- University of Virginia Engineering Department Memo by Joanna Crowe Curran, Ph. D dated March 16, 2013 concerning capacity analysis of Filterra® internal weir inlet tray.
- Terraphase Engineering letter to Jodi Mills, P.E. dated April 2, 2013 regarding Terraflume Hydraulic Test, Filterra® Bioretention System and attachments.
- Technical Evaluation Report, Filterra® System Phosphorus Treatment and Supplemental Basic Treatment Performance Monitoring. March 27th, 2014.
- State of Washington Department of Ecology Application for Conditional Use Level Designation, Contech Engineered Solutions (May 2015)

- Quality Assurance Project Plan Filterra® Bioretention System, Contech Engineered Solutions (May 2015)
- Filterra Bioretention System Armco Avenue General Use Level Designation Technical Evaluation Report, Contech Engineered Solutions (August 2019)

Applicant's Use Level Request:

General Level Use Designation for Basic (175 in/hr), Enhanced (175 in/hr), Phosphorus (100 in/hr), and Oil Treatment (50 in/hr).

Applicant's Performance Claims:

Field-testing and laboratory testing show that the Filterra® unit is promising as a stormwater treatment best management practice and can meet Ecology's performance goals for basic, enhanced, phosphorus, and oil treatment.

Findings of Fact:

Field Testing 2015-2019

1. Contech completed field testing of a 4 ft. x 4 ft. Filterra® unit at one site in Hillsboro, Oregon from September 2015 to July 2019. Throughout the monitoring period a total of 24 individual storm events were sampled, of which 23 qualified for TAPE sampling criteria.
2. Contech encountered several unanticipated events and challenges that prevented them from collecting continuous flow and rainfall data. An analysis of the flow data from the sampled events, including both the qualifying and non-qualifying events, demonstrated the system treated over 99 % of the influent flows. Peak flows during these events ranged from 25 % to 250 % of the design flow rate of 29 gallons per minute.
3. Of the 23 TAPE qualified sample events, 13 met requirements for TSS analysis. Influent concentrations ranged from 20.8 mg/L to 83 mg/L, with a mean concentration of 46.3 mg/L. The UCL95 mean effluent concentration was 15.9 mg/L, meeting the 20 mg/L performance goal for Basic Treatment.
4. All 23 TAPE qualified sample events met requirements for dissolved zinc analysis. Influent concentrations range from 0.0384 mg/L to 0.2680 mg/L, with a mean concentration of 0.0807 mg/L. The LCL 95 mean percent removal was 62.9 %, meeting the 60 % performance goal for Enhanced Treatment.
5. Thirteen of the 23 TAPE qualified sample events met requirements for dissolved copper analysis. Influent concentrations ranged from 0.00543 mg/L to 0.01660 mg/L, with a mean concentration of 0.0103 mg/L. The LCL 95 mean percent removal was 41.2 %, meeting the 30 % performance goal for Enhanced Treatment.
6. Total zinc concentrations were analyzed for all 24 sample events. Influent EMCs for total zinc ranged from 0.048 mg/L to 5.290 mg/L with a median of 0.162 mg/L. Corresponding effluent EMCs for total zinc ranged from 0.015 mg/L to 0.067 mg/L with a median of

0.029 mg/L. Total event loadings for the study for total zinc were 316.85 g at the influent and 12.92 g at the effluent sampling location, resulting in a summation of loads removal efficiency of 95.9 %.

7. Total copper concentrations were analyzed for all 24 sample events. Influent EMCs for total copper ranged from 0.003 mg/L to 35.600 mg/L with a median value of 0.043 mg/L. Corresponding effluent EMCs for total copper ranged from 0.002 mg/L to 0.015 mg/L with a median of 0.004 mg/L. Total event loadings for total copper for the study were 1,810.06 g at the influent and 1.90 g at the effluent sampling location, resulting in a summation of loads removal efficiency of 99.9 %.

Field Testing 2013

1. Filterra completed field-testing of a 6.5 ft x 4 ft. unit at one site in Bellingham, Washington. Continuous flow and rainfall data collected from January 1, 2013 through July 23, 2013 indicated that 59 storm events occurred. Water quality data was obtained from 22 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. The system treated 98.9 % of the total 8-month runoff volume during the testing period. Consequently, the system achieved the goal of treating 91 % of the volume from the site. Stormwater runoff bypassed Filterra treatment during four of the 59 storm events.
3. Of the 22 sampled events, 18 qualified for TSS analysis (influent TSS concentrations ranged from 25 to 138 mg/L). The data were segregated into sample pairs with influent concentration greater than and less than 100 mg/L. The UCL95 mean effluent concentration for the data with influent less than 100 mg/L was 5.2 mg/L, below the 20-mg/L threshold. Although the TAPE guidelines do not require an evaluation of TSS removal efficiency for influent concentrations below 100 mg/L, the mean TSS removal for these samples was 90.1 %. Average removal of influent TSS concentrations greater than 100 mg/L (three events) was 85 %. In addition, the system consistently exhibited TSS removal greater than 80 % at flow rates equivalent to a 100 in/hr infiltration rate and was observed at 150 in/hr.
4. Ten of the 22 sampled events qualified for TP analysis. Americast augmented the dataset using two sample pairs from previous monitoring at the site. Influent TP concentrations ranged from 0.11 to 0.52 mg/L. The mean TP removal for these twelve events was 72.6 %. The LCL95 mean percent removal was 66.0, well above the TAPE requirement of 50 %. Treatment above 50 % was evident at 100 in/hr infiltration rate and as high as 150 in/hr. Consequently, the Filterra test system met the TAPE Phosphorus Treatment goal at 100 in/hr. Influent ortho-P concentrations ranged from 0.005 to 0.012 mg/L; effluent ortho-P concentrations ranged from 0.005 to 0.013 mg/L. The reporting limit/resolution for the ortho-P test method is 0.01 mg/L, therefore the influent and effluent ortho-P concentrations were both at and near non-detect concentrations.

Field Testing 2008-2009

1. Filterra completed field-testing at two sites at the Port of Tacoma. Continuous flow and rainfall data collected during the 2008-2009 monitoring period indicated that 89 storm events occurred. The monitoring obtained water quality data from 27 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. During the testing at the Port of Tacoma, 98.96 to 99.89 % of the annual influent runoff volume passed through the POT1 and POT2 test systems respectively. Stormwater runoff bypassed the POT1 test system during nine storm events and bypassed the POT2 test system during one storm event. Bypass volumes ranged from 0.13 % to 15.3% of the influent storm volume. Both test systems achieved the 91 % water quality treatment-goal over the 1-year monitoring period.
3. Consultants observed infiltration rates as high as 133 in/hr during the various storms. Filterra did not provide any paired data that identified percent removal of TSS, metals, oil, or phosphorus at an instantaneous observed flow rate.
4. The maximum storm average hydraulic loading rate associated with water quality data is <40 in/hr, with the majority of flow rates < 25 in/hr. The average instantaneous hydraulic loading rate ranged from 8.6 to 53 in/hr.
5. The field data showed a removal rate greater than 80 % for TSS with an influent concentration greater than 20 mg/L at an average instantaneous hydraulic loading rate up to 53 in/hr (average influent concentration of 28.8 mg/L, average effluent concentration of 4.3 mg/L).
6. The field data showed a removal rate generally greater than 54 % for dissolved zinc at an average instantaneous hydraulic loading rate up to 60 in/hr and an average influent concentration of 0.266 mg/L (average effluent concentration of 0.115 mg/L).
7. The field data showed a removal rate generally greater than 40 % for dissolved copper at an average instantaneous hydraulic loading rate up to 35 in/hr and an average influent concentration of 0.0070 mg/L (average effluent concentration of 0.0036 mg/L).
8. The field data showed an average removal rate of 93 % for total petroleum hydrocarbon (TPH) at an average instantaneous hydraulic loading rate up to 53 in/hr and an average influent concentration of 52 mg/L (average effluent concentration of 2.3 mg/L). The data also shows achievement of less than 15 mg/L TPH for grab samples. Filterra provided limited visible sheen data due to access limitations at the outlet monitoring location.
9. The field data showed low percentage removals of total phosphorus at all storm flows at an average influent concentration of 0.189 mg/L (average effluent concentration of 0.171 mg/L). We may relate the relatively poor treatment performance of the Filterra system at this location to influent characteristics for total phosphorus that are unique to the Port of Tacoma site. It appears that the Filterra system will not meet the 50 % removal performance goal when the majority of phosphorus in the runoff is expected to be in the dissolved form.

Laboratory Testing

1. Filterra performed laboratory testing on a scaled down version of the Filterra unit. The lab data showed an average removal from 83-91 % for TSS with influents ranging from 21 to 320 mg/L, 82-84 % for total copper with influents ranging from 0.94 to 2.3 mg/L, and 50-61 % for orthophosphate with influents ranging from 2.46 to 14.37 mg/L.
2. Filterra conducted permeability tests on the soil media.
3. Lab scale testing using Sil-Co-Sil 106 showed removals ranging from 70.1 % to 95.5 % with a median removal of 90.7 %, for influent concentrations ranging from 8.3 to 260 mg/L. Filterra ran these laboratory tests at an infiltration rate of 50 in/hr.
4. Supplemental lab testing conducted in September 2009 using Sil-Co-Sil 106 showed an average removal of 90.6 %. These laboratory tests were run at infiltration rates ranging from 25 to 150 in/hr for influent concentrations ranging from 41.6 to 252.5 mg/L. Regression analysis results indicate that the Filterra system's TSS removal performance is independent of influent concentration in the concentration rage evaluated at hydraulic loading rates of up to 150 in/hr.

Contact Information:

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Ecology: Douglas C. Howie, P.E.
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Water Quality Program
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Date	Revision
December 2009	GULD for Basic, Enhanced, and Oil granted, CULD for Phosphorus
September 2011	Extended CULD for Phosphorus Treatment
September 2012	Revised design storm discussion, added Shallow System.
January 2013	Revised format to match Ecology standards, changed Filterra contact information
February 2013	Added FTIB-P system
March 2013	Added FTIB-C system
April 2013	Modified requirements for identifying appropriate size of unit

June 2013	Modified description of FTIB-C alternate configuration
March 2014	GULD awarded for Phosphorus Treatment. GULD updated for a higher flow-rate for Basic Treatment.
June 2014	Revised sizing calculation methods
March 2015	Revised Contact Information
June 2015	CULD for Basic and Enhanced at 100 in/hr infiltration rate
September 2019	GULD for Basic and Enhanced at 175 in/hr infiltration rate

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

Summary for Subcatchment Pre A: Pre A

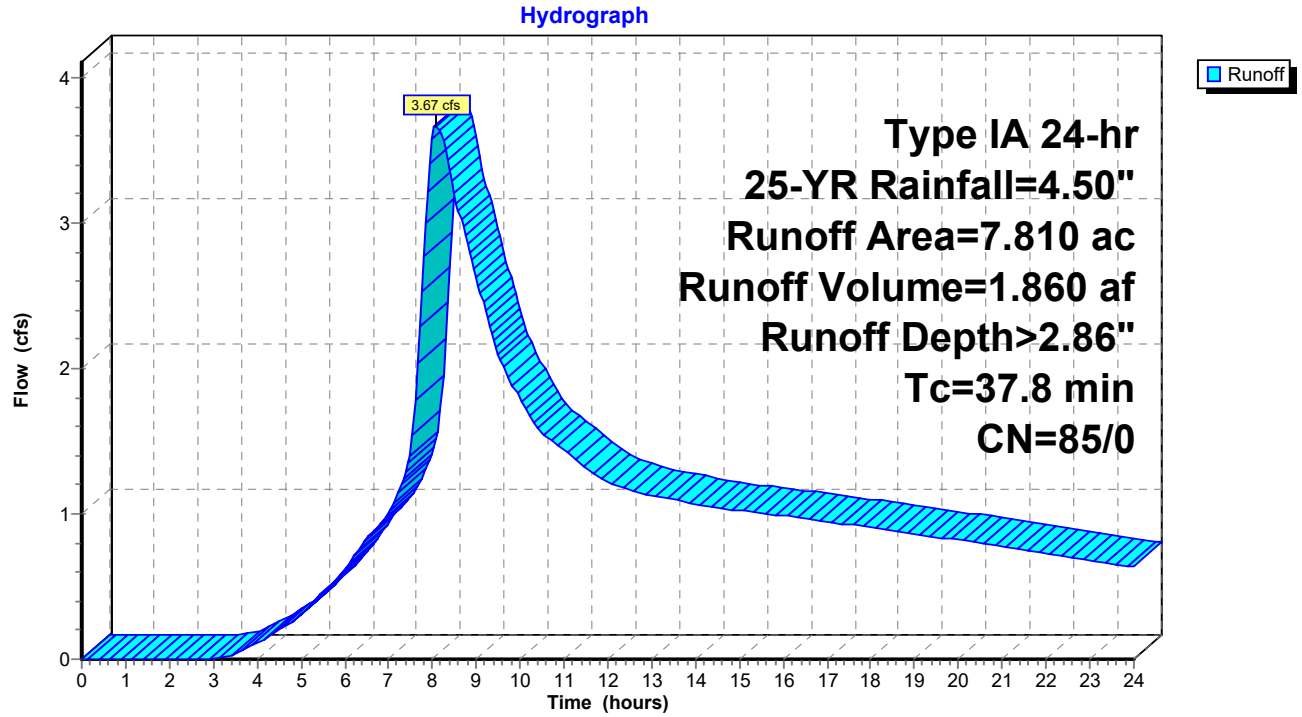
Runoff = 3.67 cfs @ 8.08 hrs, Volume= 1.860 af, Depth> 2.86"

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
*	7.810	85	
	7.810		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.8					**Direct Entry,**

Subcatchment Pre A: Pre A



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

Summary for Subcatchment 1A: Dev 1A

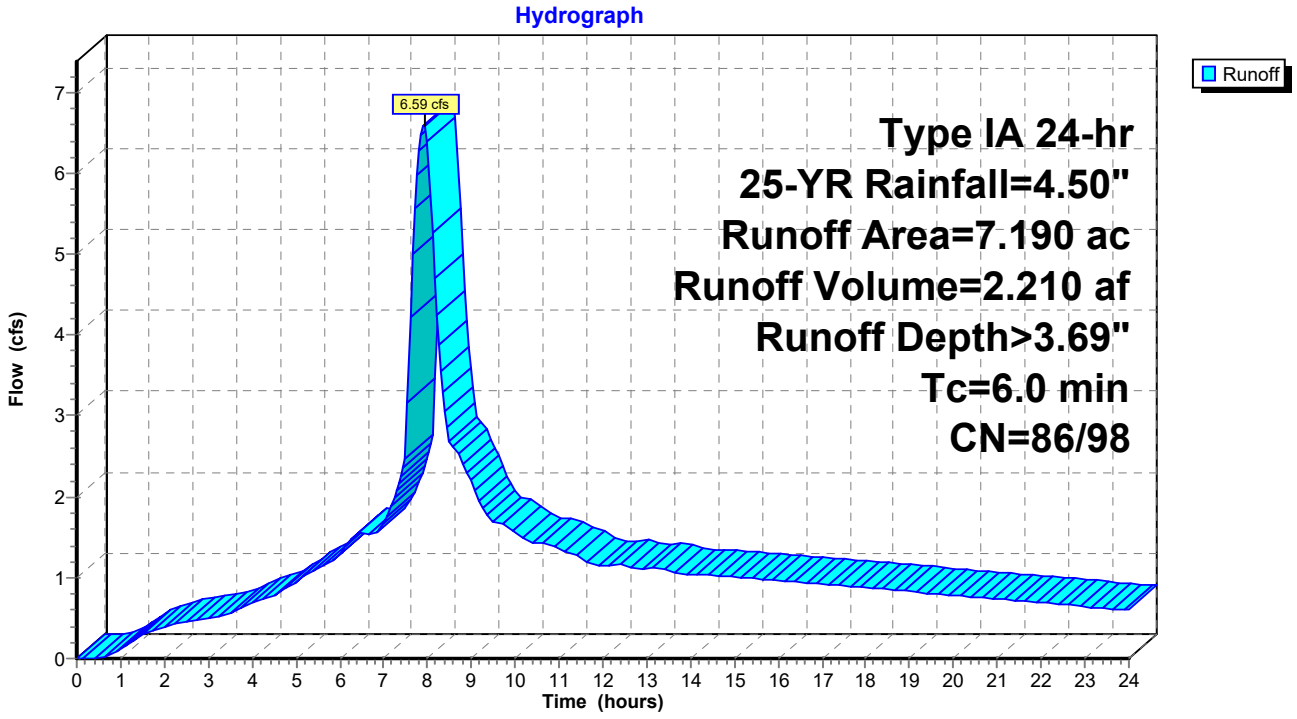
Runoff = 6.59 cfs @ 7.93 hrs, Volume= 2.210 af, Depth> 3.69"

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
*	3.950	98	
*	3.240	86	
	7.190	93	Weighted Average
	3.240		45.06% Pervious Area
	3.950		54.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 1A: Dev 1A



Summary for Subcatchment 1B: Dev 1B

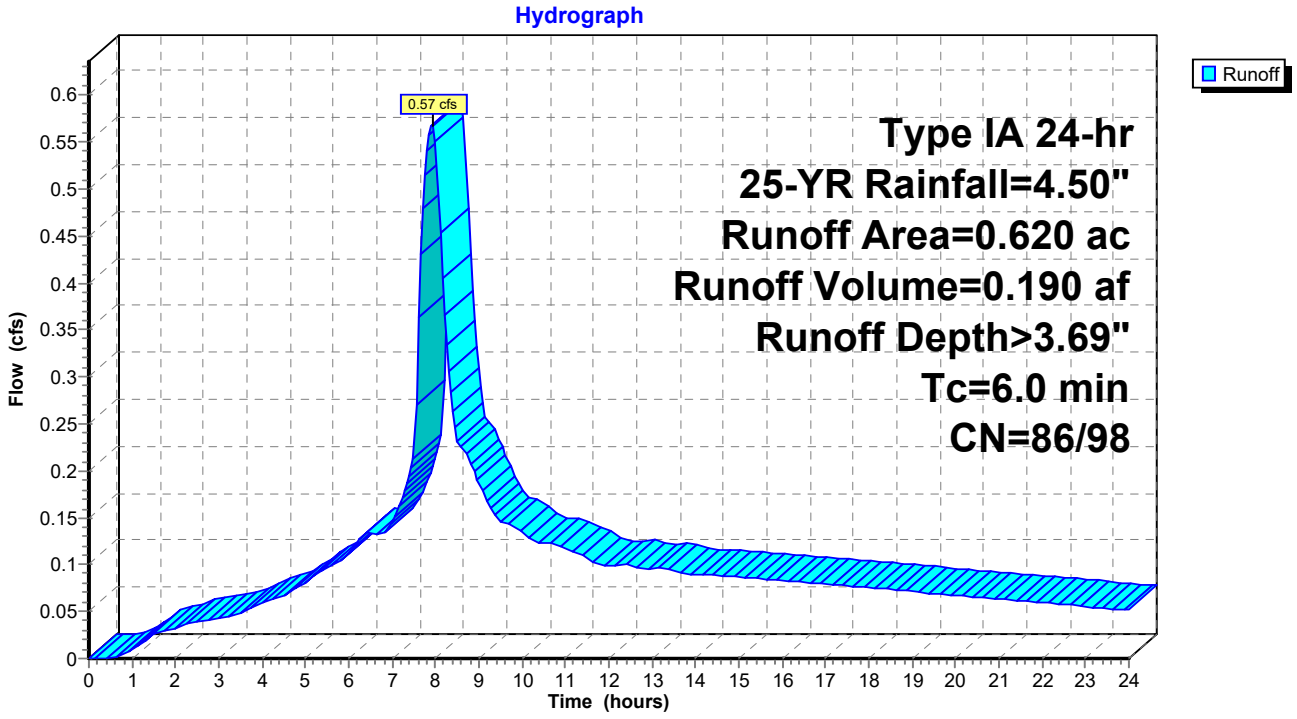
Runoff = 0.57 cfs @ 7.93 hrs, Volume= 0.190 af, Depth> 3.69"

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
*	0.340	98	
*	0.280	86	
	0.620	93	Weighted Average
	0.280		45.16% Pervious Area
	0.340		54.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 1B: Dev 1B



Summary for Pond Pond: Pond

Inflow Area = 7.190 ac, 54.94% Impervious, Inflow Depth > 3.69" for 25-YR event
Inflow = 6.59 cfs @ 7.93 hrs, Volume= 2.210 af
Outflow = 3.09 cfs @ 8.40 hrs, Volume= 2.200 af, Atten= 53%, Lag= 27.7 min
Primary = 3.09 cfs @ 8.40 hrs, Volume= 2.200 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 3.18' @ 8.40 hrs Surf.Area= 4,519 sf Storage= 10,210 cf

Plug-Flow detention time= 23.9 min calculated for 2.200 af (100% of inflow)
Center-of-Mass det. time= 20.7 min (712.3 - 691.6)

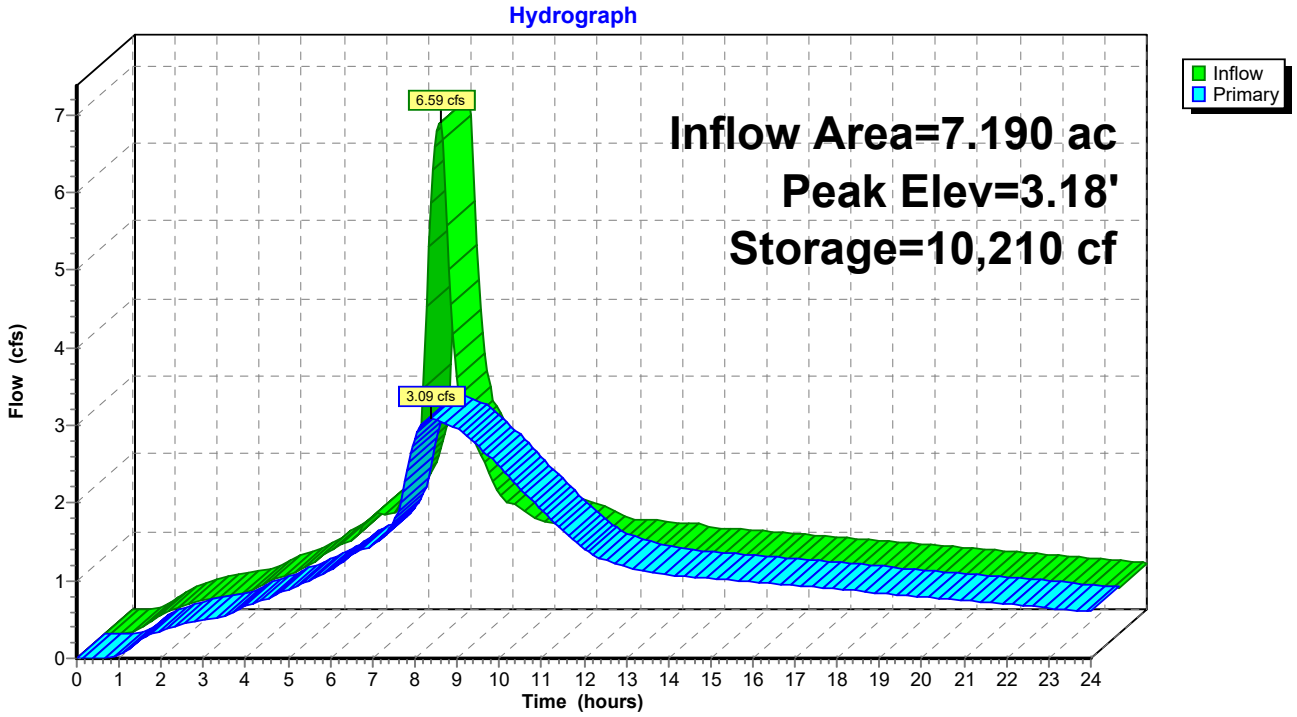
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	19,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 0.75

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	2,690	0	0
1.00	3,629	3,160	3,160
2.00	4,671	4,150	7,310
3.00	5,805	5,238	12,548
4.00	7,029	6,417	18,965
5.00	8,339	7,684	26,649

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**8.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	3.17'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.08 cfs @ 8.40 hrs HW=3.18' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 3.07 cfs @ 8.59 fps)
└**2=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.33 fps)

Pond Pond: Pond



Geotechnical Report Appendix D

REDMOND GEOTECHNICAL SERVICES

Geotechnical Investigation and Consultation Services

Proposed Mt Solo Residential Development Site

Parcel #17710100

5431 Mt. Solo Road

Longview (Cowlitz County), Washington

for

Hinton Development Corp.

Project No. 1209.003.G
June 30, 2024

REDMOND GEOTECHNICAL SERVICES

August 14, 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 Mt. Solo Residential Development Site, Parcel #17710100,
5431 Mt. Solo Road, Longview (Cowlitz County), Washington

Submitted herewith is our report entitled "Geotechnical Investigation and Consultation Services, Proposed Mt. Solo Road Residential Development Site, Parcel #17710100, 5431 Mt. Solo Road, Longview (Cowlitz County), Washington". The scope of our services was outlined in our formal proposal to Ms. Nikole Hinto of Hinton Development Corp dated July 12, 2024. Written authorization of our services was provided by Ms. Nikole Hinton of Hinton Development Corp on July 15, 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
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28881
REGISTERED
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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 MT SOLO RESIDENTIAL DEVELOPMENT SITE
PARCEL #17710100
5431 MT SOLO ROAD
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 Mt. Solo residential development project which is to be located at an existing residential and/or farm property which is sited to the west of Mt. Solo Road and north of the intersection with Willow Point Loop in Longview (Cowlitz County), Washington. The general location of the subject site, which encompasses one (1) separate tax lot and a total area of approximately 12.83 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.

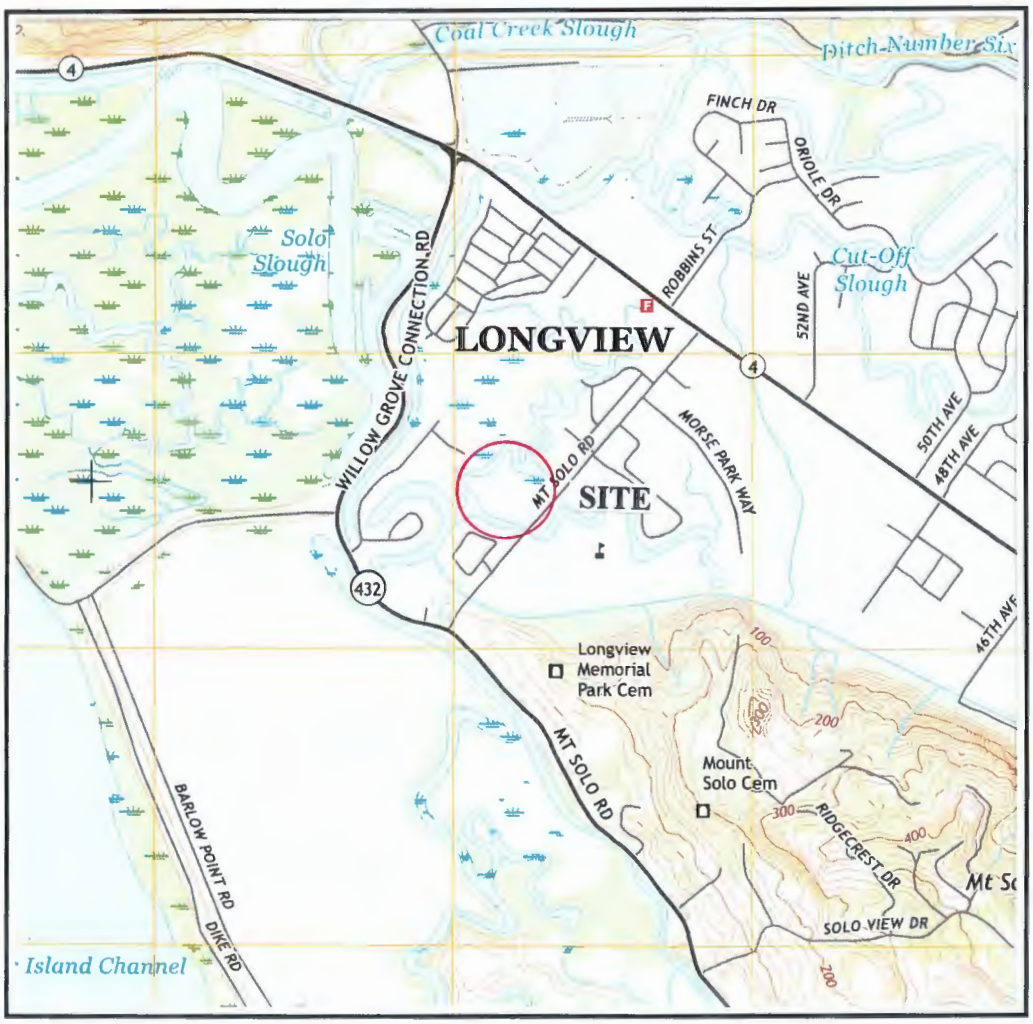
PROJECT DESCRIPTION

Based on a review of the proposed site development plan, we understand that present plans for the project will consist of the development of forty-one (41) new single-family residential home sites (lots) which will range in size from about 4,000 to 7,000 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 1,500 to 2,000 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. 1209.003.G	**MT SOLO SUBDIVISION SITE #107710100, 5431 MT SOLO ROAD**	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 ten (10) 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 Mt Solo residential development property is generally irregular in shape and encompasses a total plan area of approximately 12.83 acres. The proposed new Mt Solo residential development site is roughly bounded to the east by Mt. Solo Road and to the north, south and west by developed residential land. Additionally, the norther, southerly and westerly portions of the site are bounded by existing sloughs and/or waterways. At the time of our work, the subject proposed new Mt Solo 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 farm and/or agricultural land.

Topographically, the site is characterized as relatively flat-lying to gently sloping terrain with overall topographic relief across the site estimated at about two (2) 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 ten (10) feet beneath existing site grades on July 25, 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.

LEGEND

TH-#5 Indicates approximate location of exploratory test hole

Approximate Scale: 1" = 250'

SITE EXPLORATION PLAN

Project No. 1209.003.G	**MT SOLO SUBDIVISION SITE #107710100, 5431 MT SOLO ROAD**	Figure No. 2

Specifically, the native subsurface soils encountered across the proposed Mt Solo 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 an upper unit of medium olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey silt to a depth of about eight (8) feet beneath the existing site and/or surface grades. These upper sandy, clayey silt subgrade soils become wet to saturated at depths of about six (6) to eight (8) feet and are best characterized by relatively low to moderate strength and moderate compressibility. The upper sandy, clayey silt subgrade soils were inturn underlain by olive- to gray-brown, wet to saturated, medium stiff to medium dense, clayey, fine sandy silt to silty fine sand to the maximum depth explored of ten (10) feet beneath existing surface grades. These clayey, fine sandy silt to silty fine sand subgrade soil materials, which contain traces of organics, are best characterized by relatively low to moderate strength and low to moderate compressibility.

Groundwater

Groundwater was encountered at the time of our field work in all five (5) of the exploratory test holes (TH-#1 through TH-#5) at depths of between six (6) and eight (8) feet beneath the existing site and/or surface grades. However, due to proximity of the 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 July 25, 2024. The infiltration testing was performed in test hole TH-#1 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 posses an ultimate infiltration rate on the order of about 0.6 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 CPT analysis, which indicates that the soil behaves like clay and does not liquefy. Our analysis indicates that liquefaction of the underlying medium stiff to medium dense clayey, fine sandy silty to silty fine sand deposits located below a depth of about 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 Mt Solo 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 Mt Solo 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 Mt Solo 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 Mt Solo 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

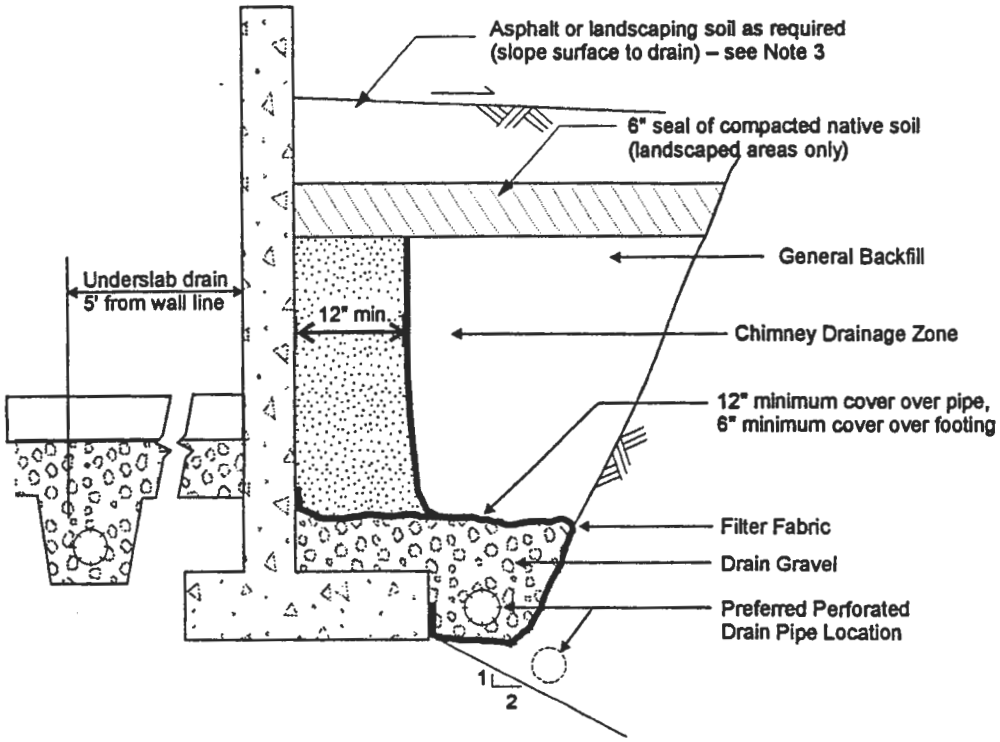
We recommend that positive measures be taken to properly finish grade the site so that drainage waters from building and/or landscaping areas as well as adjacent properties or buildings are directed away from the new apartment structures foundations. Any roof drains and/or subsurface drainage systems 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 apartment structure(s).

Groundwater was encountered at the site within all five (5) of the exploratory test holes at the time of the field work at depth of between six (6) and eight (8) feet beneath existing site grades. 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 0.3 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. 1209.003.G	MT SOLO SUBDIVISION SITE #107710100, 5431 MT SOLO ROAD	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 (Fa and Fv) 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. Ss and S1 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 Ss and S1 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 Mt Solo 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 Mt Solo residenntial 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.

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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 July 25, 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 about ten (10) 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 encountered in all five (5) of the exploratory test holes (TH-#1 through TH-#5) at the time of of the field work at depth of about six (6) 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.

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

MT SOLO SUBDIVISION SITE
PARCEL # 17710100, 5431 MT SOLO ROAD

PROJECT NO.	DATE	
1209.003.G	8/14/24	Figure A-4

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 7/25/24

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
						TEST PIT NO. TH-#1 ELEVATION
0					ML	Dark brown, moist, soft, organic, sandy, clayey SILT (Topsoil)
	X			18.8	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5	X			22.7		Becomes wet to saturated
					ML/SM	Olive to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Depth = 10.0 feet Groundwater encountered at a depth of 7 to 8 feet at time of exploration
15						
						TEST PIT NO. TH-#2 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						Becomes wet to saturated
					ML/SM	Olive to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Depth = 10.0 feet Groundwater encountered at a depth of 6 to 7 feet at time of exploration
15						

LOG OF TEST PITS

PROJECT NO. 1209.003.G | MT SOLO SUBDIVISION SITE | FIGURE NO. A-5

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 7/25/24

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		88.8	19.1	ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5	X			23.8		Becomes wet to saturated
					ML/SM	Olive- to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Depth = 10.0 feet Groundwater encountered at a deoth of 6 to 7 feet at time of exploration
15						
						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						Becomes wet to saturated
					ML/SM	Olive to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Deth = 10.0 feet Groundwater encountered at a depth og 6 to 7 feet at time of exploration
15						

LOG OF TEST PITS

PROJECT NO. 1209.003.G | MT SOLO SUBDIVISION SITE | FIGURE NO. A-6

BACKHOE COMPANY: Redmond Geotechnical BUCKET SIZE: 3 inches DATE: 7/25/24

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)
					ML	Medium to olive-brown with gray mottling, moist to very moist, medium stiff, sandy, clayey SILT
5						Becomes wet to saturated
					ML/SM	Olive to gray-brown, saturated, medium stiff to medium dense, clayey, fine sandy SILT to silty fine SAND
10						Total Depth = 10.0 feet Groundwater encountered at a depth of 6 to 7 feet at time of exploration
15						

TEST PIT NO. ELEVATION

0
5
10
15

LOG OF TEST PITS

PROJECT NO. 1209.003.G | MT SOLO SUBDIVISION SITE | FIGURE NO. A-7

MAXIMUM DENSITY TEST RESULTS

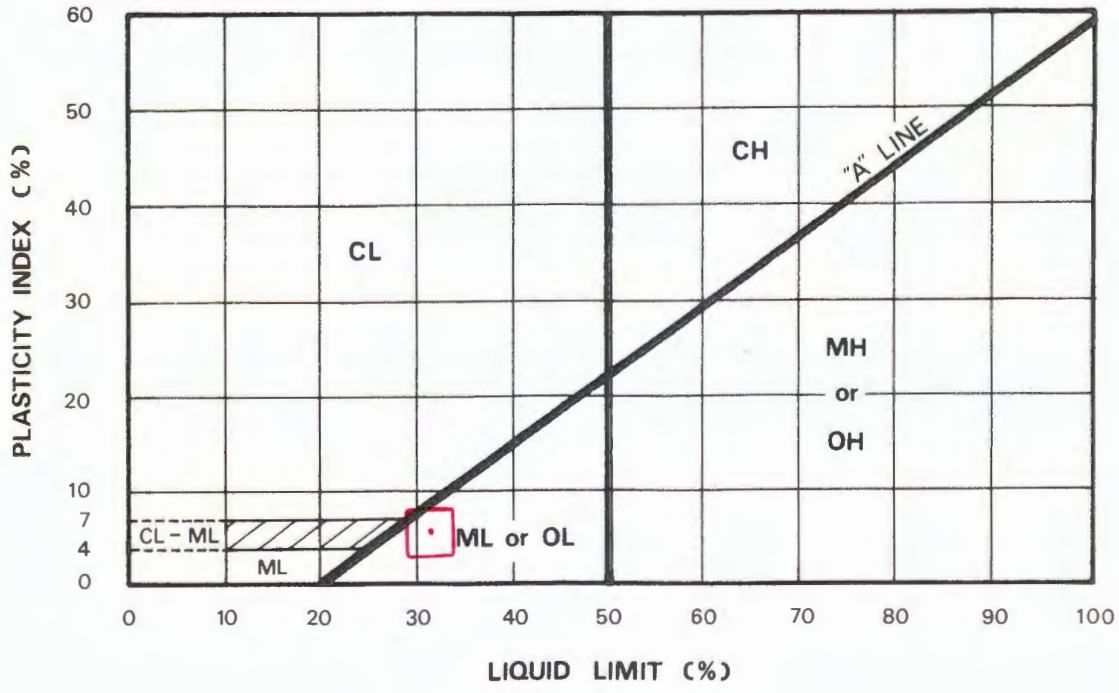
SAMPLE LOCATION	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
TH-#3 @ 2.0'	Medium to olive-brown, sandy, clayey SILT (ML)	106.0	16.0

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.: 1209.003.G	MT SOLO 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	19.1	31.6	6.3	88.0		ML

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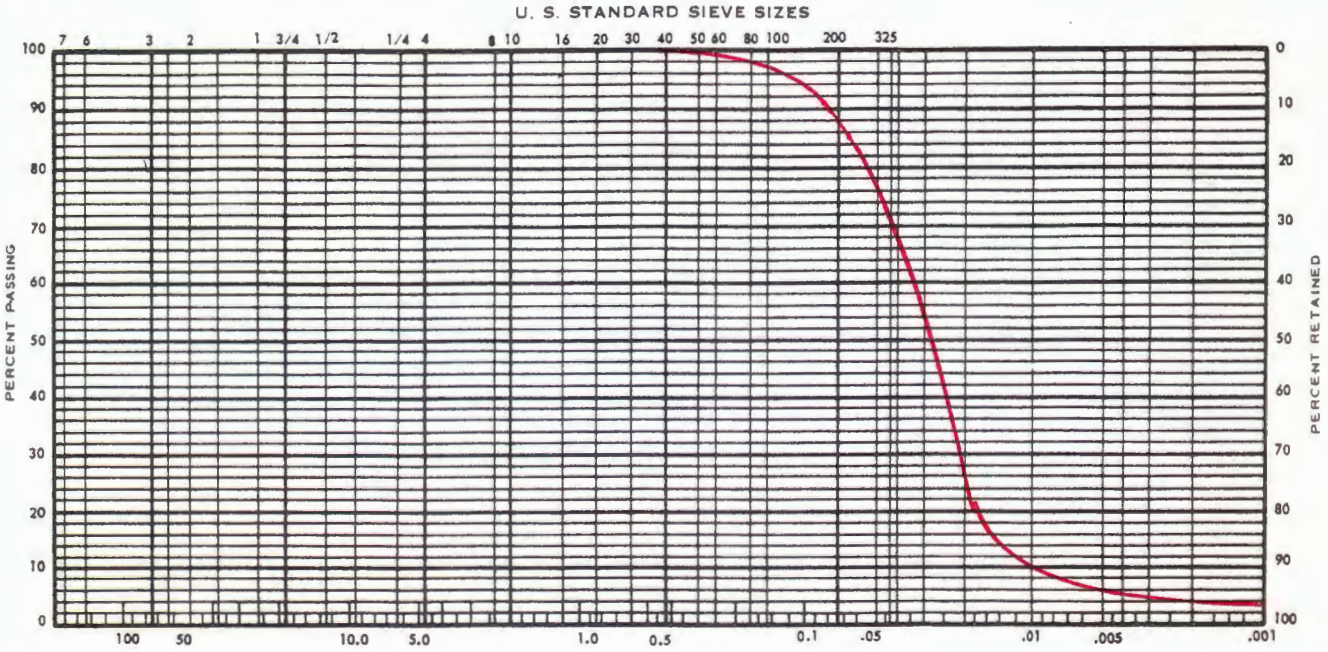
PLASTICITY CHART AND DATA

MT SOLO SUBDIVISION SITE
PARCEL # 17710100, 5431 MT SOLO TOAD

PROJECT NO.	DATE	Figure
1209.003.G	8/14/24	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

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GRADATION TEST DATA

MT SOLO SUBDIVISION SITE
PARCEL # 17710100, 5431 MT SOLO ROAD

PROJECT NO.	DATE	FIGURE
1209.003.G	8/14/24	A-10

BORING : TH-#3
DEPTH (ft) : 2.0
SPEC. GRAVITY : 2.5 (assumed)

DESCRIPTION : sandy, clayey SILT (ML)
LIQUID LIMIT : 31.6
PLASTIC LIMIT : 25.3

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	19.1	88.8	81.2	
FINAL	7.7	105.5	94.6	

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CONSOLIDATION TEST DATA

MT SOLO SUBDIVISION SITE
PARCEL # 17710100, 5431 MT SOLO ROAD

PROJECT NO.	DATE	Figure
1209.003.G	8/14/24	A-11

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#1

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	219	322	431
Expansion Dial (o.ooo1")	0	0	1
Expansion Pressure (psf)	0	0	3
Moisture Content (%)	24.6	19.4	14.1
Dry Density (pcf)	102.7	105.4	108.5
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

Filterra O&M	**E1**
Detention Pond O&M	**E2**
Yard Drain Maintenance	**E3**
Maintenance of LID Facilities	**E4**

Filterra Owner's Manual

filterra®

Bioretention Systems

CONTECH®

ENGINEERED SOLUTIONS

Table of Contents

Introduction 4
Activation Overview 4
Filterra Plant Selection Overview 6
Warranty Overview 6
Routine Maintenance Guidelines 6
Maintenance Visit Procedure 9
Appendix 1 – Activation Checklist 12
Appendix 2 – Planting Requirements for Filterra Systems 13

Enclosed

Local Area Filterra Plant List

Introduction

Thank you for your purchase of the Filterra® Bioretention System. Filterra is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system's biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra system.

Included with your purchase is Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at www.ContechES.com.

Activation Overview

Activation of the Filterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

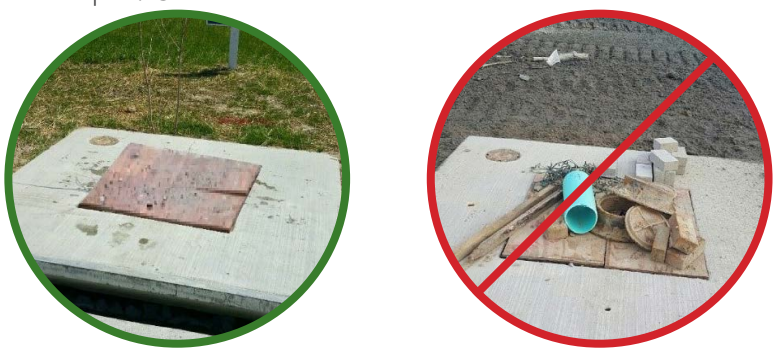
- Removal of construction runoff protection devices
- Planting of the system's vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra systems.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch certified for use in Filterra systems.

Minimum Requirements

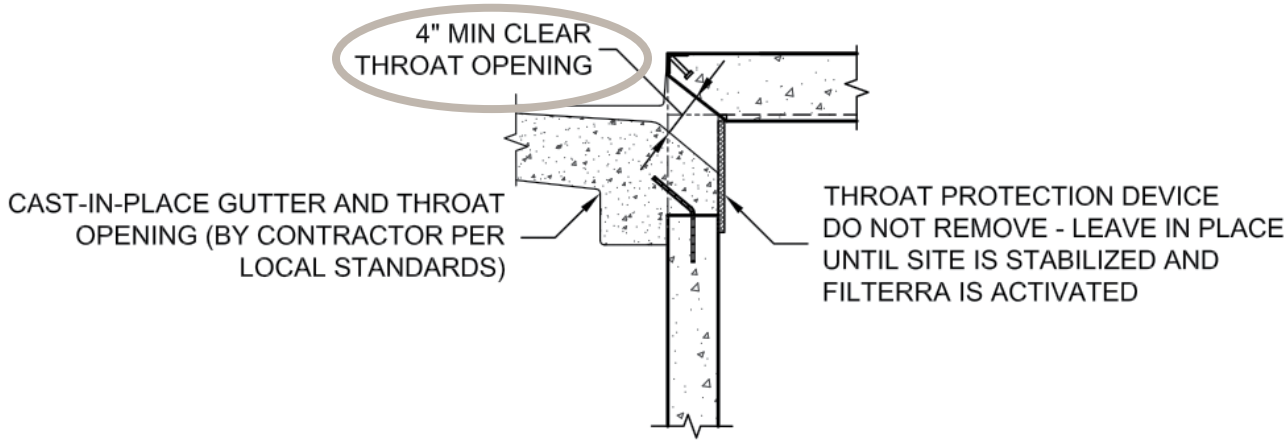
The minimum requirements for Filterra Activation are as follows:

1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



2. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.

3. Filterra throat opening should be at least 4" in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra Plant Selection Overview

A Plant List has been enclosed with this packet highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra system. Plants installed in the Filterra system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra system.

The "Planting Requirements for Filterra Systems" document is included as an appendix and discusses proper selection and care of the plants within Filterra systems.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra system's warranty and waive the manufacturer provided Activation and Maintenance services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra system or runoff protection devices
- Removal of any Filterra system components
- Failure to prevent construction related runoff from entering the Filterra system
- Failure to properly store and protect any Filterra components (including media and underdrain stone) that may be shipped separately from the vault

Routine Maintenance Guidelines

With proper routine maintenance, the biofiltration media within the Filterra system should last as long as traditional bioretention media. Routine maintenance is included by the manufacturer on all Filterra systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra systems also contain pretreatment or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance, and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated.

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing) during the first year.

Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft^2)	Volume at 3" (ft^3)	# of 2 ft^3 Mulch Bags
4	4	4	4	2
6	4	6	6	3
8	4	8	8	4
6	6	9	9	5
8	6	12	12	6
10	6	15	15	8
12	6	18	18	9
13	7	23	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

1. Inspection of Filterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Damage to Box Structure	yes | no
Damage to Grate	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
Buckets Removed	_____

- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____

4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra inlet to allow for entry of trash during a storm event.
- Replace Filterra grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if necessary.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	_____ (ft)
Width at Widest Point	_____ (ft)
Health	healthy | unhealthy
Damage to Plant	yes | no
Plant Replaced	yes | no

6. Clean area around Filterra

- Clean area around unit and remove all refuse to be disposed of appropriately.

7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.
Maintenance is ideally to be performed twice annually.				

Filterra Inspection & Maintenance Log

Filterra System Size/Model:_____ **Location:** _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate	Vegetation Species	Issues with System	Comments
1/1/17	*5 – 5 gal Buckets*	*3″*	*Lowe's Premium Brown Mulch*	*4′*	*Galaxy Magnolia*	*- Standing water in downstream structure*	*- Removed blockage in downstream structure*

Appendix 1 – Filterra® Activation Checklist

Project Name: _____ Company: _____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name: _____ Site Owner/End User Phone/Email: _____

Preferred Activation Date: _____ (provide 2 weeks minimum from date this form is submitted)

Site Designation	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

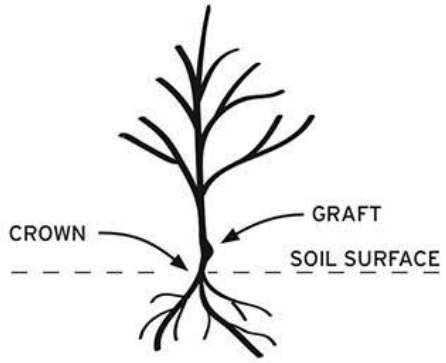
Attach additional sheets as necessary.

NOTE: A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

Signature _____ Date _____

Appendix 2 – Planting Requirements for Filterra® Systems

Plant Material Selection



- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25 feet.
- For standard 21" media depth, a 7 – 15 gallon container size shall be used. Media less than 21" (Filterra boxes only) will require smaller container plants.
- For precast Filterra systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some of the faster growing species, or species known to produce basal sprouts.

Plant Installation

- During transport protect the plant leaves from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively the pot can be cut away to minimize root ball disturbance.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
- To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
- Plant staking may be required.

Mulch Installation

- Only mulch that has been meeting Contech Engineered Solutions' mulch specifications can be used in the Filterra system.
- Mulch must be applied to a depth of 3" evenly over the surface of the media.

Irrigation Requirements

- Each Filterra system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water Therefore for a 6' by 6' Filterra approximately 20-60 gallons of water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate then calculate the time needed to irrigate the Filterra. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6' by 6' filter.

Notes

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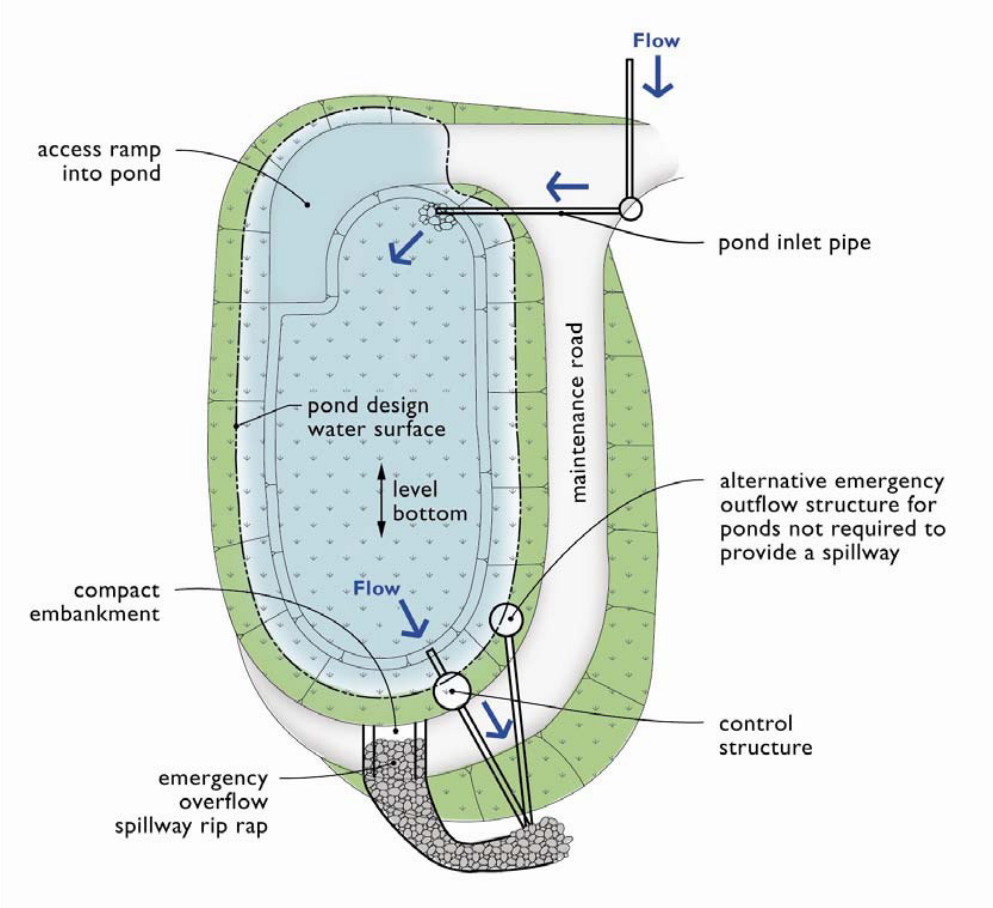
Detention Pond

A stormwater detention pond is an open basin built by excavating below existing ground or by constructing above-ground berms (embankments). The detention pond temporarily stores stormwater runoff during rain events and slowly releases it through an outlet (control structure). Detention ponds are typically designed to completely drain within 24 hours after the completion of a storm event. Styles vary greatly from well-manicured to natural appearing. Generally, more natural-appearing vegetation is preferred for reduced maintenance and enhanced wildlife habitat.

Facility objects that are typically associated with a detention pond include:

- access road or easement
- fence, gate, and water quality sign
- typical bioswale
- wet bioswale
- media filter cartridge
- control structure/flow restrictor
- energy dissipaters
- conveyance stormwater pipe



Example of a Manicured Detention Pond

Key Operations and Maintenance Considerations

- Maintenance is of primary importance if detention ponds are to continue to function well.
- Sediment should be removed when the standards in the defect table are exceeded. Sediments must be disposed in accordance with current local health department requirements and the Minimum Functional Standards for Solid Waste Handling. For additional guidance see Book 3, Appendix 3-E, Recommendations for Management of Street Waste.
- Handle sediments removed during the maintenance operation in a manner consistent with Book 3, Appendix 3-E, Recommendations for Management of Street Waste.
- If a shallow marsh has established, then contact Clark County Department of Environmental Services for advice.
- Maintenance of sediment forebays and attention to sediment accumulation within the pond is extremely important. Continually monitor sediment deposition in the basin. Owners, operators, and maintenance authorities should be aware that significant concentrations of metals (e.g., lead, zinc, and cadmium) as well as some organics such as pesticides, may be expected to accumulate at the bottom of these types of facilities. Regularly conduct testing sediment, especially near points of inflow, to determine the leaching potential and level of accumulation of potentially hazardous material before disposal.
- Slope areas that have become bare should be revegetated and eroded areas should be regraded prior to being revegetated.
- A common tool for cleaning detention ponds is a small bulldozer or excavator to remove built-up sediment and debris from the bottom of the pond during the dry season.

Plant Material

Table 1: Stormwater Tract "Low Grow" Seed Mix* for Detention Pond

Stormwater Tract "Low Grow" Seed Mix*		
Botanical Name	Common Name	% By Weight
Festuca arundinacea var.	Dwarf tall fescue	40%
Lolium perenne var. barclay	Dwarf perennial rye** 'Barclay'	30%
Festuca rubra	Red fescue	25%
Agrostis tenius	Colonial bentgrass	5%
Selected plants shall not include any plants from the State of Washington Noxious Weed List. Refer to clark.wa.gov/weed/ for a current list of noxious weeds.		

*Adapted from Ecology 2012, v.III, Ch 3.2.

** If wildflowers are used and sowing is done before Labor Day, the amount of dwarf perennial rye can be reduced proportionately to the amount of wildflower seed used.

Detention Pond			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
			Note: table spans multiple pages.
General	Trash and Debris	Any trash and debris which exceed 1 cubic foot per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Site is free of trash and debris.
	Poisonous Plants and Noxious Weeds	Any poisonous plants or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Coordinate with Clark County Environmental Services Department, Vegetation Management Program.)	No danger of poisonous vegetation where maintenance personnel or the public might normally be. Eradication of Class A weeds as required by State law. Control of Class B weeds designated by Clark County Weed Board. Control of other listed weeds as directed by local policies. Apply requirements of adopted IPM policy for the use of herbicides.
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vaccuming, or equipment movements). If trees are not interfering with access or maintenance, do not remove. Dead, diseased, or dying trees are identified. (Use a certified Arborist to determine health of tree or removal requirements.)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard trees.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants. (Coordinate removal/cleanup with local water quality response agency.)	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with Clark County Maintenance and Operations department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies.)

Detention Pond			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
			Note: table spans multiple pages.
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted Clark County Operations and Maintenance policies.
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes have been stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner (If Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Pond Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation.	Dike is built back to the design elevation.
		If settlement is apparent, measure berm to determine amount of settlement.	
		Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	
	Piping	Discernible water flow through pond berm. Ongoing erosion with potential for erosion to continue.	Piping eliminated. Erosion potential resolved.
		(Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	
Emergency Overflow/ Spillway and Berms Over 4 Feet in Height	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.

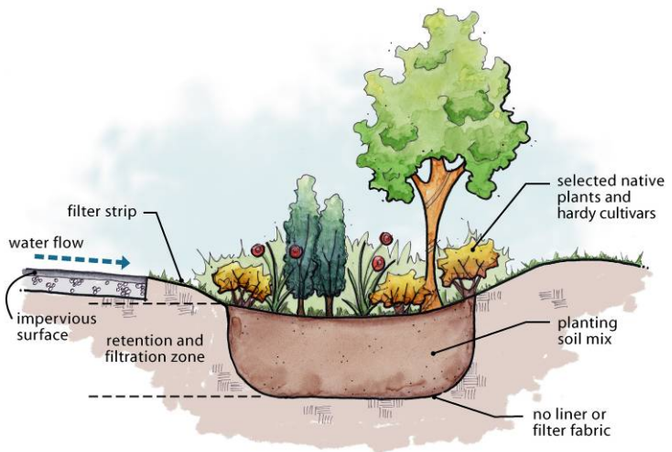
Detention Pond			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
			Note: table spans multiple pages.
	Piping	Discernible water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.)	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway	Rock Missing	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes have been stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.

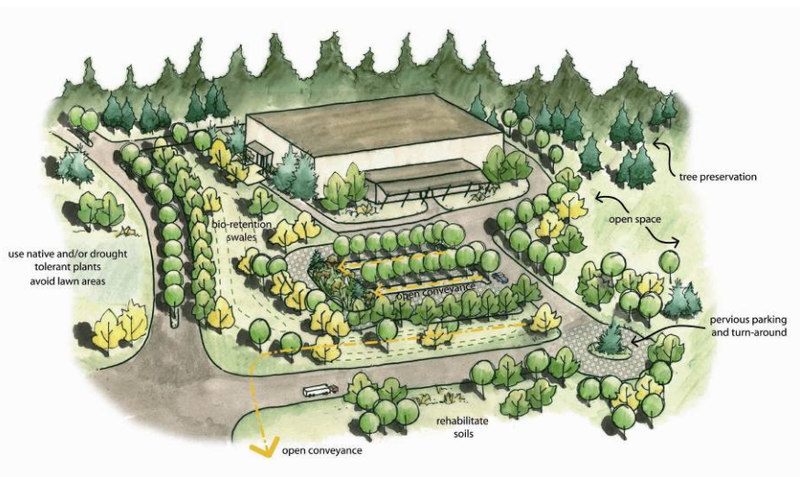
Yard Drain Maintenance Guide

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Excepted When Maintenance is Performed
General	Trash & Debris	• Trash or debris which is located immediately in front of the yard drain inlet or is blocking inletting capacity by more than 10% • Trash or debris (in the yard drain) that exceeds 60 percent of the sump depth as measured from the bottom of the sump to invert of the lowest pipe into or out of the yard drain, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. • Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height • Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g. methane)	• No trash or debris located immediately in front of yard drain or on grate opening • No trash or debris in the yard drain • Inlet and outlet pipes free of trash or debris • No dead animals or vegetation present within the yard drain
	Sediment	• Sediment (in the yard drain) that exceeds 60 percent of the sump depth as measured from the bottom of sump to invert of the lowest pipe into or out of the yard drain, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	• No sediment in the yard drain
	Damage to Grate	• Grate has cracks wider than 1/4 inch. (Intent is to make sure no material is running into yard drain) • Grate not sitting flush on top of yard drain, i.e., separation of more than 3/4 inch of the grate from the top of yard drain • Grate not securely attached or is missing	• Grate is free of holes and cracks. • Grate is sitting flush on the yard drain and firmly attached
	Fractures or Cracks in Yard drain Walls/ Bottom	• Maintenance person judges that yard drain is unsound • Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering yard drain through cracks	• Yard drain replaced or repaired to design standards • Pipe is regrouted and secure at yard drain wall
	Settlement/ Misalignment	• Failure of yard drain has created a safety, function, or design problem.	• Yard drain replaced or repaired to design standards.
	Vegetation	• Vegetation growing across and blocking more than 10% of the yard drain opening • Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	• No vegetation blocking opening to yard drain • No vegetation or root growth present

Maintenance of Low Impact Development Facilities

Revised January, 2007





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PIERCE COUNTY EXTENSION

AHBL

For:

PUGET SOUND ACTION TEAM

Maintenance of Low Impact Development Facilities

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Maintenance of Low Impact Development Facilities

A. Introduction

The maintenance of LID facilities is essential to ensure that designed stormwater management performance and other benefits continue over the full life cycle of the installation. Some of the maintenance agreements and activities associated with LID practices are similar to those performed for conventional stormwater systems; however, the scale, location, and the nature of a LID approach will also require new maintenance strategies.

The following outlines typical maintenance goals and objectives, types of maintenance agreements and training, and provides matrices with maintenance activities and schedules for bioretention areas, amended construction site soils, permeable paving, vegetated roofs, and roof rainwater collection systems.

1. *Goals and Objectives*
   Many maintenance goals of LID facilities will be similar throughout the Puget Sound region. The following provides a standard set of goals that can be added to or modified according to the specific physical settings and needs of a local jurisdiction.
   A) Flow Control and Drainage
      - Maintain pre-development infiltration capacity (reduce total volume of surface flows) and flow attenuation of facility.
      - Maintain pre-development detention capability to reduce peak flows.
      - Safely convey design storm flows.

   B) Water Quality Treatment
      - Maintain pre-development infiltration and detention capability.
      - Preserve soil and plant health and contact of storm flows with those plant soil systems.

   C) Safety and Emergency Vehicle Access
      - Maintain adequate sight distances.
      - Create signage for emergency vehicle access and facilities.
      - Ensure the sufficient carrying capacity for emergency vehicles of any permeable load-bearing surfaces.

   D) Cost Effectiveness
      - Maintain facilities for long-term, high quality performance at a cost that is equal to, or less than, conventional systems.
      - Prevent expensive repair of large scale or catastrophic problems through continued routine procedures.

   E) Aesthetics
      - Develop LID facilities as a landscape amenity as well as a stormwater management system.

   F) Public Health
      - Minimize potential for disease transmission and mosquito breeding by maintaining designed infiltration capacity, storm flow conveyance, ponding depths, and dewatering rates.

   G) Community Participation
      - Provide educational materials to homeowners and commercial property owners explaining the benefits, function, and importance of community participation for the long-term performance of LID facilities.

2. *Support Strategies*
Effective measures to support and ensure quality maintenance of LID facilities include education, incentives, and regulations. In order to provide the most effective maintenance programs, a variety of strategies should be selected from the list below.

A) Education
- Simple, concise messages delivered throughout the project life cycle.
- Brochures explaining the functions, benefits, and responsibilities of facilities at transfer of deed.
- Information bulletins over public access channels.
- Community volunteers providing informal workshops.
- Ongoing involvement of developer with community groups.
- Training programs for those maintaining the systems.

B) Incentives
- Reduce stormwater utility fees for individual homeowners or commercial properties.
- Provide support for property owners with technical advice and materials, such as mulch and plants.
- Provide awards and recognition to innovative developers and communities that build and properly maintain LID facilities.

C) Regulations
- Require maintenance plans and agreements prior to project approvals. (These would include a list of all proposed facilities, facility locations, a schedule of maintenance procedures, monitoring requirements, if any, and an agreement that all subject properties are collectively liable for the ongoing maintenance of the facilities.)
- Mandate jurisdictional maintenance and additional taxes for funding.
- Require fines for corrective actions.
- State that maintenance responsibilities and liabilities are shared by all property owners for projects with facilities designed to serve multiple properties or owned and/or maintained collectively.
- Require deed restrictions or covenants conveyed with deed for the full life cycle of all project types.

3. *Maintenance Responsibilities*
Low Impact Development facilities range in size and complexity. Accordingly, entities responsible for maintenance should be appropriately matched to the tasks required to ensure long-term performance. An individual homeowner may be able to reasonably maintain a rain garden, permeable driveway, or other small facility; however, larger facilities are often maintained through private parties, shared maintenance agreements or the presiding jurisdiction. In addition, the use and ownership of properties can often help dictate the most appropriate means of facility maintenance. Below are some general guidelines for the three primary categories of Maintenance Responsibilities.

A) Property Owners

- Are usually responsible for small facilities located on an individual property.
- Require basic knowledge and understanding of how the system functions.
- Jurisdiction(s) can improve system function over time by offering basic training to property owners.
- Should know when to seek and where to find technical assistance and any additional information.
- Requirements for maintenance should be conveyed with deed.
- Failure to properly maintain LID facilities may result in jurisdictional liens.

B) Private Parties

- Handle the widest range of LID projects in size and scope.
- Handle most commercial or multi-family properties. Copies of agreement may be required prior to project approval.
- Unique maintenance agreements should be developed based on the scale, use, and characteristics of the site and conservation areas, as well as level of expertise of the property owner and the responsible jurisdiction.
- Maintenance agreements can be between a variety of parties, such as individual homeowners, property owner associations, or even jurisdictions.
- Outside groups responsible for maintenance should be trained in the design, function, benefits, and maintenance of LID facilities.
- Recognize that integrated LID management practices require more frequent inspection than conventional facilities.
- Third-party maintainers should provide documentation to the property owners of the type of maintenance performed, a certificate of function, and any non-routine maintenance needs requiring specialized corrective actions.
- Jurisdictions may choose to provide an educational course for prospective maintenance parties and a list of approved or recommended parties.

C) Jurisdictions

- Will handle most public LID infrastructure.
- Should be prepared to handle non-routine maintenance issues for a variety of facilities.
- Maintain primarily large facilities, except for those requiring corrective action.
- Private LID facilities requiring corrective action may require a jurisdiction to hire a private party or use their own staff to complete the work. Property owners should be billed for these expenses.

4. *Inspections*

Regular and appropriately timed inspections are necessary for the proper operation of LID facilities over the full life cycle of the installation. Inspectors should be trained in the design and proper function and appearance of LID practices. Inspections should be seasonally timed in order to have early detection, repair and efficiency. These inspections should include the following: During Fall to clear debris and organic material from structures and prepare for impending storms; early winter storm events to confirm proper flow control operation and to identify any erosion problems; before major horticultural cycles (i.e., prior to weed varieties dispersing seeds); and any other regularly scheduled maintenance activities. To ensure continuity and to better identify trends in the function of facilities, the same individual(s) should inspect the same drainage area. Finally, LID facilities are integrated into the development landscape and willing homeowners can provide frequent inspection and identification of basic problems with minimal training.

C. Compost Amended Construction Site Soil Maintenance Schedule

Compost amendments enhance the water storage and pollutant filtering capability of disturbed soils and improve plant performance on construction sites.

Routine

Activity	Objective	Schedule	Notes
Add compost of mulch: Spread material by hand to minimize damage to plant material.	Maintain organic matter content of soil, optimize soil moisture retention, prevent erosion, and enhance plant growth and survivability.	Once every one or two years.	Compost amended landscapes are stormwater management facilities and pesticide inputs should be eliminated or used only in unusual circumstances. Landscape management personnel should be trained to adjust chemical applications accordingly.

F. Roof Rainwater Collection System Maintenance Schedule

Maintenance requirements for rainwater collection systems include typical household and system specific procedures. All controls, overflows and cleanouts should be readily accessible and alerts for system problems should be easily visible and audible. The following procedures are operation and maintenance requirements recorded with the deed of homes using roof water harvesting systems in San Juan County, Washington.

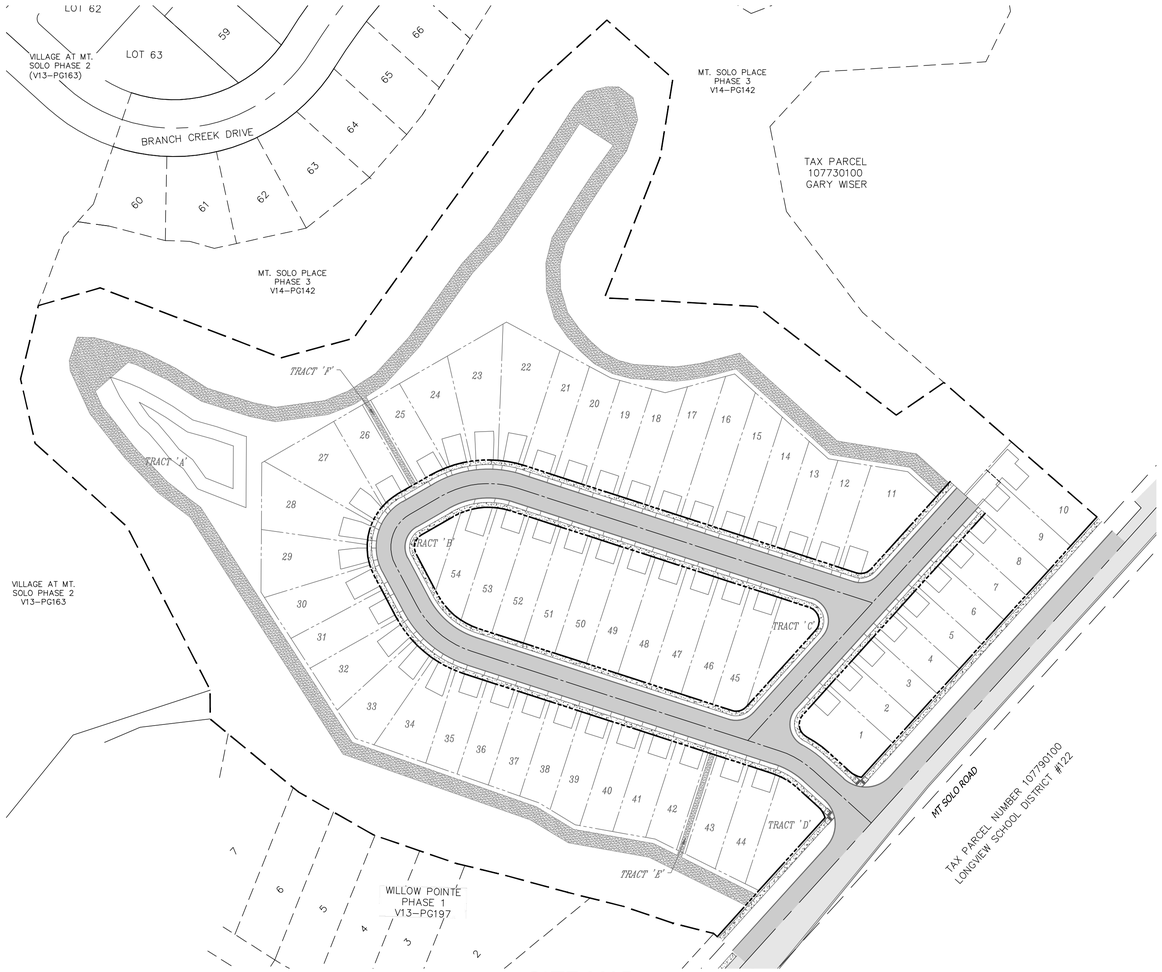
Routine

Activity	Objective	Schedule	Notes
Remove debris from roof: Sweep, rake or use leaf blower.	Prevent debris from entering collection and filter system.	Determined by inspection.	
Clean gutters: By hand or use leaf blower.	Prevent debris from entering collection and filter system.	Determined by inspection (generally September, November, January and April). The most critical cleaning is in mid- to late-Spring to flush the pollen deposits from surrounding trees.	Covers for gutters may be appropriate for specific locations, but can make regular cleaning more difficult and will not prevent pollen from entering filter system.
Clean downspout basket screens: Remove debris from screens at top of downspout.	Prevent debris from entering collection and filter system, and clogging of system.	Same as gutters.	
Clean pre-filters	Prevent debris from entering collection and filter system, and clogging of system.	Monthly	
Clean storage tanks of debris: Drain tank and remove debris from bottom of tank.	Prevent contamination.	Determined by inspection.	
Clean particle filters	Prevent contamination.	6 months or determined by pressure drop in system.	
Clean and replace UV filters	Prevent contamination.	Clean every 6 months and replace bulb every 12 months or according to manufacturer's recommendation.	
Chlorinate storage tank: Chlorinate to 0.2ppm-0.5ppm (1/4 cup of household bleach (5.25%) at the rate of 1 cup of bleach to 1000 gallons of stored water)	Prevent contamination.	Quarterly	
Flush household taps: Remove carbon filter and flush until chlorine odor is noticed at taps. Chlorinated water should be left standing in the piping for 30 minutes. Replace the carbon filter.	Prevent contamination.	When storage tanks are cleaned.	

TAYLOR ISLAND ESTATES PUD

CITY OF LONGVIEW, WASHINGTON

IN SECTION 23 T. 8 N., R. 3 W., W.M. COWLITZ COUNTY, WASHINGTON



SITE MAP

SCALE: 1" = 80'

VICINITY MAP

NO SCALE

LEGEND

EXISTING:	PROPOSED:
GAS VALVE	SANITARY MANHOLE
GAS RISER	SANITARY CLEANOUT
GUY ANCHOR	STORM MANHOLE
POWER POLE	CATCH BASIN/ W/TEMP. STORM INLET PROTECTION
ELECTRICAL SERVICE	CURB INLET
SANITARY MANHOLE	THRUST BLOCK
STORM DRYWELL	WATER VALVE
SEPTIC TANK	FIRE HYDRANT
TELEPHONE PEDESTAL	WATER BLOW-OFF
FIRE HYDRANT	WATER SERVICE LATERAL AND METER
WATER VALVE	STORM LINE
WELL	WATER LINE
WATER METER	SANITARY LINE
INDICATES MAILBOX	PROPERTY LINE
CATCH BASIN	PHASE LINE
CENTERLINE	MAJOR CONTOURS
ELECTRIC LOCATE	MINOR CONTOURS
TELEPHONE LOCATE	ADA RAMPS COMPLETED W/STREET CONSTRUCTION
FENCE	SIDEWALK COMPLETED W/STREET CONSTRUCTION
OVERHEAD POWER	NEW PAVEMENT
GAS LINE LOCATE	
5 FOOT CONTOUR	
1 FOOT CONTOUR	
WATER LINE	
SANITARY LINE	
STORM LINE	
EXISTING PAVEMENT	

HORIZONTAL DATUM:

NAD83(2011)(EPOCH:2010.0000), WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, U.S. SURVEY FEET

VERTICAL DATUM:

NAVD 88 (GEOID 18)
ELEVATIONS ESTABLISHED USING A TRIMBLE R10 RECEIVER OPERATING IN A REAL TIME KINEMATIC MODE (RTK), RECEIVING GPS CORRECTIONS FROM THE WASHINGTON STATE REFERENCE NETWORK (WSRN).

NOTE:

-BOUNDARY CALCULATED BY MINISTER GLAESER SURVEYING, INC.
-TOPOGRAPHIC DATA COMPILED FROM TOPOGRAPHIC SURVEYS PERFORMED BY MINISTER GLAESER SURVEYING, INC.

Sheet List Table

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PRE 4.0	PRELIM STREET & UTILITY PLAN
PRE 5.0	PRELIM PLAT
PRE6.0	PRELIMINARY LANDSCAPE PLAN

DEVELOPER
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VANCOUVER, WA 98685
(360) 852-2035
NIKOLE@HINTONDEVELOPMENT.COM

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STAYLOR@SGAENGINEERING.COM

SURVEYOR
MINISTER-GLAESER SURVEYING
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2200 E. EVERGREEN BLVD
VANCOUVER, WASHINGTON 98661
(360) 694-3313
DAD@MGSURVEY.COM

GEOTECHNICAL ENGINEER
REDMOND GEOTECHNICAL SERVICES
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PO BOX 20547
PORTLAND, OR 97294
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REDMONDGEOTECHNICALSERVICES@GMAIL.COM

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23005739
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PROFESSIONAL ENGINEER

05/13/2025

COVER SHEET
TAYLOR ISLAND ESTATES PUD
CITY OF LONGVIEW WASHINGTON

PRELIM - VERSION 2

REVISIONS

DESIGNED BY:	NAW
DRAWN BY:	NAW
CHECKED BY:	JTM
SCALE:	1" = 80'

JOB NUMBER	SHEET
2419	PRE 1.0

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TAYLOR ISLAND ESTATES PUD

BEING A PORTION OF SECTION 23, 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:

TJ & ANDREW FREY
2719 FIR STREET
LONGVIEW, WA 98632

PARCEL # & PROPERTY ADDRESS: 107710100
5431 MT SOLO ROAD, 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	107710100			
CURRENT USE	SINGLE FAMILY RESIDENCE			
ZONING DESIGNATION	R-1			
GROSS SITE AREA	12.57	ACRES	547,496	S.F.
TRANSIT ROUTES	THERE IS A PUBLIC BUS STOP APPROXIMATELY 300' SOUTH 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. THE SITE CONTAINS AN EXISTING SEPTIC SYSTEM. NO WELLS ARE KNOWN TO EXIST ON-SITE.			

ENVIRONMENTAL CONDITIONS

THERE ARE NO EXISTING 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.

VILLAGE AT MT. SOLO PHASE 2 (V13-PG163)
LOT 63
BRANCH CREEK DRIVE
MT. SOLO PLACE PHASE 3 V14-PG142
TAX PARCEL 107730100 GARY WISER
TAX PARCEL NUMBER 107710100 FREY T J/ANDREW L
OVERHANG
BARN
SHED NO FOUNDATION
HOUSE
GUTTER LINE
CURB LINE
MT SOLO ROAD
TAX PARCEL NUMBER 107790100 LONGVIEW SCHOOL DISTRICT #122
WILLOW POINTE PHASE 1 V13-PG197
RIM=7.19

-N-

0 50 100 150
Scale: 1" = 50'

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05/13/2025

EXISTING CONDITIONS

TAYLOR ISLAND ESTATES PUD

CITY OF LONGVIEW WASHINGTON

PRELIM - VERSION 2

REVISIONS

DESIGNED BY:	NAW
DRAWN BY:	NAW
CHECKED BY:	JTM
SCALE:	1" = 50'

JOB NUMBER	SHEET
2419	PRE 2.0

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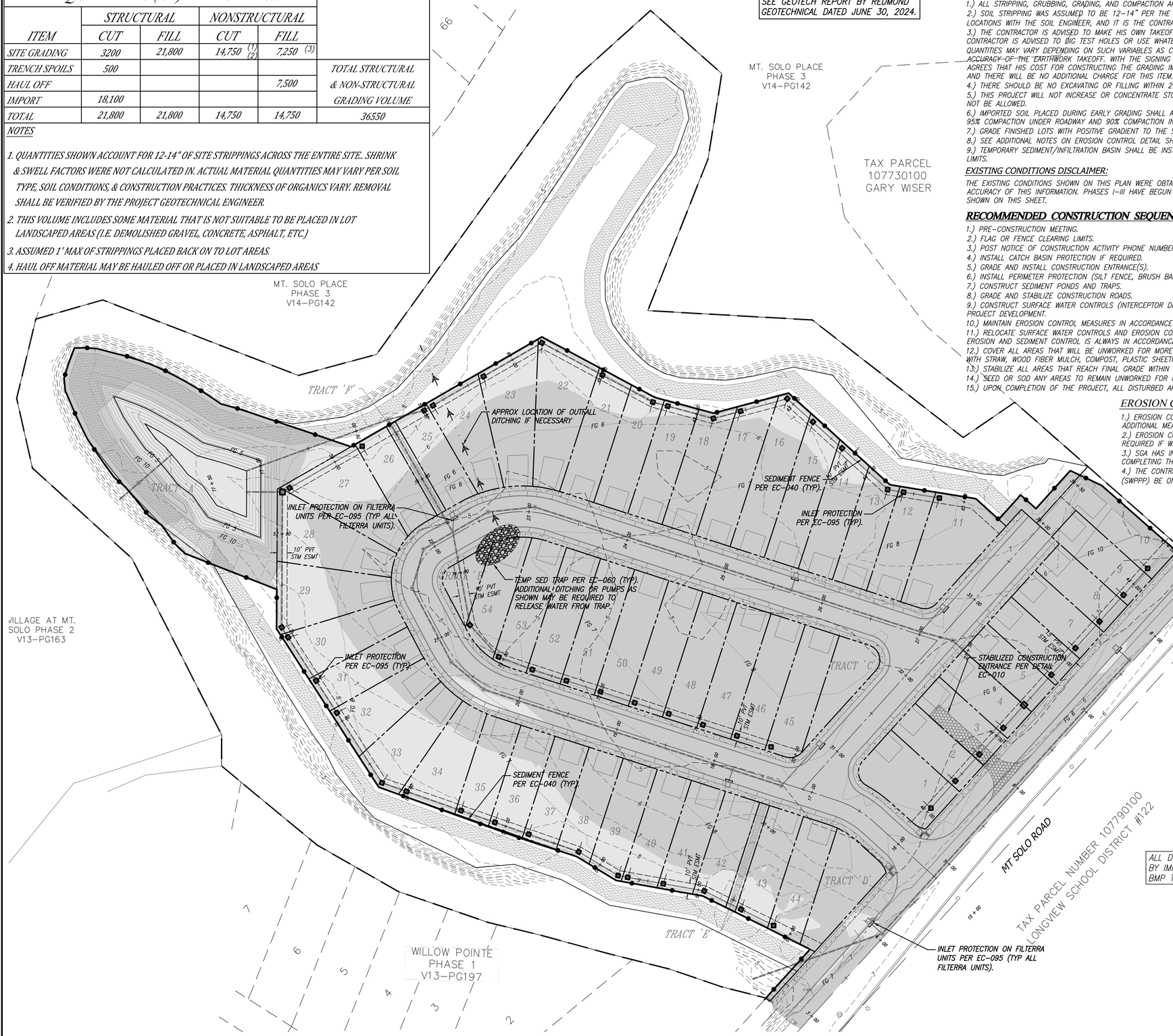
DIRT QUANTITIES (CY) - PHASE IV & V

ITEM	STRUCTURAL CUT	STRUCTURAL FILL	NONSTRUCTURAL CUT	NONSTRUCTURAL FILL	
SITE GRADING	3200	21,800	14,750 (1) (2)	7,250 (3)	
TRENCH SPOILS	500				TOTAL STRUCTURAL
HAUL OFF				7,500	& NON-STRUCTURAL
IMPORT	18,100				GRADING VOLUME
TOTAL	21,800	21,800	14,750	14,750	36550

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

SEE GEOTECH REPORT BY REDMOND GEOTECHNICAL DATED JUNE 30, 2024.



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, ADDITIONAL 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.

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)

ALL DISTURBED AREAS THAT WILL NOT BE COVERED BY IMPERVIOUS SURFACE SHALL BE AMENDED PER BMP T5.13. SEE SPECS SHEETS C8.0–C8.2.

-N-

0 50 100 150

Scale: 1" = 50'

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05/13/2025

TAYLOR ISLAND ESTATES PUD

CITY OF LONGVIEW WASHINGTON

PRELIM GRADING & EROSION CONTROL PLAN

PRELIM - VERSION 2

REVISIONS

DESIGNED BY:	NAW
DRAWN BY:	NAW
CHECKED BY:	JTM
SCALE:	1" = 50'

JOB NUMBER	SHEET
2419	PRE 3.0

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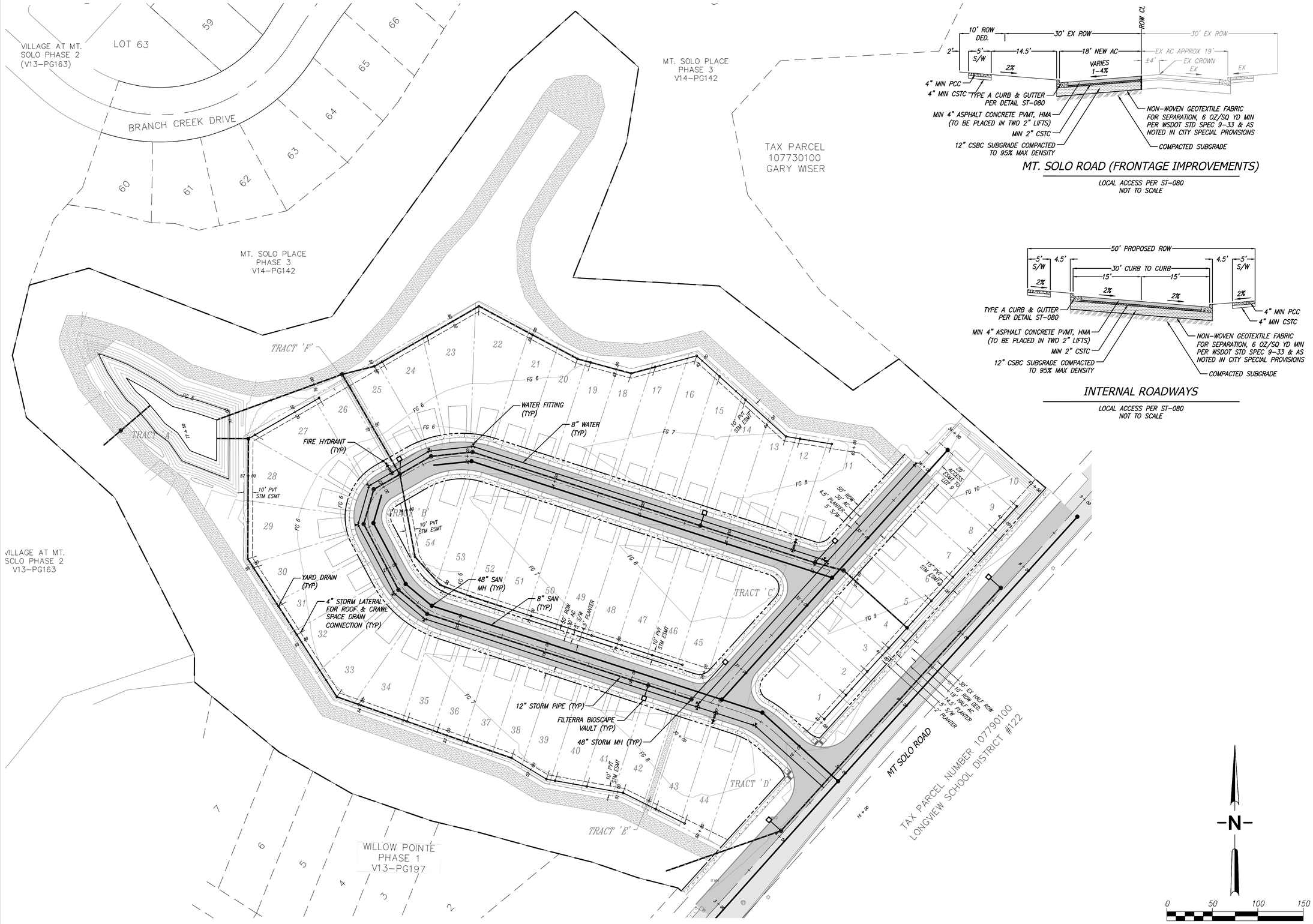

MT. SOLO ROAD (FRONTAGE IMPROVEMENTS)

LOCAL ACCESS PER ST–080
NOT TO SCALE

INTERNAL ROADWAYS

LOCAL ACCESS PER ST–080
NOT TO SCALE

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CIVIL ENGINEERING ~ LAND PLANNING
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NATHAN A. WILLIAMS
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05/13/2025

PRELIM STREET & UTILITY PLAN

TAYLOR ISLAND ESTATES PUD

CITY OF LONGVIEW WASHINGTON

PRELIM - VERSION 2

REVISIONS

DESIGNED BY:	NAW
DRAWN BY:	NAW
CHECKED BY:	JTM
SCALE:	1" = 50'

JOB NUMBER	SHEET
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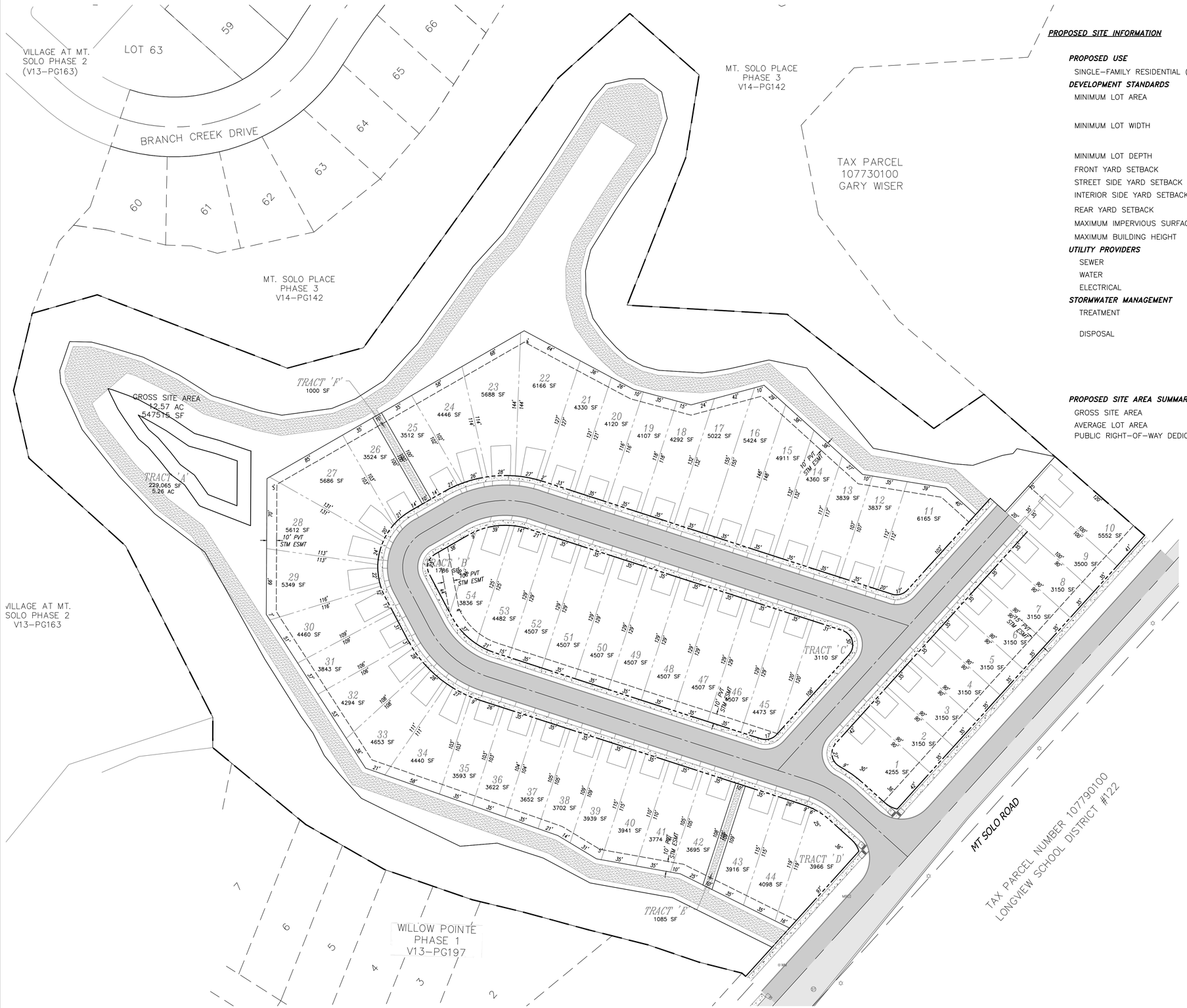


PROPOSED SITE INFORMATION

PROPOSED USE

SINGLE–FAMILY RESIDENTIAL (54 LOT) SUBDIVISION

DEVELOPMENT STANDARDS

MINIMUM LOT AREA	6,000 SF PER R–1 3,000 SF ALLOWED PER PUD 3,150 SF LOT SIZE PROPOSED
MINIMUM LOT WIDTH	50' MIN. ALLOWED, 50' MIN. PROPOSED 25' MIN. FOR PIE LOTS 35' MIN. FOR TRIANGULAR LOT
MINIMUM LOT DEPTH	N/A
FRONT YARD SETBACK	25'
STREET SIDE YARD SETBACK	15'
INTERIOR SIDE YARD SETBACK	5'
REAR YARD SETBACK	15'
MAXIMUM IMPERVIOUS SURFACE	65%
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 CONTECH FILTERRA SYSTEMS
DISPOSAL	STORMWATER WILL BE RELEASED TO THE EXISTING CDID1 DRAINAGE SURROUNDING THE SITE. THE PROJECT IS FLOW CONTROL EXEMPT PER THE 2019 SWMMWW, BUT A DETENTION POND WILL BE USED TO METER THE 25–YR RELEASE PER CITY OF LONGVIEW REQUIREMENTS.

PROPOSED SITE AREA SUMMARY	ACRES	S.F.
GROSS SITE AREA	12.57	547496
AVERAGE LOT AREA	0.10	4254
PUBLIC RIGHT–OF–WAY DEDICATED	1.80	78323

OPEN SPACE TRACT 'A' WILL BE OWNED & MAINTAINED BY CDID. A STORMWATER EASEMENT WILL BE DEDICATED OVER THE TRACT TO THE HOA FOR ACCESS, INSPECTION, & MAINTENANCE OF THE DETENTION POND.

TRACTS B–F WILL BE OWNED & MAINTAINED BY THE HOA.

SCA ENGINEERING & DESIGN
CIVIL ENGINEERING ~ LAND PLANNING
DEVELOPMENT SERVICES
LANDSCAPE ARCHITECTURE
2005 BROADWAY
VANCOUVER, WA 98663
PHONE (360)993-0911
FAX (360)993-0912

NATHAN A. WISEMAN — STATE OF WASHINGTON — 24019 — REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY NOT FOR CONSTRUCTION

TAYLOR ISLAND ESTATES PUD

PRELIM PLAT

CITY OF LONGVIEW WASHINGTON

PRELIM - VERSION 2

REVISIONS

DESIGNED BY:	NAW
DRAWN BY:	NAW
CHECKED BY:	JTM
SCALE:	1" = 50'

JOB NUMBER	SHEET
2419	PRE 5.0

© SCA ENGINEERING PLLC – DATE PLOTTED: May. 13, 2025 – 10:06 AM SCA DRAWING FILE: W:\LWC\2419– TAYLOR ISLAND ESTATES SUBDIVISION\DRAWINGS\2–PRELIM SHEET SET\PRE 5.0 – PRELIM PLAT.DWG

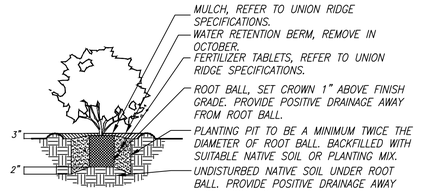
B&B Deciduous Tree Planting Details

NO SCALE

PLANTING LEGEND

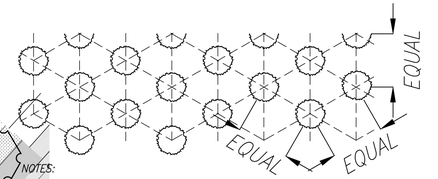
TREES	BOTANICAL NAME / COMMON NAME	SIZE	SPACING	QUANTITY
	Acer palmatum 'Sangu Kaku' CORAL BARK JAPANESE MAPLE	2" CAL.	AS SHOWN	15
	Acer rubrum 'Autumn Flame' AUTUMN FLAME MAPLE	2" CAL.	30' O.C.	18
	Chamaecyparis nootkatensis 'Pendula' WEEPING ALASKAN CEDAR	7-8' HT.	AS SHOWN	12

GROUNDCOVER	NAME	SIZE	SPACING	QUANTITY
	LANDSCAPE AREA: TURF, MULCH, ROCK OR APPROVED EQUAL			25,542 SF



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.

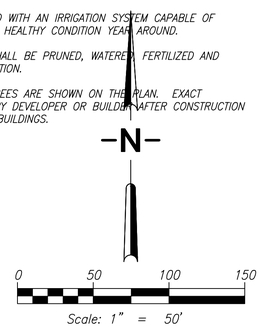
TREES SHALL BE WATERED AND MAINTAINED IN A HEALTHY CONDITION YEAR ROUND. EXISTING TREES SHALL BE PROTECTED FROM DAMAGE DURING AND FOLLOWING CONSTRUCTION. PRUNING AND OTHER MAINTENANCE SHALL BE PERFORMED BY INDIVIDUAL HOMEOWNERS OR THE HOMEOWNER'S ASSOCIATION.

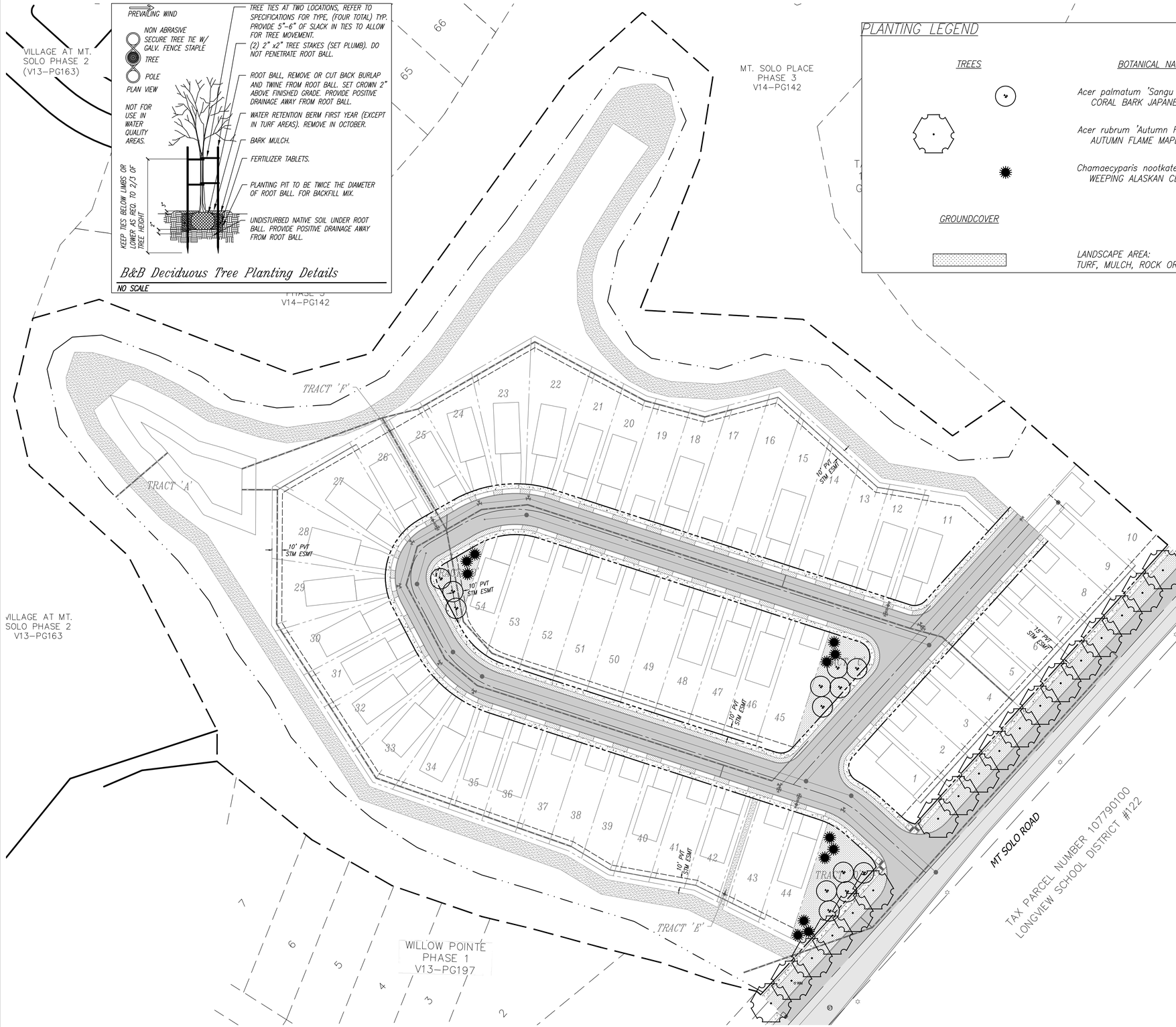
LANDSCAPE NOTES

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.





SCA ENGINEERING & DESIGN
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STATE OF WASHINGTON
LICENSED LANDSCAPE ARCHITECT
SCOTT A. TAYLOR
LICENSE NO. 1247
EXPIRES ON

PRELIMINARY LANDSCAPE PLAN

TAYLOR ISLAND ESTATES PUD

CITY OF LONGVIEW WASHINGTON

PRELIM - VERSION 2

REVISIONS

DESIGNED BY:	NAW
DRAWN BY:	NAW
CHECKED BY:	JTM
SCALE:	1" = 50'

JOB NUMBER	SHEET
2419	PRE6.0

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TRAFFIC ANALYSIS REPORT

FOR

MOUNT SOLO ROAD SUBDIVISION

MOUNT SOLO ROAD

LONGVIEW

SUBMITTED BY

December 2024

Project 24-21

TRAFFIC ANALYSIS REPORT

FOR

MOUNT SOLO ROAD SUBDIVISION

MOUNT SOLO ROAD

LONGVIEW

Prepared By

CHARBONNEAU Engineering LLC

12-6-24

December 2024

Project 24-21

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

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FL2499

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INTRODUCTION

This traffic study has been prepared to evaluate and document the operations and safety conditions for the Mount Solo Road Subdivision development being planned in Longview, Washington. The development will construct a total of 54 single-family housing units across from Mount Solo Middle School and approximately 0.30 mile northeasterly of SR432/Willow Grove Connection (road) intersection. The proposed site is presently open farmland. 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 on Mount Solo Road, SR4/Ocean Beach Highway and SR432/Willow Grove Connector.

TRAFFIC ANALYSIS CONSIDERATIONS

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

- Inventory and record pertinent information such as traffic control devices, circulation patterns, lane conditions, pedestrian & bicycle facilities, transit availability, 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 Mt Solo Road
    - SR432/Willow Grove Connection at Mt Solo Road
    - SR432/Willow Grove Connection at SR4/Ocean Beach Highway
    - Mt Solo Road at Mt Solo Middle School – north access
    - Mt Solo Road at the proposed subdivision site access

- New traffic counts were collected in November 2024 at the study intersections. 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 location on Mount Solo Road.
- 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 Mount Solo Road Subdivision is planned for 54 single-family housing units. The property currently consists of farmland with one home on the site. The home will be demolished. Vehicular access as shown on the site plan will include a full-movement street connection to NW Mount Solo Road across from the Mount Solo Middle School location and approximately 0.30-mile northeast of SR432/Willow Grove Connector. The new access will be configured as a three-way intersection design and controlled by stop signing on the site's approach.

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

Mount Solo Road is a local street with two travel lanes and left turn lanes provided at the two middle school access points. Sidewalk is provided on the street's east side from the school property towards the northeast. Sidewalk to the south occurs on the street's west side. The Mount Solo Road alignment is tangent and with a flat grade. When the new approach is added it is recommended that it be stop-controlled at the intersection with Mount Solo Road. The travel speed on Mount Solo Road is 35 MPH. A school zone with flashers and speed 20 MPH signing is present along the school property.

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 SR432/Willow Grove Connection is a four-way signalized intersection. All approaches include separate lanes for the left, through, and right turn movements. The left turns have protected phasing. Pedestrian crosswalks with pushbutton actuation are present on the north, south, and east approaches.

SR4/Ocean Beach Highway at Mount Solo Road is a three-way signalized intersection. A separate westbound left turn lane with protected phasing is provided. The northbound approach on Mount Solo Road includes separate left and right turn lanes. Pedestrian crosswalks with pushbutton actuation are present on each approach.

Mount Solo Road at the middle school's north access is configured as a tee-shaped design with stop control posted on the school's driveway approach. The driveway includes separate left and right turn lanes. A separate southbound left turn lane occurs on Mount Solo Road. Crosswalks are not marked at the intersection.

Mount Solo Road at SR432/Willow Grove Connection is a stop-controlled tee-shaped intersection with stop signing on the Mount Solo Road approach. There are no separate turn lanes at this location. However, a westbound right turn taper design is present for turning onto Mount Solo Road. Crosswalks are not marked on the intersection.

TRAFFIC OPERATIONAL ANALYSIS

The study intersections were analyzed for level of service (LOS) conditions, delay, and safety. A total of five intersections were evaluated. LOS and queuing analyses were completed in the AM and PM peak hour periods for the following scenarios:

- Year 2024 Traffic
- 2027 Background Traffic
- 2027 Total Traffic

In order to perform the LOS analysis, it was necessary to collect new traffic counts. The November 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 2024 volumes to account for the background traffic volumes. The year 2027 background traffic volumes are illustrated in Figure 3. Longview staff confirmed that in-process traffic was applicable and documented that a total of 31 single-family housing units for another subdivision along Mount Solo Road must be accounted for in the analysis. The appendix contains the trip calculation for the in-process data and the trips are illustrated on Figure 2.

The year 2027 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 54 homes. The trip generation is summarized in Table 1.

Table 1 Trip Generation

ITE Land Use	Units (#)	Weekday						
		ADT	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
PROPOSED SITE TRIPS								
Single-Family (#210)	54							
Generation Rate [1]		9.43	0.70	25%	75%	0.94	63%	37%
Site Trips		**509**	**38**	10	28	**51**	32	19
EXISTING SITE TRIPS (TRIP CREDITS)								
Single-Family (#210)	1							
Generation Rate [1]		9.43	0.70	25%	75%	0.94	63%	37%
Site Trips		**-9**	**-1**	0	-1	**-1**	-1	0
Net Site Trips		**500**	**37**	10	27	**50**	31	19

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

The existing project site is currently used as farmland and contains one residence. The home will be demolished, allowing for trip credits as documented in Table 1.

Development of project is expected to generate a net of 500 daily trips, 37 AM peak hour trips, and 50 PM peak hour trips.

The Mount Solo Road Subdivision trip distribution was based on input provided by the City Engineer. The distribution is illustrated on Figure 4. The corresponding trip assignments are presented on Figure 5 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											
			2024 Existing				2027 Background				2027 Total			
			Crit. Mov't	LOS	Delay	v/c	Crit. Mov't	LOS	Delay	v/c	Crit. Mov't	LOS	Delay	v/c
1. Willow Grove Connection Road (SR432) and Mt. Solo Road	Two-way Stop	AM	SB	B	14.9	0.25	SB	C	15.8	0.27	SB	C	16.3	0.29
		PM	SB	B	13.4	0.11	SB	B	14.0	0.12	SB	B	14.2	0.14
2. Mt. Solo Middle School driveway and Mt. Solo Road	Two-way Stop	AM	WB	B	11.9	0.22	WB	B	12.0	0.22	WB	B	12.1	0.23
		PM	WB	A	9.0	0.00	WB	A	9.0	0.00	WB	A	9.1	0.00
3. Proposed Site Access and Mt. Solo Road	Two-way Stop	AM	EB	B	11.1	0.00	EB	B	11.3	0.00	EB	B	11.2	0.05
		PM	EB	A	0.0	0.00	EB	A	0.0	0.00	EB	A	9.5	0.03
4. Ocean Beach Hwy (SR4) and Mt. Solo Road	Signal	AM	-	B	16.2	0.28	-	B	16.4	0.28	-	B	16.2	0.29
		PM	-	B	15.6	0.28	-	B	15.9	0.29	-	B	15.5	0.30
5. Willow Grove Connection Road (SR432) and Ocean Beach Hwy (SR4)	Signal	AM	-	C	22.0	0.25	-	C	22.0	0.26	-	C	22.1	0.26
		PM	-	C	21.1	0.31	-	C	21.1	0.32	-	C	21.1	0.33

Notes: 2016 Highway Capacity Manual methodology used in analysis, Synchro v11. 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 two signalized study intersections on SR4/Ocean

Beach Highway at SR432/Willow Grove Connector and at Mount Solo Road determined that both intersections will meet the operational standards with LOS `C` or better and v/c ratios of 0.33 or less in the peak hours through the year 2027 total traffic scenario.

At the stop-controlled intersections acceptable LOS `C` or better will be maintained and the v/c ratios will not exceed 0.33 through the year 2027 total traffic scenario.

The proposed site access at Mount Solo Road will experience acceptable LOS `B` or better through the year 2027 total traffic scenario. The v/c ratios will not exceed 0.05 and meet the standard of operation.

Based on these results no intersection improvements are necessary in conjunction with the proposed development.

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. The critical approach movements were assessed at the study intersections for the existing, background, and worst-case year 2027 total traffic conditions.

At the SR4/Ocean Beach Highway intersection with SR432/Willow Grove Connection the southbound left turn queue (175 feet) exceeds the available turn lane length (125 feet) in the AM peak hour for the existing, year 2027 background, and year 2027 total traffic scenarios.

Since the demand queue does not worsen due to the proposed development and no intersections will be blocked by the queue, no mitigation is proposed. Queues on the other approaches at the intersection will not exceed the turn lane capacity.

At the signalized intersection of SR4/Ocean Beach Highway and Mount Solo Road the westbound left turn lane has a storage distance of 225 feet and the peak hour demand is not projected to exceed 100 feet. The northbound approach provides for 175 feet of stacking in the left and right turn lanes. The projected peak hour queues will not exceed 100 feet.

At the intersection of Mount Solo Road and the middle school's north site access the southbound left turn lane provides for 175 feet of storage and during the worst-case AM peak hour the queues are projected to be less than four vehicles.

At the proposed site access intersection with Mount Solo Road northbound queues are not anticipated due to the low volume of site traffic turning into the site. Only two cars will turn left during the AM peak hour and nine cars will turn left in the PM peak hour. With 460 feet of separation between the site access point and the middle school's north access no traffic conflicts between the two intersections is anticipated.

Queues on Mount Solo Road at the stop-controlled intersection with SR432/Willow Grove Connection will not exceed one to two vehicles on the southbound approach.

SIGHT DISTANCE

Intersection sight distance (ISD) at the proposed access on Mount Solo Road was reviewed in accordance with AASHTO standards. The existing posted speed is 35 MPH. According to Table 9-7 of the AASHTO Policy on Geometric Design of Highways and Streets, for 35 MPH the required ISD equates to 390 feet. The Mount Solo Road street grade has nearly a flat with a tangent alignment and the available ISD exceeds 700 feet in both directions. 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. Separate southbound left turn lanes exist at both school accesses on Mount Solo Road. A left turn warrant was prepared for the northbound movement at the site access. The warrant was not met and a left turn lane is not recommended at the site access point.

TRAFFIC SIGNAL WARRANTS

The peak hour signal warrant was evaluated for the study intersections on Mount Solo Road at SR432/Willow Grove Connection, the north middle school driveway, and the site access. It was determined that the warrant was not met at these locations through the year 2027 total traffic scenario. Therefore, no traffic signals are recommended. 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 Type and Rate Summary

	Intersection	Crash Type									Total Crashes	Crash History (Years)	Crashes per year	Crash rate per M.E.V.*
		Backing	Sideswipe	Rear End	Turn	Head-on	Angle	Fixed Object	Pedalcyclist	Pedestrian				
1.	Mt. Solo Rd & Willow Grove Connection Road (SR 432)	0	0	1	6	0	0	0	0	0	7	5	1.4	**0.64**
2.	Mt. Solo Rd & Mt. Solo Middle School driveway	0	0	0	0	0	0	0	0	0	0	5	0.0	**0.00**
4.	Ocean Beach Hwy (SR 4) & Mt. Solo Rd	0	0	3	5	1	0	0	0	1	9	5	1.8	**0.52**
5.	Ocean Beach Hwy (SR 4) & Willow Grove Connection Rd (SR 432)	0	0	7	0	0	1	2	0	0	10	5	2.0	**0.58**

None of the study intersections experienced a rate greater 0.64 MEV/year and therefore no safety improvements are recommended.

PEDESTRIANS, BICYCLES, & BUSES

Sidewalk is available on the east side of Mount Solo Road from the middle school's north access to SR4/Ocean Beach Highway. Sidewalk also exists along the west side of Mount Solo Road in front of the existing subdivision's frontage at Willow Point Loop.

New sidewalk will be placed along Mount Solo Road at the subdivision's property frontage and on the streets within the subdivision. The design (reference Figure `b` - Site Plan) will provide safe pedestrian connectivity to Mount Solo Road.

Bicycle lanes are not available along Mount Solo Road. 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 Mount Solo Road Subdivision development containing 54 homes has been prepared to determine the potential impacts at the study intersections along Mount Solo Road and SR4/Ocean Beach Highway. Development of the site is expected to generate 500 daily trips, 37 AM peak hour trips, and 50 PM peak hour trips. One existing home on the property site will be demolished.

Vehicular access as shown on the site plan will include a full-movement street connection to Mount Solo Road at a point approximately 460 feet north of the Mount Solo Middle School's north access. The new access will be configured as a three-way intersection design and be controlled by stop signing.

Intersection sight distance (ISD) at the proposed access on Mount Solo Road was reviewed in accordance with AASHTO standards. The existing posted speed is 35 MPH. Based on the AASHTO standards for 35 MPH the required ISD equates to 390 feet. The available ISD exceeds 700 feet in both directions and exceeds the standard. 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 intersections determined that all locations will operate at acceptable LOS `C` or better in the peak hours through the year 2027 total traffic scenario. The v/c ratios in all cases will not exceed a value of 0.33 and also meets the operational standard. As a result no improvements to the study intersections are necessary.

Left turn lanes are currently available on SR4/Ocean Beach Highway at the study intersections. Separate southbound left turn lanes exist at both school accesses on Mount Solo Road. A left turn warrant was prepared for the northbound movement at the site access. The warrant was not met and a left turn lane is not recommended at the site access point.

The peak hour signal warrant was evaluated for the study intersections on Mount Solo Road at SR432/Willow Grove Connection, the north middle school driveway, and the site access. It was determined that the warrant was not met at these locations through the year 2027 total traffic scenario. Therefore, no traffic signals are recommended.

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. 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 0.64 MEV/year and therefore no safety improvements are recommended.

Other than construction of the proposed site access approach connection to Mount Solo Road no off-site intersection improvements are recommended in conjunction with the proposed development. Stop signing with stop bar pavement markings are recommended on the site access approach to Mount Solo Road.

Appendix

- Vicinity Map — Figure `a`
- Site Plan — Figure `b`
- Lane Configurations &Traffic Control — Figure `c`
- Traffic Flow Diagrams
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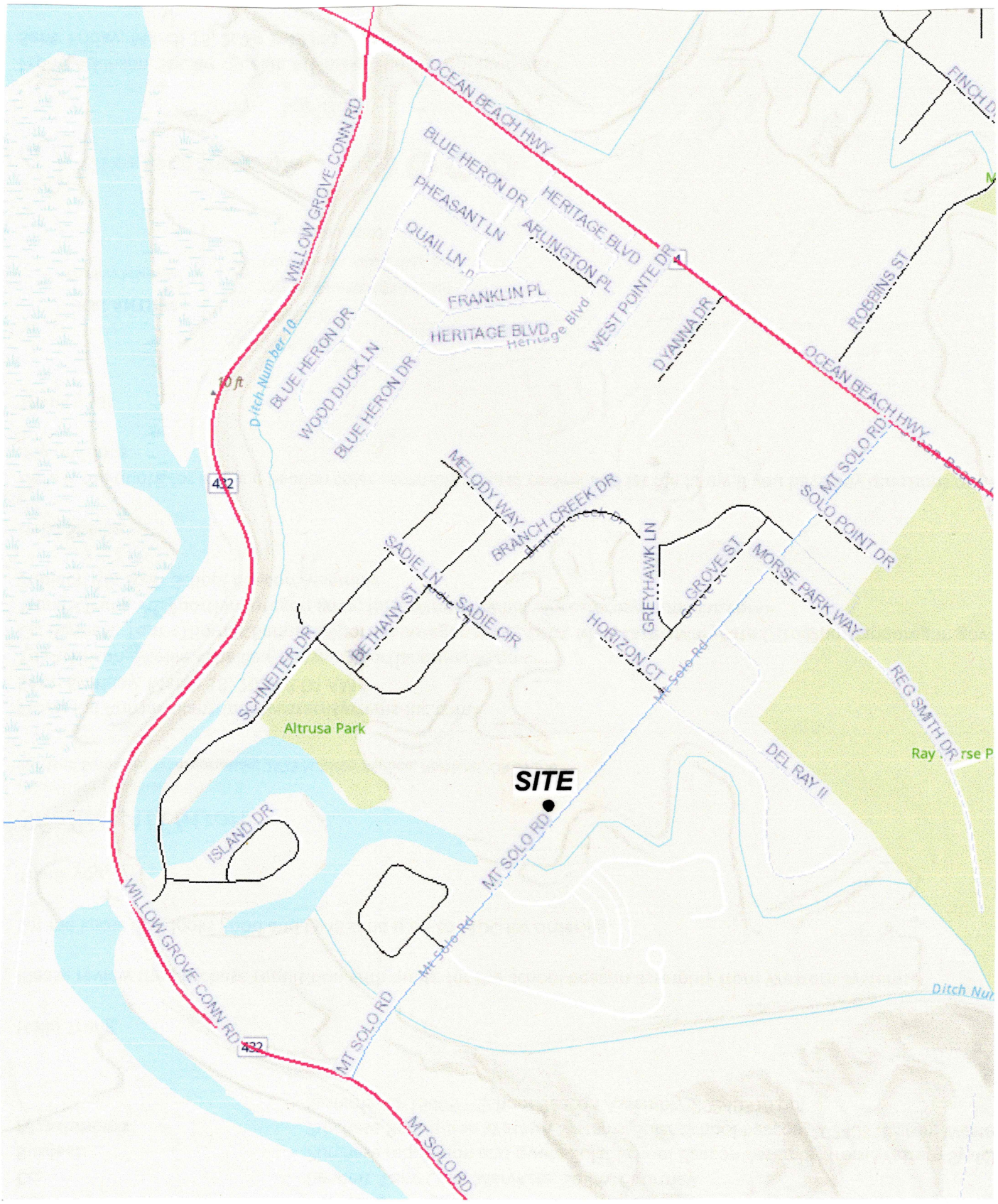
- Crash History Summary (furnished by WSDOT)
- Synchro Capacity Analysis Reports

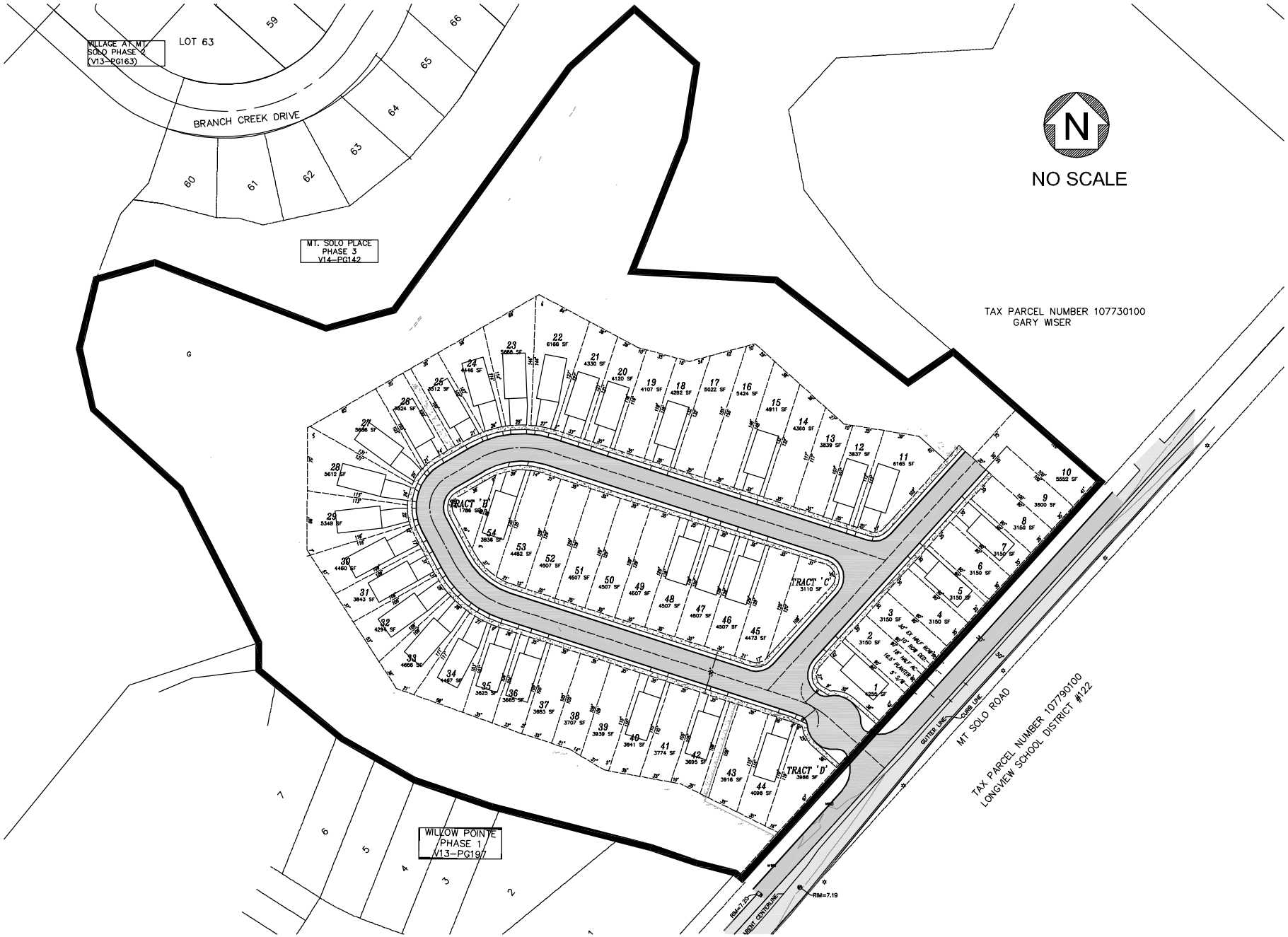


FILE NAME: 2421flow.dwg

PLOT DATE: 11.24.24

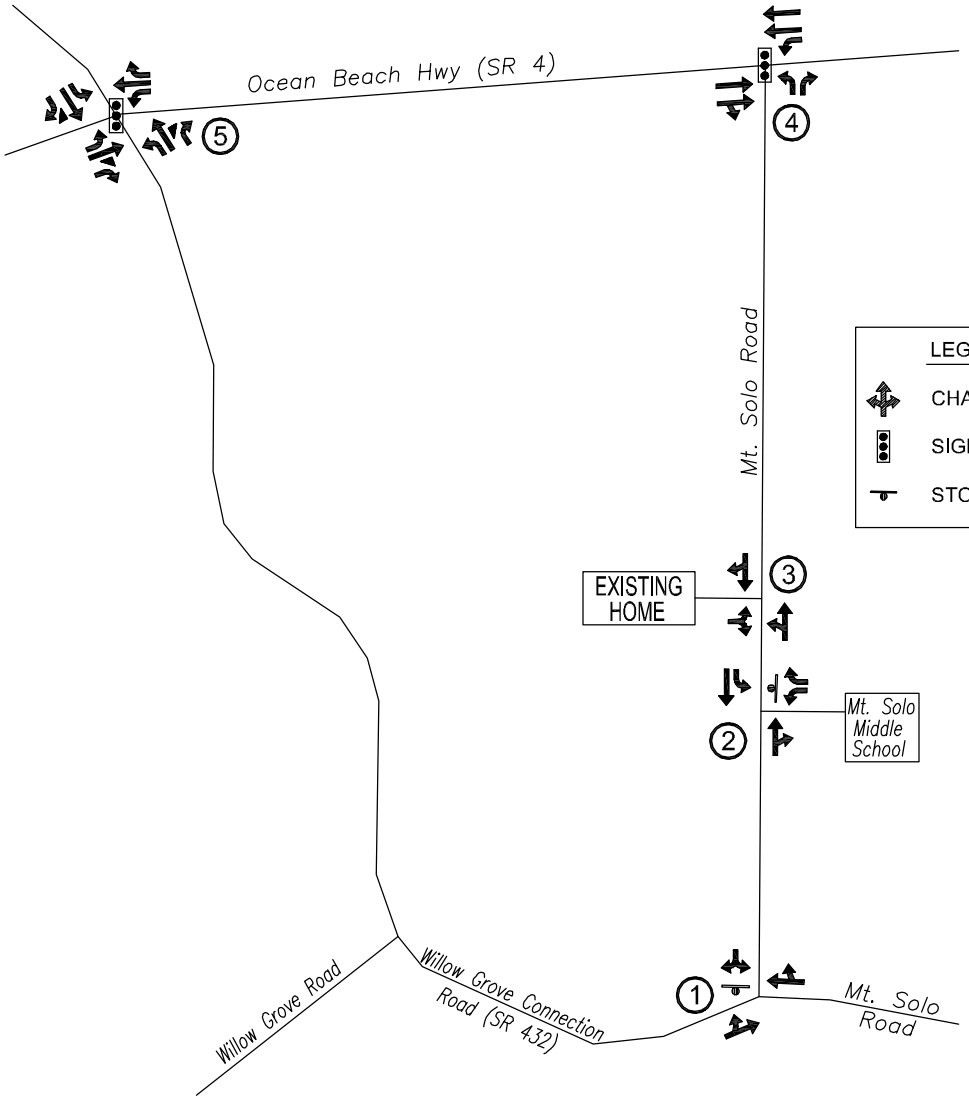
CHARBONNEAU ENGINEERING LLC PROJECT: 24-21	NOTES: NO SCALE	N	VICINITY MAP MT. SOLO ROAD SUBDIVISION	FIGURE a

PLOT DATE: 11.24.24 FILE: 2421flow.dwg



CHARBONNEAU ENGINEERING LLC PROJECT: 24-21	NOTES: Site plan provided by SGA Engineering & Design.	SITE PLAN MT. SOLO ROAD SUBDIVISION	FIGURE b

PLOT DATE: 11.24.24 FILE: 2421flow.dwg



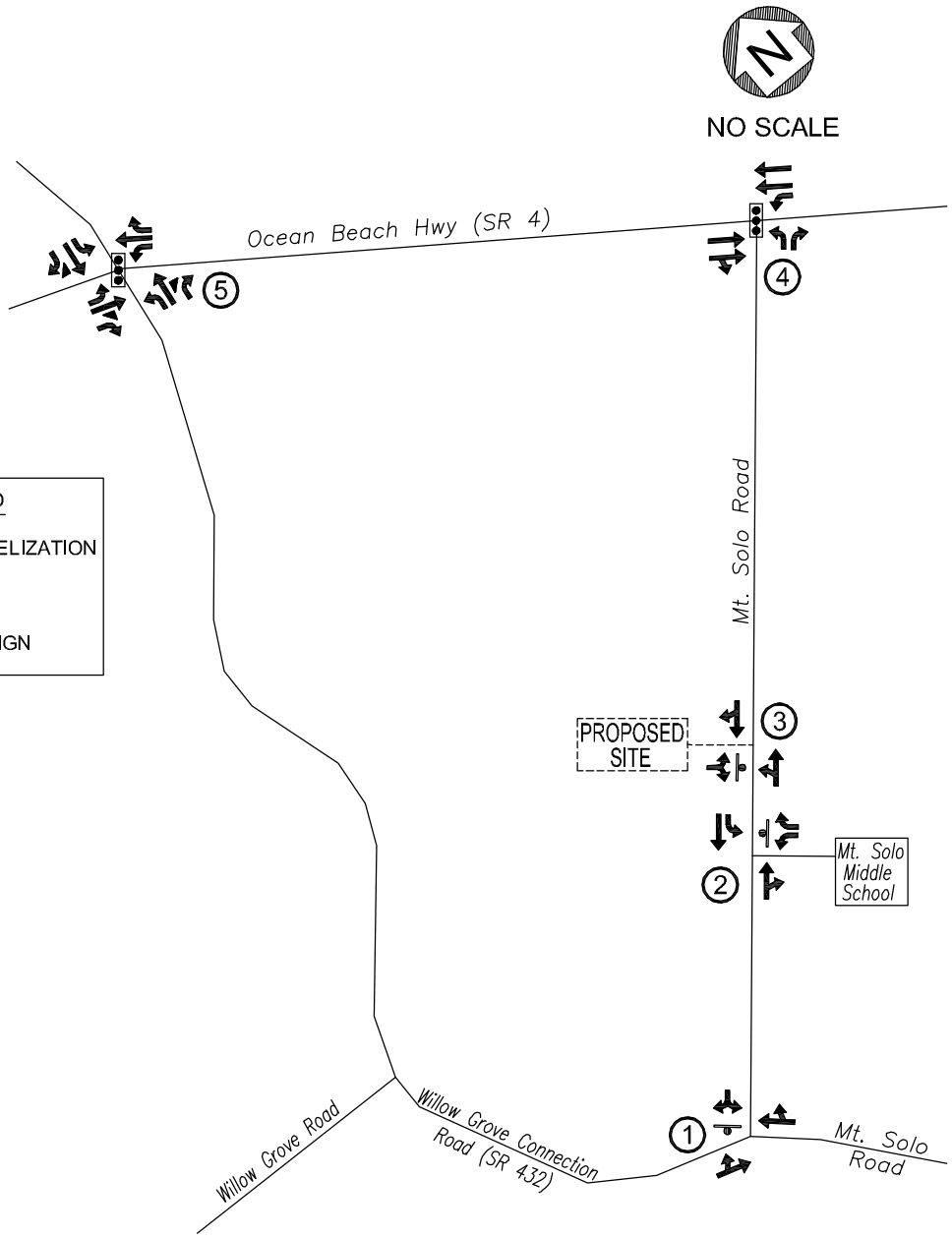
EXISTING

LEGEND

CHANNELIZATION

SIGNAL

STOP SIGN



PROPOSED

CHARBONNEAU ENGINEERING LLC

PROJECT: 24-21

NOTES:

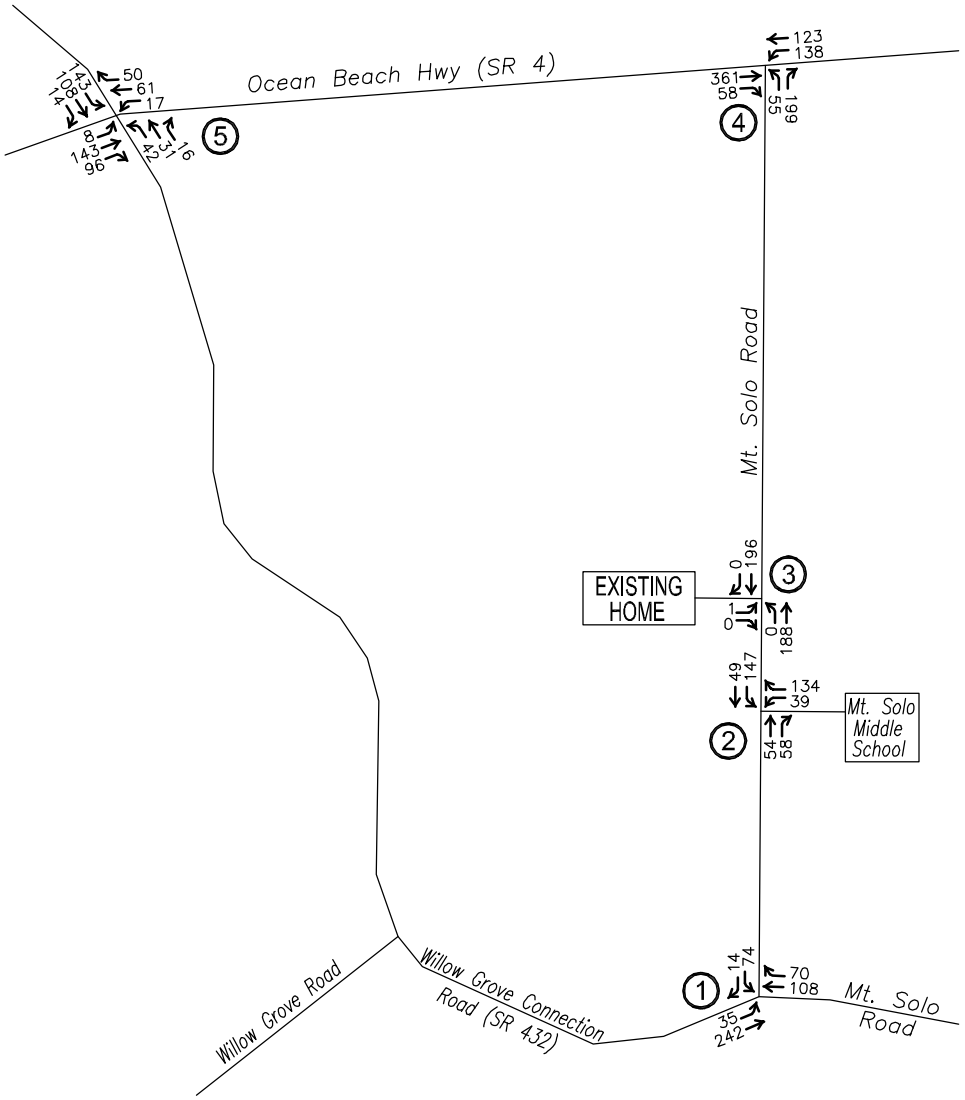
LANE CONFIGURATION AND TRAFFIC CONTROL

MT. SOLO ROAD SUBDIVISION

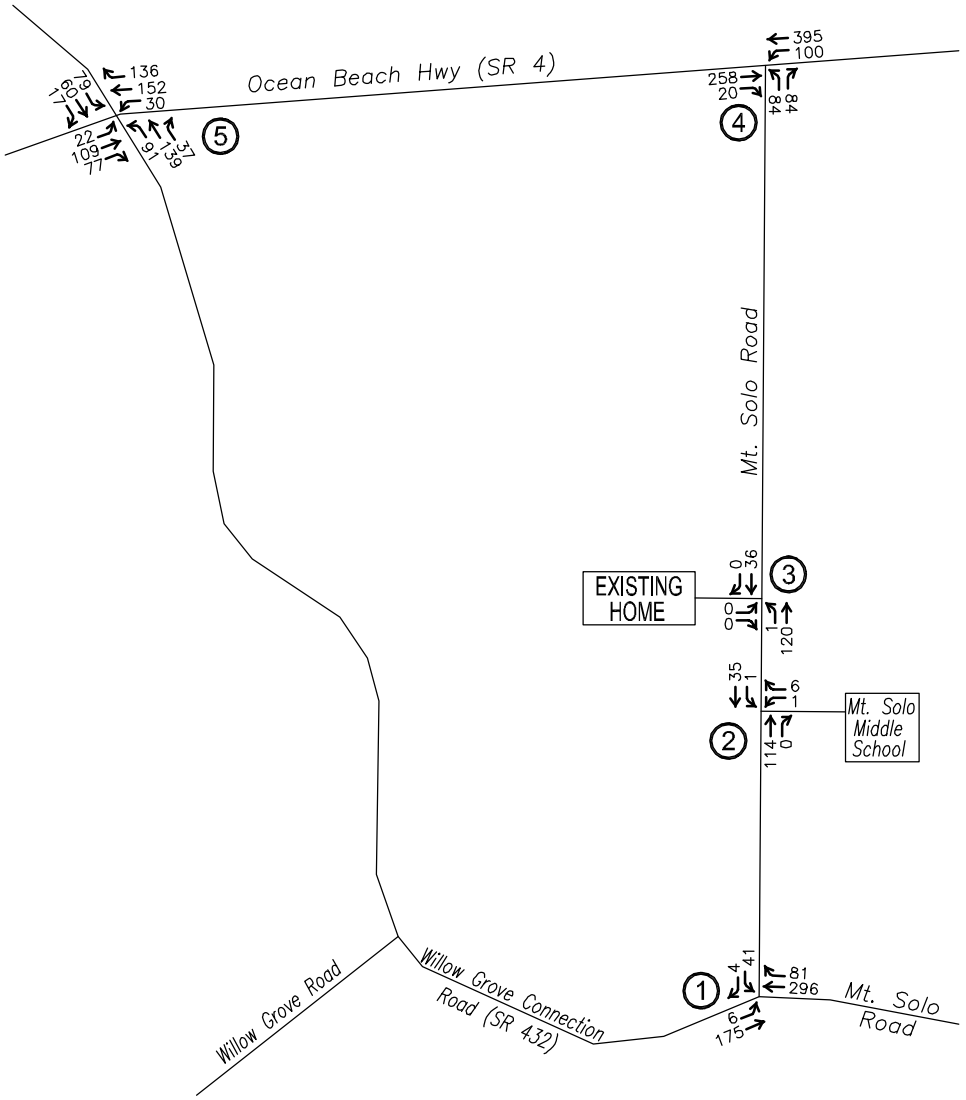
FIGURE

C

PLOT DATE: 11.24.24 FILE: 2421flow.dwg



AM PEAK HOUR



PM PEAK HOUR

NO SCALE

CHARBONNEAU ENGINEERING LLC

PROJECT: 24-21

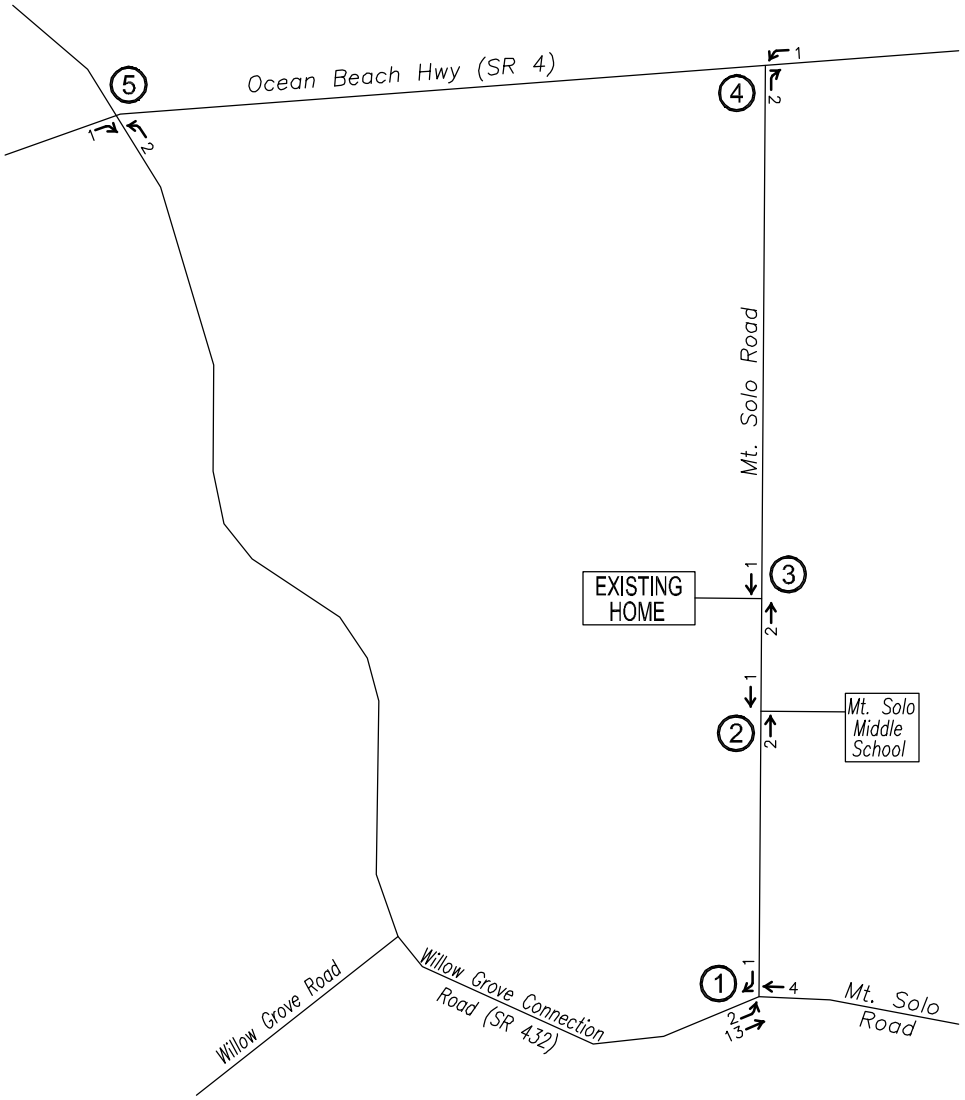
NOTES:

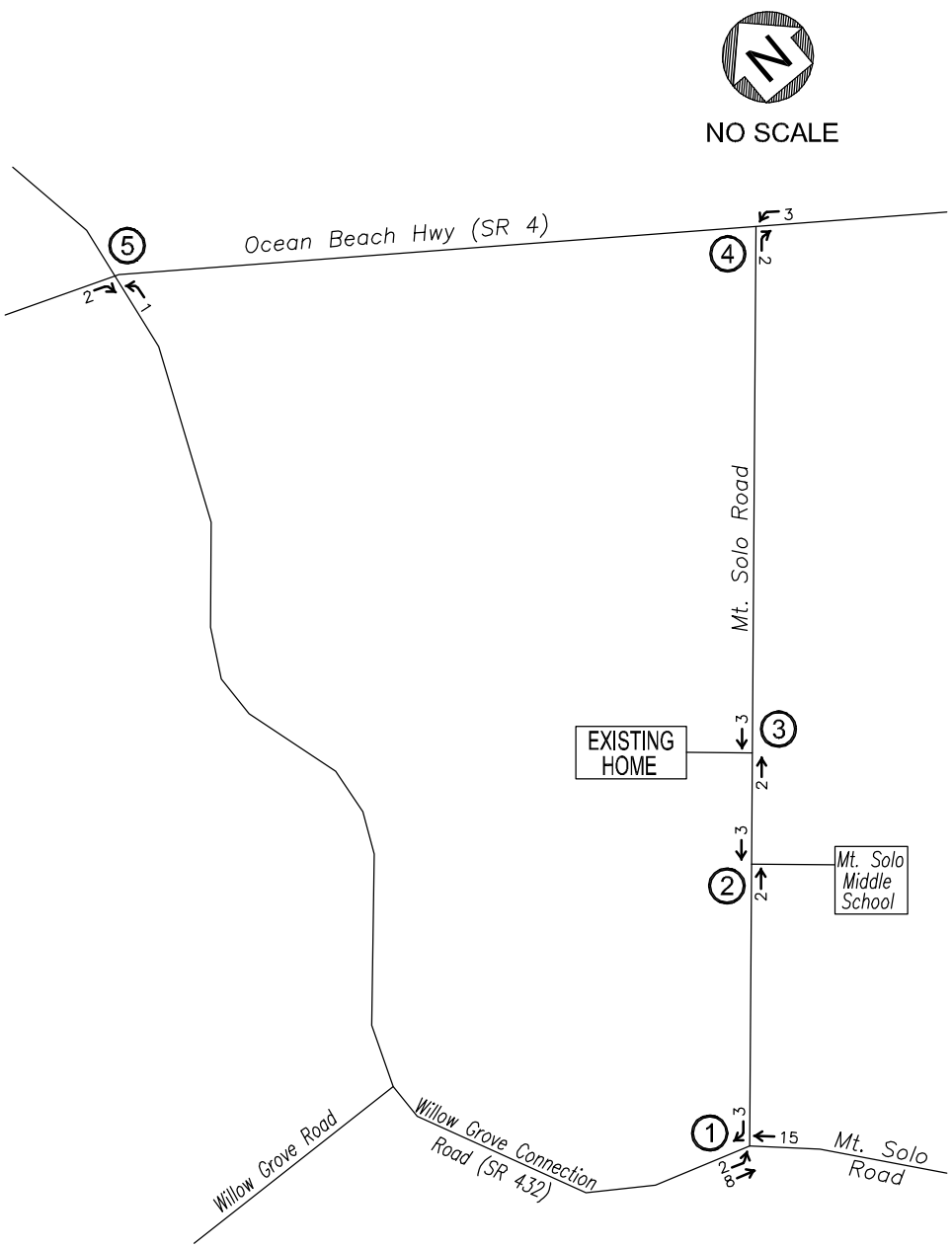
2024 EXISTING TRAFFIC

MT. SOLO ROAD SUBDIVISION

FIGURE 1

PLOT DATE: 11.24.24 FILE: 2421flow.dwg





CHARBONNEAU ENGINEERING LLC

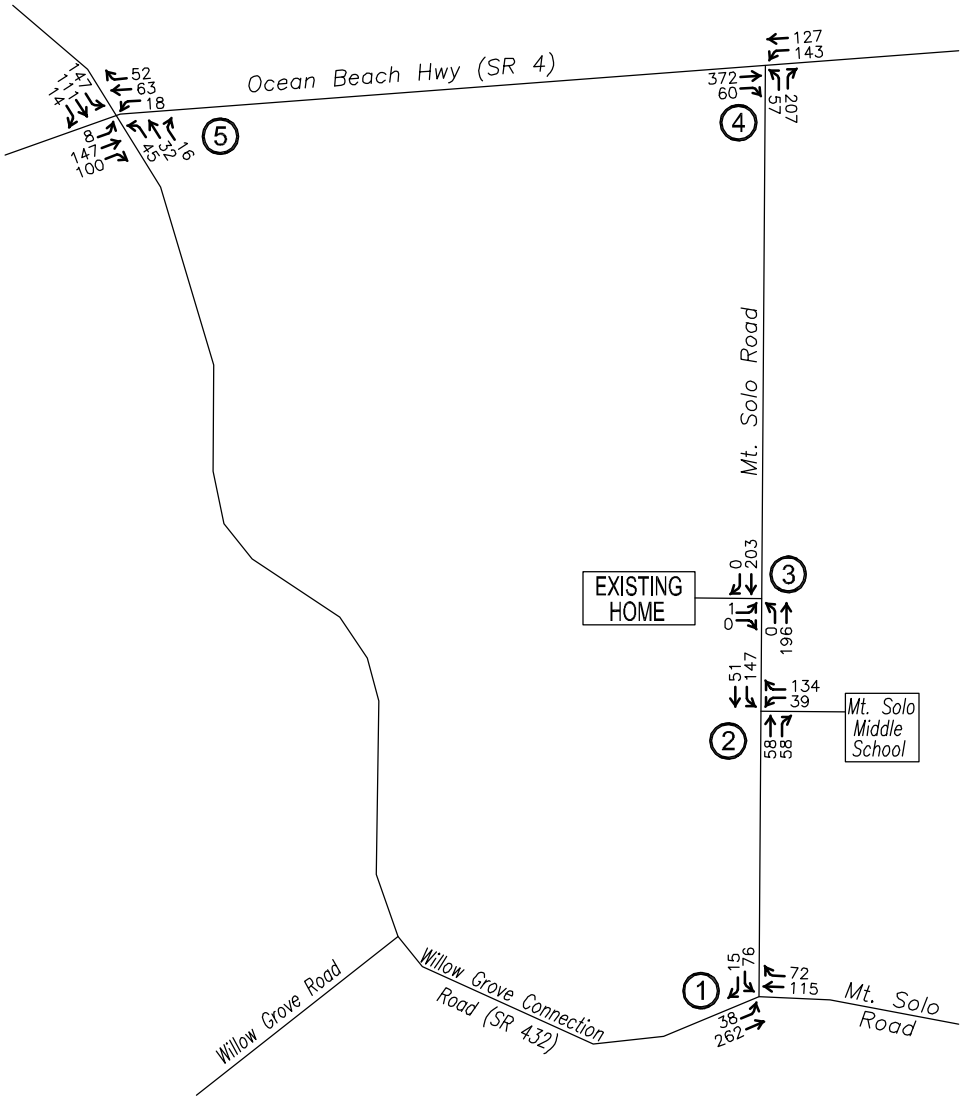
PROJECT: 24-21

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

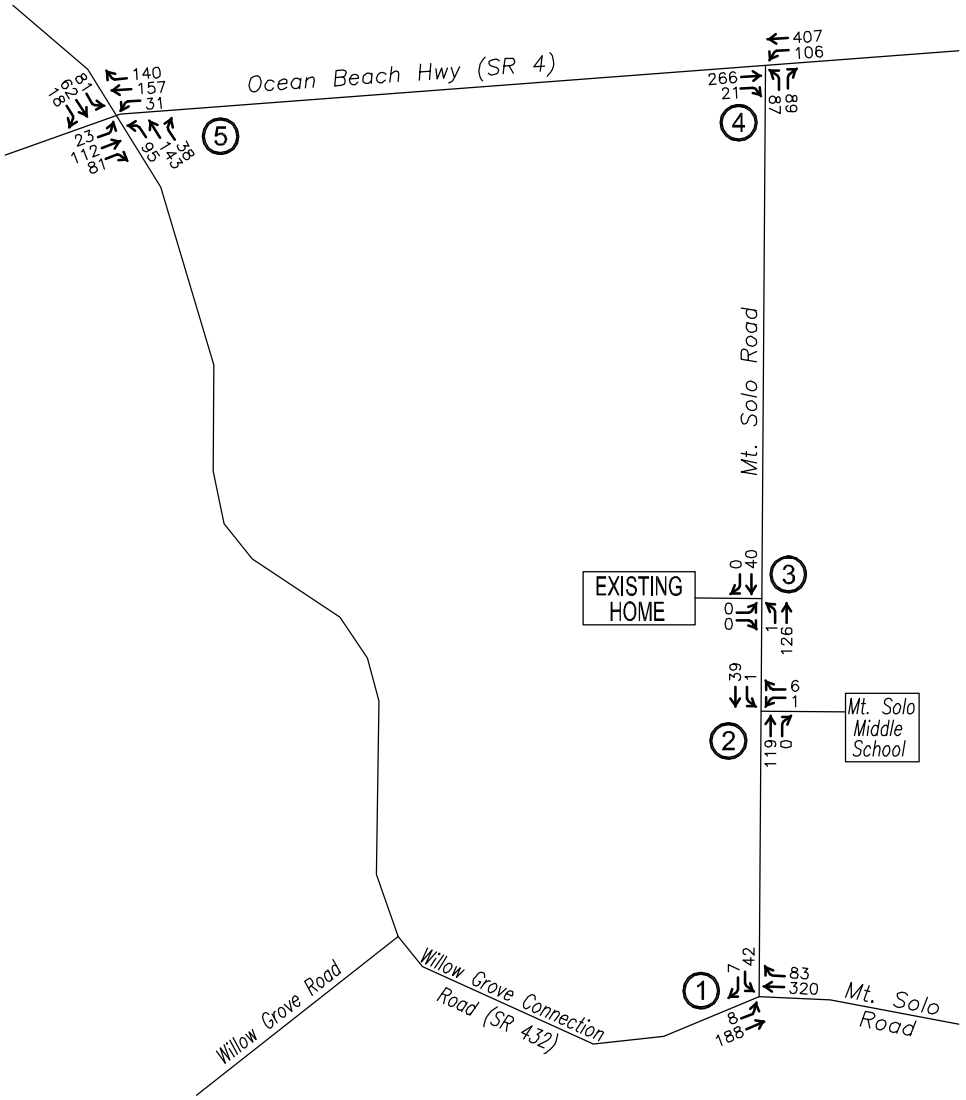
IN-PROCESS TRAFFIC
MT. SOLO ROAD SUBDIVISION

FIGURE 2

PLOT DATE: 11.24.24 FILE: 2421flow.dwg



AM PEAK HOUR



PM PEAK HOUR

CHARBONNEAU ENGINEERING LLC

PROJECT: 24-21

NOTES: 2027 Background Traffic = 2024 Existing Traffic + growth (1%/yr for 3 yrs) + In-process Traffic.

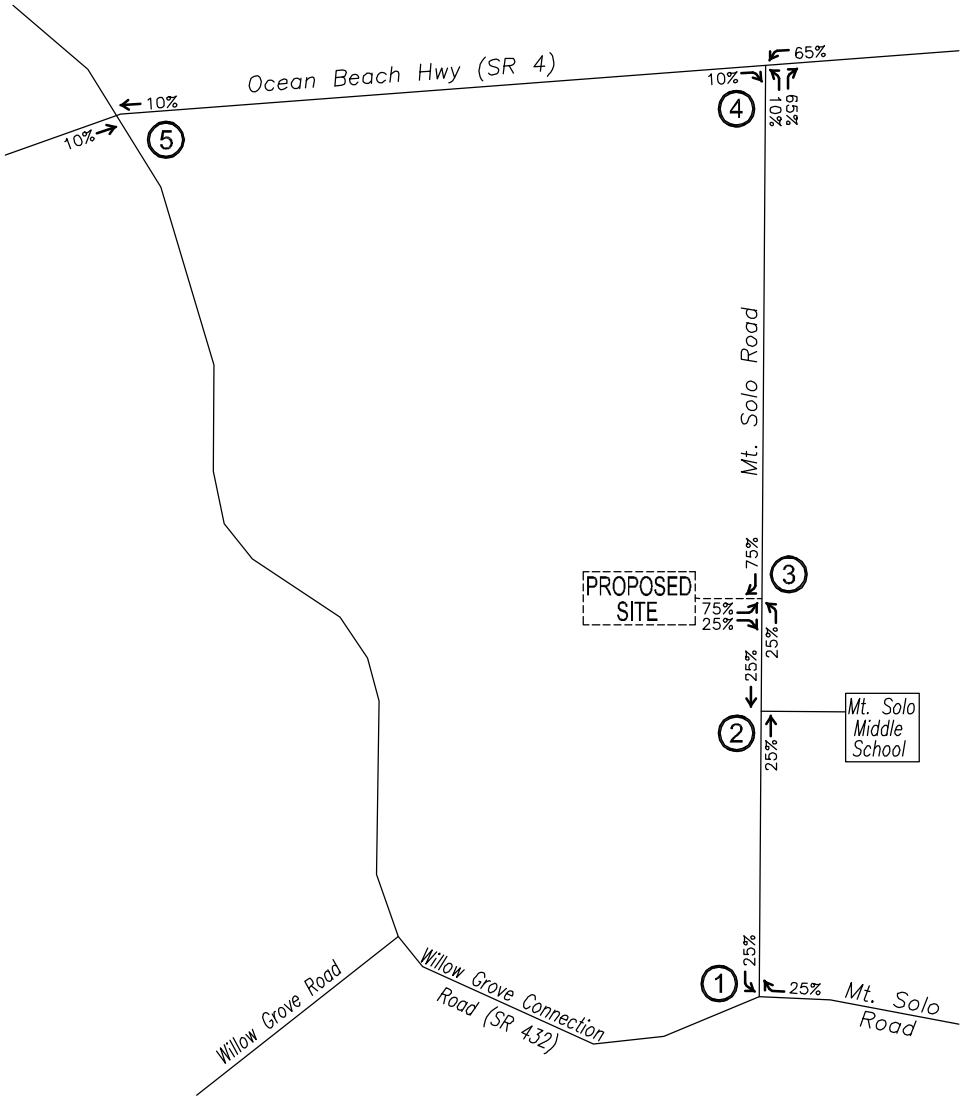
2027 BACKGROUND TRAFFIC

MT. SOLO ROAD SUBDIVISION

FIGURE 3

PLOT DATE: 11.24.24 FILE: 2421flow.dwg

NO SCALE



CHARBONNEAU ENGINEERING LLC

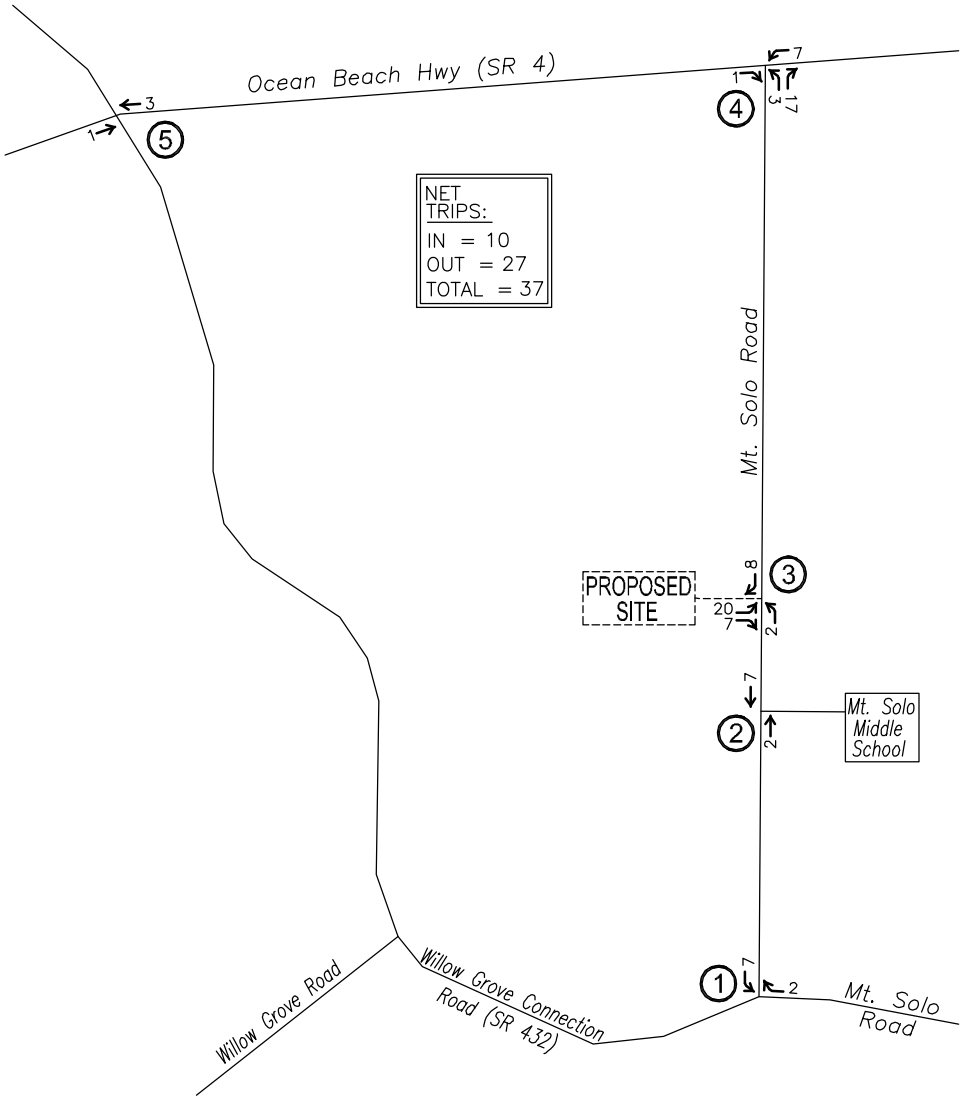
PROJECT: 24-21

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

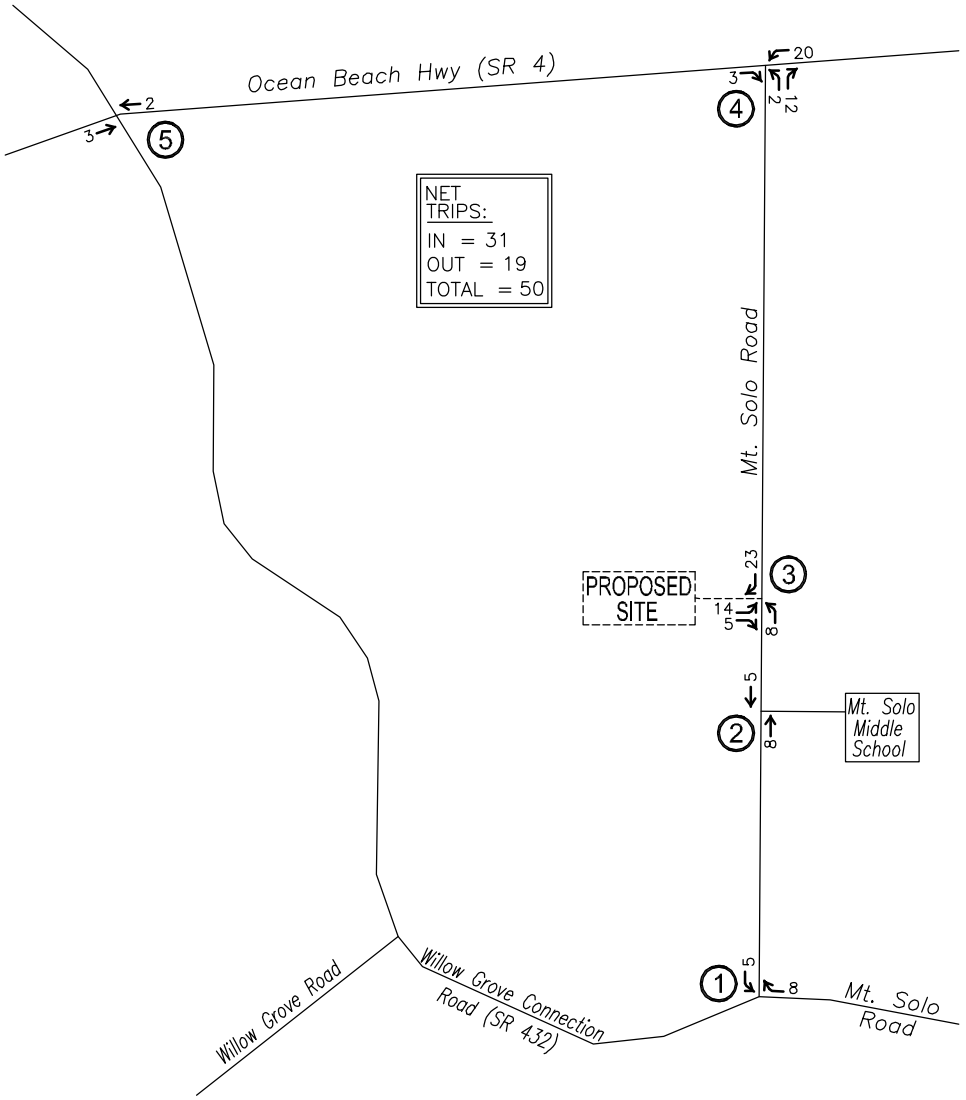
FIGURE 4

PLOT DATE: 11.24.24 FILE: 2421flow.dwg



AM PEAK HOUR

NO SCALE



PM PEAK HOUR

CHARBONNEAU ENGINEERING LLC

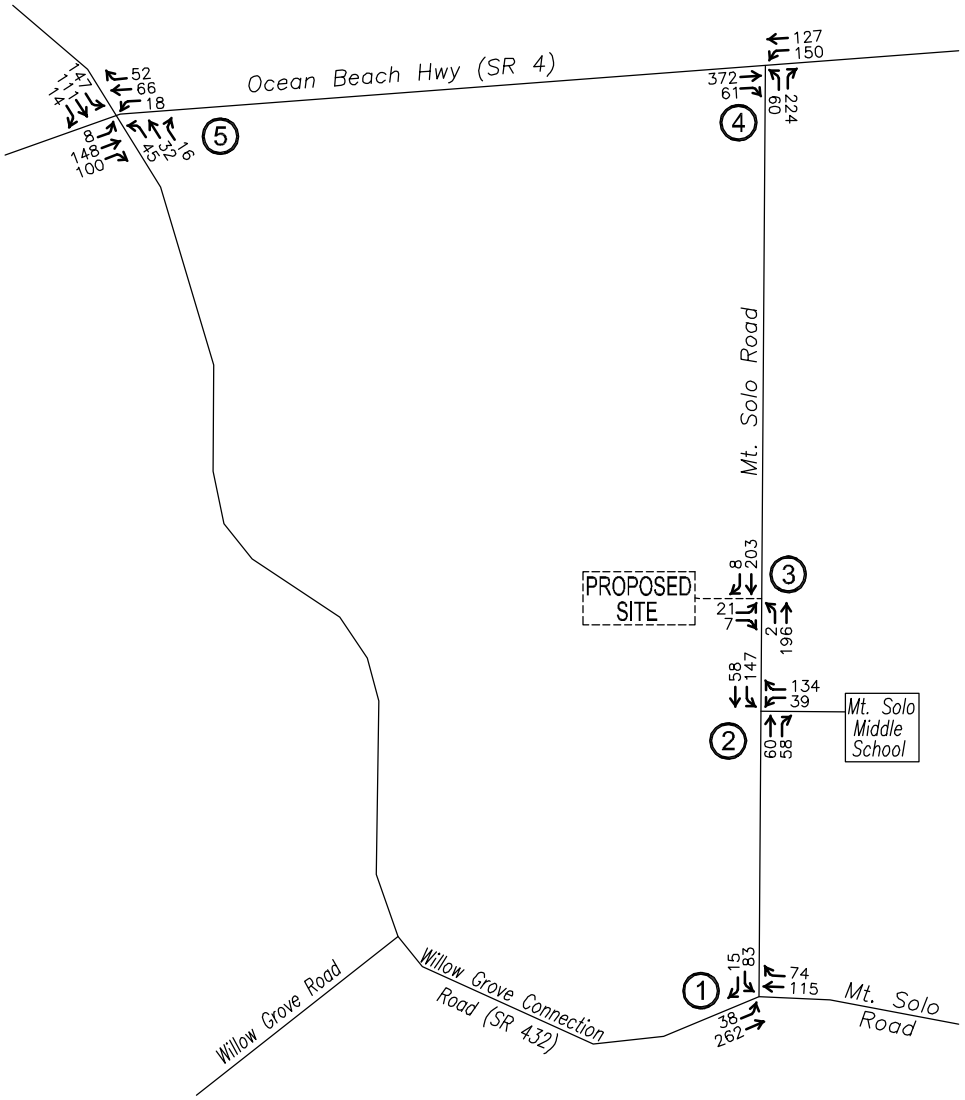
PROJECT: 24-21

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.

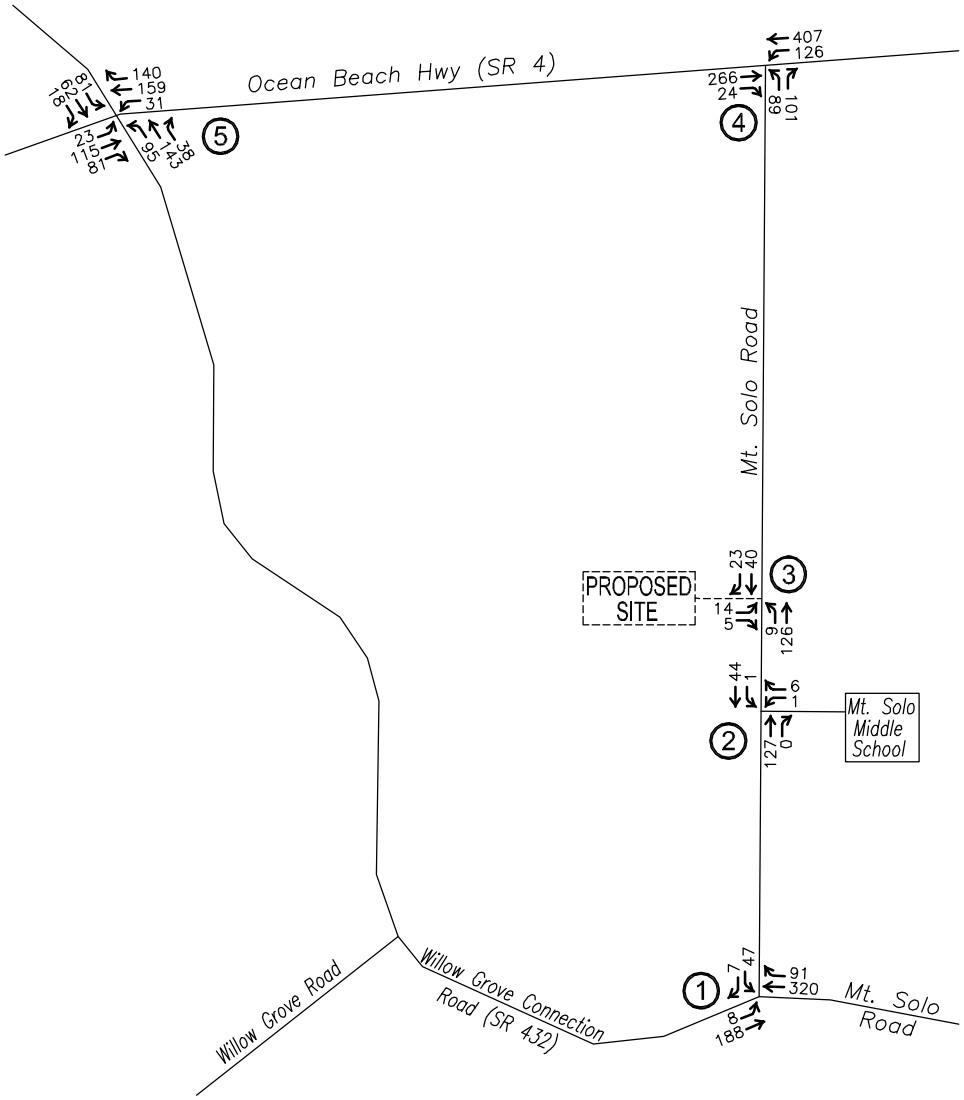
NET TRIP ASSIGNMENT
MT. SOLO ROAD SUBDIVISION

FIGURE 5

PLOT DATE: 11.24.24 FILE: 2421flow.dwg



AM PEAK HOUR



PM PEAK HOUR

CHARBONNEAU ENGINEERING LLC

PROJECT: 24-21

NOTES: 2027 Total Traffic = 2027 Background Traffic + Net Trip Assignment.

2027 TOTAL TRAFFIC
MT. SOLO ROAD SUBDIVISION

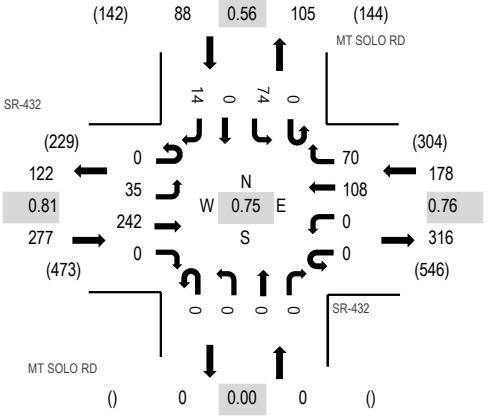
FIGURE 6

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

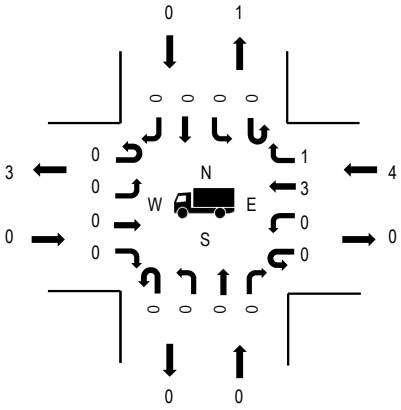
Location: 1 MT SOLO RD & SR-432 AM
Date: Tuesday, November 12, 2024
Peak Hour: 07:05 AM - 08:05 AM
Peak 15-Minutes: 07:25 AM - 07:40 AM

Peak Hour

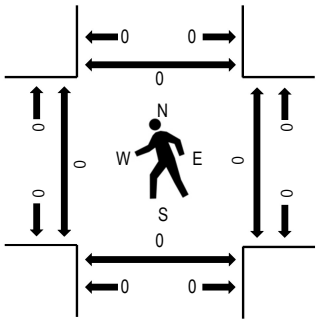
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.81
WB	2.2%	0.76
NB	0.0%	0.00
SB	0.0%	0.56
All	0.7%	0.75

Traffic Counts - Motorized Vehicles

Interval Start Time	SR-432 Eastbound				SR-432 Westbound				MT SOLO RD Northbound				MT SOLO RD Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
7:00 AM	0	5	14	0	0	0	6	4	0	0	0	0	0	4	0	0	33	542
7:05 AM	0	6	20	0	0	0	9	3	0	0	0	0	0	0	0	0	38	543
7:10 AM	0	3	23	0	0	0	6	7	0	0	0	0	0	2	0	1	42	530
7:15 AM	0	3	18	0	0	0	8	1	0	0	0	0	0	8	0	0	38	528
7:20 AM	0	1	16	0	0	0	6	8	0	0	0	0	0	1	0	0	32	523
7:25 AM	0	3	20	0	0	0	17	9	0	0	0	0	0	11	0	2	62	517
7:30 AM	0	4	28	0	0	0	7	10	0	0	0	0	0	8	0	1	58	488
7:35 AM	0	7	20	0	0	0	9	8	0	0	0	0	0	14	0	2	60	472
7:40 AM	0	1	26	0	0	0	11	5	0	0	0	0	0	14	0	3	60	444
7:45 AM	0	3	20	0	0	0	10	5	0	0	0	0	0	5	0	1	44	419
7:50 AM	0	1	18	0	0	0	7	2	0	0	0	0	0	4	0	1	33	405
7:55 AM	0	3	17	0	0	0	10	7	0	0	0	0	0	4	0	1	42	395
8:00 AM	0	0	16	0	0	0	8	5	0	0	0	0	0	3	0	2	34	377
8:05 AM	0	0	16	0	0	0	6	1	0	0	0	0	0	2	0	0	25	
8:10 AM	0	1	16	0	0	0	14	2	0	0	0	0	0	6	0	1	40	
8:15 AM	0	0	13	0	0	0	13	3	0	0	0	0	0	2	0	2	33	
8:20 AM	0	0	13	0	0	0	6	2	0	0	0	0	0	5	0	0	26	
8:25 AM	0	1	14	0	0	0	9	4	0	0	0	0	0	4	0	1	33	
8:30 AM	0	0	24	0	0	0	9	2	0	0	0	0	0	6	0	1	42	
8:35 AM	0	1	18	0	0	0	7	2	0	0	0	0	0	3	0	1	32	
8:40 AM	0	0	21	0	0	0	9	1	0	0	0	0	0	4	0	0	35	
8:45 AM	0	2	12	0	0	0	8	3	0	0	0	0	0	3	0	2	30	
8:50 AM	0	1	9	0	0	0	7	1	0	0	0	0	0	5	0	0	23	
8:55 AM	0	1	14	0	0	0	5	2	0	0	0	0	0	2	0	0	24	
Count Total	0	47	426	0	0	0	207	97	0	0	0	0	0	120	0	22	919	
Peak Hour	0	35	242	0	0	0	108	70	0	0	0	0	0	74	0	14	543	

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

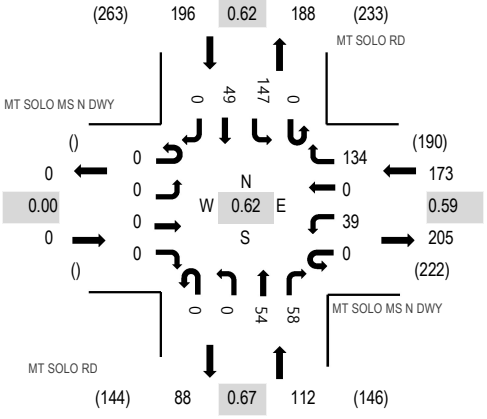
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	1	0	0	0	1	7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	0	0
7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0
7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0
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	0	0	0	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	2	0	2	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	1	0	1	7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	0	0
7:55 AM	0	0	1	0	1	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	0	0	0	0	0
8:05 AM	2	0	0	0	2	8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	0	0
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	0	0
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	1	0	1	8:30 AM	0	0	0	0	0	8:30 AM	0	0	0	0	0
8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0
8:40 AM	1	0	1	0	2	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	1	0	0	0	1	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	6	0	6	0	12	Count Total	0	0	0	0	0	Count Total	0	0	0	0	0
Peak Hour	0	0	4	0	4	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

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

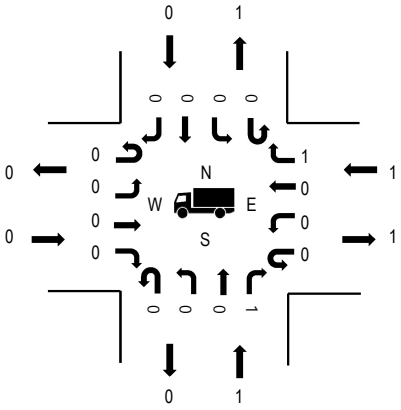
Location: 2 MT SOLO RD & MT SOLO MS N DWY AM
Date: Tuesday, November 12, 2024
Peak Hour: 07:05 AM - 08:05 AM
Peak 15-Minutes: 07:25 AM - 07:40 AM

Peak Hour

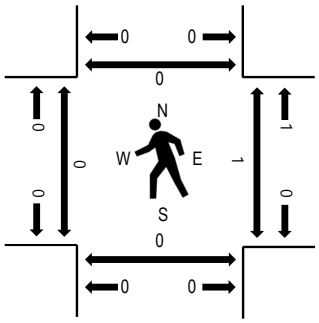
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.00
WB	0.6%	0.59
NB	0.9%	0.67
SB	0.0%	0.62
All	0.4%	0.62

Traffic Counts - Motorized Vehicles

Interval Start Time	MT SOLO MS N DWY Eastbound				MT SOLO MS N DWY Westbound				MT SOLO RD Northbound				MT SOLO RD Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
7:00 AM	0	0	0	0	0	0	0	5	0	0	2	2	0	2	2	0	13	480
7:05 AM	0	0	0	0	0	0	0	3	0	0	6	3	0	2	0	0	14	481
7:10 AM	0	0	0	0	0	1	0	1	0	0	6	5	0	3	5	0	21	476
7:15 AM	0	0	0	0	0	3	0	9	0	0	3	5	0	12	2	0	34	462
7:20 AM	0	0	0	0	0	2	0	5	0	0	5	4	0	15	0	0	31	439
7:25 AM	0	0	0	0	0	6	0	14	0	0	7	5	0	21	9	0	62	420
7:30 AM	0	0	0	0	0	5	0	18	0	0	5	8	0	26	5	0	67	370
7:35 AM	0	0	0	0	0	8	0	19	0	0	6	11	0	15	5	0	64	314
7:40 AM	0	0	0	0	0	7	0	17	0	0	2	3	0	14	10	0	53	259
7:45 AM	0	0	0	0	0	2	0	17	0	0	4	5	0	18	2	0	48	212
7:50 AM	0	0	0	0	0	1	0	17	0	0	2	2	0	17	5	0	44	175
7:55 AM	0	0	0	0	0	3	0	11	0	0	4	5	0	3	3	0	29	140
8:00 AM	0	0	0	0	0	1	0	3	0	0	4	2	0	1	3	0	14	119
8:05 AM	0	0	0	0	0	0	0	2	0	0	1	0	0	1	5	0	9	
8:10 AM	0	0	0	0	0	1	0	1	0	0	2	0	0	0	3	0	7	
8:15 AM	0	0	0	0	0	0	0	1	0	0	3	0	0	2	5	0	11	
8:20 AM	0	0	0	0	0	0	0	1	0	0	4	0	0	2	5	0	12	
8:25 AM	0	0	0	0	0	0	0	1	0	0	4	1	0	2	4	0	12	
8:30 AM	0	0	0	0	0	0	0	1	0	0	2	0	0	1	7	0	11	
8:35 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	5	0	9	
8:40 AM	0	0	0	0	0	1	0	0	0	0	1	0	0	0	4	0	6	
8:45 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	7	0	11	
8:50 AM	0	0	0	0	0	0	0	1	0	0	2	1	0	2	3	0	9	
8:55 AM	0	0	0	0	0	0	0	2	0	0	1	0	0	1	4	0	8	
Count Total	0	0	0	0	0	41	0	149	0	0	84	62	0	160	103	0	599	
Peak Hour	0	0	0	0	0	39	0	134	0	0	54	58	0	147	49	0	481	

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	0	0	0	0	0	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	0	0
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	0	0	0	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	1	0	0	1	7:30 AM	0	0	0	0	0	7:30 AM	0	0	1	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	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	1	0	1	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	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	0	0	0	0
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	0	0
8:25 AM	0	0	0	0	0	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	0	0	0	0	0	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0
8:40 AM	0	0	0	0	0	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	0	1	1	0	2	Count Total	0	0	0	0	0	Count Total	0	0	1	0	1
Peak Hour	0	1	1	0	2	Peak Hour	0	0	0	0	0	Peak Hour	0	0	1	0	1

ALL TRAFFIC DATA SERVICES
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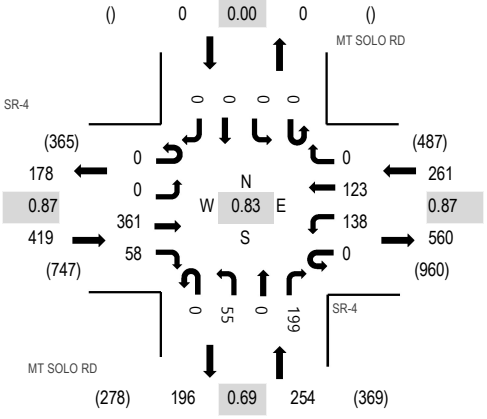
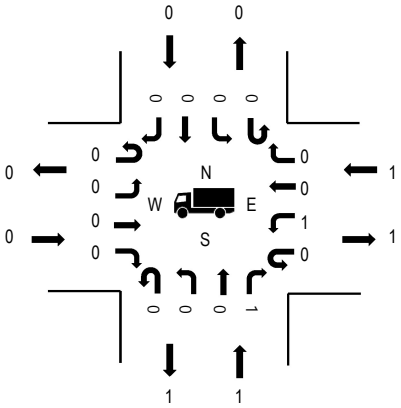
Location: 3 MT SOLO RD & SR-4 AM
Date: Tuesday, November 12, 2024
Peak Hour: 07:10 AM - 08:10 AM
Peak 15-Minutes: 07:25 AM - 07:40 AM

Peak Hour

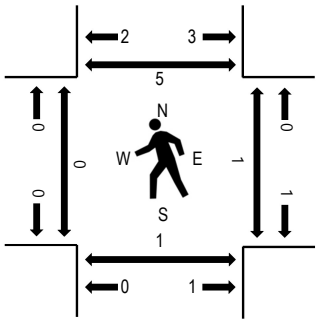
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.87
WB	0.4%	0.87
NB	0.4%	0.69
SB	0.0%	0.00
All	0.2%	0.83

Traffic Counts - Motorized Vehicles

Interval Start Time	SR-4 Eastbound				SR-4 Westbound				MT SOLO RD Northbound				MT SOLO RD Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
7:00 AM	0	0	17	2	0	3	9	0	0	6	0	6	0	0	0	0	43	904
7:05 AM	0	0	27	1	0	4	6	0	0	2	0	13	0	0	0	0	53	927
7:10 AM	0	0	29	3	0	8	8	0	0	3	0	10	0	0	0	0	61	934
7:15 AM	0	0	40	3	0	8	10	0	0	1	0	17	0	0	0	0	79	914
7:20 AM	0	0	17	8	0	13	11	0	0	4	0	17	0	0	0	0	70	893
7:25 AM	0	0	36	8	0	21	6	0	0	6	0	14	0	0	0	0	91	884
7:30 AM	0	0	37	7	0	18	10	0	0	6	0	25	0	0	0	0	103	856
7:35 AM	0	0	28	5	0	12	9	0	0	8	0	27	0	0	0	0	89	805
7:40 AM	0	0	31	11	0	9	8	0	0	7	0	20	0	0	0	0	86	762
7:45 AM	0	0	33	2	0	21	9	0	0	5	0	13	0	0	0	0	83	752
7:50 AM	0	0	24	6	0	13	14	0	0	3	0	18	0	0	0	0	78	734
7:55 AM	0	0	32	2	0	4	10	0	0	4	0	16	0	0	0	0	68	714
8:00 AM	0	0	27	1	0	8	13	0	0	4	0	13	0	0	0	0	66	699
8:05 AM	0	0	27	2	0	3	15	0	0	4	0	9	0	0	0	0	60	
8:10 AM	0	0	20	1	0	7	11	0	0	1	0	1	0	0	0	0	41	
8:15 AM	0	0	21	0	0	8	22	0	0	1	0	6	0	0	0	0	58	
8:20 AM	0	0	30	0	0	9	10	0	0	3	0	9	0	0	0	0	61	
8:25 AM	0	0	36	2	0	4	13	0	0	1	0	7	0	0	0	0	63	
8:30 AM	0	0	31	3	0	2	10	0	0	2	0	4	0	0	0	0	52	
8:35 AM	0	0	22	3	0	4	6	0	0	2	0	9	0	0	0	0	46	
8:40 AM	0	0	40	2	0	6	16	0	0	3	0	9	0	0	0	0	76	
8:45 AM	0	0	27	1	1	2	25	0	0	1	0	8	0	0	0	0	65	
8:50 AM	0	0	26	2	0	3	15	0	0	3	0	9	0	0	0	0	58	
8:55 AM	0	0	12	2	0	11	19	0	0	0	0	9	0	0	0	0	53	
Count Total	0	0	670	77	1	201	285	0	0	80	0	289	0	0	0	0	1,603	
Peak Hour	0	0	361	58	0	138	123	0	0	55	0	199	0	0	0	0	934	

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	1	0	0	1	2
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	0	0
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	0	0	0	7:20 AM	0	0	0	0	0	7:20 AM	0	0	1	1	2
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	1	0	1	7:50 AM	0	0	0	0	0	7:50 AM	0	1	0	1	2
7:55 AM	0	1	0	0	1	7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	2	2
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	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	1	0	0	1
8:20 AM	0	0	1	0	1	8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	0	0
8:25 AM	0	0	0	0	0	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	0	0	0	0	0	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0
8:40 AM	0	1	0	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	1	2	2	0	5	Count Total	0	0	0	0	0	Count Total	1	2	1	6	10
Peak Hour	0	1	1	0	2	Peak Hour	0	0	0	0	0	Peak Hour	0	1	1	5	7

ALL TRAFFIC DATA SERVICES
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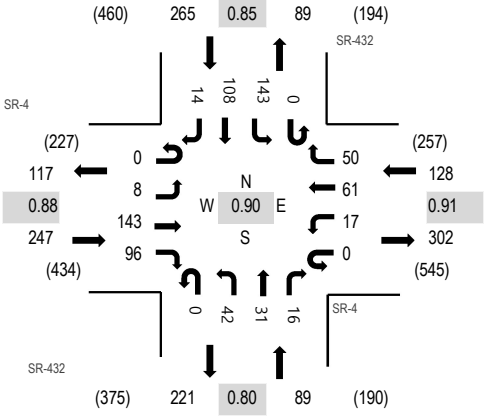
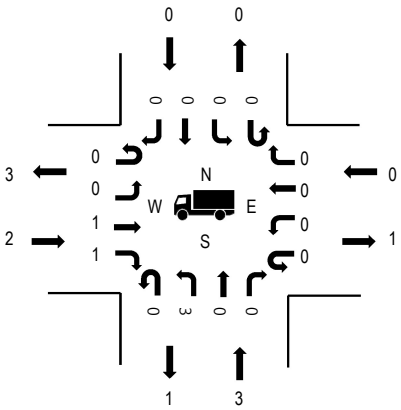
Location: 4 SR-432 & SR-4 AM
Date: Tuesday, November 12, 2024
Peak Hour: 07:00 AM - 08:00 AM
Peak 15-Minutes: 07:20 AM - 07:35 AM

Peak Hour

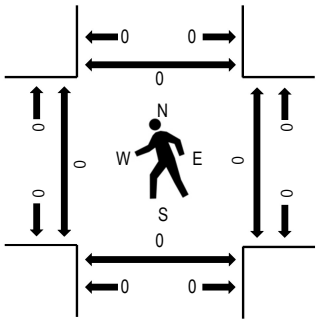
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.8%	0.88
WB	0.0%	0.91
NB	3.4%	0.80
SB	0.0%	0.85
All	0.7%	0.90

Traffic Counts - Motorized Vehicles

Interval Start Time	SR-4 Eastbound				SR-4 Westbound				SR-432 Northbound				SR-432 Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
7:00 AM	0	0	17	13	0	1	6	5	0	1	1	2	0	9	7	0	62	729
7:05 AM	0	2	8	7	0	2	4	1	0	5	0	1	0	9	18	1	58	715
7:10 AM	0	0	8	3	0	3	3	2	0	2	2	2	0	7	10	1	43	705
7:15 AM	0	2	17	6	0	0	4	5	0	4	2	1	0	13	12	0	66	700
7:20 AM	0	0	16	6	0	3	10	3	0	4	1	1	0	13	4	1	62	693
7:25 AM	0	0	13	10	0	2	5	3	0	4	5	1	0	18	12	0	73	674
7:30 AM	0	2	10	10	0	1	6	4	0	6	2	0	0	16	11	0	68	659
7:35 AM	0	0	9	11	0	1	5	2	0	4	5	1	0	11	9	1	59	655
7:40 AM	0	0	6	7	0	2	5	6	0	4	3	3	0	13	7	1	57	645
7:45 AM	0	1	10	9	0	1	5	6	0	3	2	1	0	11	7	7	63	647
7:50 AM	0	1	11	8	0	0	3	9	0	1	6	1	0	8	5	2	55	639
7:55 AM	0	0	18	6	0	1	5	4	0	4	2	2	0	15	6	0	63	639
8:00 AM	0	0	8	6	0	0	5	8	0	5	4	1	0	3	6	2	48	612
8:05 AM	0	1	14	4	0	3	2	2	0	3	1	3	0	7	7	1	48	
8:10 AM	0	0	10	7	0	0	3	3	0	2	2	0	0	3	7	1	38	
8:15 AM	0	0	9	4	0	1	6	10	0	6	5	2	0	10	6	0	59	
8:20 AM	0	1	3	1	0	2	5	3	0	6	4	1	0	9	8	0	43	
8:25 AM	0	0	15	5	0	1	6	7	0	0	3	3	0	11	6	1	58	
8:30 AM	0	0	15	13	0	0	3	3	0	4	6	2	0	8	8	2	64	
8:35 AM	0	0	9	2	0	0	3	1	0	3	2	1	0	14	14	0	49	
8:40 AM	0	1	14	7	0	0	2	5	0	8	4	3	0	9	5	1	59	
8:45 AM	0	0	10	5	0	0	4	10	0	2	0	1	0	16	6	1	55	
8:50 AM	0	2	7	6	0	2	7	10	0	3	1	3	0	9	4	1	55	
8:55 AM	0	0	7	1	0	2	5	5	0	5	1	1	0	2	5	2	36	
Count Total	0	13	264	157	0	28	112	117	0	89	64	37	0	244	190	26	1,341	
Peak Hour	0	8	143	96	0	17	61	50	0	42	31	16	0	143	108	14	729	

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	2	0	0	0	2	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	0	0
7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	1	1	7:15 AM	0	0	0	0	0
7:20 AM	0	0	0	0	0	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	1	0	0	1	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	2	0	0	2	7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0
8:00 AM	1	0	0	0	1	8:00 AM	0	0	0	0	0	8:00 AM	0	0	0	0	0
8:05 AM	0	0	0	1	1	8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	0	0
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	0	0
8:25 AM	0	0	0	1	1	8:25 AM	0	1	0	0	1	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	0	1	0	0	1	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	0	0
8:40 AM	1	1	0	0	2	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	4	5	0	2	11	Count Total	0	1	0	1	2	Count Total	0	0	0	0	0
Peak Hour	2	3	0	0	5	Peak Hour	0	0	0	1	1	Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
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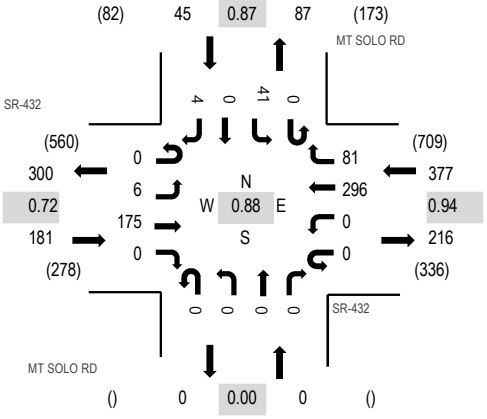
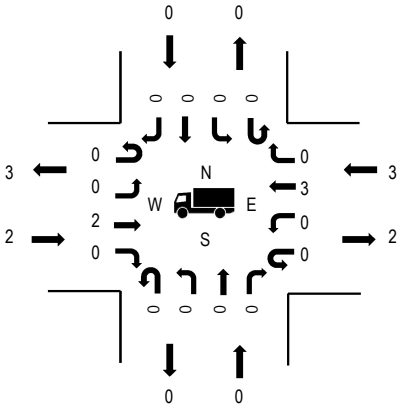
Location: 1 MT SOLO RD & SR-432 PM
Date: Tuesday, November 12, 2024
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:30 PM - 04:45 PM

Peak Hour

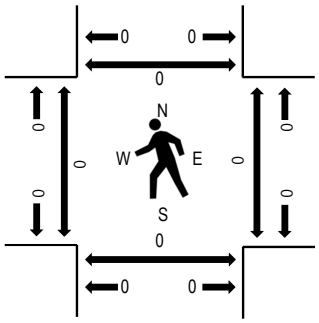
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	1.1%	0.72
WB	0.8%	0.94
NB	0.0%	0.00
SB	0.0%	0.87
All	0.8%	0.88

Traffic Counts - Motorized Vehicles

Interval Start Time	SR-432 Eastbound				SR-432 Westbound				MT SOLO RD Northbound				MT SOLO RD Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	0	12	0	0	0	25	1	0	0	0	0	0	5	0	1	44	603
4:05 PM	0	0	12	0	0	0	23	7	0	0	0	0	0	5	0	0	47	602
4:10 PM	0	0	22	0	0	0	28	10	0	0	0	0	0	2	0	0	62	589
4:15 PM	0	0	10	0	0	0	25	5	0	0	0	0	0	6	0	0	46	573
4:20 PM	0	0	11	0	0	0	27	7	0	0	0	0	0	2	0	0	47	575
4:25 PM	0	1	14	0	0	0	19	6	0	0	0	0	0	3	0	1	44	568
4:30 PM	0	1	25	0	0	0	22	5	0	0	0	0	0	2	0	0	55	577
4:35 PM	0	2	14	0	0	0	30	9	0	0	0	0	0	4	0	0	59	566
4:40 PM	0	1	20	0	0	0	22	11	0	0	0	0	0	3	0	1	58	543
4:45 PM	0	0	9	0	0	0	23	8	0	0	0	0	0	5	0	0	45	519
4:50 PM	0	1	10	0	0	0	26	7	0	0	0	0	0	2	0	1	47	502
4:55 PM	0	0	16	0	0	0	26	5	0	0	0	0	0	2	0	0	49	483
5:00 PM	0	0	7	0	0	0	25	9	0	0	0	0	0	1	0	1	43	466
5:05 PM	0	0	10	0	0	0	17	6	0	0	0	0	0	0	0	1	34	
5:10 PM	0	0	7	0	0	0	28	7	0	0	0	0	0	2	0	2	46	
5:15 PM	0	0	10	0	0	0	26	9	0	0	0	0	0	2	0	1	48	
5:20 PM	0	0	8	0	0	0	18	14	0	0	0	0	0	0	0	0	40	
5:25 PM	0	0	12	0	0	0	25	12	0	0	0	0	0	4	0	0	53	
5:30 PM	0	1	9	0	0	0	21	7	0	0	0	0	0	4	0	2	44	
5:35 PM	0	0	4	0	0	0	23	4	0	0	0	0	0	3	0	2	36	
5:40 PM	0	1	4	0	0	0	21	5	0	0	0	0	0	1	0	2	34	
5:45 PM	0	0	8	0	0	0	12	4	0	0	0	0	0	4	0	0	28	
5:50 PM	0	0	5	0	0	0	17	5	0	0	0	0	0	1	0	0	28	
5:55 PM	0	0	11	0	0	0	15	2	0	0	0	0	0	3	0	1	32	
Count Total	0	8	270	0	0	0	544	165	0	0	0	0	0	66	0	16	1,069	
Peak Hour	0	6	175	0	0	0	296	81	0	0	0	0	0	41	0	4	603	

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
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	0	0	0	0	0
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	0	0	0	0	0
4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
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	1	0	1	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	1	0	0	0	1	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	1	0	2	0	3	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	0	0	0	0	0
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	0	0	0	0	0
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	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	0	0	0	0	0
5:30 PM	0	0	2	0	2	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	0	0
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	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	4	0	5	0	9	Count Total	0	0	0	0	0	Count Total	0	0	0	0	0
Peak Hour	2	0	3	0	5	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
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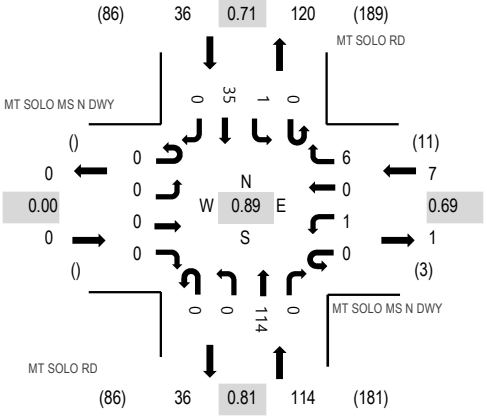
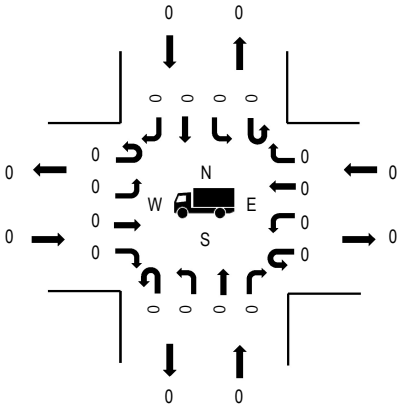
Location: 2 MT SOLO RD & MT SOLO MS N DWY PM
Date: Tuesday, November 12, 2024
Peak Hour: 04:30 PM - 05:30 PM
Peak 15-Minutes: 04:30 PM - 04:45 PM

Peak Hour

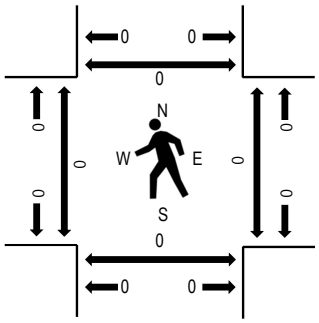
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.00
WB	0.0%	0.69
NB	0.0%	0.81
SB	0.0%	0.71
All	0.0%	0.89

Traffic Counts - Motorized Vehicles

Interval Start Time	MT SOLO MS N DWY Eastbound				MT SOLO MS N DWY Westbound				MT SOLO RD Northbound				MT SOLO RD Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	7	0	12	148
4:05 PM	0	0	0	0	0	0	0	0	0	0	7	0	0	0	8	0	15	151
4:10 PM	0	0	0	0	0	0	0	1	0	0	9	1	0	0	2	0	13	150
4:15 PM	0	0	0	0	0	1	0	1	0	0	5	0	0	0	4	0	11	146
4:20 PM	0	0	0	0	0	0	0	1	0	0	6	0	0	0	3	0	10	145
4:25 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	1	3	0	9	148
4:30 PM	0	0	0	0	0	1	0	0	0	0	10	0	0	0	1	0	12	157
4:35 PM	0	0	0	0	0	0	0	1	0	0	10	0	0	0	4	0	15	157
4:40 PM	0	0	0	0	0	0	0	0	0	0	12	0	0	0	5	0	17	149
4:45 PM	0	0	0	0	0	0	0	1	0	0	8	0	0	0	3	0	12	143
4:50 PM	0	0	0	0	0	0	0	0	0	0	8	0	0	0	3	0	11	140
4:55 PM	0	0	0	0	0	0	0	1	0	0	6	0	0	0	4	0	11	136
5:00 PM	0	0	0	0	0	0	0	1	0	0	8	0	0	1	5	0	15	130
5:05 PM	0	0	0	0	0	0	0	2	0	0	11	0	0	0	1	0	14	
5:10 PM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	3	0	9	
5:15 PM	0	0	0	0	0	0	0	0	0	0	9	0	0	0	1	0	10	
5:20 PM	0	0	0	0	0	0	0	0	0	0	12	0	0	0	1	0	13	
5:25 PM	0	0	0	0	0	0	0	0	0	0	14	0	0	0	4	0	18	
5:30 PM	0	0	0	0	0	0	0	0	0	0	8	0	0	0	4	0	12	
5:35 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	4	0	7	
5:40 PM	0	0	0	0	0	0	0	0	0	0	7	0	0	0	4	0	11	
5:45 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	4	0	9	
5:50 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	2	0	7	
5:55 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	5	
Count Total	0	0	0	0	0	2	0	9	0	0	180	1	0	2	84	0	278	
Peak Hour	0	0	0	0	0	1	0	6	0	0	114	0	0	1	35	0	157	

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
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	0	0	0	0	0
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	0	0	0	0	0
4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
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	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	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	0	0	0	0	0
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	0	0	0	0	0
5:15 PM	0	0	0	0	0	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	0	0
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	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	0	0	0	0	0	Count Total	0	0	0	0	0	Count Total	0	0	0	0	0
Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

ALL TRAFFIC DATA SERVICES
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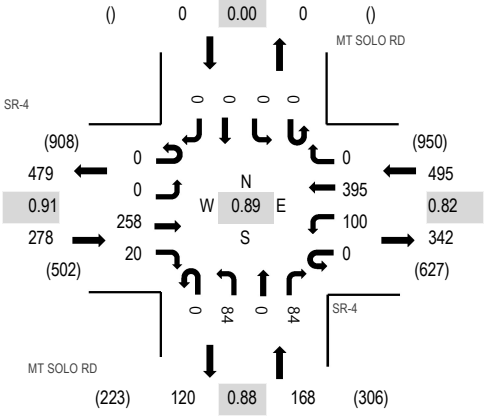
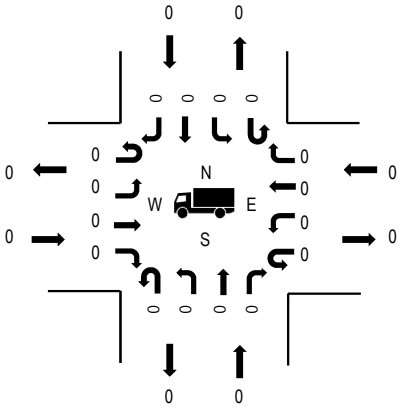
Location: 3 MT SOLO RD & SR-4 PM
Date: Tuesday, November 12, 2024
Peak Hour: 04:40 PM - 05:40 PM
Peak 15-Minutes: 05:15 PM - 05:30 PM

Peak Hour

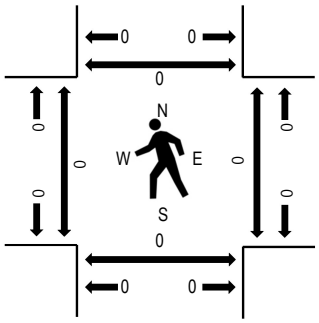
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.91
WB	0.0%	0.82
NB	0.0%	0.88
SB	0.0%	0.00
All	0.0%	0.89

Traffic Counts - Motorized Vehicles

Interval Start Time	SR-4 Eastbound				SR-4 Westbound				MT SOLO RD Northbound				MT SOLO RD Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	0	14	3	0	15	27	0	0	4	0	5	0	0	0	0	68	893
4:05 PM	0	0	24	1	0	6	29	0	0	6	0	8	0	0	0	0	74	890
4:10 PM	0	0	24	1	0	4	42	0	0	7	0	9	0	0	0	0	87	889
4:15 PM	0	0	20	2	0	7	34	0	0	4	0	5	0	0	0	0	72	875
4:20 PM	0	0	24	0	0	5	42	0	0	7	0	6	0	0	0	0	84	904
4:25 PM	0	0	19	3	0	6	30	0	0	4	0	6	0	0	0	0	68	890
4:30 PM	0	0	11	1	0	7	39	0	0	9	0	11	0	0	0	0	78	916
4:35 PM	0	0	22	1	0	8	24	0	0	4	0	3	0	0	0	0	62	918
4:40 PM	0	0	21	1	0	3	37	0	0	10	0	6	0	0	0	0	78	941
4:45 PM	0	0	16	2	0	12	35	0	0	12	0	3	0	0	0	0	80	938
4:50 PM	0	0	26	2	0	5	24	0	0	0	0	6	0	0	0	0	63	903
4:55 PM	0	0	24	1	0	6	32	0	0	7	0	9	0	0	0	0	79	900
5:00 PM	0	0	14	2	0	9	29	0	0	4	0	7	0	0	0	0	65	865
5:05 PM	0	0	17	2	0	10	26	0	0	6	0	12	0	0	0	0	73	
5:10 PM	0	0	24	3	0	2	30	0	0	5	0	9	0	0	0	0	73	
5:15 PM	0	0	30	0	0	6	49	0	0	9	0	7	0	0	0	0	101	
5:20 PM	0	0	16	2	0	12	28	0	0	9	0	3	0	0	0	0	70	
5:25 PM	0	0	21	3	0	11	47	0	0	4	0	8	0	0	0	0	94	
5:30 PM	0	0	25	2	0	3	30	0	0	12	0	8	0	0	0	0	80	
5:35 PM	0	0	24	0	0	21	28	0	0	6	0	6	0	0	0	0	85	
5:40 PM	0	0	20	1	0	8	40	0	0	1	0	5	0	0	0	0	75	
5:45 PM	0	0	4	1	0	5	21	0	0	6	0	8	0	0	0	0	45	
5:50 PM	0	0	12	2	0	11	25	0	0	4	0	6	0	0	0	0	60	
5:55 PM	0	0	13	1	0	4	16	0	0	4	0	6	0	0	0	0	44	
Count Total	0	0	465	37	0	186	764	0	0	144	0	162	0	0	0	0	1,758	
Peak Hour	0	0	258	20	0	100	395	0	0	84	0	84	0	0	0	0	941	

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

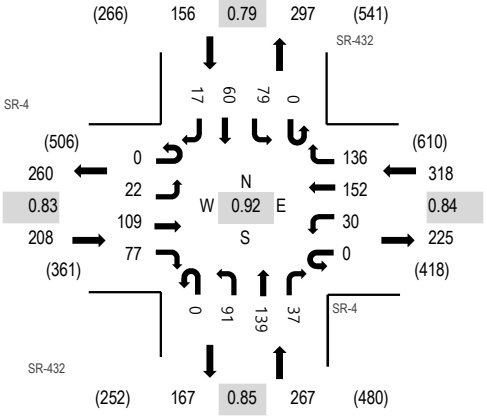
Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	0	0	0	0	4:00 PM	0	0	0	0	0	4:00 PM	3	0	0	0	3
4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0	4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0	4:10 PM	2	0	0	0	2
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	0	0	0	0	0
4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0	4:30 PM	0	0	0	0	0	4:30 PM	1	0	0	0	1
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	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	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	0	0	0	0	0
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	1	0	0	1	2
5:15 PM	0	0	0	0	0	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	0	0
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	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	0	0	0	0	0	Count Total	0	0	0	0	0	Count Total	7	0	0	1	8
Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0	Peak Hour	1	0	0	1	2

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

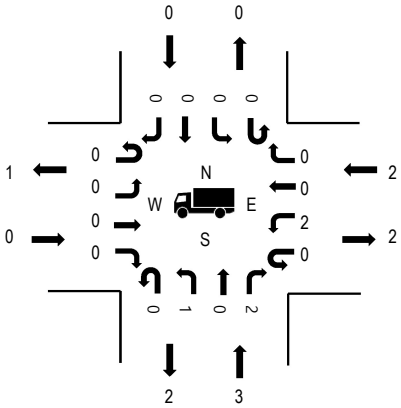
Location: 4 SR-432 & SR-4 PM
Date: Tuesday, November 12, 2024
Peak Hour: 04:05 PM - 05:05 PM
Peak 15-Minutes: 04:10 PM - 04:25 PM

Peak Hour

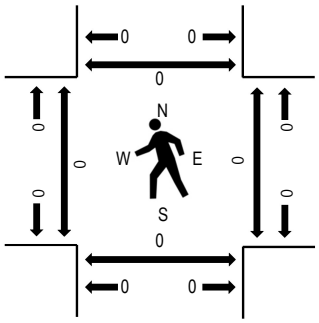
Motorized Vehicles



Heavy Vehicles



Pedestrians



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.83
WB	0.6%	0.84
NB	1.1%	0.85
SB	0.0%	0.79
All	0.5%	0.92

Traffic Counts - Motorized Vehicles

Interval Start Time	SR-4 Eastbound				SR-4 Westbound				SR-432 Northbound				SR-432 Southbound					Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	2	9	6	0	3	8	9	0	9	8	5	0	2	5	2	68	941
4:05 PM	0	2	11	6	0	4	6	8	0	8	10	5	0	11	7	3	81	949
4:10 PM	0	3	8	9	0	1	16	12	0	7	8	4	0	5	9	3	85	939
4:15 PM	0	0	13	5	0	2	11	14	0	6	16	1	0	8	3	1	80	915
4:20 PM	0	2	7	5	0	3	16	19	0	10	15	2	0	9	4	1	93	910
4:25 PM	0	4	6	7	0	3	14	15	0	4	10	6	0	7	5	0	81	890
4:30 PM	0	1	7	10	0	1	19	7	0	5	7	5	0	4	7	0	73	878
4:35 PM	0	2	13	13	0	5	17	12	0	4	15	1	0	3	5	0	90	881
4:40 PM	0	1	5	4	0	2	9	11	0	8	12	1	0	12	8	2	75	850
4:45 PM	0	2	6	5	0	1	11	12	0	6	8	4	0	4	4	0	63	843
4:50 PM	0	2	14	3	0	2	7	7	0	12	12	1	0	6	4	3	73	833
4:55 PM	0	1	11	2	0	1	10	15	0	9	15	5	0	6	3	1	79	820
5:00 PM	0	2	8	8	0	5	16	4	0	12	11	2	0	4	1	3	76	776
5:05 PM	0	0	9	3	0	2	11	14	0	8	10	3	0	8	1	2	71	
5:10 PM	0	2	9	1	0	2	8	5	0	12	10	1	0	8	2	1	61	
5:15 PM	0	2	7	2	0	1	14	20	0	8	7	2	0	9	3	0	75	
5:20 PM	0	0	9	4	0	1	12	14	0	7	11	4	0	5	3	3	73	
5:25 PM	0	1	13	3	0	1	14	14	0	8	5	0	0	5	4	1	69	
5:30 PM	0	1	10	2	0	0	20	10	0	12	13	2	0	5	1	0	76	
5:35 PM	0	1	7	2	0	2	11	15	0	4	4	4	0	6	3	0	59	
5:40 PM	0	0	10	3	0	2	19	12	0	6	8	0	0	6	1	1	68	
5:45 PM	0	2	3	4	0	1	13	8	0	5	8	2	0	3	1	3	53	
5:50 PM	0	1	9	8	0	0	5	12	0	4	7	4	0	7	2	1	60	
5:55 PM	0	1	3	4	0	1	3	5	0	10	2	0	0	4	1	1	35	
Count Total	0	35	207	119	0	46	290	274	0	184	232	64	0	147	87	32	1,717	
Peak Hour	0	22	109	77	0	30	152	136	0	91	139	37	0	79	60	17	949	

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
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	0	0	0	0	0
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	0	0	0	0	0
4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
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	1	0	0	1	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	1	0	1	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	0	2	1	0	3	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	0	0	0	0	0
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	1	0	0	0	1	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	0	1	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	0	0	0	0	0
5:30 PM	0	1	0	0	1	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	0	1	0	0	1	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	0	0
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	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	5	3	0	9	Count Total	0	0	0	0	0	Count Total	0	0	0	0	0
Peak Hour	0	3	2	0	5	Peak Hour	0	0	0	0	0	Peak Hour	0	0	0	0	0

Table 1. Projected trip generation for Mt. Solo Subdivision (northeast of Altrusa Park).

ITE Land Use	Units (#)	Weekday						
		ADT	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
UNOCCUPIED UNITS								
Single-Family (#210)	31							
Generation Rate [1]		9.52	0.75	25%	75%	1.00	63%	37%
Site Trips		**295**	**23**	6	17	**31**	20	11

[1] Source: *Trip Generation*, 9th Edition, ITE, 2012, average rates.

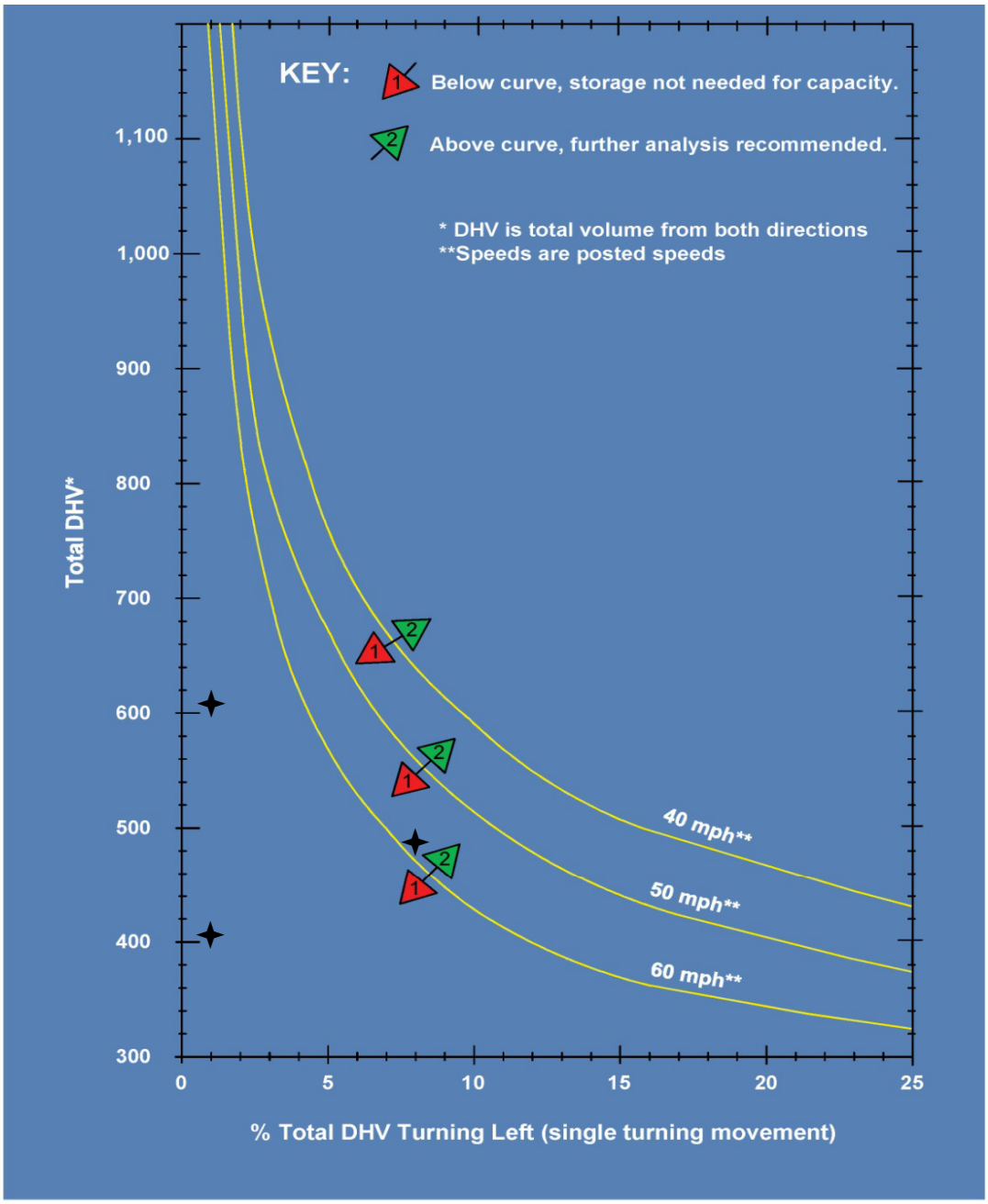


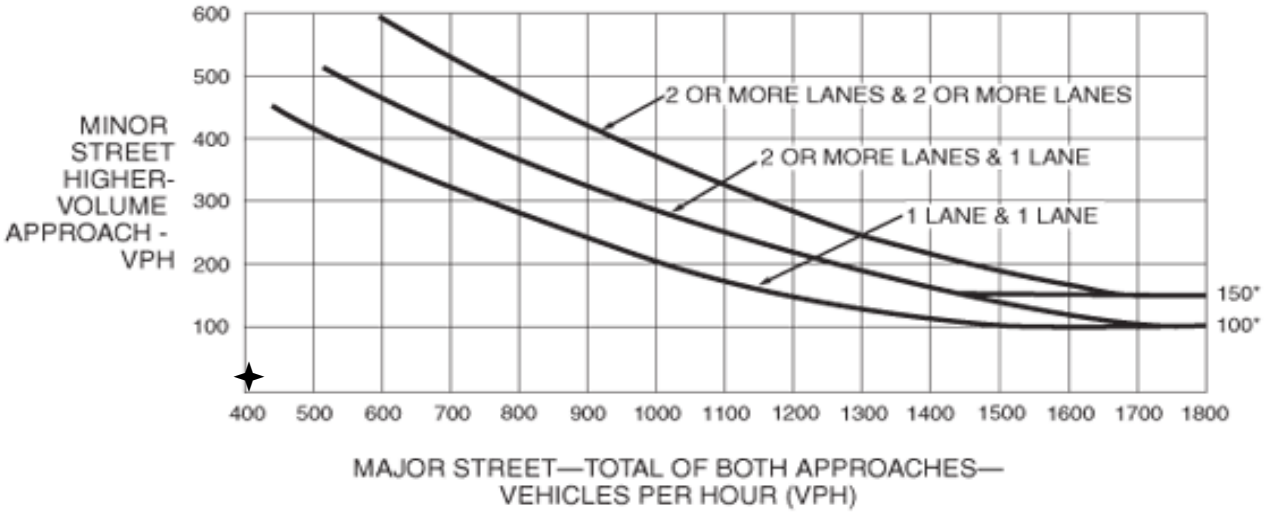
Exhibit 1310-7a. Left-turn Storage Guidelines-: Two-Lane, Unsignalized.

Storage requirements for critical left-turn movements at unsignalized intersections on 2-lane highways.

Intersection	Mov't	Analysis Period	Speed V (mph)	Left Turns in Advancing Volume (vph)	Advancing Volume V_A (vph)	Opposing Volume V_O (vph)	Total DHV	% Left Turns in DHV L	Storage Req'd (ft)
1. Mt. Solo Rd and Willow Grove Rd (SR432)	EB LT	2027 Total Traffic-AM Peak	50	38	300	189	489	8%	None
		2027 Total Traffic-PM Peak		8	196	411	607	1%	None
3. Site Access and Mt. Solo Rd	NB LT	2027 Total Traffic-AM Peak	20	2	198	211	409	1%	None
		2027 Total Traffic-PM Peak		9	135	63	198	5%	None

Source: WSDOT Design Guide, February 2019.

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.

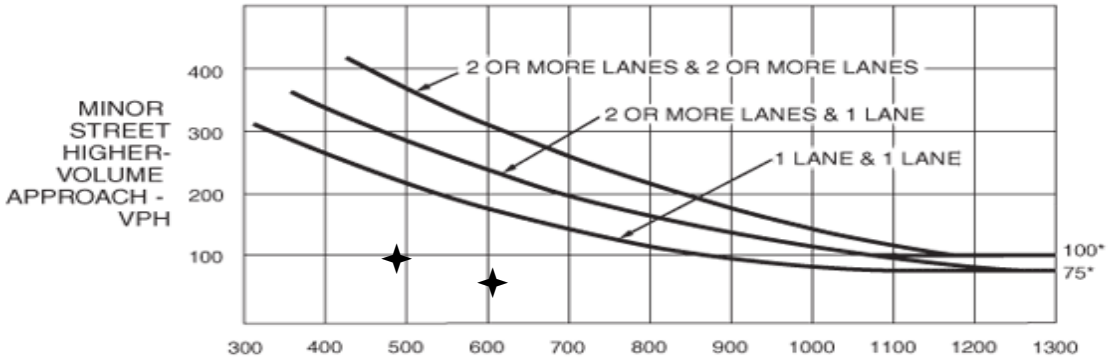
Peak hour volume warrant for signalization data.

Intersection	Analysis Period	Major Street Speed (mph)	Major Street		Minor Street High Volume Approach		Signal Warranted?
			Volume (vph)	Lanes (#)	Volume (vph)	Lanes (#)	
1. Willow Grove Conn Rd and Mt. Solo Rd	2027 Total Traffic - AM Peak Hour	50	489	1	98	1	No
	2027 Total Traffic - PM Peak Hour		607		54		No
2. Mt. Solo MS Drwy and Mt. Solo Road	2027 Total Traffic - AM Peak Hour	20	323	1	173	1	No
	2027 Total Traffic - PM Peak Hour		172		7		No
3. Site Access and Mt. Solo Rd	2027 Total Traffic - AM Peak Hour	20	409	1	28	1	No
	2027 Total Traffic - PM Peak Hour		198		19		No

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

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Table for Figure 4C-4

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)
1300	75	1300	75 or 100*	1300	100
1200	75	1200	80 or 100*	1200	100
1100	75	1100	100	1100	120
1000	80	1000	120	1000	150
900	100	900	140	900	175
800	120	800	160	800	225
700	145	700	200	700	260
600	170	600	245	600	315
500	220	500	280	500	370
400	260	400	340	400	Not available

* Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

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

MT SOLO RD @ NORTH ACCESS TO MT SOLO MIDDLE SCHOOL - *No Reported Crashes*

SR 004 (aka Ocean Beach Hwy, MP 55.21 - 55.33) @ SR 432 (aka Willow Grove Conn, MP 0.00 - 0.03) & COAL CREEK RD

SR 004 (aka Ocean Beach Hwy, MP 55.84 - 55.89) @ MT SOLO RD

SR 432 (aka Willow Grove Rd, MP 1.19 - 1.23) @ MT SOLO RD

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.

REPORT NUMBER	PRIMARY TRAFFICWAY	INTERSECTING TRAFFICWAY	MILEPOST	DATE	MOST SEVERE INJURY TYPE	# INJ	# FAT	# VEH	# PEDS	# BIKES	WEATHER	ROADWAY SURFACE CONDITION
EB04426	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.23	01/19/2021	Possible Injury	1	0	2	0	0	Clear or Partly Cloudy	Dry
ED85395	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.24	07/16/2023	No Apparent Injury	0	0	2	0	0	Clear or Partly Cloudy	Dry
EE28529	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.24	12/08/2023	No Apparent Injury	0	0	2	0	0	Overcast	Dry
E906813	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.24	03/16/2019	No Apparent Injury	0	0	1	0	0	Overcast	Dry
EB45897	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.24	07/02/2021	Died in Hospital	1	1	1	0	0	Overcast	Dry
EA06350	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.24	01/20/2020	No Apparent Injury	0	0	2	0	0	Raining	Wet
EC06506	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.24	12/28/2021	Suspected Minor Injury	1	0	2	0	0	Overcast	Snow/Slush
EC50034	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.24	05/13/2022	No Apparent Injury	0	0	2	0	0	Raining	Wet
ED63168	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.25	05/18/2023	Possible Injury	1	0	2	0	0	Clear or Partly Cloudy	Dry
ED16663	004 - Ocean Beach Hwy	Willow Grove Conn Rd	55.27	12/15/2022	No Apparent Injury	0	0	2	0	0	Clear	Ice
EE19739	004 - Ocean Beach Hwy	Mt. Solo Rd	55.87	11/07/2023	No Apparent Injury	0	0	1	1	0	Overcast	Dry
EE00121	004 - Ocean Beach Hwy	Mt. Solo Rd	55.87	09/06/2023	No Apparent Injury	0	0	2	0	0	Clear or Partly Cloudy	Dry
E994686	004 - Ocean Beach Hwy	Mt. Solo Rd	55.87	12/15/2019	No Apparent Injury	0	0	2	0	0	Clear or Partly Cloudy	Dry
E918241	004 - Ocean Beach Hwy	Mt. Solo Rd	55.87	04/25/2019	No Apparent Injury	0	0	2	0	0	Clear or Partly Cloudy	Dry
EB69349	004 - Ocean Beach Hwy	Mt. Solo Rd	55.87	09/16/2021	No Apparent Injury	0	0	2	0	0	Clear	Dry
EB50522	004 - Ocean Beach Hwy	Mt. Solo Rd	55.87	07/21/2021	No Apparent Injury	0	0	2	0	0	Clear or Partly Cloudy	Dry

REPORT NUMBER	LIGHTING CONDITION	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 COMPASS DIRECTION FROM	VEHICLE 1 COMPASS DIRECTION TO	VEHICLE 2 COMPASS DIRECTION FROM	VEHICLE 2 COMPASS DIRECTION TO
EB04426	Daylight	From same direction - both going straight - one stopped - rear-end	North	South	cle Stopped	cle Stopped
ED85395	Daylight	From same direction - both going straight - one stopped - rear-end	East	West	East	West
EE28529	Dusk	From same direction - both going straight - one stopped - rear-end	East	West	cle Stopped	cle Stopped
E906813	Dark-Street Lights On	Signal Pole	West	East		
EB45897	Daylight	Signal Pole	West	East		
EA06350	Daylight	From same direction - both going straight - both moving - rear-end	North	South	North	West
EC06506	Daylight	Entering at angle	South	North	East	West
EC50034	Daylight	From same direction - both going straight - one stopped - rear-end	West	East	West	cle Stopped
ED63168	Daylight	From same direction - both going straight - both moving - rear-end	East	West	East	West
ED16663	Daylight	From same direction - both going straight - both moving - sideswipe	West	East	West	East
EE19739	Dark-Street Lights On	Vehicle going straight hits pedestrian	East	West		
EE00121	Daylight	From same direction - both going straight - one stopped - rear-end	East	South	cle Stopped	cle Stopped
E994686	Daylight	From opposite direction - one left turn - one straight	East	South	West	East
E918241	Daylight	Entering at angle	East	South	West	East
EB69349	Daylight	Over Roadway Power Lines	West	East	East	West
EB50522	Daylight	Entering at angle	cle Stopped	East	West	East

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01/01/2019 - 12/31/2023

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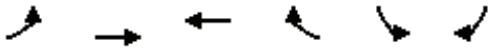
REPORT NUMBER	PRIMARY TRAFFICWAY	INTERSECTING TRAFFICWAY	MILEPOST	DATE	MOST SEVERE INJURY TYPE	# INJ	# FAT	# VEH	# PEDS	# BIKES	WEATHER	ROADWAY SURFACE CONDITION
EA41895	004 - Ocean Beach Hwy	Mt. Solo Rd	55.87	06/22/2020	Possible Injury	1	0	2	0	0	Clear	Dry
EB81908	004 - Ocean Beach Hwy	Mt. Solo Rd	55.87	10/22/2021	No Apparent Injury	0	0	2	0	0	Overcast	Dry
E886160	004 - Ocean Beach Hwy	Mt. Solo Rd	55.87	01/19/2019	Possible Injury	1	0	2	0	0	Clear or Partly Cloudy	Wet
EB21045	432 - Willow Grove Conn Rd	Mt. Solo Rd	1.21	04/10/2021	Suspected Serious Injury	4	0	2	0	0	Overcast	Dry
ED39441	432 - Willow Grove Conn Rd	Mt. Solo Rd	1.21	02/21/2023	Suspected Serious Injury	1	0	2	0	0	Raining	Wet
EB30556	432 - Willow Grove Conn Rd	Mt. Solo Rd	1.21	05/15/2021	No Apparent Injury	0	0	2	0	0	Clear or Partly Cloudy	Dry
ED24081	432 - Willow Grove Conn Rd	Mt. Solo Rd	1.21	01/06/2023	No Apparent Injury	0	0	2	0	0	Raining	Wet
EC63207	432 - Willow Grove Conn Rd	Mt. Solo Rd	1.21	07/06/2022	Suspected Minor Injury	2	0	2	0	0	Overcast	Dry
EA19270	432 - Willow Grove Conn Rd	Mt. Solo Rd	1.21	02/20/2020	No Apparent Injury	0	0	2	0	0	Clear or Partly Cloudy	Dry
E894221	432 - Willow Grove Conn Rd	Mt. Solo Rd	1.21	02/12/2019	No Apparent Injury	0	0	2	0	0	Clear or Partly Cloudy	Wet

REPORT NUMBER	LIGHTING CONDITION	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 COMPASS DIRECTION FROM	VEHICLE 1 COMPASS DIRECTION TO	VEHICLE 2 COMPASS DIRECTION FROM	VEHICLE 2 COMPASS DIRECTION TO
EA41895	Daylight	From opposite direction - one left turn - one straight	West	East	East	South
EB81908	Daylight	From opposite direction - one left turn - one straight	East	South	West	East
E886160	Daylight	From same direction - both going straight - one stopped - rear-end	West	East	cle Stopped	cle Stopped
EB21045	Daylight	Entering at angle	South	West	East	West
ED39441	Daylight	Entering at angle	Southeast	South	East	West
EB30556	Daylight	Entering at angle	Southeast	Northeast	cle Stopped	cle Stopped
ED24081	Dark-No Street Lights	Entering at angle	East	South	South	North
EC63207	Daylight	Entering at angle	North	East	East	West
EA19270	Daylight	Entering at angle	North	East	West	North
E894221	Daylight	Entering at angle	North	East	East	West



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	35	242	108	70	74	14
Future Volume (vph)	35	242	108	70	74	14
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Heavy Vehicles (%)	0%	0%	2%	2%	0%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 39.6%		ICU Level of Service A	
Analysis Period (min) 15			

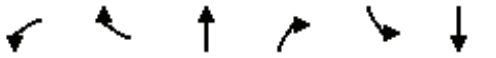
Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	35	242	108	70	74	14
Future Vol, veh/h	35	242	108	70	74	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	47	323	144	93	99	19

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	237	0	-	0	608	191
Stage 1	-	-	-	-	191	-
Stage 2	-	-	-	-	417	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1342	-	-	-	462	856
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	669	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1342	-	-	-	442	856
Mov Cap-2 Maneuver	-	-	-	-	442	-
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	669	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	14.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1342	-	-	-	479
HCM Lane V/C Ratio	0.035	-	-	-	0.245
HCM Control Delay (s)	7.8	0	-	-	14.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	39	134	54	58	147	49
Future Volume (vph)	39	134	54	58	147	49
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.62	0.62	0.62	0.62	0.62	0.62
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 25.1%		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	39	134	54	58	147	49
Future Vol, veh/h	39	134	54	58	147	49
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	60	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	62	62	62	62	62	62
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	63	216	87	94	237	79

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	689	136	0	0	182	0
Stage 1	135	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.2	-
Pot Cap-1 Maneuver	413	915	-	-	1405	-
Stage 1	894	-	-	-	-	-
Stage 2	577	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	342	913	-	-	1404	-
Mov Cap-2 Maneuver	342	-	-	-	-	-
Stage 1	893	-	-	-	-	-
Stage 2	479	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.9	0	6.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	342	913	1404	-
HCM Lane V/C Ratio	-	-	0.184	0.237	0.169	-
HCM Control Delay (s)	-	-	17.9	10.2	8.1	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.9	0.6	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1	0	0	188	196	0
Future Volume (vph)	1	0	0	188	196	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization	20.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	0	0	188	196	0
Future Vol, veh/h	1	0	0	188	196	0
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, %	0	0	1	1	1	1
Mvmt Flow	1	0	0	209	218	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	427	218	218	0	-	0
Stage 1	218	-	-	-	-	-
Stage 2	209	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.11	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.209	-	-	-
Pot Cap-1 Maneuver	588	827	1358	-	-	-
Stage 1	823	-	-	-	-	-
Stage 2	831	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	588	827	1358	-	-	-
Mov Cap-2 Maneuver	588	-	-	-	-	-
Stage 1	823	-	-	-	-	-
Stage 2	831	-	-	-	-	-

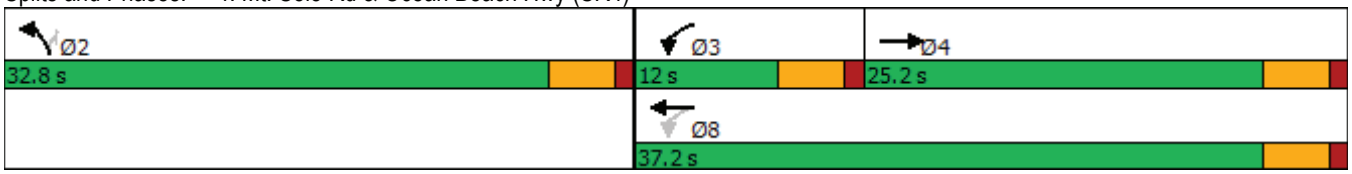
Approach	EB	NB	SB
HCM Control Delay, s	11.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1358	-	588	-	-
HCM Lane V/C Ratio	-	-	0.002	-	-
HCM Control Delay (s)	0	-	11.1	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	361	58	138	123	55	199
Future Volume (vph)	361	58	138	123	55	199
Confl. Peds. (#/hr)		1	2		1	2
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases			8			2
Detector Phase	4		3	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	25.2		9.5	25.2	32.1	32.1
Total Split (s)	25.2		12.0	37.2	32.8	32.8
Total Split (%)	36.0%		17.1%	53.1%	46.9%	46.9%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None		None	None	Max	Max
Act Effct Green (s)	14.3		26.1	26.1	28.4	28.4
Actuated g/C Ratio	0.22		0.41	0.41	0.45	0.45
v/c Ratio	0.62		0.47	0.10	0.08	0.28
Control Delay	24.4		16.5	11.3	11.9	3.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	24.4		16.5	11.3	11.9	3.1
LOS	C		B	B	B	A
Approach Delay	24.4			14.1	5.0	
Approach LOS	C			B	A	

Intersection Summary			
Cycle Length: 70			
Actuated Cycle Length: 63.6			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.62			
Intersection Signal Delay: 16.2		Intersection LOS: B	
Intersection Capacity Utilization 53.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 4: Mt. Solo Rd & Ocean Beach Hwy (SR4)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	361	58	138	123	55	199
Future Volume (veh/h)	361	58	138	123	55	199
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	435	70	166	148	66	240
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	632	101	360	1350	860	765
Arrive On Green	0.20	0.20	0.10	0.37	0.48	0.48
Sat Flow, veh/h	3211	498	1810	3705	1810	1610
Grp Volume(v), veh/h	251	254	166	148	66	240
Grp Sat Flow(s),veh/h/ln	1805	1809	1810	1805	1810	1610
Q Serve(g_s), s	7.7	7.8	4.0	1.6	1.2	5.5
Cycle Q Clear(g_c), s	7.7	7.8	4.0	1.6	1.2	5.5
Prop In Lane		0.28	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	366	367	360	1350	860	765
V/C Ratio(X)	0.68	0.69	0.46	0.11	0.08	0.31
Avail Cap(c_a), veh/h	627	628	415	1981	860	765
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	22.0	22.0	15.6	12.2	8.5	9.6
Incr Delay (d2), s/veh	2.3	2.3	0.9	0.0	0.2	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	3.2	1.5	0.5	0.5	1.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.3	24.4	16.5	12.2	8.7	10.7
LnGrp LOS	C	C	B	B	A	B
Approach Vol, veh/h	505			314	306	
Approach Delay, s/veh	24.3			14.5	10.3	
Approach LOS	C			B	B	

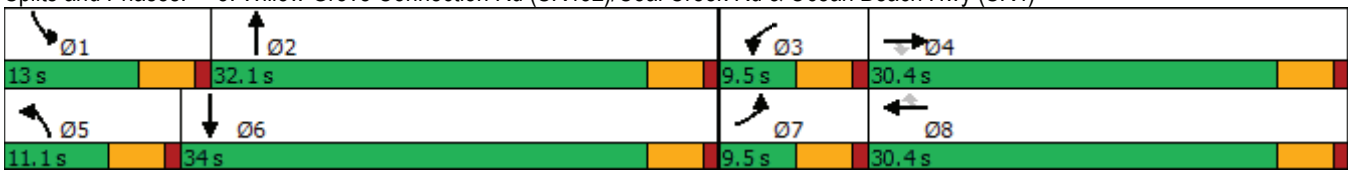
Timer - Assigned Phs		2	3	4		8
Phs Duration (G+Y+Rc), s		32.8	10.2	16.6		26.8
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s		28.3	7.5	20.7		32.7
Max Q Clear Time (g_c+I1), s		7.5	6.0	9.8		3.6
Green Ext Time (p_c), s		1.0	0.1	2.1		0.8

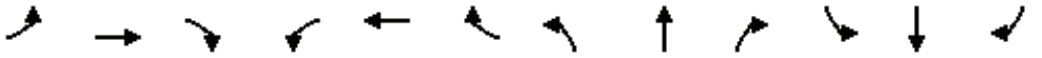
Intersection Summary	
HCM 6th Ctrl Delay	17.8
HCM 6th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	143	96	17	61	50	42	31	16	143	108	14
Future Volume (vph)	8	143	96	17	61	50	42	31	16	143	108	14
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	3%	3%	3%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			Free
Detector Phase	7	4	4	3	8	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		5.0	5.0	
Minimum Split (s)	9.5	30.4	30.4	9.5	26.4	26.4	9.5	31.5		9.5	22.9	
Total Split (s)	9.5	30.4	30.4	9.5	30.4	30.4	11.1	32.1		13.0	34.0	
Total Split (%)	11.2%	35.8%	35.8%	11.2%	35.8%	35.8%	13.1%	37.8%		15.3%	40.0%	
Yellow Time (s)	3.5	3.5	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		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	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		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	Max		None	Max	
Act Effct Green (s)	5.1	11.8	11.8	5.1	11.8	11.8	6.4	28.1	63.7	8.6	34.9	63.7
Actuated g/C Ratio	0.08	0.19	0.19	0.08	0.19	0.19	0.10	0.44	1.00	0.14	0.55	1.00
v/c Ratio	0.06	0.46	0.26	0.13	0.19	0.14	0.27	0.04	0.01	0.65	0.12	0.01
Control Delay	32.6	27.5	4.7	33.5	23.2	0.7	33.7	13.6	0.0	43.6	11.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.6	27.5	4.7	33.5	23.2	0.7	33.7	13.6	0.0	43.6	11.8	0.0
LOS	C	C	A	C	C	A	C	B	A	D	B	A
Approach Delay		18.8			15.7			20.7			28.3	
Approach LOS		B			B			C			C	

Intersection Summary	
Cycle Length: 85	
Actuated Cycle Length: 63.7	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 22.0	Intersection LOS: C
Intersection Capacity Utilization 36.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Willow Grove Connection Rd (SR432)/Coal Creek Rd & Ocean Beach Hwy (SR4)





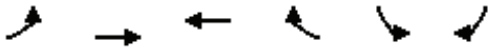
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	143	96	17	61	50	42	31	16	143	108	14
Future Volume (veh/h)	8	143	96	17	61	50	42	31	16	143	108	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		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	1885	1885	1885	1900	1900	1900	1856	1856	1856	1900	1900	1900
Adj Flow Rate, veh/h	9	159	107	19	68	56	47	34	0	159	120	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1	0	0	0	3	3	3	0	0	0
Cap, veh/h	21	244	207	41	266	226	79	828		201	974	
Arrive On Green	0.01	0.13	0.13	0.02	0.14	0.14	0.04	0.45	0.00	0.11	0.51	0.00
Sat Flow, veh/h	1795	1885	1598	1810	1900	1610	1767	1856	1572	1810	1900	1610
Grp Volume(v), veh/h	9	159	107	19	68	56	47	34	0	159	120	0
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	1810	1900	1610	1767	1856	1572	1810	1900	1610
Q Serve(g_s), s	0.3	5.0	3.9	0.6	2.0	1.9	1.6	0.6	0.0	5.3	2.0	0.0
Cycle Q Clear(g_c), s	0.3	5.0	3.9	0.6	2.0	1.9	1.6	0.6	0.0	5.3	2.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	21	244	207	41	266	226	79	828		201	974	
V/C Ratio(X)	0.43	0.65	0.52	0.47	0.26	0.25	0.59	0.04		0.79	0.12	
Avail Cap(c_a), veh/h	145	789	669	146	796	674	189	828		249	974	
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	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.4	25.6	25.1	29.9	23.7	23.7	29.0	9.7	0.0	26.8	7.8	0.0
Incr Delay (d2), s/veh	13.6	2.9	2.0	8.1	0.5	0.6	6.9	0.1	0.0	13.0	0.3	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	0.2	2.2	1.4	0.3	0.8	0.7	0.8	0.2	0.0	2.8	0.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.9	28.5	27.1	37.9	24.2	24.3	35.9	9.8	0.0	39.8	8.1	0.0
LnGrp LOS	D	C	C	D	C	C	D	A		D	A	
Approach Vol, veh/h		275			143			81			279	
Approach Delay, s/veh		28.5			26.1			24.9			26.2	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.4	32.1	5.9	12.5	7.3	36.2	5.2	13.2
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	8.5	27.6	5.0	25.9	6.6	29.5	5.0	25.9
Max Q Clear Time (g_c+I1), s	7.3	2.6	2.6	7.0	3.6	4.0	2.3	4.0
Green Ext Time (p_c), s	0.0	0.1	0.0	1.0	0.0	0.6	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	26.8
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	6	175	296	81	41	4
Future Volume (vph)	6	175	296	81	41	4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 30.5%		ICU Level of Service A	
Analysis Period (min) 15			

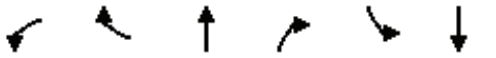
Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	6	175	296	81	41	4
Future Vol, veh/h	6	175	296	81	41	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	7	199	336	92	47	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	428	0	-	0	595	382
Stage 1	-	-	-	-	382	-
Stage 2	-	-	-	-	213	-
Critical Hdwy	4.1	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.2	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1142	-	-	-	469	667
Stage 1	-	-	-	-	692	-
Stage 2	-	-	-	-	825	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1142	-	-	-	466	667
Mov Cap-2 Maneuver	-	-	-	-	466	-
Stage 1	-	-	-	-	687	-
Stage 2	-	-	-	-	825	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	13.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1142	-	-	-	479
HCM Lane V/C Ratio	0.006	-	-	-	0.107
HCM Control Delay (s)	8.2	0	-	-	13.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1	6	114	0	1	35
Future Volume (vph)	1	6	114	0	1	35
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization	16.0%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	6	114	0	1	35
Future Vol, veh/h	1	6	114	0	1	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	60	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1	7	128	0	1	39

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	169	128	0	0	128	0
Stage 1	128	-	-	-	-	-
Stage 2	41	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	826	927	-	-	1470	-
Stage 1	903	-	-	-	-	-
Stage 2	987	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	825	927	-	-	1470	-
Mov Cap-2 Maneuver	825	-	-	-	-	-
Stage 1	903	-	-	-	-	-
Stage 2	986	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	825	927	1470	-
HCM Lane V/C Ratio	-	-	0.001	0.007	0.001	-
HCM Control Delay (s)	-	-	9.4	8.9	7.5	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	1	120	36	0
Future Volume (vph)	0	0	1	120	36	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization	10.4%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	1	120	36	0
Future Vol, veh/h	0	0	1	120	36	0
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, %	0	0	0	0	0	0
Mvmt Flow	0	0	1	133	40	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	175	40	40	0	-	0
Stage 1	40	-	-	-	-	-
Stage 2	135	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	819	1037	1583	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	896	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	818	1037	1583	-	-	-
Mov Cap-2 Maneuver	818	-	-	-	-	-
Stage 1	987	-	-	-	-	-
Stage 2	896	-	-	-	-	-

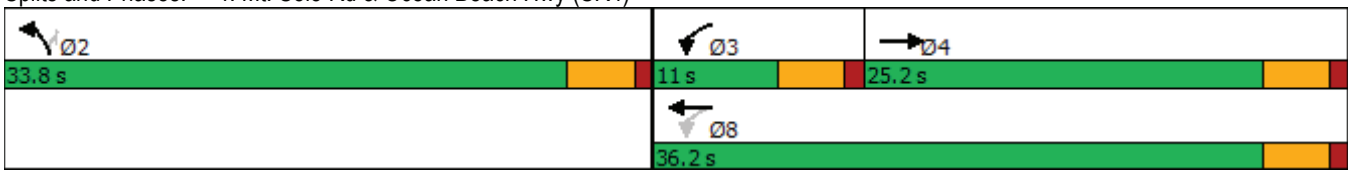
Approach	EB	NB	SB
HCM Control Delay, s	0	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1583	-	-	-	-
HCM Lane V/C Ratio	0.001	-	-	-	-
HCM Control Delay (s)	7.3	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	258	20	100	395	84	84
Future Volume (vph)	258	20	100	395	84	84
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases			8			2
Detector Phase	4		3	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	25.2		9.5	25.2	32.1	32.1
Total Split (s)	25.2		11.0	36.2	33.8	33.8
Total Split (%)	36.0%		15.7%	51.7%	48.3%	48.3%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None		None	None	Max	Max
Act Effct Green (s)	11.7		20.1	20.1	29.8	29.8
Actuated g/C Ratio	0.20		0.34	0.34	0.50	0.50
v/c Ratio	0.44		0.30	0.36	0.10	0.11
Control Delay	22.3		14.7	14.7	10.4	3.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	22.3		14.7	14.7	10.4	3.4
LOS	C		B	B	B	A
Approach Delay	22.3			14.7	6.9	
Approach LOS	C			B	A	

Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 59.1	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.44	
Intersection Signal Delay: 15.6	Intersection LOS: B
Intersection Capacity Utilization 29.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: Mt. Solo Rd & Ocean Beach Hwy (SR4)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	258	20	100	395	84	84
Future Volume (veh/h)	258	20	100	395	84	84
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	290	22	112	444	94	94
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	482	36	334	1079	970	864
Arrive On Green	0.14	0.14	0.07	0.30	0.54	0.54
Sat Flow, veh/h	3497	257	1810	3705	1810	1610
Grp Volume(v), veh/h	153	159	112	444	94	94
Grp Sat Flow(s),veh/h/ln	1805	1854	1810	1805	1810	1610
Q Serve(g_s), s	4.3	4.4	2.7	5.4	1.4	1.6
Cycle Q Clear(g_c), s	4.3	4.4	2.7	5.4	1.4	1.6
Prop In Lane		0.14	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	256	263	334	1079	970	864
V/C Ratio(X)	0.60	0.60	0.34	0.41	0.10	0.11
Avail Cap(c_a), veh/h	684	702	414	2095	970	864
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	22.0	22.0	16.7	15.3	6.2	6.2
Incr Delay (d2), s/veh	2.2	2.2	0.6	0.3	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	1.8	1.0	1.9	0.5	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.2	24.2	17.2	15.6	6.4	6.5
LnGrp LOS	C	C	B	B	A	A
Approach Vol, veh/h	312			556	188	
Approach Delay, s/veh	24.2			15.9	6.4	
Approach LOS	C			B	A	

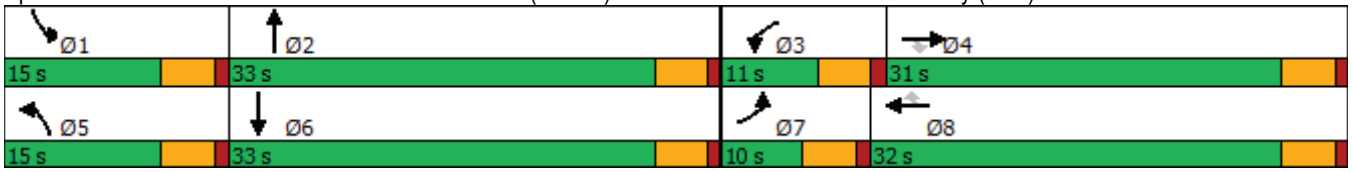
Timer - Assigned Phs		2	3	4		8
Phs Duration (G+Y+Rc), s		33.8	8.6	12.2		20.8
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s		29.3	6.5	20.7		31.7
Max Q Clear Time (g_c+I1), s		3.6	4.7	6.4		7.4
Green Ext Time (p_c), s		0.6	0.0	1.4		2.8

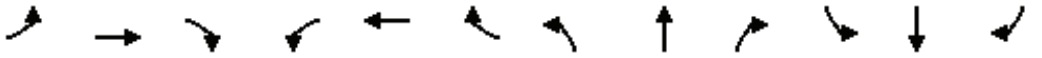
Intersection Summary	
HCM 6th Ctrl Delay	16.7
HCM 6th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	22	109	77	30	152	136	91	139	37	79	60	17
Future Volume (vph)	22	109	77	30	152	136	91	139	37	79	60	17
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%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			Free
Detector Phase	7	4	4	3	8	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		5.0	5.0	
Minimum Split (s)	9.5	30.4	30.4	9.5	26.4	26.4	9.5	31.5		9.5	22.9	
Total Split (s)	10.0	31.0	31.0	11.0	32.0	32.0	15.0	33.0		15.0	33.0	
Total Split (%)	11.1%	34.4%	34.4%	12.2%	35.6%	35.6%	16.7%	36.7%		16.7%	36.7%	
Yellow Time (s)	3.5	3.5	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		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	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		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	Max		None	Max	
Act Effct Green (s)	5.7	11.6	11.6	6.4	12.0	12.0	8.7	30.6	65.5	8.5	30.3	65.5
Actuated g/C Ratio	0.09	0.18	0.18	0.10	0.18	0.18	0.13	0.47	1.00	0.13	0.46	1.00
v/c Ratio	0.15	0.35	0.21	0.19	0.48	0.36	0.42	0.17	0.03	0.37	0.07	0.01
Control Delay	36.2	28.7	3.3	35.6	30.6	7.7	35.5	15.7	0.0	34.7	15.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.2	28.7	3.3	35.6	30.6	7.7	35.5	15.7	0.0	34.7	15.5	0.0
LOS	D	C	A	D	C	A	D	B	A	C	B	A
Approach Delay		20.0			21.3			20.3			23.6	
Approach LOS		C			C			C			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 65.5	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 21.1	Intersection LOS: C
Intersection Capacity Utilization 38.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Willow Grove Connection Rd (SR432)/Coal Creek Rd & Ocean Beach Hwy (SR4)





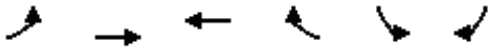
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	109	77	30	152	136	91	139	37	79	60	17
Future Volume (veh/h)	22	109	77	30	152	136	91	139	37	79	60	17
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		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	1885	1885	1885	1900	1900	1900
Adj Flow Rate, veh/h	24	118	84	33	165	148	99	151	0	86	65	0
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	1	1	1	1	1	1	0	0	0
Cap, veh/h	50	253	214	63	265	225	129	895		114	885	
Arrive On Green	0.03	0.13	0.13	0.04	0.14	0.14	0.07	0.47	0.00	0.06	0.47	0.00
Sat Flow, veh/h	1810	1900	1610	1795	1885	1598	1795	1885	1598	1810	1900	1610
Grp Volume(v), veh/h	24	118	84	33	165	148	99	151	0	86	65	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1610	1795	1885	1598	1795	1885	1598	1810	1900	1610
Q Serve(g_s), s	0.8	3.5	2.9	1.1	5.0	5.4	3.3	2.8	0.0	2.9	1.2	0.0
Cycle Q Clear(g_c), s	0.8	3.5	2.9	1.1	5.0	5.4	3.3	2.8	0.0	2.9	1.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	50	253	214	63	265	225	129	895		114	885	
V/C Ratio(X)	0.48	0.47	0.39	0.52	0.62	0.66	0.77	0.17		0.76	0.07	
Avail Cap(c_a), veh/h	163	823	698	191	847	718	308	895		311	885	
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	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.3	24.5	24.3	29.0	24.8	24.9	27.9	9.2	0.0	28.2	9.0	0.0
Incr Delay (d2), s/veh	7.2	1.3	1.2	6.6	2.4	3.3	9.2	0.4	0.0	9.8	0.2	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	1.5	1.1	0.6	2.2	2.0	1.6	0.9	0.0	1.5	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.5	25.9	25.4	35.6	27.1	28.2	37.1	9.6	0.0	38.0	9.2	0.0
LnGrp LOS	D	C	C	D	C	C	D	A		D	A	
Approach Vol, veh/h		226			346			250			151	
Approach Delay, s/veh		26.8			28.4			20.5			25.6	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.3	33.6	6.6	12.6	8.9	33.0	6.2	13.1
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	10.5	28.5	6.5	26.5	10.5	28.5	5.5	27.5
Max Q Clear Time (g_c+I1), s	4.9	4.8	3.1	5.5	5.3	3.2	2.8	7.4
Green Ext Time (p_c), s	0.1	0.6	0.0	0.8	0.1	0.3	0.0	1.2

Intersection Summary	
HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	38	262	115	72	76	15
Future Volume (vph)	38	262	115	72	76	15
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Heavy Vehicles (%)	0%	0%	2%	2%	0%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 41.5%		ICU Level of Service A	
Analysis Period (min) 15			

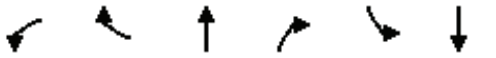
Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	262	115	72	76	15
Future Vol, veh/h	38	262	115	72	76	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	51	349	153	96	101	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	249	0	-	0	652	201
Stage 1	-	-	-	-	201	-
Stage 2	-	-	-	-	451	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1328	-	-	-	436	845
Stage 1	-	-	-	-	838	-
Stage 2	-	-	-	-	646	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1328	-	-	-	415	845
Mov Cap-2 Maneuver	-	-	-	-	415	-
Stage 1	-	-	-	-	798	-
Stage 2	-	-	-	-	646	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	15.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1328	-	-	-	453
HCM Lane V/C Ratio	0.038	-	-	-	0.268
HCM Control Delay (s)	7.8	0	-	-	15.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.1



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	39	134	58	58	147	51
Future Volume (vph)	39	134	58	58	147	51
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.62	0.62	0.62	0.62	0.62	0.62
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 25.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	6.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	39	134	58	58	147	51
Future Vol, veh/h	39	134	58	58	147	51
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	60	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	62	62	62	62	62	62
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	63	216	94	94	237	82

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	699	143	0	0	189	0
Stage 1	142	-	-	-	-	-
Stage 2	557	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.2	-
Pot Cap-1 Maneuver	408	907	-	-	1397	-
Stage 1	887	-	-	-	-	-
Stage 2	576	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	338	905	-	-	1396	-
Mov Cap-2 Maneuver	338	-	-	-	-	-
Stage 1	886	-	-	-	-	-
Stage 2	478	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	0	6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	338	905	1396	-
HCM Lane V/C Ratio	-	-	0.186	0.239	0.17	-
HCM Control Delay (s)	-	-	18.1	10.2	8.1	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.9	0.6	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1	0	0	196	203	0
Future Volume (vph)	1	0	0	196	203	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization	20.7%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	0	0	196	203	0
Future Vol, veh/h	1	0	0	196	203	0
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, %	0	0	1	1	1	1
Mvmt Flow	1	0	0	218	226	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	444	226	226	0	-	0
Stage 1	226	-	-	-	-	-
Stage 2	218	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.11	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.209	-	-	-
Pot Cap-1 Maneuver	575	818	1348	-	-	-
Stage 1	816	-	-	-	-	-
Stage 2	823	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	575	818	1348	-	-	-
Mov Cap-2 Maneuver	575	-	-	-	-	-
Stage 1	816	-	-	-	-	-
Stage 2	823	-	-	-	-	-

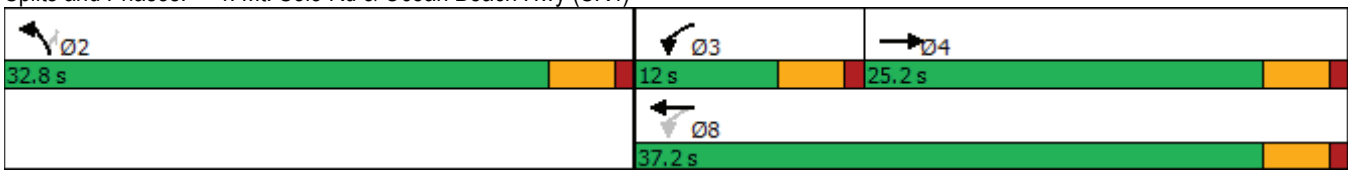
Approach	EB	NB	SB
HCM Control Delay, s	11.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1348	-	575	-	-
HCM Lane V/C Ratio	-	-	0.002	-	-
HCM Control Delay (s)	0	-	11.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	372	60	143	127	57	207
Future Volume (vph)	372	60	143	127	57	207
Confl. Peds. (#/hr)		1	2		1	2
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases			8			2
Detector Phase	4		3	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	25.2		9.5	25.2	32.1	32.1
Total Split (s)	25.2		12.0	37.2	32.8	32.8
Total Split (%)	36.0%		17.1%	53.1%	46.9%	46.9%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None		None	None	Max	Max
Act Effct Green (s)	14.5		26.4	26.4	28.4	28.4
Actuated g/C Ratio	0.23		0.41	0.41	0.45	0.45
v/c Ratio	0.63		0.50	0.10	0.09	0.29
Control Delay	24.6		17.0	11.3	12.0	3.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	24.6		17.0	11.3	12.0	3.1
LOS	C		B	B	B	A
Approach Delay	24.6			14.3	5.0	
Approach LOS	C			B	A	

Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 63.8	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 16.4	Intersection LOS: B
Intersection Capacity Utilization 54.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: Mt. Solo Rd & Ocean Beach Hwy (SR4)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	372	60	143	127	57	207
Future Volume (veh/h)	372	60	143	127	57	207
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	448	72	172	153	69	249
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	644	103	362	1370	852	758
Arrive On Green	0.21	0.21	0.10	0.38	0.47	0.47
Sat Flow, veh/h	3211	498	1810	3705	1810	1610
Grp Volume(v), veh/h	258	262	172	153	69	249
Grp Sat Flow(s),veh/h/ln	1805	1809	1810	1805	1810	1610
Q Serve(g_s), s	8.0	8.1	4.2	1.7	1.3	5.8
Cycle Q Clear(g_c), s	8.0	8.1	4.2	1.7	1.3	5.8
Prop In Lane		0.28	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	373	374	362	1370	852	758
V/C Ratio(X)	0.69	0.70	0.48	0.11	0.08	0.33
Avail Cap(c_a), veh/h	622	623	410	1964	852	758
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	22.1	22.1	15.6	12.1	8.7	10.0
Incr Delay (d2), s/veh	2.3	2.4	1.0	0.0	0.2	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	3.3	1.6	0.6	0.5	1.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.4	24.5	16.6	12.1	8.9	11.1
LnGrp LOS	C	C	B	B	A	B
Approach Vol, veh/h	520			325	318	
Approach Delay, s/veh	24.4			14.5	10.6	
Approach LOS	C			B	B	

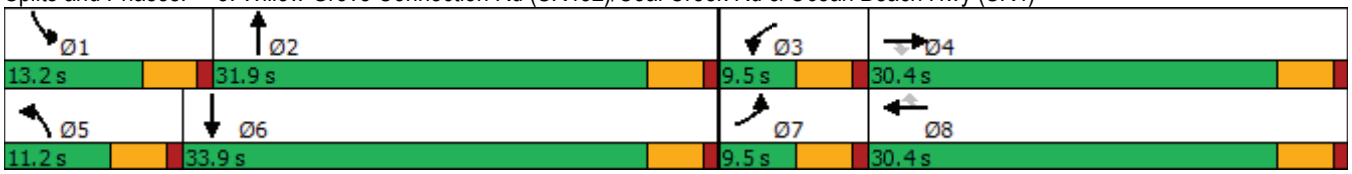
Timer - Assigned Phs		2	3	4		8
Phs Duration (G+Y+Rc), s		32.8	10.4	16.9		27.3
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s		28.3	7.5	20.7		32.7
Max Q Clear Time (g_c+I1), s		7.8	6.2	10.1		3.7
Green Ext Time (p_c), s		1.0	0.1	2.1		0.9

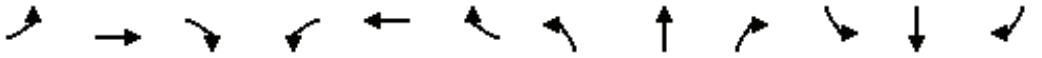
Intersection Summary	
HCM 6th Ctrl Delay	17.9
HCM 6th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	147	100	18	63	52	45	32	16	147	111	14
Future Volume (vph)	8	147	100	18	63	52	45	32	16	147	111	14
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	3%	3%	3%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			Free
Detector Phase	7	4	4	3	8	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		5.0	5.0	
Minimum Split (s)	9.5	30.4	30.4	9.5	26.4	26.4	9.5	31.5		9.5	22.9	
Total Split (s)	9.5	30.4	30.4	9.5	30.4	30.4	11.2	31.9		13.2	33.9	
Total Split (%)	11.2%	35.8%	35.8%	11.2%	35.8%	35.8%	13.2%	37.5%		15.5%	39.9%	
Yellow Time (s)	3.5	3.5	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		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	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		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	Max		None	Max	
Act Effct Green (s)	5.1	11.9	11.9	5.1	11.9	11.9	6.5	27.9	63.8	8.8	34.9	63.8
Actuated g/C Ratio	0.08	0.19	0.19	0.08	0.19	0.19	0.10	0.44	1.00	0.14	0.55	1.00
v/c Ratio	0.06	0.47	0.27	0.14	0.20	0.14	0.28	0.04	0.01	0.65	0.12	0.01
Control Delay	32.6	27.7	5.1	33.6	23.2	0.7	33.9	13.8	0.0	43.4	11.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.6	27.7	5.1	33.6	23.2	0.7	33.9	13.8	0.0	43.4	11.9	0.0
LOS	C	C	A	C	C	A	C	B	A	D	B	A
Approach Delay		19.0			15.8			21.1			28.3	
Approach LOS		B			B			C			C	

Intersection Summary	
Cycle Length: 85	
Actuated Cycle Length: 63.8	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 22.0	Intersection LOS: C
Intersection Capacity Utilization 37.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Willow Grove Connection Rd (SR432)/Coal Creek Rd & Ocean Beach Hwy (SR4)





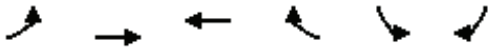
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	147	100	18	63	52	45	32	16	147	111	14
Future Volume (veh/h)	8	147	100	18	63	52	45	32	16	147	111	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		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	1885	1885	1885	1900	1900	1900	1856	1856	1856	1900	1900	1900
Adj Flow Rate, veh/h	9	163	111	20	70	58	50	36	0	163	123	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1	0	0	0	3	3	3	0	0	0
Cap, veh/h	21	248	210	43	273	231	82	819		205	966	
Arrive On Green	0.01	0.13	0.13	0.02	0.14	0.14	0.05	0.44	0.00	0.11	0.51	0.00
Sat Flow, veh/h	1795	1885	1598	1810	1900	1610	1767	1856	1572	1810	1900	1610
Grp Volume(v), veh/h	9	163	111	20	70	58	50	36	0	163	123	0
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	1810	1900	1610	1767	1856	1572	1810	1900	1610
Q Serve(g_s), s	0.3	5.1	4.0	0.7	2.0	2.0	1.7	0.7	0.0	5.4	2.1	0.0
Cycle Q Clear(g_c), s	0.3	5.1	4.0	0.7	2.0	2.0	1.7	0.7	0.0	5.4	2.1	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	21	248	210	43	273	231	82	819		205	966	
V/C Ratio(X)	0.43	0.66	0.53	0.47	0.26	0.25	0.61	0.04		0.79	0.13	
Avail Cap(c_a), veh/h	145	787	667	146	793	672	191	819		254	966	
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	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.5	25.6	25.2	29.9	23.6	23.6	29.0	9.9	0.0	26.8	8.0	0.0
Incr Delay (d2), s/veh	13.6	2.9	2.0	7.9	0.5	0.6	7.1	0.1	0.0	13.0	0.3	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	0.2	2.3	1.5	0.4	0.9	0.7	0.8	0.2	0.0	2.9	0.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.0	28.6	27.2	37.8	24.1	24.2	36.1	10.0	0.0	39.8	8.3	0.0
LnGrp LOS	D	C	C	D	C	C	D	A		D	A	
Approach Vol, veh/h		283			148			86			286	
Approach Delay, s/veh		28.5			26.0			25.2			26.3	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.5	31.9	6.0	12.7	7.4	36.1	5.2	13.4
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	8.7	27.4	5.0	25.9	6.7	29.4	5.0	25.9
Max Q Clear Time (g_c+I1), s	7.4	2.7	2.7	7.1	3.7	4.1	2.3	4.0
Green Ext Time (p_c), s	0.1	0.1	0.0	1.1	0.0	0.6	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	26.9
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	8	188	320	83	42	7
Future Volume (vph)	8	188	320	83	42	7
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

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

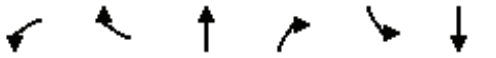
Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	188	320	83	42	7
Future Vol, veh/h	8	188	320	83	42	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	9	214	364	94	48	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	458	0	-	0	643	411
Stage 1	-	-	-	-	411	-
Stage 2	-	-	-	-	232	-
Critical Hdwy	4.1	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.2	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1114	-	-	-	439	643
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	809	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1114	-	-	-	435	643
Mov Cap-2 Maneuver	-	-	-	-	435	-
Stage 1	-	-	-	-	665	-
Stage 2	-	-	-	-	809	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	14
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1114	-	-	-	456
HCM Lane V/C Ratio	0.008	-	-	-	0.122
HCM Control Delay (s)	8.3	0	-	-	14
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1	6	119	0	1	39
Future Volume (vph)	1	6	119	0	1	39
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization	16.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	6	119	0	1	39
Future Vol, veh/h	1	6	119	0	1	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	60	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1	7	134	0	1	44

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	180	134	0	0	134	0
Stage 1	134	-	-	-	-	-
Stage 2	46	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	814	920	-	-	1463	-
Stage 1	897	-	-	-	-	-
Stage 2	982	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	813	920	-	-	1463	-
Mov Cap-2 Maneuver	813	-	-	-	-	-
Stage 1	897	-	-	-	-	-
Stage 2	981	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	813	920	1463	-
HCM Lane V/C Ratio	-	-	0.001	0.007	0.001	-
HCM Control Delay (s)	-	-	9.4	8.9	7.5	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	1	126	40	0
Future Volume (vph)	0	0	1	126	40	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization	10.8%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	1	126	40	0
Future Vol, veh/h	0	0	1	126	40	0
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, %	0	0	0	0	0	0
Mvmt Flow	0	0	1	140	44	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	186	44	44	0	-	0
Stage 1	44	-	-	-	-	-
Stage 2	142	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	808	1032	1577	-	-	-
Stage 1	984	-	-	-	-	-
Stage 2	890	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	807	1032	1577	-	-	-
Mov Cap-2 Maneuver	807	-	-	-	-	-
Stage 1	983	-	-	-	-	-
Stage 2	890	-	-	-	-	-

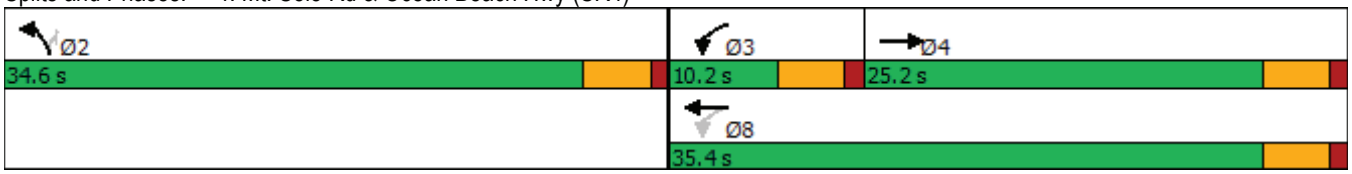
Approach	EB	NB	SB
HCM Control Delay, s	0	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1577	-	-	-	-
HCM Lane V/C Ratio	0.001	-	-	-	-
HCM Control Delay (s)	7.3	0	0	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	266	21	106	407	87	89
Future Volume (vph)	266	21	106	407	87	89
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases			8			2
Detector Phase	4		3	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	25.2		9.5	25.2	32.1	32.1
Total Split (s)	25.2		10.2	35.4	34.6	34.6
Total Split (%)	36.0%		14.6%	50.6%	49.4%	49.4%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None		None	None	Max	Max
Act Effct Green (s)	11.9		19.7	19.7	30.6	30.6
Actuated g/C Ratio	0.20		0.33	0.33	0.52	0.52
v/c Ratio	0.45		0.34	0.38	0.11	0.11
Control Delay	22.4		15.9	15.4	10.0	3.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	22.4		15.9	15.4	10.0	3.2
LOS	C		B	B	B	A
Approach Delay	22.4			15.5	6.6	
Approach LOS	C			B	A	

Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 59.4	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.45	
Intersection Signal Delay: 15.9	Intersection LOS: B
Intersection Capacity Utilization 30.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: Mt. Solo Rd & Ocean Beach Hwy (SR4)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	266	21	106	407	87	89
Future Volume (veh/h)	266	21	106	407	87	89
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	299	24	119	457	98	100
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	488	39	331	1084	975	868
Arrive On Green	0.14	0.14	0.08	0.30	0.54	0.54
Sat Flow, veh/h	3481	270	1810	3705	1810	1610
Grp Volume(v), veh/h	159	164	119	457	98	100
Grp Sat Flow(s),veh/h/ln	1805	1851	1810	1805	1810	1610
Q Serve(g_s), s	4.6	4.7	2.9	5.7	1.5	1.7
Cycle Q Clear(g_c), s	4.6	4.7	2.9	5.7	1.5	1.7
Prop In Lane		0.15	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	260	267	331	1084	975	868
V/C Ratio(X)	0.61	0.62	0.36	0.42	0.10	0.12
Avail Cap(c_a), veh/h	669	686	379	1997	975	868
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	22.4	22.5	17.0	15.7	6.3	6.3
Incr Delay (d2), s/veh	2.3	2.3	0.7	0.3	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	2.0	1.1	2.0	0.5	0.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.7	24.8	17.7	15.9	6.5	6.6
LnGrp LOS	C	C	B	B	A	A
Approach Vol, veh/h	323			576	198	
Approach Delay, s/veh	24.7			16.3	6.5	
Approach LOS	C			B	A	

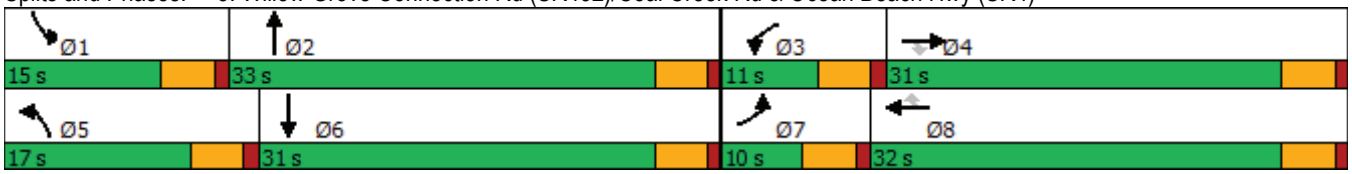
Timer - Assigned Phs		2	3	4		8
Phs Duration (G+Y+Rc), s		34.6	8.7	12.6		21.3
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s		30.1	5.7	20.7		30.9
Max Q Clear Time (g_c+I1), s		3.7	4.9	6.7		7.7
Green Ext Time (p_c), s		0.6	0.0	1.4		2.8

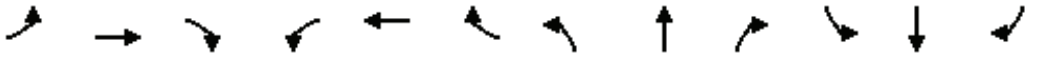
Intersection Summary	
HCM 6th Ctrl Delay	17.0
HCM 6th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	112	81	31	157	140	95	143	38	81	62	18
Future Volume (vph)	23	112	81	31	157	140	95	143	38	81	62	18
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%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			Free
Detector Phase	7	4	4	3	8	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		5.0	5.0	
Minimum Split (s)	9.5	30.4	30.4	9.5	26.4	26.4	9.5	31.5		9.5	22.9	
Total Split (s)	10.0	31.0	31.0	11.0	32.0	32.0	17.0	33.0		15.0	31.0	
Total Split (%)	11.1%	34.4%	34.4%	12.2%	35.6%	35.6%	18.9%	36.7%		16.7%	34.4%	
Yellow Time (s)	3.5	3.5	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		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	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		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	Max		None	Max	
Act Effct Green (s)	5.8	11.8	11.8	6.4	12.1	12.1	9.2	30.1	65.2	8.5	29.5	65.2
Actuated g/C Ratio	0.09	0.18	0.18	0.10	0.19	0.19	0.14	0.46	1.00	0.13	0.45	1.00
v/c Ratio	0.16	0.36	0.22	0.19	0.49	0.36	0.41	0.18	0.03	0.37	0.08	0.01
Control Delay	36.3	28.6	3.6	35.6	30.5	7.6	34.2	15.9	0.0	34.8	16.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.3	28.6	3.6	35.6	30.5	7.6	34.2	15.9	0.0	34.8	16.3	0.0
LOS	D	C	A	D	C	A	C	B	A	C	B	A
Approach Delay		20.1			21.3			20.0			23.8	
Approach LOS		C			C			C			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 65.2	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 21.1	Intersection LOS: C
Intersection Capacity Utilization 39.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Willow Grove Connection Rd (SR432)/Coal Creek Rd & Ocean Beach Hwy (SR4)





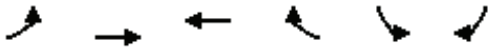
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	112	81	31	157	140	95	143	38	81	62	18
Future Volume (veh/h)	23	112	81	31	157	140	95	143	38	81	62	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		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	1885	1885	1885	1900	1900	1900
Adj Flow Rate, veh/h	25	122	88	34	171	152	103	155	0	88	67	0
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	1	1	1	1	1	1	0	0	0
Cap, veh/h	51	259	220	64	271	230	135	883		115	868	
Arrive On Green	0.03	0.14	0.14	0.04	0.14	0.14	0.08	0.47	0.00	0.06	0.46	0.00
Sat Flow, veh/h	1810	1900	1610	1795	1885	1598	1795	1885	1598	1810	1900	1610
Grp Volume(v), veh/h	25	122	88	34	171	152	103	155	0	88	67	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1610	1795	1885	1598	1795	1885	1598	1810	1900	1610
Q Serve(g_s), s	0.8	3.6	3.0	1.1	5.2	5.5	3.4	2.9	0.0	2.9	1.2	0.0
Cycle Q Clear(g_c), s	0.8	3.6	3.0	1.1	5.2	5.5	3.4	2.9	0.0	2.9	1.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	51	259	220	64	271	230	135	883		115	868	
V/C Ratio(X)	0.49	0.47	0.40	0.53	0.63	0.66	0.76	0.18		0.76	0.08	
Avail Cap(c_a), veh/h	164	827	701	192	852	722	369	883		312	868	
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	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.1	24.3	24.0	28.8	24.5	24.6	27.6	9.4	0.0	28.0	9.3	0.0
Incr Delay (d2), s/veh	7.0	1.3	1.2	6.5	2.4	3.2	8.7	0.4	0.0	10.0	0.2	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	1.6	1.1	0.6	2.3	2.1	1.6	1.0	0.0	1.5	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.1	25.6	25.2	35.4	26.9	27.9	36.3	9.8	0.0	38.1	9.5	0.0
LnGrp LOS	D	C	C	D	C	C	D	A		D	A	
Approach Vol, veh/h		235			357			258			155	
Approach Delay, s/veh		26.6			28.1			20.4			25.7	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	33.0	6.7	12.8	9.1	32.3	6.2	13.3
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	10.5	28.5	6.5	26.5	12.5	26.5	5.5	27.5
Max Q Clear Time (g_c+I1), s	4.9	4.9	3.1	5.6	5.4	3.2	2.8	7.5
Green Ext Time (p_c), s	0.1	0.7	0.0	0.8	0.1	0.3	0.0	1.3

Intersection Summary	
HCM 6th Ctrl Delay	25.4
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	38	262	115	74	83	15
Future Volume (vph)	38	262	115	74	83	15
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Heavy Vehicles (%)	0%	0%	2%	2%	0%	0%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		

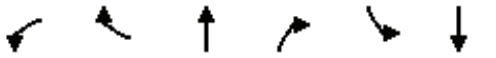
Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	262	115	74	83	15
Future Vol, veh/h	38	262	115	74	83	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	0	0	2	2	0	0
Mvmt Flow	51	349	153	99	111	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	252	0	-	0	654	203
Stage 1	-	-	-	-	203	-
Stage 2	-	-	-	-	451	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1325	-	-	-	435	843
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	646	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1325	-	-	-	414	843
Mov Cap-2 Maneuver	-	-	-	-	414	-
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	646	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	16.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1325	-	-	-	449
HCM Lane V/C Ratio	0.038	-	-	-	0.291
HCM Control Delay (s)	7.8	0	-	-	16.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.2



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	39	134	60	58	147	58
Future Volume (vph)	39	134	60	58	147	58
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.62	0.62	0.62	0.62	0.62	0.62
Heavy Vehicles (%)	1%	1%	1%	1%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 25.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	6.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	39	134	60	58	147	58
Future Vol, veh/h	39	134	60	58	147	58
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	60	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	62	62	62	62	62	62
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	63	216	97	94	237	94

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	714	146	0	0	192	0
Stage 1	145	-	-	-	-	-
Stage 2	569	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.2	-
Pot Cap-1 Maneuver	399	904	-	-	1394	-
Stage 1	885	-	-	-	-	-
Stage 2	568	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	330	902	-	-	1393	-
Mov Cap-2 Maneuver	330	-	-	-	-	-
Stage 1	884	-	-	-	-	-
Stage 2	471	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.1	0	5.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	330	902	1393	-
HCM Lane V/C Ratio	-	-	0.191	0.24	0.17	-
HCM Control Delay (s)	-	-	18.5	10.2	8.1	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0.9	0.6	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	21	7	2	196	203	8
Future Volume (vph)	21	7	2	196	203	8
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization	21.9%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	21	7	2	196	203	8
Future Vol, veh/h	21	7	2	196	203	8
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, %	0	0	1	1	1	1
Mvmt Flow	23	8	2	218	226	9

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	453	231	235	0	-	0
Stage 1	231	-	-	-	-	-
Stage 2	222	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.11	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.209	-	-	-
Pot Cap-1 Maneuver	568	813	1338	-	-	-
Stage 1	812	-	-	-	-	-
Stage 2	820	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	567	813	1338	-	-	-
Mov Cap-2 Maneuver	567	-	-	-	-	-
Stage 1	810	-	-	-	-	-
Stage 2	820	-	-	-	-	-

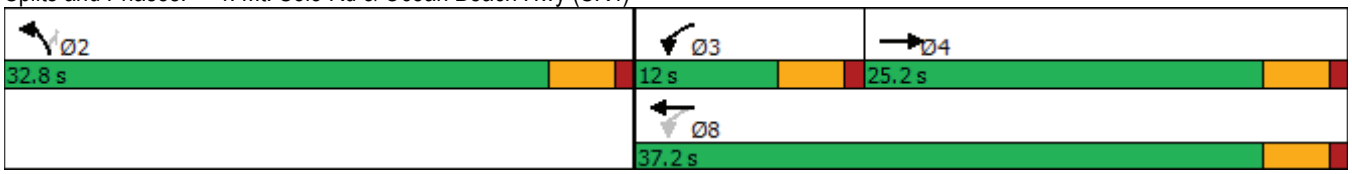
Approach	EB	NB	SB
HCM Control Delay, s	11.2	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1338	-	613	-	-
HCM Lane V/C Ratio	0.002	-	0.051	-	-
HCM Control Delay (s)	7.7	0	11.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	372	61	150	127	60	224
Future Volume (vph)	372	61	150	127	60	224
Confl. Peds. (#/hr)		1	2		1	2
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases			8			2
Detector Phase	4		3	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	25.2		9.5	25.2	32.1	32.1
Total Split (s)	25.2		12.0	37.2	32.8	32.8
Total Split (%)	36.0%		17.1%	53.1%	46.9%	46.9%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None		None	None	Max	Max
Act Effct Green (s)	14.6		26.5	26.5	28.4	28.4
Actuated g/C Ratio	0.23		0.41	0.41	0.44	0.44
v/c Ratio	0.63		0.52	0.10	0.09	0.31
Control Delay	24.5		17.6	11.3	12.0	3.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	24.5		17.6	11.3	12.0	3.1
LOS	C		B	B	B	A
Approach Delay	24.5			14.7	5.0	
Approach LOS	C			B	A	

Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 63.9	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 16.2	Intersection LOS: B
Intersection Capacity Utilization 55.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: Mt. Solo Rd & Ocean Beach Hwy (SR4)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	372	61	150	127	60	224
Future Volume (veh/h)	372	61	150	127	60	224
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	448	73	181	153	72	270
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	642	104	368	1383	847	754
Arrive On Green	0.21	0.21	0.10	0.38	0.47	0.47
Sat Flow, veh/h	3204	504	1810	3705	1810	1610
Grp Volume(v), veh/h	259	262	181	153	72	270
Grp Sat Flow(s),veh/h/ln	1805	1808	1810	1805	1810	1610
Q Serve(g_s), s	8.0	8.1	4.4	1.7	1.3	6.5
Cycle Q Clear(g_c), s	8.0	8.1	4.4	1.7	1.3	6.5
Prop In Lane		0.28	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	373	373	368	1383	847	754
V/C Ratio(X)	0.69	0.70	0.49	0.11	0.08	0.36
Avail Cap(c_a), veh/h	618	619	408	1953	847	754
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	22.2	22.3	15.6	12.0	8.9	10.3
Incr Delay (d2), s/veh	2.3	2.4	1.0	0.0	0.2	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	3.3	1.6	0.6	0.5	2.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.5	24.7	16.6	12.1	9.1	11.6
LnGrp LOS	C	C	B	B	A	B
Approach Vol, veh/h	521			334	342	
Approach Delay, s/veh	24.6			14.5	11.1	
Approach LOS	C			B	B	

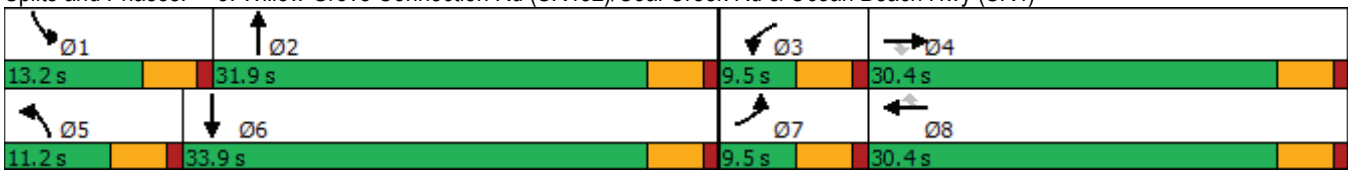
Timer - Assigned Phs		2	3	4		8
Phs Duration (G+Y+Rc), s		32.8	10.7	17.0		27.7
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s		28.3	7.5	20.7		32.7
Max Q Clear Time (g_c+I1), s		8.5	6.4	10.1		3.7
Green Ext Time (p_c), s		1.1	0.1	2.1		0.9

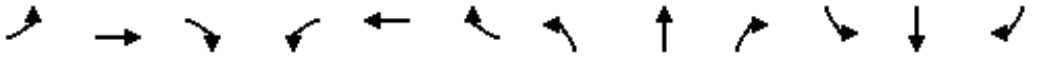
Intersection Summary	
HCM 6th Ctrl Delay	17.9
HCM 6th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	148	100	18	66	52	45	32	16	147	111	14
Future Volume (vph)	8	148	100	18	66	52	45	32	16	147	111	14
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	3%	3%	3%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			Free
Detector Phase	7	4	4	3	8	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		5.0	5.0	
Minimum Split (s)	9.5	30.4	30.4	9.5	26.4	26.4	9.5	31.5		9.5	22.9	
Total Split (s)	9.5	30.4	30.4	9.5	30.4	30.4	11.2	31.9		13.2	33.9	
Total Split (%)	11.2%	35.8%	35.8%	11.2%	35.8%	35.8%	13.2%	37.5%		15.5%	39.9%	
Yellow Time (s)	3.5	3.5	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		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	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		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	Max		None	Max	
Act Effct Green (s)	5.1	11.9	11.9	5.1	11.9	11.9	6.5	27.9	63.8	8.8	34.8	63.8
Actuated g/C Ratio	0.08	0.19	0.19	0.08	0.19	0.19	0.10	0.44	1.00	0.14	0.55	1.00
v/c Ratio	0.06	0.47	0.27	0.14	0.21	0.14	0.28	0.04	0.01	0.65	0.12	0.01
Control Delay	32.6	27.7	5.1	33.6	23.3	0.7	33.9	13.8	0.0	43.5	11.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.6	27.7	5.1	33.6	23.3	0.7	33.9	13.8	0.0	43.5	11.9	0.0
LOS	C	C	A	C	C	A	C	B	A	D	B	A
Approach Delay		19.0			16.0			21.1			28.3	
Approach LOS		B			B			C			C	

Intersection Summary	
Cycle Length: 85	
Actuated Cycle Length: 63.8	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 22.1	Intersection LOS: C
Intersection Capacity Utilization 37.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Willow Grove Connection Rd (SR432)/Coal Creek Rd & Ocean Beach Hwy (SR4)





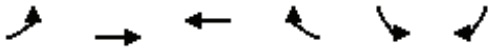
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	148	100	18	66	52	45	32	16	147	111	14
Future Volume (veh/h)	8	148	100	18	66	52	45	32	16	147	111	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		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	1885	1885	1885	1900	1900	1900	1856	1856	1856	1900	1900	1900
Adj Flow Rate, veh/h	9	164	111	20	73	58	50	36	0	163	123	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1	0	0	0	3	3	3	0	0	0
Cap, veh/h	21	249	211	43	274	232	82	818		205	965	
Arrive On Green	0.01	0.13	0.13	0.02	0.14	0.14	0.05	0.44	0.00	0.11	0.51	0.00
Sat Flow, veh/h	1795	1885	1598	1810	1900	1610	1767	1856	1572	1810	1900	1610
Grp Volume(v), veh/h	9	164	111	20	73	58	50	36	0	163	123	0
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	1810	1900	1610	1767	1856	1572	1810	1900	1610
Q Serve(g_s), s	0.3	5.1	4.0	0.7	2.1	2.0	1.7	0.7	0.0	5.5	2.1	0.0
Cycle Q Clear(g_c), s	0.3	5.1	4.0	0.7	2.1	2.0	1.7	0.7	0.0	5.5	2.1	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	21	249	211	43	274	232	82	818		205	965	
V/C Ratio(X)	0.43	0.66	0.53	0.47	0.27	0.25	0.61	0.04		0.79	0.13	
Avail Cap(c_a), veh/h	145	786	666	146	792	671	191	818		253	965	
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	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.5	25.6	25.1	30.0	23.7	23.6	29.1	9.9	0.0	26.8	8.0	0.0
Incr Delay (d2), s/veh	13.6	2.9	2.0	7.9	0.5	0.6	7.1	0.1	0.0	13.0	0.3	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	0.2	2.3	1.5	0.4	0.9	0.7	0.8	0.2	0.0	2.9	0.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.1	28.6	27.2	37.8	24.2	24.2	36.1	10.0	0.0	39.8	8.3	0.0
LnGrp LOS	D	C	C	D	C	C	D	A		D	A	
Approach Vol, veh/h		284			151			86			286	
Approach Delay, s/veh		28.5			26.0			25.2			26.3	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.6	31.9	6.0	12.7	7.4	36.1	5.2	13.5
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	8.7	27.4	5.0	25.9	6.7	29.4	5.0	25.9
Max Q Clear Time (g_c+I1), s	7.5	2.7	2.7	7.1	3.7	4.1	2.3	4.1
Green Ext Time (p_c), s	0.1	0.1	0.0	1.1	0.0	0.6	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	26.9
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	8	188	320	91	47	7
Future Volume (vph)	8	188	320	91	47	7
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Shared Lane Traffic (%)						
Sign Control		Free	Free		Stop	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 32.4%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	188	320	91	47	7
Future Vol, veh/h	8	188	320	91	47	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	9	214	364	103	53	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	467	0	-	0	648	416
Stage 1	-	-	-	-	416	-
Stage 2	-	-	-	-	232	-
Critical Hdwy	4.1	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.2	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1105	-	-	-	437	639
Stage 1	-	-	-	-	668	-
Stage 2	-	-	-	-	809	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1105	-	-	-	433	639
Mov Cap-2 Maneuver	-	-	-	-	433	-
Stage 1	-	-	-	-	662	-
Stage 2	-	-	-	-	809	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	14.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1105	-	-	-	452
HCM Lane V/C Ratio	0.008	-	-	-	0.136
HCM Control Delay (s)	8.3	0	-	-	14.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1	6	127	0	1	44
Future Volume (vph)	1	6	127	0	1	44
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization 16.7%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	6	127	0	1	44
Future Vol, veh/h	1	6	127	0	1	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	60	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1	7	143	0	1	49

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	194	143	0	0	143	0
Stage 1	143	-	-	-	-	-
Stage 2	51	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	799	910	-	-	1452	-
Stage 1	889	-	-	-	-	-
Stage 2	977	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	798	910	-	-	1452	-
Mov Cap-2 Maneuver	798	-	-	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	976	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	798	910	1452	-
HCM Lane V/C Ratio	-	-	0.001	0.007	0.001	-
HCM Control Delay (s)	-	-	9.5	9	7.5	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0	-

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	14	5	9	126	40	23
Future Volume (vph)	14	5	9	126	40	23
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop			Free	Free	

Intersection Summary			
Control Type: Unsignalized			
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	14	5	9	126	40	23
Future Vol, veh/h	14	5	9	126	40	23
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, %	0	0	0	0	0	0
Mvmt Flow	16	6	10	140	44	26

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	217	57	70	0	-	0
Stage 1	57	-	-	-	-	-
Stage 2	160	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	776	1015	1544	-	-	-
Stage 1	971	-	-	-	-	-
Stage 2	874	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	771	1015	1544	-	-	-
Mov Cap-2 Maneuver	771	-	-	-	-	-
Stage 1	964	-	-	-	-	-
Stage 2	874	-	-	-	-	-

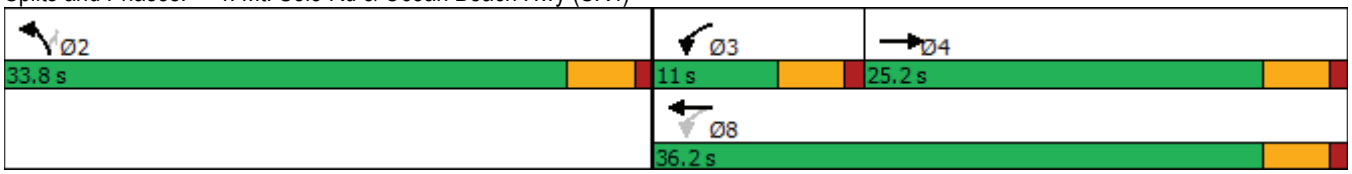
Approach	EB	NB	SB
HCM Control Delay, s	9.5	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1544	-	823	-	-
HCM Lane V/C Ratio	0.006	-	0.026	-	-
HCM Control Delay (s)	7.3	0	9.5	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	266	24	126	407	89	101
Future Volume (vph)	266	24	126	407	89	101
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases			8			2
Detector Phase	4		3	8	2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	25.2		9.5	25.2	32.1	32.1
Total Split (s)	25.2		11.0	36.2	33.8	33.8
Total Split (%)	36.0%		15.7%	51.7%	48.3%	48.3%
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None		None	None	Max	Max
Act Effct Green (s)	11.9		20.3	20.3	29.8	29.8
Actuated g/C Ratio	0.20		0.34	0.34	0.50	0.50
v/c Ratio	0.45		0.39	0.37	0.11	0.13
Control Delay	22.2		16.0	14.8	10.5	3.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	22.2		16.0	14.8	10.5	3.2
LOS	C		B	B	B	A
Approach Delay	22.2			15.1	6.7	
Approach LOS	C			B	A	

Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 59.2	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.45	
Intersection Signal Delay: 15.5	Intersection LOS: B
Intersection Capacity Utilization 31.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: Mt. Solo Rd & Ocean Beach Hwy (SR4)



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	266	24	126	407	89	101
Future Volume (veh/h)	266	24	126	407	89	101
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	299	27	142	457	100	113
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	487	44	353	1133	950	845
Arrive On Green	0.15	0.15	0.09	0.31	0.52	0.52
Sat Flow, veh/h	3445	300	1810	3705	1810	1610
Grp Volume(v), veh/h	160	166	142	457	100	113
Grp Sat Flow(s),veh/h/ln	1805	1846	1810	1805	1810	1610
Q Serve(g_s), s	4.6	4.7	3.5	5.6	1.6	2.0
Cycle Q Clear(g_c), s	4.6	4.7	3.5	5.6	1.6	2.0
Prop In Lane		0.16	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	263	269	353	1133	950	845
V/C Ratio(X)	0.61	0.62	0.40	0.40	0.11	0.13
Avail Cap(c_a), veh/h	669	685	405	2050	950	845
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	22.4	22.4	16.6	15.0	6.7	6.8
Incr Delay (d2), s/veh	2.3	2.3	0.7	0.2	0.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	2.0	1.3	1.9	0.6	0.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.7	24.7	17.4	15.3	6.9	7.1
LnGrp LOS	C	C	B	B	A	A
Approach Vol, veh/h	326			599	213	
Approach Delay, s/veh	24.7			15.8	7.0	
Approach LOS	C			B	A	

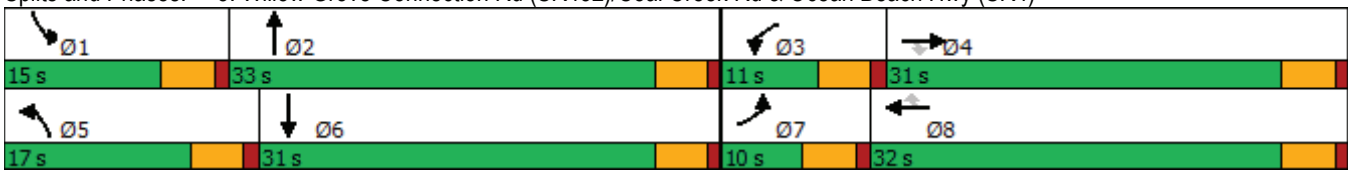
Timer - Assigned Phs		2	3	4		8
Phs Duration (G+Y+Rc), s		33.8	9.4	12.6		22.0
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s		29.3	6.5	20.7		31.7
Max Q Clear Time (g_c+I1), s		4.0	5.5	6.7		7.6
Green Ext Time (p_c), s		0.6	0.0	1.4		2.9

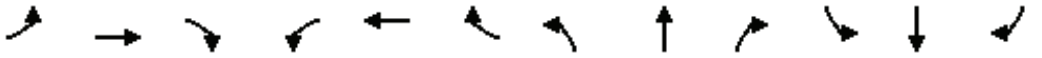
Intersection Summary	
HCM 6th Ctrl Delay	16.7
HCM 6th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	115	81	31	159	140	95	143	38	81	62	18
Future Volume (vph)	23	115	81	31	159	140	95	143	38	81	62	18
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%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			Free
Detector Phase	7	4	4	3	8	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		5.0	5.0	
Minimum Split (s)	9.5	30.4	30.4	9.5	26.4	26.4	9.5	31.5		9.5	22.9	
Total Split (s)	10.0	31.0	31.0	11.0	32.0	32.0	17.0	33.0		15.0	31.0	
Total Split (%)	11.1%	34.4%	34.4%	12.2%	35.6%	35.6%	18.9%	36.7%		16.7%	34.4%	
Yellow Time (s)	3.5	3.5	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		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	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		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Recall Mode	None	None	None	None	None	None	None	Max		None	Max	
Act Effct Green (s)	5.8	11.8	11.8	6.4	12.1	12.1	9.2	30.1	65.2	8.5	29.5	65.2
Actuated g/C Ratio	0.09	0.18	0.18	0.10	0.19	0.19	0.14	0.46	1.00	0.13	0.45	1.00
v/c Ratio	0.16	0.36	0.22	0.19	0.49	0.36	0.41	0.18	0.03	0.37	0.08	0.01
Control Delay	36.3	28.7	3.6	35.6	30.6	7.6	34.3	15.9	0.0	34.8	16.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.3	28.7	3.6	35.6	30.6	7.6	34.3	15.9	0.0	34.8	16.3	0.0
LOS	D	C	A	D	C	A	C	B	A	C	B	A
Approach Delay		20.2			21.4			20.0			23.8	
Approach LOS		C			C			C			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 65.2	
Natural Cycle: 85	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 21.1	Intersection LOS: C
Intersection Capacity Utilization 39.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Willow Grove Connection Rd (SR432)/Coal Creek Rd & Ocean Beach Hwy (SR4)





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	115	81	31	159	140	95	143	38	81	62	18
Future Volume (veh/h)	23	115	81	31	159	140	95	143	38	81	62	18
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		1.00	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	1885	1885	1885	1900	1900	1900
Adj Flow Rate, veh/h	25	125	88	34	173	152	103	155	0	88	67	0
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	1	1	1	1	1	1	0	0	0
Cap, veh/h	51	259	220	64	272	230	135	883		115	868	
Arrive On Green	0.03	0.14	0.14	0.04	0.14	0.14	0.08	0.47	0.00	0.06	0.46	0.00
Sat Flow, veh/h	1810	1900	1610	1795	1885	1598	1795	1885	1598	1810	1900	1610
Grp Volume(v), veh/h	25	125	88	34	173	152	103	155	0	88	67	0
Grp Sat Flow(s),veh/h/ln	1810	1900	1610	1795	1885	1598	1795	1885	1598	1810	1900	1610
Q Serve(g_s), s	0.8	3.7	3.0	1.1	5.3	5.5	3.4	2.9	0.0	2.9	1.2	0.0
Cycle Q Clear(g_c), s	0.8	3.7	3.0	1.1	5.3	5.5	3.4	2.9	0.0	2.9	1.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	51	259	220	64	272	230	135	883		115	868	
V/C Ratio(X)	0.49	0.48	0.40	0.53	0.64	0.66	0.76	0.18		0.76	0.08	
Avail Cap(c_a), veh/h	164	827	701	192	852	722	369	883		312	868	
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	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.1	24.3	24.0	28.8	24.5	24.6	27.6	9.4	0.0	28.1	9.3	0.0
Incr Delay (d2), s/veh	7.0	1.4	1.2	6.5	2.5	3.2	8.7	0.4	0.0	10.0	0.2	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	1.6	1.1	0.6	2.3	2.1	1.6	1.0	0.0	1.5	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.2	25.7	25.2	35.4	27.0	27.8	36.3	9.8	0.0	38.1	9.5	0.0
LnGrp LOS	D	C	C	D	C	C	D	A		D	A	
Approach Vol, veh/h		238			359			258			155	
Approach Delay, s/veh		26.6			28.2			20.4			25.7	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	33.0	6.7	12.8	9.1	32.3	6.2	13.3
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	10.5	28.5	6.5	26.5	12.5	26.5	5.5	27.5
Max Q Clear Time (g_c+I1), s	4.9	4.9	3.1	5.7	5.4	3.2	2.8	7.5
Green Ext Time (p_c), s	0.1	0.7	0.0	0.8	0.1	0.3	0.0	1.3

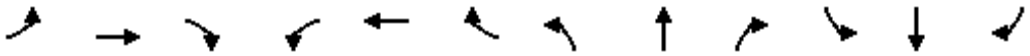
Intersection Summary	
HCM 6th Ctrl Delay	25.4
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	505	166	148	66	240
v/c Ratio	0.62	0.47	0.10	0.08	0.28
Control Delay	24.4	16.5	11.3	11.9	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	24.4	16.5	11.3	11.9	3.1
Queue Length 50th (ft)	87	40	17	14	0
Queue Length 95th (ft)	117	67	29	36	30
Internal Link Dist (ft)	587		550	738	
Turn Bay Length (ft)		130		80	
Base Capacity (vph)	1169	355	1863	806	844
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.43	0.47	0.08	0.08	0.28

Intersection Summary



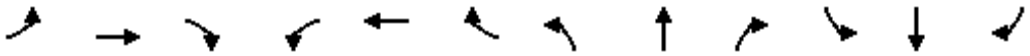
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	9	159	107	19	68	56	47	34	18	159	120	16
v/c Ratio	0.06	0.46	0.26	0.13	0.19	0.14	0.27	0.04	0.01	0.65	0.12	0.01
Control Delay	32.6	27.5	4.7	33.5	23.2	0.7	33.7	13.6	0.0	43.6	11.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.6	27.5	4.7	33.5	23.2	0.7	33.7	13.6	0.0	43.6	11.8	0.0
Queue Length 50th (ft)	3	53	0	7	21	0	16	6	0	55	22	0
Queue Length 95th (ft)	19	115	24	30	57	0	56	30	0	#184	77	0
Internal Link Dist (ft)		600			585			509			302	
Turn Bay Length (ft)	155		375	150			120		115	120		55
Base Capacity (vph)	142	777	740	144	785	746	184	812	1568	245	1040	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.20	0.14	0.13	0.09	0.08	0.26	0.04	0.01	0.65	0.12	0.01

Intersection Summary

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

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	312	112	444	94	94
v/c Ratio	0.44	0.30	0.36	0.10	0.11
Control Delay	22.3	14.7	14.7	10.4	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.3	14.7	14.7	10.4	3.4
Queue Length 50th (ft)	52	27	60	17	0
Queue Length 95th (ft)	82	54	87	50	23
Internal Link Dist (ft)	587		550	738	
Turn Bay Length (ft)		130		80	
Base Capacity (vph)	1279	373	1969	910	861
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.24	0.30	0.23	0.10	0.11

Intersection Summary

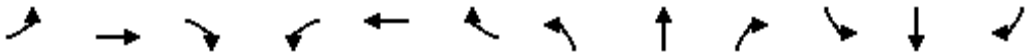


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	24	118	84	33	165	148	99	151	40	86	65	18
v/c Ratio	0.15	0.35	0.21	0.19	0.48	0.36	0.42	0.17	0.03	0.37	0.07	0.01
Control Delay	36.2	28.7	3.3	35.6	30.6	7.7	35.5	15.7	0.0	34.7	15.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.2	28.7	3.3	35.6	30.6	7.7	35.5	15.7	0.0	34.7	15.5	0.0
Queue Length 50th (ft)	9	40	0	12	57	0	34	31	0	30	13	0
Queue Length 95th (ft)	36	95	15	45	125	43	97	102	0	87	51	0
Internal Link Dist (ft)		600			585			509			302	
Turn Bay Length (ft)	155		375	150			120		115	120		55
Base Capacity (vph)	158	803	755	185	824	784	299	877	1599	302	880	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.15	0.11	0.18	0.20	0.19	0.33	0.17	0.03	0.28	0.07	0.01

Intersection Summary

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	520	172	153	69	249
v/c Ratio	0.63	0.50	0.10	0.09	0.29
Control Delay	24.6	17.0	11.3	12.0	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	24.6	17.0	11.3	12.0	3.1
Queue Length 50th (ft)	91	41	18	14	0
Queue Length 95th (ft)	121	69	30	37	30
Internal Link Dist (ft)	587		550	738	
Turn Bay Length (ft)		130		80	
Base Capacity (vph)	1165	351	1856	803	847
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.45	0.49	0.08	0.09	0.29

Intersection Summary



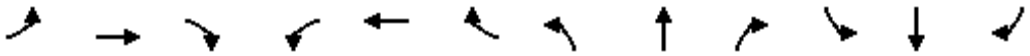
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	9	163	111	20	70	58	50	36	18	163	123	16
v/c Ratio	0.06	0.47	0.27	0.14	0.20	0.14	0.28	0.04	0.01	0.65	0.12	0.01
Control Delay	32.6	27.7	5.1	33.6	23.2	0.7	33.9	13.8	0.0	43.4	11.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.6	27.7	5.1	33.6	23.2	0.7	33.9	13.8	0.0	43.4	11.9	0.0
Queue Length 50th (ft)	3	54	0	7	22	0	17	7	0	56	23	0
Queue Length 95th (ft)	19	118	27	31	58	0	58	32	0	#188	79	0
Internal Link Dist (ft)		600			585			509			302	
Turn Bay Length (ft)	155		375	150			120		115	120		55
Base Capacity (vph)	142	776	739	143	784	746	187	805	1568	250	1038	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.21	0.15	0.14	0.09	0.08	0.27	0.04	0.01	0.65	0.12	0.01

Intersection Summary

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

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	323	119	457	98	100
v/c Ratio	0.45	0.34	0.38	0.11	0.11
Control Delay	22.4	15.9	15.4	10.0	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.4	15.9	15.4	10.0	3.2
Queue Length 50th (ft)	53	29	63	17	0
Queue Length 95th (ft)	84	58	92	50	24
Internal Link Dist (ft)	587		550	738	
Turn Bay Length (ft)		130		80	
Base Capacity (vph)	1270	347	1906	928	879
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.25	0.34	0.24	0.11	0.11

Intersection Summary

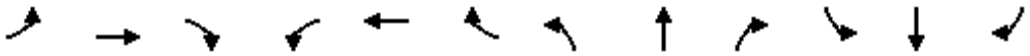


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	25	122	88	34	171	152	103	155	41	88	67	20
v/c Ratio	0.16	0.36	0.22	0.19	0.49	0.36	0.41	0.18	0.03	0.37	0.08	0.01
Control Delay	36.3	28.6	3.6	35.6	30.5	7.6	34.2	15.9	0.0	34.8	16.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.3	28.6	3.6	35.6	30.5	7.6	34.2	15.9	0.0	34.8	16.3	0.0
Queue Length 50th (ft)	9	41	0	12	59	0	35	32	0	30	13	0
Queue Length 95th (ft)	37	98	18	46	129	44	98	104	0	89	55	0
Internal Link Dist (ft)		600			585			509			302	
Turn Bay Length (ft)	155		375	150			120		115	120		55
Base Capacity (vph)	159	808	760	186	830	791	358	869	1599	304	859	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.15	0.12	0.18	0.21	0.19	0.29	0.18	0.03	0.29	0.08	0.01

Intersection Summary

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	521	181	153	72	270
v/c Ratio	0.63	0.52	0.10	0.09	0.31
Control Delay	24.5	17.6	11.3	12.0	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	24.5	17.6	11.3	12.0	3.1
Queue Length 50th (ft)	91	44	18	15	0
Queue Length 95th (ft)	121	73	30	38	31
Internal Link Dist (ft)	587		550	738	
Turn Bay Length (ft)		130		80	
Base Capacity (vph)	1163	351	1854	802	858
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.45	0.52	0.08	0.09	0.31

Intersection Summary



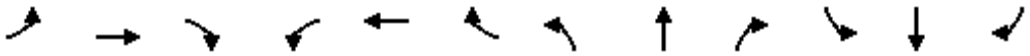
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	9	164	111	20	73	58	50	36	18	163	123	16
v/c Ratio	0.06	0.47	0.27	0.14	0.21	0.14	0.28	0.04	0.01	0.65	0.12	0.01
Control Delay	32.6	27.7	5.1	33.6	23.3	0.7	33.9	13.8	0.0	43.5	11.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.6	27.7	5.1	33.6	23.3	0.7	33.9	13.8	0.0	43.5	11.9	0.0
Queue Length 50th (ft)	3	54	0	7	23	0	17	7	0	56	23	0
Queue Length 95th (ft)	19	118	27	31	60	0	58	32	0	#188	79	0
Internal Link Dist (ft)		600			585			509			302	
Turn Bay Length (ft)	155		375	150			120		115	120		55
Base Capacity (vph)	142	776	739	143	783	745	187	805	1568	249	1037	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.21	0.15	0.14	0.09	0.08	0.27	0.04	0.01	0.65	0.12	0.01

Intersection Summary

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

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	326	142	457	100	113
v/c Ratio	0.45	0.39	0.37	0.11	0.13
Control Delay	22.2	16.0	14.8	10.5	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	16.0	14.8	10.5	3.2
Queue Length 50th (ft)	54	35	61	18	0
Queue Length 95th (ft)	84	66	90	53	25
Internal Link Dist (ft)	587		550	738	
Turn Bay Length (ft)		130		80	
Base Capacity (vph)	1276	369	1964	907	868
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.26	0.38	0.23	0.11	0.13

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	25	125	88	34	173	152	103	155	41	88	67	20
v/c Ratio	0.16	0.36	0.22	0.19	0.49	0.36	0.41	0.18	0.03	0.37	0.08	0.01
Control Delay	36.3	28.7	3.6	35.6	30.6	7.6	34.3	15.9	0.0	34.8	16.3	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.3	28.7	3.6	35.6	30.6	7.6	34.3	15.9	0.0	34.8	16.3	0.0
Queue Length 50th (ft)	9	42	0	12	59	0	35	32	0	30	13	0
Queue Length 95th (ft)	37	100	18	46	131	44	98	104	0	89	55	0
Internal Link Dist (ft)		600			585			509			302	
Turn Bay Length (ft)	155		375	150			120		115	120		55
Base Capacity (vph)	159	809	761	186	831	791	359	868	1599	304	858	1615
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.15	0.12	0.18	0.21	0.19	0.29	0.18	0.03	0.29	0.08	0.01

Intersection Summary